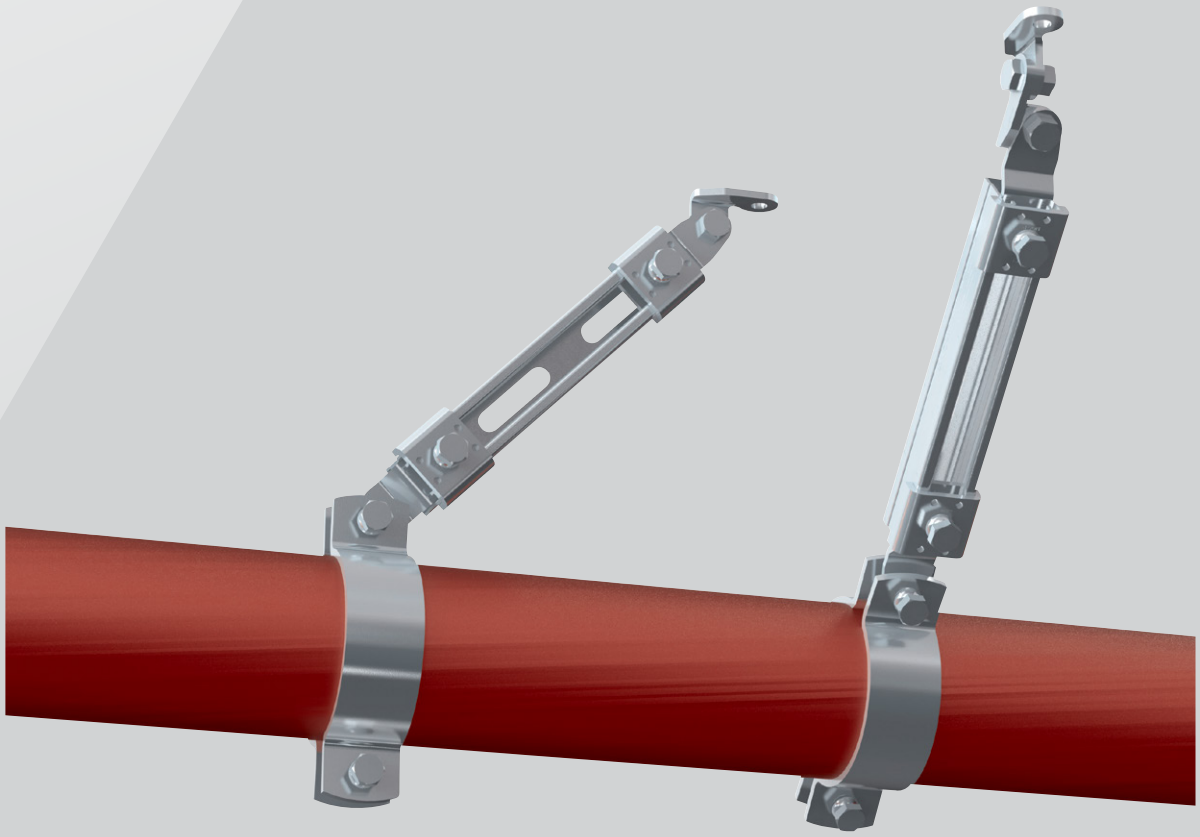
MECHANICAL ANCHORS FOR SEISMIC BRACING

NFPA 13 seismic bracing anchor load tables



HILTI MECHANICAL ANCHORS AND CAST-IN ANCHORS FOR SEISMIC BRACING IN ACCORDANCE WITH NFPA 13

Hilti post-installed mechanical anchors and single point cast-in-place anchors are common, cost effective methods for attaching both structural and non-structural elements to concrete base materials. Non-structural elements, such as fire sprinkler pipes; electrical conduit and cable trays; heating, ventilation and air conditioning (HVAC) equipment and ductwork are especially suited for Hilti anchoring systems.

For fire sprinkler pipe applications, Hilti anchors have been effectively used for many years to support the gravity loaded hangers as well as the sway bracing for resisting the lateral and vertical motion resulting from seismic loads.

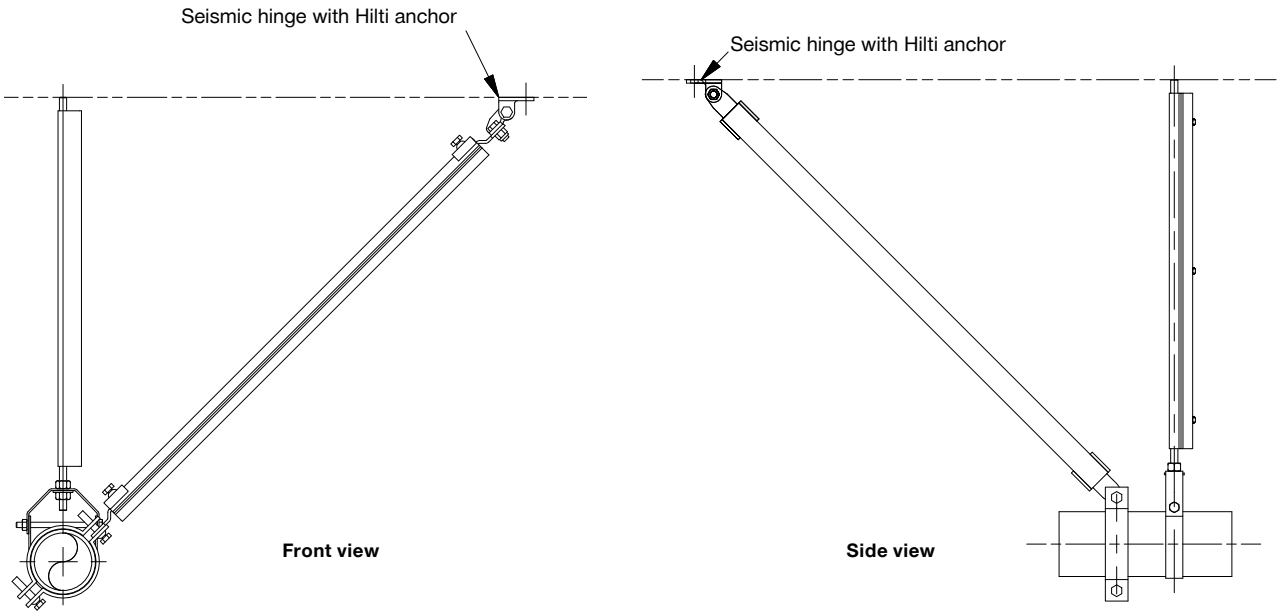


Figure 1 — Typical sprinkler pipe hanger with seismic sway

While Hilti anchors can be designed and installed to support gravity loads of the pipe through the attachment of the hanger to the concrete, this document will focus on the design of the anchorage to attach the sway brace assembly to the concrete structure. Contact Hilti for more information related to Hilti anchors to support the vertical pipe hanger.

In a seismic event the earthquake forces are resisted by the transverse and longitudinal sway bracing and the sway braces will transfer the loads through a fastener that is attached to the concrete. In general, the capacity of the fastener in concrete is dictated by a design per ACI 318 Chapter 17, and the design of the sway brace components is dictated by NFPA 13-16 Section 9.3.5 and NFPA 13-19 Section 18.5.

Note: For simplicity, this document will reference the 2016 NFPA-13 and 2019 NFPA-13 document sections.

This document will not cover the design of the components of the pipe support hangers or sway bracing. Rather, this document will provide the maximum horizontal load that can be applied to the sway brace, F_{pw}, based on the Hilti fastener type and embedment depth, fastener load capacity, the concrete strength and configuration, the sway brace to fastener connector (seismic hinge) geometry, and the brace angle. See Figure 2 on the following page. F_{pw} does not consider the adequacy of the seismic hinge or other components of the sway bracing or vertical hanger. The design engineer of record must ensure all of these components are suitable for the application and design loads.

This document is a supplement to the Hilti North American Product Technical Guide, Volume 2, Anchor Fastening Technical Guide, Edition 21 (PTG Ed. 21). Please refer to the publication in its entirety, which is available at www.hilti.com or www.hilti.ca, for complete details including data development, product specifications, general suitability, installation, corrosion and spacing and edge distance guidelines, for the Hilti anchoring systems noted within.

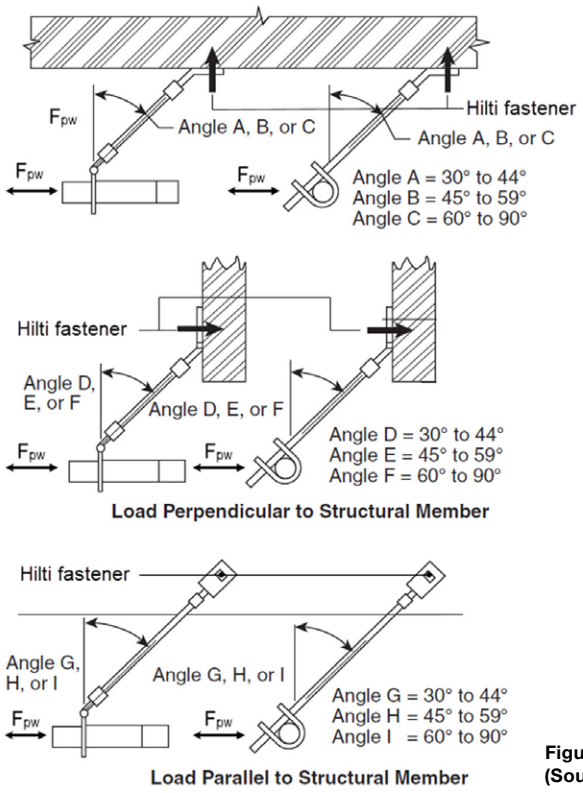


Figure 2 — Sway brace load, F_{pw}, from typical sway brace configuration (Source: NFPA 13 2016 Edition Figure 9.3.5.12.1 and NFPA 13 2019 Edition Figure 18.5.12.1)

Horizontal earthquake load design per NFPA-13

The maximum horizontal earthquake load, F_{pw} that will not exceed the allowable capacity of the anchor, can be derived from NFPA 13-16 Eq. A.9.3.5.12.2a and NFPA 13-19 Eq. A18.5.12.2a:

$$\left(\frac{T}{T_{allow}}\right)+\left(\frac{V}{V_{allow}}\right)\leq 1.2$$

where:

T = applied service tension load, including the effect of prying = F_{pw} x P_r for all Angle Categories

F_{pw} = horizontal earthquake load

P_r = prying factor based on fitting geometry and brace angle from vertical as determined from NFPA 13-16 A.9.3.5.12.2 and NFPA 13-19 A18.5.12.2

T_{allow} = allowable service tension load

V = applied service shear load =

Angle Category A, B, and C: $V = F_{pw}$

Angle Category D, E, and F: $V=\frac{F_{pw}}{\tan\theta}$

Angle Category G, H, and I: $V=\frac{F_{pw}}{\sin\theta}$

θ = brace angle (see Figure 2)

V_{allow} = allowable service shear load

T/T_{allow} shall not be greater than 1.0

V/V_{allow} shall not be greater than 1.0

Substituting for T and V for the various angle categories:

Angle Category A, B, and C:

$$\left(\frac{F_{pw}\cdot P_r}{T_{allow}}\right)+\left(\frac{F_{pw}}{V_{allow}}\right)\leq 1.2$$

where:

$F_{pw}\cdot P_r / T_{allow} \leq 1.0$

$F_{pw} / V_{allow} \leq 1.0$

Angle Category D, E, and F:

$$\left(\frac{F_{pw}\cdot P_r}{T_{allow}}\right)+\left(\frac{F_{pw}/\tan\theta}{V_{allow}}\right)\leq 1.2$$

where:

$F_{pw}\cdot P_r / T_{allow} \leq 1.0$

$(F_{pw} / \tan\theta) / V_{allow} \leq 1.0$

Angle Category G, H, and I:

$$\left(\frac{F_{pw}\cdot P_r}{T_{allow}}\right)+\left(\frac{F_{pw}/\sin\theta}{V_{allow}}\right)\leq 1.2$$

where:

$F_{pw}\cdot P_r / T_{allow} \leq 1.0$

$(F_{pw} / \sin\theta) / V_{allow} \leq 1.0$

Design Tables for Pre-calculated Horizontal Earthquake Load

The design tables starting on page 8 determine the maximum horizontal load, F_{pw}, that will satisfy NFPA 13-16 Eq. A.9.3.5.12.2a and NFPA 13-19 Eq. A18.5.12.2a, for various Hilti post-installed and cast-in anchors used in conjunction with various seismic brace swivel attachments to attach the sway brace to concrete.

Notes:

- T_{allow} and V_{allow} used as the calculation basis for F_{pw} in the tables are determined from a strength design calculation according to ACI 318 Ch. 17 and converted to allowable values per NFPA 13-16 A.9.3.5.12.8.3(D) and NFPA 13-19 A18.5.12.7.3(D).
- Anchor calculation assumes cracked concrete condition and seismic design category C through F.
- Minimum edge distance noted in tables assumes a single anchor with one nearby edge with the shear load perpendicular toward the edge. For an anchor in a corner, the distance to the edge parallel to the direction of the shear must be at least 1.5 times the minimum edge distance noted in the table.
- Minimum spacing distance noted in tables assumes two anchors in the middle of the concrete with no edge distance reductions.
- Seismic brace swivel attachment prying factors noted in the tables are from data published according to the following documents
  - Hilti MQS-SP-L-1/2” and MQS-SP-T-1/2” seismic hinge prying factors taken from Hilti Statement on the Prying Factors in regard to Hilti Seismic hinge (all sizes) technical document, dated November 18, 2019.
  - Tolco™ Figure 909, 910, and 980 swivel brace attachment prying factors taken from Seismic Bracing Anchor Load Charts B-Line series technical publication, given by Tolco on March 1st, 2021.
  - Afcon™ AF075, AF076, AF077, AF771, and AF700 swivel brace attachment prying factors taken from Anvil International’s Seismic Technical Information, downloaded March 1st, 2021.
  - The above noted documents are subject to change. Contact Hilti for copies of the reference documents noted above.
  - Contact Hilti for copies of the reference documents noted above.
  - TOLCO™ trademark is owned by Eaton Corporation plc.
  - AFCON™ trademark is owned by Anvil International LLC.
- Prying factors are provided that give the highest value for the given angle category. The corresponding value of P_r and F_{pw} will be conservative for the other angles within the angle category.
- For angle categories D to I, the angle, θ, is selected that leads to the highest value for the applied shear load, V. The corresponding value of F_{pw} will be conservative for the other angles within the angle category. θ = 30° for Angle D and G, θ = 45° for Angle E and H, and θ = 60° or 75° for Angle F and I.
- F_{pw} does not consider the adequacy of the seismic hinge or other components of the sway bracing or vertical hanger. The design engineer of record must ensure all components are suitable for the application and design loads.
- Values in tables are applicable for noted concrete compressive strength and for concrete with higher compressive strengths.
- For applications outside of the above noted parameters, contact Hilti for assistance.

Design Example:

We will use a carbon steel 1/2-in. diameter x 3-1/4-in. effective embedment depth Hilti KWIK Bolt TZ2 (KB-TZ2) expansion anchor to attach a Hilti seismic lateral brace into 3,000 psi normal weight concrete. We will assume the concrete is cracked for the seismic design. We will assume the anchor is in the middle of a concrete slab (no edge or anchor spacing influence). We will use a Hilti MQS-SP-L-1/2" seismic hinge with a brace angle of 45 degrees (Angle B) attached to the underside of the concrete. Prying factor for this specific hinge in angle category B is 1.580.

The LRFD tension and shear capacity of the KB-TZ2 is determined through a calculation per ACI 318 Ch. 17 based on the design variables from ICC-ES ESR-4266. A design using the Hilti PROFIS Engineering design software yielded the following LRFD capacities (design is performed in cracked concrete with seismic reduction factors per ACI 318-19 17.10.5.4):

T_{LRFD} = 2,660 lb.

V_{LRFD} = 4,471 lb.

To convert the values to an Allowable Stress Design (ASD) value, multiply the LRFD value by 0.43 (NFPA 13-16 A.9.3.5.12.8.3(D)) or NFPA 13-19 A18.5.12.7.3(D).

T_{allow} = 2,660 · 0.43 = 1,144 lb.

V_{allow} = 4,471 · 0.43 = 1,923 lb.

We will calculate a maximum horizontal shear, F_{pw} = 631 lb. Thus:

$$\left(\frac{F_{pw} \cdot P_r}{T_{allow}}\right)+\left(\frac{F_{pw}}{V_{allow}}\right)=\left(\frac{631 \cdot 1.580}{1{,}144}\right)+\left(\frac{631}{1{,}923}\right) = 1.20 \le 1.2 \text{ OK}$$

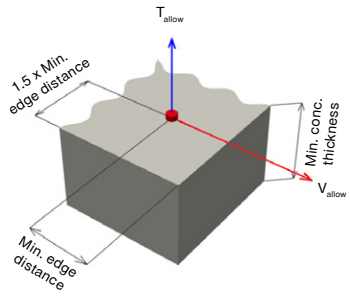
$F_{pw} \cdot P_r / T_{allow}$ = 631 · 1.580 / 1,144 = 0.87 ≤ 1.0 OK

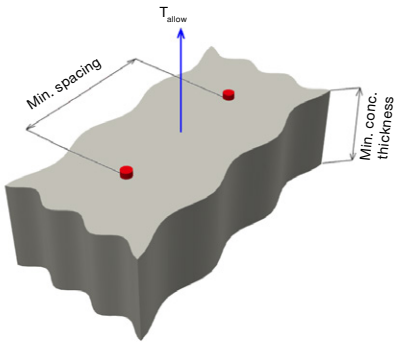
F_{pw} / V_{allow} = 631 / 1,923 = 0.33 ≤ 1.0 OK

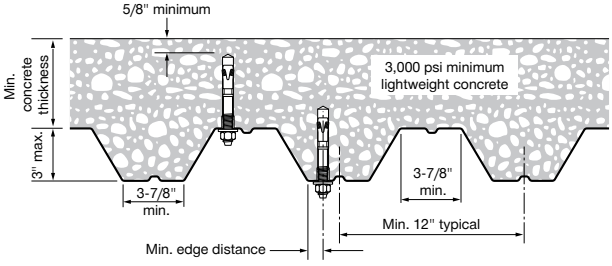
∴ Maximum horizontal load, F_{pw} = 631 lb.

Alternatively, the maximum horizontal load, F_{pw}, can be determined from the shortcut tables starting on page 8. Going to page 8, F_{pw} can be selected as shown (refer to the Hilti MQS-SP-L-1/2" table, using Angle B, for the 1/2x3-1/4 KB-TZ2 anchor).

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"									
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1-1/2	8	12	5	123	267	388	239	223	201	147	119	168	206
	2	5	6	5	166	359	522	321	300	271	198	160	227	278
	2-1/2	9-1/2	7-1/2	5	232	551	837	487	481	406	277	243	344	422
	3-1/4	8-1/2	9-3/4	5-1/2	279	631	937	561	538	471	333	280	396	485







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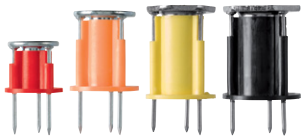

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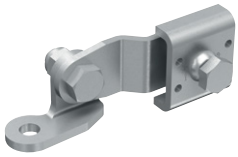

For comprehensive information on the above noted anchors reference the Hilti North American Product Technical Guide, Volume 2: Anchor Fastening Technical Guide, Edition 21, or the above noted ICC Evaluation Service reports.

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel
Hilti KWIK Bolt TZ2 in 3,000 psi normal weight cracked concrete

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1-1/2	8	12	5	123	267	388	239	223	201	147	119	168	206
	2	5	6	5	166	359	522	321	300	271	198	160	227	278
	2-1/2	9-1/2	7-1/2	5	232	551	837	487	481	406	277	243	344	422
	3-1/4	8-1/2	9-3/4	5-1/2	279	631	937	561	538	471	333	280	396	485

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1-1/2	5	8	5	167	299	323	258	186	254	238	200	130	183	224	251
	2	5-1/4	6	5	255	455	490	393	282	386	364	307	197	278	341	381
	2-1/2	5-1/4	7-1/2	5	280	488	524	426	302	418	402	347	213	301	369	413
1/2	1-1/2	8	12	5	191	342	369	295	213	290	272	228	148	209	256	286
	2	5	6	5	257	461	497	398	287	390	367	307	199	282	345	386
	2-1/2	9-1/2	7-1/2	5	383	726	791	616	456	603	521	429	309	436	534	598
	3-1/4	8-1/2	9-3/4	5-1/2	445	819	888	702	512	688	625	515	352	497	608	681
5/8	2-3/4	13	8-1/4	5	442	902	989	757	570	740	601	495	379	536	656	734
	3-1/4	12	9-3/4	5-1/2	567	1078	1175	915	677	896	772	636	459	648	793	887
	4	11	12	6	617	1153	1254	984	723	964	853	703	493	696	852	954
3/4	3-1/4	15-1/4	9-3/4	5-1/2	567	1172	1288	982	742	960	772	636	492	695	851	953
	3-3/4	14	11-1/4	6	703	1370	1497	1159	863	1134	957	789	581	820	1004	1124
	4-3/4	11-3/4	14-1/4	8	772	1462	1594	1242	918	1216	1051	866	623	879	1076	1205

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1-1/2	5	8	5	147	268	367	321	211	225	224	197	160	227	278	311
	2	5-1/4	6	5	224	407	556	487	320	342	343	303	243	344	421	471
	2-1/2	5-1/4	7-1/2	5	247	440	591	521	340	373	379	343	261	368	451	505
1/2	1-1/2	8	12	5	167	306	420	367	241	257	256	225	183	259	317	355
	2	5	6	5	226	412	565	494	325	346	345	303	247	349	428	478
	2-1/2	9-1/2	7-1/2	5	325	640	918	786	527	528	484	424	393	555	680	761
	3-1/4	8-1/2	9-3/4	5-1/2	389	728	1021	883	586	606	581	508	441	623	764	855
5/8	2-3/4	13	8-1/4	5	375	788	1164	982	668	643	558	489	491	694	850	951
	3-1/4	12	9-3/4	5-1/2	482	951	1364	1167	784	784	717	628	583	824	1010	1130
	4	11	12	6	533	1021	1447	1245	832	846	793	694	623	880	1078	1206
3/4	3-1/4	15-1/4	9-3/4	5-1/2	482	1024	1519	1278	872	833	717	628	639	903	1106	1238
	3-3/4	14	11-1/4	6	598	1205	1746	1486	1003	989	889	778	743	1050	1286	1440
	4-3/4	11-3/4	14-1/4	8	656	1291	1849	1583	1062	1064	976	855	791	1118	1369	1533

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	1-1/2	8	12	5	189	344	292	215	287	225	147	208	254
	2	5	6	5	254	463	394	290	387	303	198	280	342
	2-1/2	9-1/2	7-1/2	5	378	730	610	461	597	424	306	433	529
	3-1/4	8-1/2	9-3/4	5-1/2	441	824	695	518	681	508	348	493	603

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	1-1/2	8	12	5	121	225	367	191	197	171	183	259	317
	2	5	6	5	164	303	494	258	266	230	246	349	428
	2-1/2	9-1/2	7-1/2	5	229	458	786	404	398	322	391	555	680
	3-1/4	8-1/2	9-3/4	5-1/2	274	529	883	457	461	386	440	623	764
5/8	2-3/4	13	8-1/4	5	264	550	982	501	462	371	489	694	850
	3-1/4	12	9-3/4	5-1/2	339	680	1167	600	590	477	581	824	1010
	4	11	12	6	374	736	1245	643	641	527	621	880	1078
3/4	3-1/4	15-1/4	9-3/4	5-1/2	339	706	1278	651	594	477	637	903	1106
	3-3/4	14	11-1/4	6	420	856	1486	762	736	592	741	1050	1286
	4-3/4	11-3/4	14-1/4	8	461	924	1583	815	802	650	789	1118	1369

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	1-1/2	8	12	5	187	340	378	232	283	253	188	267	326
	2	5	6	5	252	458	509	313	381	341	254	360	439
	2-1/2	9-1/2	7-1/2	5	374	721	813	504	588	476	405	574	701
	3-1/4	8-1/2	9-3/4	5-1/2	436	815	912	562	671	572	455	644	786
5/8	2-3/4	13	8-1/4	5	431	895	1020	636	720	550	508	720	878
	3-1/4	12	9-3/4	5-1/2	554	1071	1208	749	873	706	602	853	1041
	4	11	12	6	605	1146	1288	796	939	781	642	909	1109
3/4	3-1/4	15-1/4	9-3/4	5-1/2	554	1164	1328	829	933	706	662	938	1143
	3-3/4	14	11-1/4	6	687	1361	1541	957	1104	875	768	1088	1327
	4-3/4	11-3/4	14-1/4	8	754	1453	1639	1015	1185	962	817	1157	1411

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel
Hilti KWIK Bolt TZ2 in 4,000 psi normal weight cracked concrete

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1-1/2	8	12	5	143	308	448	275	257	232	170	137	195	238
	2	5	6	5	192	415	603	371	347	313	229	185	262	321
	2-1/2	8-1/4	7-1/2	5	268	613	915	545	526	456	320	272	385	471
	3-1/4	7-1/2	9-3/4	5-1/2	322	699	1018	625	585	527	384	312	441	540

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace										
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1-1/2	5	8	5	193	345	373	298	215	293	275	230	150	211	258	289
	2	4-3/4	6	5	284	494	530	431	306	423	409	355	216	305	373	418
	2-1/2	4-1/2	7-1/2	5	312	529	565	465	326	457	450	401	233	329	402	450
1/2	1-1/2	8	12	5	220	395	426	341	246	335	314	263	171	241	295	331
	2	5	6	5	297	532	574	459	331	451	423	355	230	325	398	445
	2-1/2	8-1/4	7-1/2	5	431	799	867	683	500	669	601	496	343	484	592	663
	3-1/4	7-1/2	9-3/4	5-1/2	499	897	968	774	558	759	712	595	388	548	671	751
5/8	2-3/4	11-1/4	8-1/4	5	510	1001	1094	845	630	827	694	572	424	598	732	820
	3-1/4	10-1/4	9-3/4	5-1/2	640	1187	1289	1015	743	994	891	735	509	719	879	984
	4	9-1/2	12	6	694	1266	1370	1088	790	1066	985	812	545	770	942	1055
3/4	3-1/4	13-1/4	9-3/4	5-1/2	655	1303	1426	1098	822	1074	891	735	551	778	951	1065
	3-3/4	12-1/4	11-1/4	6	805	1513	1646	1288	949	1261	1105	911	646	912	1116	1249
	4-3/4	10-1/4	14-1/4	8	828	1547	1682	1319	969	1292	1143	942	661	934	1143	1280

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace										
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1-1/2	5	8	5	169	309	424	370	244	259	259	227	185	262	321	359
	2	4-3/4	6	5	251	445	597	527	343	378	386	350	264	372	456	510
	2-1/2	4-1/2	7-1/2	5	276	479	632	562	364	409	425	396	281	397	487	544
1/2	1-1/2	8	12	5	193	353	485	423	279	296	296	260	212	299	366	410
	2	5	6	5	261	476	653	570	376	399	398	350	285	403	494	552
	2-1/2	8-1/4	7-1/2	5	376	709	999	862	574	589	559	489	431	609	746	834
	3-1/4	7-1/2	9-3/4	5-1/2	438	802	1103	962	634	672	670	587	481	680	833	932
5/8	2-3/4	11-1/4	8-1/4	5	433	879	1277	1086	734	721	645	564	543	767	940	1053
	3-1/4	10-1/4	9-3/4	5-1/2	557	1053	1484	1280	853	874	828	725	640	904	1108	1240
	4	9-1/2	12	6	608	1128	1569	1362	902	941	915	801	681	962	1178	1318
3/4	3-1/4	13-1/4	9-3/4	5-1/2	557	1143	1669	1416	959	936	828	725	708	1000	1225	1372
	3-3/4	12-1/4	11-1/4	6	690	1338	1905	1635	1094	1106	1026	899	818	1155	1415	1583
	4-3/4	10-1/4	14-1/4	8	714	1370	1943	1671	1116	1135	1061	929	835	1180	1446	1618

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	1-1/2	8	12	5	218	397	338	248	331	260	169	240	293
	2	5	6	5	294	535	455	334	446	350	228	323	395
	2-1/2	8-1/4	7-1/2	5	427	804	676	506	663	489	339	480	587
	3-1/4	7-1/2	9-3/4	5-1/2	494	902	767	564	752	587	384	544	665

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	1-1/2	8	12	5	140	260	423	221	228	197	211	299	366
	2	5	6	5	189	350	570	297	307	266	284	403	494
	2-1/2	8-1/4	7-1/2	5	264	513	862	446	447	372	429	609	746
	3-1/4	7-1/2	9-3/4	5-1/2	317	590	962	502	517	446	480	680	833
5/8	2-3/4	11-1/4	8-1/4	5	305	624	1086	557	534	429	541	767	940
	3-1/4	10-1/4	9-3/4	5-1/2	391	762	1280	662	664	551	638	904	1108
	4	9-1/2	12	6	432	823	1362	707	719	609	679	962	1178
3/4	3-1/4	13-1/4	9-3/4	5-1/2	391	808	1416	725	685	551	705	1000	1225
	3-3/4	12-1/4	11-1/4	6	485	961	1635	843	836	683	815	1155	1415
	4-3/4	10-1/4	14-1/4	8	501	987	1671	863	859	706	833	1180	1446

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	1-1/2	8	12	5	216	393	437	268	327	292	218	308	376
	2	5	6	5	291	529	588	361	440	393	293	415	507
	2-1/2	8-1/4	7-1/2	5	423	794	891	550	653	550	444	629	767
	3-1/4	7-1/2	9-3/4	5-1/2	490	892	992	610	742	660	495	701	855
5/8	2-3/4	11-1/4	8-1/4	5	498	994	1126	700	805	635	561	795	970
	3-1/4	10-1/4	9-3/4	5-1/2	628	1180	1324	817	970	816	660	935	1140
	4	9-1/2	12	6	681	1259	1406	866	1041	901	701	993	1211
3/4	3-1/4	13-1/4	9-3/4	5-1/2	640	1294	1469	914	1045	816	732	1037	1265
	3-3/4	12-1/4	11-1/4	6	789	1503	1692	1047	1229	1011	843	1195	1457
	4-3/4	10-1/4	14-1/4	8	812	1538	1729	1069	1260	1046	861	1220	1489

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel
Hilti KWIK Bolt TZ2 in 5,000 psi normal weight cracked concrete

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1-1/2	8	12	5	159	345	501	308	288	260	190	154	218	266
	2	5	6	5	215	464	675	415	388	350	256	207	293	359
	2-1/2	7-1/4	7-1/2	5	300	665	978	593	562	499	358	296	419	513
	3-1/4	6-3/4	9-3/4	5-1/2	360	754	1081	677	621	574	429	338	478	585

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1-1/2	5	8	5	215	386	417	334	240	327	307	258	167	236	289	324
	2	4-1/4	6	5	309	525	562	461	324	453	446	396	231	326	400	447
	2-1/2	4	7-1/2	5	337	560	597	495	344	487	490	449	248	351	429	480
1/2	1-1/2	8	12	5	246	441	476	381	275	374	351	294	191	270	330	370
	2	5	6	5	332	595	642	514	370	504	473	396	257	364	445	498
	2-1/2	7-1/4	7-1/2	5	472	858	929	738	535	724	671	554	370	523	639	716
	3-1/4	6-3/4	9-3/4	5-1/2	544	959	1031	833	594	817	779	665	417	589	721	807
5/8	2-3/4	10	8-1/4	5	570	1081	1179	918	679	899	776	639	460	650	795	891
	3-1/4	9-1/4	9-3/4	5-1/2	700	1275	1380	1096	795	1075	996	821	550	776	950	1063
	4	8-1/2	12	6	758	1357	1463	1173	844	1150	1082	908	588	830	1016	1137
3/4	3-1/4	11-3/4	9-3/4	5-1/2	732	1410	1538	1194	887	1169	997	821	599	846	1034	1158
	3-3/4	11	11-1/4	6	882	1629	1766	1394	1018	1366	1235	1018	699	987	1208	1352
	4-3/4	9	14-1/4	8	873	1615	1752	1381	1010	1353	1219	1005	692	978	1197	1340

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1-1/2	5	8	5	189	346	474	414	273	290	289	254	207	293	359	401
	2	4-1/4	6	5	274	476	629	559	362	406	421	391	279	395	483	541
	2-1/2	4	7-1/2	5	300	510	663	594	381	439	464	443	297	420	514	575
1/2	1-1/2	8	12	5	216	395	542	473	312	331	331	290	237	334	410	458
	2	5	6	5	291	532	730	638	420	446	445	391	319	450	552	617
	2-1/2	7-1/4	7-1/2	5	414	765	1062	923	610	639	624	547	461	652	798	893
	3-1/4	6-3/4	9-3/4	5-1/2	479	861	1167	1025	671	727	734	656	513	724	887	992
5/8	2-3/4	10	8-1/4	5	484	954	1368	1171	786	787	721	631	585	827	1013	1134
	3-1/4	9-1/4	9-3/4	5-1/2	614	1136	1579	1371	907	949	926	811	686	969	1186	1328
	4	8-1/2	12	6	666	1214	1664	1455	957	1019	1018	896	727	1027	1259	1408
3/4	3-1/4	11-3/4	9-3/4	5-1/2	622	1242	1790	1528	1028	1021	926	811	764	1079	1322	1480
	3-3/4	11	11-1/4	6	772	1446	2031	1755	1167	1203	1147	1005	878	1240	1519	1699
	4-3/4	9	14-1/4	8	761	1433	2016	1741	1158	1191	1132	991	870	1230	1506	1685

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	1-1/2	8	12	5	244	444	378	277	371	290	189	268	328
	2	5	6	5	328	598	509	374	499	391	255	361	441
	2-1/2	7-1/4	7-1/2	5	467	863	731	541	717	547	366	519	634
	3-1/4	6-3/4	9-3/4	5-1/2	539	964	825	600	810	656	413	585	715

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	1-1/2	8	12	5	157	291	473	247	255	221	236	334	410
	2	5	6	5	211	392	638	333	343	297	318	450	552
	2-1/2	7-1/4	7-1/2	5	295	559	923	480	489	416	460	652	798
	3-1/4	6-3/4	9-3/4	5-1/2	354	640	1025	537	563	499	511	724	887
5/8	2-3/4	10	8-1/4	5	340	683	1171	602	592	480	583	827	1013
	3-1/4	9-1/4	9-3/4	5-1/2	437	830	1371	712	726	616	683	969	1186
	4	8-1/2	12	6	483	895	1455	759	785	681	725	1027	1259
3/4	3-1/4	11-3/4	9-3/4	5-1/2	437	885	1528	785	766	616	761	1079	1322
	3-3/4	11	11-1/4	6	542	1049	1755	909	915	764	875	1241	1519
	4-3/4	9	14-1/4	8	535	1038	1741	901	905	754	868	1230	1506

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	1-1/2	8	12	5	242	439	488	300	365	327	243	345	421
	2	5	6	5	325	591	658	404	492	440	328	464	567
	2-1/2	7-1/4	7-1/2	5	463	853	952	586	706	615	475	673	821
	3-1/4	6-3/4	9-3/4	5-1/2	534	953	1056	647	799	725	526	746	910
5/8	2-3/4	10	8-1/4	5	557	1075	1212	751	876	710	604	856	1044
	3-1/4	9-1/4	9-3/4	5-1/2	687	1268	1415	871	1049	912	705	999	1220
	4	8-1/2	12	6	744	1349	1500	921	1124	1005	748	1059	1292
3/4	3-1/4	11-3/4	9-3/4	5-1/2	715	1401	1583	982	1138	912	789	1118	1363
	3-3/4	11	11-1/4	6	865	1619	1814	1119	1333	1130	904	1281	1562
	4-3/4	9	14-1/4	8	856	1605	1799	1110	1320	1115	897	1270	1550

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel
Hilti KWIK Bolt TZ2 in 6,000 psi normal weight cracked concrete

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1-1/2	8	12	5	175	377	548	337	315	285	208	168	238	292
	2	5	6	5	235	508	739	455	425	384	280	227	321	393
	2-1/2	6-3/4	7-1/2	5	329	709	1029	634	591	535	392	316	448	548
	3-1/4	6	9-3/4	5-1/2	393	801	1134	721	652	614	470	360	509	624

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace										
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1-1/2	5	8	5	236	423	457	366	263	359	337	282	183	259	317	354
	2	3-3/4	6	5	330	551	588	486	339	478	479	434	244	344	421	471
	2-1/2	3-3/4	7-1/2	5	359	586	623	521	359	513	525	492	261	369	451	505
1/2	1-1/2	8	12	5	270	484	522	418	301	410	385	323	209	296	362	405
	2	5	6	5	363	652	703	563	405	552	519	434	282	398	488	546
	2-1/2	6-3/4	7-1/2	5	507	908	980	785	565	770	724	607	393	556	680	761
	3-1/4	6	9-3/4	5-1/2	583	1010	1083	882	625	866	838	728	442	624	764	855
5/8	2-3/4	9-1/4	8-1/4	5	615	1150	1250	981	721	961	850	700	492	694	850	951
	3-1/4	8-1/2	9-3/4	5-1/2	752	1349	1456	1166	839	1143	1074	900	584	825	1010	1130
	4	7-3/4	12	6	813	1432	1541	1244	888	1221	1165	995	623	881	1078	1206
3/4	3-1/4	10-3/4	9-3/4	5-1/2	797	1501	1634	1277	941	1250	1092	900	640	904	1106	1238
	3-3/4	10	11-1/4	6	949	1726	1867	1485	1076	1456	1351	1115	744	1051	1286	1440
	4-3/4	8-1/4	14-1/4	8	911	1671	1810	1433	1043	1405	1285	1059	718	1015	1241	1390

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace										
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1-1/2	5	8	5	207	378	519	454	299	318	317	278	227	321	393	439
	2	3-3/4	6	5	293	501	654	585	376	430	452	429	292	413	506	566
	2-1/2	3-3/4	7-1/2	5	321	536	688	620	396	464	497	485	310	438	536	600
1/2	1-1/2	8	12	5	237	433	594	519	341	363	362	318	259	366	449	502
	2	5	6	5	319	583	800	699	460	489	488	429	349	494	605	676
	2-1/2	6-3/4	7-1/2	5	445	812	1114	974	641	682	681	599	487	688	843	943
	3-1/4	6	9-3/4	5-1/2	515	911	1220	1077	701	773	790	719	539	761	932	1043
5/8	2-3/4	9-1/4	8-1/4	5	531	1018	1444	1242	830	843	789	691	621	877	1075	1203
	3-1/4	8-1/2	9-3/4	5-1/2	661	1207	1656	1447	953	1013	1011	888	724	1022	1252	1401
	4	7-3/4	12	6	716	1286	1743	1532	1002	1086	1098	982	766	1082	1325	1483
3/4	3-1/4	10-3/4	9-3/4	5-1/2	682	1326	1891	1623	1087	1096	1014	888	811	1146	1404	1571
	3-3/4	10	11-1/4	6	832	1538	2136	1856	1227	1286	1257	1101	928	1311	1606	1796
	4-3/4	8-1/4	14-1/4	8	797	1486	2076	1798	1193	1238	1194	1045	899	1270	1556	1741

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	1-1/2	8	12	5	267	486	414	304	406	318	207	294	359
	2	5	6	5	360	655	557	410	547	429	279	396	483
	2-1/2	6-3/4	7-1/2	5	502	913	777	571	763	599	390	552	674
	3-1/4	6	9-3/4	5-1/2	577	1015	874	631	858	709	438	620	758

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	1-1/2	8	12	5	172	319	519	270	279	242	259	366	449
	2	5	6	5	231	429	699	364	376	326	348	494	605
	2-1/2	6-3/4	7-1/2	5	323	599	974	508	525	455	485	688	843
	3-1/4	6	9-3/4	5-1/2	387	683	1077	567	602	546	537	761	932
5/8	2-3/4	9-1/4	8-1/4	5	373	734	1242	641	638	525	619	877	1075
	3-1/4	8-1/2	9-3/4	5-1/2	479	889	1447	755	779	675	721	1022	1252
	4	7-3/4	12	6	530	957	1532	802	841	746	764	1082	1325
3/4	3-1/4	10-3/4	9-3/4	5-1/2	479	952	1623	836	827	675	809	1146	1404
	3-3/4	10	11-1/4	6	594	1125	1856	964	983	837	925	1311	1606
	4-3/4	8-1/4	14-1/4	8	564	1082	1798	934	944	794	896	1270	1556

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	1-1/2	8	12	5	265	481	535	328	400	358	267	378	461
	2	5	6	5	357	648	721	442	539	482	359	509	621
	2-1/2	6-3/4	7-1/2	5	498	903	1004	616	752	673	500	709	865
	3-1/4	6	9-3/4	5-1/2	572	1005	1108	677	847	781	553	783	955
5/8	2-3/4	9-1/4	8-1/4	5	603	1143	1285	794	937	777	640	907	1107
	3-1/4	8-1/2	9-3/4	5-1/2	738	1342	1492	916	1117	998	744	1054	1286
	4	7-3/4	12	6	798	1425	1577	966	1194	1084	786	1114	1359
3/4	3-1/4	10-3/4	9-3/4	5-1/2	782	1491	1679	1039	1218	999	837	1186	1446
	3-3/4	10	11-1/4	6	931	1716	1915	1179	1421	1238	955	1352	1650
	4-3/4	8-1/4	14-1/4	8	893	1661	1858	1145	1370	1176	926	1312	1600

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel Hilti KWIK Bolt TZ2 in the soffit of 3,000 psi or 4,000 psi lightweight concrete over metal deck — 2-in W-deck profiles

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2" [1]							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	4.100	1.580	0.870	1.850
1/2	1-1/2	1	12	2-1/2	84	183	266	163	97	200	286	180
	2	1	6	2-1/2	109	235	341	210	126	259	367	233
	2-1/2	1	7-1/2	2-1/2	168	354	509	317	191	388	547	349
	3-1/4	1	9-3/4	2-1/2	171	387	575	344	192	420	615	375

1 Anchor may be placed in upper or lower flute. Prying factors noted assume the seismic swivel brace has its full bearing area in contact with the metal deck.

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.100	1.050	1.360	2.490	1.100	1.050	1.360
3/8	1-1/2	1-1/8	8	2-1/2	121	205	210	181	134	221	226	197
	2	1-1/8	6	2-1/2	175	302	310	266	193	325	334	288
	2-1/2	1-1/8	7-1/2	2-1/2	181	310	318	274	192	324	333	287
1/2	1-1/2	1-1/8	12	2-1/2	131	232	238	202	145	251	258	221
	2	1-1/8	6	2-1/2	168	297	306	260	188	323	332	285
	2-1/2	1-1/8	7-1/2	2-1/2	255	446	458	391	283	483	496	427
	3-1/4	1-1/8	9-3/4	2-1/2	273	497	512	431	299	535	550	466
5/8	2-3/4	1-1/8	8-1/4	2-1/2	303	528	543	464	338	573	588	507
	4	1-1/8	12	2-1/2	346	611	629	535	386	666	684	586
3/4	3-1/4	1-1/8	9-3/4	2-1/2	270	489	504	425	293	522	537	456
	3-3/4	1-1/8	11-1/4	3-1/4	314	645	668	547	355	706	730	601

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	3.070	1.320	0.960	1.070	3.070	1.320	0.960	1.070
3/8	1-1/2	1-1/8	8	2-1/2	103	184	220	208	115	200	236	224
	2	1-1/8	6	2-1/2	149	271	326	307	165	293	349	330
	2-1/2	1-1/8	7-1/2	2-1/2	154	279	334	315	164	293	349	329
1/2	1-1/2	1-1/8	12	2-1/2	110	206	251	236	123	225	271	255
	2	1-1/8	6	2-1/2	142	265	322	302	160	290	349	329
	2-1/2	1-1/8	7-1/2	2-1/2	216	399	483	453	241	434	520	491
	3-1/4	1-1/8	9-3/4	2-1/2	228	440	542	506	253	475	581	544
5/8	2-3/4	1-1/8	8-1/4	2-1/2	257	473	571	537	288	516	617	582
	4	1-1/8	12	2-1/2	293	545	663	622	328	597	718	676
3/4	3-1/4	1-1/8	9-3/4	2-1/2	227	433	533	498	248	465	567	531
	3-3/4	1-1/8	11-1/4	3-1/4	255	560	713	658	288	615	778	720

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.160	1.380	2.520	1.160	1.380
1/2	1-1/2	1-1/4	12	2-1/2	129	224	200	144	244	219
	2	1-1/4	6	2-1/2	166	288	257	186	314	282
	2-1/2	1-1/4	7-1/2	2-1/2	252	432	387	280	469	423
	3-1/4	1-1/4	9-3/4	2-1/2	270	480	426	296	517	461

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	4.170	2.000	0.960
1/2	1-1/2	1-1/4	12	2-1/2	83	154	251	95	170	271
	2	1-1/4	6	2-1/2	107	199	322	124	220	349
	2-1/2	1-1/4	7-1/2	2-1/2	165	300	483	188	331	520
	3-1/4	1-1/4	9-3/4	2-1/2	168	324	542	188	354	581
5/8	2-3/4	1-1/4	8-1/4	2-1/2	198	357	571	226	395	617
	4	1-1/4	12	2-1/2	221	408	663	255	453	718
3/4	3-1/4	1-1/4	9-3/4	2-1/2	167	321	533	186	347	567
	3-3/4	1-1/4	11-1/4	3-1/4	188	391	713	212	441	778

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	1.140	2.550	1.090	1.140
1/2	1-1/2	1-1/4	12	2-1/2	128	233	227	142	253	246
	2	1-1/4	6	2-1/2	165	299	291	184	325	317
	2-1/2	1-1/4	7-1/2	2-1/2	250	448	437	277	486	473
	3-1/4	1-1/4	9-3/4	2-1/2	268	500	485	293	538	523
5/8	2-3/4	1-1/4	8-1/4	2-1/2	298	531	517	332	576	562
	4	1-1/4	12	2-1/2	339	615	598	379	669	652
3/4	3-1/4	1-1/4	9-3/4	2-1/2	265	492	478	288	525	511
	3-3/4	1-1/4	11-1/4	3-1/4	307	649	627	346	710	687

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel
Hilti KB1 in 3,000 psi normal weight cracked concrete

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	2	6-1/4	6	5	135	291	423	260	243	220	161	130	184	225
	3-1/4	6-1/4	9-3/4	6	264	560	806	502	463	425	315	250	354	434

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1-1/2	8	8	5	135	242	261	209	151	205	193	162	105	148	181	203
	2	4	6	5	203	357	384	310	221	305	291	249	155	220	269	301
1/2	2	6-1/4	6	5	208	373	402	322	232	316	297	249	161	228	279	312
	3-1/4	6-1/4	9-3/4	6	402	713	768	618	443	607	576	488	310	438	536	600
5/8	2-3/4	11-1/4	8-1/4	5	357	743	817	622	471	608	486	401	312	440	539	603
	4	9-1/2	12	6	601	1098	1188	943	685	924	853	703	473	668	817	914
3/4	3-1/4	10	9-3/4	5-1/2	460	879	958	745	552	730	626	516	374	528	646	723
	4-3/4	7-3/4	14-1/4	8	674	1186	1276	1031	735	1012	967	827	517	730	893	999

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1-1/2	8	8	5	119	217	297	260	171	182	181	159	130	183	225	251
	2	4	6	5	179	321	434	382	250	271	274	245	191	270	330	369
1/2	2	6-1/4	6	5	183	334	458	400	263	280	279	245	200	283	346	387
	3-1/4	6-1/4	9-3/4	6	354	640	871	764	501	539	542	482	382	540	661	739
5/8	2-3/4	11-1/4	8-1/4	5	304	648	964	811	554	527	452	396	405	573	701	785
	4	9-1/2	12	6	527	977	1361	1181	782	816	793	694	590	834	1022	1143
3/4	3-1/4	10	9-3/4	5-1/2	391	775	1113	952	640	638	582	509	476	672	823	922
	4-3/4	7-3/4	14-1/4	8	594	1066	1443	1268	829	900	911	816	634	896	1098	1228

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	2	6-1/4	6	5	206	375	319	234	313	245	160	227	277
	3-1/4	6-1/4	9-3/4	6	399	717	613	447	601	482	307	435	531

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	2	6-1/4	6	5	132	246	400	209	215	187	199	283	346
	3-1/4	6-1/4	9-3/4	6	260	474	764	399	416	366	381	540	661
5/8	2-3/4	11-1/4	8-1/4	5	213	445	811	413	374	301	404	573	701
	4	9-1/2	12	6	374	713	1181	613	623	527	588	834	1022
3/4	3-1/4	10	9-3/4	5-1/2	275	553	952	489	480	387	474	672	823
	4-3/4	7-3/4	14-1/4	8	440	793	1268	664	698	621	632	896	1098

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	2	6-1/4	6	5	204	371	412	253	309	276	206	291	355
	3-1/4	6-1/4	9-3/4	6	395	710	787	482	593	535	392	556	678
5/8	2-3/4	11-1/4	8-1/4	5	349	738	843	526	591	445	420	595	725
	4	9-1/2	12	6	590	1091	1219	751	902	781	608	861	1050
3/4	3-1/4	10	9-3/4	5-1/2	450	873	986	611	711	573	491	696	849
	4-3/4	7-3/4	14-1/4	8	662	1180	1306	799	989	900	651	922	1126

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel
Hilti KB1 in 4,000 psi normal weight cracked concrete

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	2	6-1/4	6	5	156	336	488	300	281	254	185	150	212	260
	3-1/4	5-1/2	9-3/4	6	282	585	835	526	480	446	337	262	371	455

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1-1/2	8	8	5	156	280	302	242	174	237	223	187	121	171	209	234
	2	3-1/2	6	5	226	387	415	339	239	333	326	287	170	240	294	329
1/2	2	6-1/4	6	5	240	431	465	372	268	365	343	287	186	263	322	361
	3-1/4	5-1/2	9-3/4	6	423	742	797	645	459	633	607	522	323	457	559	625
5/8	2-3/4	9-3/4	8-1/4	5	413	826	905	696	521	680	562	463	349	493	603	675
	4	8-1/4	12	6	673	1199	1292	1038	745	1019	962	812	520	735	899	1007
3/4	3-1/4	9-1/2	9-3/4	5-1/2	521	968	1052	827	606	810	723	596	415	586	716	802
	4-3/4	6-3/4	14-1/4	8	751	1287	1377	1127	794	1107	1084	955	565	798	976	1092

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1-1/2	8	8	5	137	250	343	300	197	210	209	184	150	212	260	290
	2	3-1/2	6	5	200	350	465	412	267	298	308	283	206	291	357	399
1/2	2	6-1/4	6	5	211	385	529	462	304	323	323	283	231	326	400	447
	3-1/4	5-1/2	9-3/4	6	373	667	900	792	518	564	572	515	396	560	686	767
5/8	2-3/4	9-3/4	8-1/4	5	351	724	1061	898	609	592	522	457	449	634	777	870
	4	8-1/4	12	6	592	1074	1468	1285	844	904	906	801	642	908	1112	1244
3/4	3-1/4	9-1/2	9-3/4	5-1/2	452	858	1212	1045	696	712	672	588	522	738	904	1011
	4-3/4	6-3/4	14-1/4	8	665	1163	1544	1370	888	991	1023	943	685	968	1185	1326

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	2	6-1/4	6	5	238	433	369	271	362	283	185	262	320
	3-1/4	5-1/2	9-3/4	6	419	746	639	464	628	513	320	454	554

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	2	6-1/4	6	5	153	284	462	241	249	215	230	326	400
	3-1/4	5-1/2	9-3/4	6	278	497	792	415	438	391	395	560	686
5/8	2-3/4	9-3/4	8-1/4	5	246	511	898	459	432	347	448	634	777
	4	8-1/4	12	6	432	794	1285	671	697	609	640	908	1112
3/4	3-1/4	9-1/2	9-3/4	5-1/2	317	620	1045	540	540	447	521	738	904
	4-3/4	6-3/4	14-1/4	8	502	878	1370	722	776	716	683	968	1185

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	2	6-1/4	6	5	236	428	476	292	356	319	237	336	410
	3-1/4	5-1/2	9-3/4	6	416	738	816	499	619	565	407	576	703
5/8	2-3/4	9-3/4	8-1/4	5	403	821	932	580	662	514	464	658	803
	4	8-1/4	12	6	661	1193	1324	812	995	895	660	935	1141
3/4	3-1/4	9-1/2	9-3/4	5-1/2	511	962	1080	667	790	662	538	763	930
	4-3/4	6-3/4	14-1/4	8	738	1280	1408	858	1084	1011	702	994	1214

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel
Hilti KB1 in 5,000 psi normal weight cracked concrete

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	2	6-1/4	6	5	174	376	546	336	314	284	207	168	237	291
	3-1/4	5	9-3/4	6	296	606	858	545	493	464	354	272	385	471

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1-1/2	8	8	5	174	313	337	270	195	265	249	209	135	191	234	262
	2	3-1/4	6	5	245	411	438	362	253	356	355	321	181	256	314	351
1/2	2	6-1/4	6	5	268	481	519	416	299	408	383	321	208	294	360	403
	3-1/4	5	9-3/4	6	440	764	819	666	472	654	633	549	334	472	577	646
5/8	2-3/4	8-3/4	8-1/4	5	461	894	977	757	563	741	628	518	380	536	656	734
	4	7-1/2	12	6	733	1280	1375	1115	793	1095	1053	908	559	789	966	1081
3/4	3-1/4	9-1/2	9-3/4	5-1/2	570	1041	1126	894	649	876	809	667	448	633	774	867
	4-3/4	6	14-1/4	8	814	1365	1456	1204	840	1184	1181	1068	603	852	1042	1166

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1-1/2	8	8	5	153	280	384	335	221	235	234	206	168	237	290	325
	2	3-1/4	6	5	217	373	488	436	281	320	336	317	218	308	377	422
1/2	2	6-1/4	6	5	236	430	591	516	340	361	360	317	258	365	447	500
	3-1/4	5	9-3/4	6	388	688	923	815	531	584	596	542	407	576	705	789
5/8	2-3/4	8-3/4	8-1/4	5	392	787	1138	970	654	647	583	511	485	685	839	939
	4	7-1/2	12	6	647	1152	1551	1367	892	976	992	896	684	966	1183	1323
3/4	3-1/4	9-1/2	9-3/4	5-1/2	499	927	1290	1119	741	773	751	658	560	791	969	1084
	4-3/4	6	14-1/4	8	723	1240	1622	1449	933	1064	1116	1054	724	1024	1254	1402

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	2	6-1/4	6	5	266	484	412	303	404	317	206	292	357
	3-1/4	5	9-3/4	6	436	768	660	477	649	535	331	469	573

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	2	6-1/4	6	5	171	317	516	269	278	241	257	365	447
	3-1/4	5	9-3/4	6	292	516	815	428	455	412	406	576	705
5/8	2-3/4	8-3/4	8-1/4	5	276	560	970	498	483	388	483	685	839
	4	7-1/2	12	6	483	861	1367	718	758	681	682	966	1183
3/4	3-1/4	9-1/2	9-3/4	5-1/2	355	676	1119	581	591	500	558	791	969
	4-3/4	6	14-1/4	8	550	947	1449	767	841	801	723	1024	1254

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	2	6-1/4	6	5	263	479	532	327	398	356	265	376	459
	3-1/4	5	9-3/4	6	432	760	838	512	640	589	418	592	722
5/8	2-3/4	8-3/4	8-1/4	5	451	889	1005	624	721	574	501	710	866
	4	7-1/2	12	6	720	1273	1407	860	1071	980	701	993	1213
3/4	3-1/4	9-1/2	9-3/4	5-1/2	559	1035	1156	712	855	740	576	816	996
	4-3/4	6	14-1/4	8	801	1359	1487	904	1159	1103	741	1050	1282

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel
Hilti KB1 in 6,000 psi normal weight cracked concrete

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"									
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	2	6-1/4	6	5	190	412	598	368	344	311	227	184	260	318
	3-1/4	5	9-3/4	6	307	622	876	561	504	478	369	280	396	485

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1-1/2	8	8	5	190	339	366	294	211	288	271	228	147	208	254	285
	2	3	6	5	261	430	458	381	264	375	380	352	191	270	330	370
1/2	2	6-1/4	6	5	294	527	569	456	328	447	420	352	228	323	395	442
	3-1/4	5	9-3/4	6	454	782	838	684	483	672	654	573	343	484	592	663
5/8	2-3/4	8	8-1/4	5	504	953	1038	810	598	793	688	567	406	573	701	785
	4	6-3/4	12	6	785	1347	1443	1179	832	1159	1132	995	591	835	1022	1143
3/4	3-1/4	9-1/2	9-3/4	5-1/2	612	1101	1189	951	685	932	874	730	476	673	823	922
	4-3/4	5-1/2	14-1/4	8	868	1430	1521	1267	877	1247	1264	1170	635	897	1098	1228

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1-1/2	8	8	5	167	304	416	364	239	255	255	225	182	257	315	352
	2	3	6	5	233	393	507	455	292	339	360	347	228	322	394	441
1/2	2	6-1/4	6	5	258	472	647	566	372	396	395	347	283	400	489	548
	3-1/4	5	9-3/4	6	401	706	941	833	541	600	617	565	417	588	721	806
5/8	2-3/4	8	8-1/4	5	430	841	1203	1031	691	694	639	560	515	728	892	998
	4	6-3/4	12	6	694	1217	1619	1435	931	1036	1068	982	717	1014	1242	1389
3/4	3-1/4	9-1/2	9-3/4	5-1/2	538	984	1354	1182	778	826	822	721	591	835	1022	1144
	4-3/4	5-1/2	14-1/4	8	773	1304	1685	1513	969	1125	1197	1154	757	1069	1310	1464

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	2	6-1/4	6	5	291	530	451	332	443	347	226	320	391
	3-1/4	5	9-3/4	6	450	786	678	488	666	554	340	481	588

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	2	6-1/4	6	5	187	347	566	295	305	264	282	400	489
	3-1/4	5	9-3/4	6	303	531	833	438	469	429	415	588	721
5/8	2-3/4	8	8-1/4	5	302	603	1031	531	524	425	514	728	892
	4	6-3/4	12	6	524	918	1435	757	811	746	716	1014	1242
3/4	3-1/4	9-1/2	9-3/4	5-1/2	389	724	1182	616	634	548	589	835	1022
	4-3/4	5-1/2	14-1/4	8	591	1006	1513	804	896	867	755	1069	1310

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	2	6-1/4	6	5	289	524	583	358	437	390	291	412	503
	3-1/4	5	9-3/4	6	446	778	856	523	657	609	427	605	738
5/8	2-3/4	8	8-1/4	5	494	947	1067	661	773	630	532	754	919
	4	6-3/4	12	6	771	1341	1475	900	1134	1055	735	1042	1272
3/4	3-1/4	9-1/2	9-3/4	5-1/2	601	1095	1219	749	911	811	607	861	1050
	4-3/4	5-1/2	14-1/4	8	854	1423	1551	940	1222	1183	773	1095	1338

Maximum allowable pipe horizontal load, F_{pw} (lb) carbon steel Hilti KB1 in the soffit of 3,000 psi or 4,000 psi lightweight concrete over metal deck — 2-in W-deck profiles

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2" [1]							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	4.100	1.580	0.870	1.850
1/2	2	1	6	2-1/2	83	194	292	172	89	204	304	181
	3-1/4	1	9-3/4	2-1/2	152	340	503	303	162	357	523	318

1 Anchor may be placed in upper or lower flute. Prying factors noted assume the seismic swivel brace has its full bearing area in contact with the metal deck.

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.100	1.050	1.360	2.490	1.100	1.050	1.360
3/8	1-1/2	1-1/8	8	2-1/2	84	145	148	128	87	148	152	131
	2	1-1/8	6	2-1/2	150	270	278	235	155	278	286	242
1/2	2	1-1/8	6	2-1/2	136	251	259	216	143	262	270	227
	3-1/4	1-1/8	9-3/4	2-1/2	241	436	449	378	254	454	468	396
5/8	2-3/4	1-1/8	8-1/4	2-1/2	239	430	443	374	268	470	484	412
	4	1-1/8	12	2-1/2	310	564	581	489	348	617	635	539
3/4	3-1/4	1-1/8	9-3/4	2-1/2	248	447	461	389	278	489	503	428

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	3.070	1.320	0.960	1.070	3.070	1.320	0.960	1.070
3/8	1-1/2	1-1/8	8	2-1/2	72	130	156	147	74	133	160	151
	2	1-1/8	6	2-1/2	126	240	294	275	131	247	302	283
1/2	2	1-1/8	6	2-1/2	111	221	274	255	119	231	286	267
	3-1/4	1-1/8	9-3/4	2-1/2	203	386	474	443	214	404	494	462
5/8	2-3/4	1-1/8	8-1/4	2-1/2	202	382	468	438	227	420	509	478
	4	1-1/8	12	2-1/2	261	499	614	574	294	550	669	627
3/4	3-1/4	1-1/8	9-3/4	2-1/2	209	397	487	455	235	436	529	497

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.160	1.380	2.520	1.160	1.380
1/2	2	1-1/4	6	2-1/2	134	242	214	142	253	224
	3-1/4	1-1/4	9-3/4	2-1/2	238	421	374	251	439	392

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	4.170	2.000	0.960
1/2	2	1-1/4	6	2-1/2	82	162	274	88	170	286
	3-1/4	1-1/4	9-3/4	2-1/2	149	286	474	160	300	494
5/8	2-3/4	1-1/4	8-1/4	2-1/2	149	283	468	172	316	509
	4	1-1/4	12	2-1/2	192	369	614	222	411	669
3/4	3-1/4	1-1/4	9-3/4	2-1/2	155	294	487	179	328	529

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	1.140	2.550	1.090	1.140
1/2	2	1-1/4	6	2-1/2	133	252	245	140	264	256
	3-1/4	1-1/4	9-3/4	2-1/2	236	438	426	249	457	444
5/8	2-3/4	1-1/4	8-1/4	2-1/2	234	433	421	263	473	460
	4	1-1/4	12	2-1/2	304	567	551	341	620	603
3/4	3-1/4	1-1/4	9-3/4	2-1/2	243	450	437	273	492	478

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCS-WF in 3,000 psi normal weight cracked concrete with Grade A36 threaded rod (or stronger)

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1.63	4-1/4	5	5	151	318	457	285	263	241	180	142	201	247

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1.11	3	3-1/2	5	129	228	245	197	141	194	184	156	99	140	171	191
1/2	1.63	4-1/4	5	5	229	405	436	351	251	345	327	278	176	249	304	340
5/8	1.90	4-3/4	5-3/4	5	288	510	549	442	316	434	412	350	221	313	383	428
3/4	1.83	4-1/2	5-1/2	5	272	482	518	418	299	410	389	331	209	296	362	405

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1.11	3	3-1/2	5	113	204	278	244	160	172	173	154	122	172	211	236
1/2	1.63	4-1/4	5	5	201	363	494	433	284	306	308	274	217	306	375	420
5/8	1.90	4-3/4	5-3/4	5	253	457	622	545	357	385	388	345	273	385	472	528
3/4	1.83	4-1/2	5-1/2	5	240	432	588	515	338	364	367	326	258	364	446	499

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	1.63	4-1/4	5	5	227	407	348	254	341	274	174	247	302

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	1.63	4-1/4	5	5	148	269	433	227	237	209	216	306	375
5/8	1.90	4-3/4	5-3/4	5	186	339	545	285	298	263	272	385	472
3/4	1.83	4-1/2	5-1/2	5	176	321	515	270	282	248	257	364	446

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	1.63	4-1/4	5	5	225	403	446	274	337	305	223	315	385
5/8	1.90	4-3/4	5-3/4	5	283	507	562	344	424	383	280	397	484
3/4	1.83	4-1/2	5-1/2	5	267	479	531	325	401	362	265	375	458

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCS-WF in 4,000 psi normal weight cracked concrete with Grade A36 threaded rod (or stronger)

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1.63	4	5	5	174	360	513	323	295	274	207	161	228	279

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1.11	3	3-1/2	5	148	262	282	227	163	223	212	181	114	161	197	220
1/2	1.63	4	5	5	260	455	489	396	282	389	373	321	199	281	343	384
5/8	1.90	4-3/4	5-3/4	5	332	588	633	510	365	501	476	404	256	361	442	495
3/4	1.83	4-1/4	5-1/2	5	314	556	599	482	345	473	450	382	242	342	418	468

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1.11	3	3-1/2	5	131	235	320	280	184	198	200	178	140	198	243	272
1/2	1.63	4	5	5	229	410	552	486	318	347	352	317	243	344	421	471
5/8	1.90	4-3/4	5-3/4	5	293	528	718	630	413	445	448	399	315	445	545	610
3/4	1.83	4-1/4	5-1/2	5	277	499	679	595	390	421	424	377	298	421	515	576

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	1.63	4	5	5	258	458	393	285	386	316	197	279	341

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	1.63	4	5	5	171	306	486	255	269	241	243	344	421
5/8	1.90	4-3/4	5-3/4	5	215	392	630	329	344	303	314	445	545
3/4	1.83	4-1/4	5-1/2	5	203	370	595	311	325	287	297	421	515

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	1.63	4	5	5	255	453	501	306	380	348	250	354	432
5/8	1.90	4-3/4	5-3/4	5	326	585	649	398	490	443	323	458	559
3/4	1.83	4-1/4	5-1/2	5	308	553	613	376	463	418	306	433	529

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCS-WF in 5,000 psi normal weight cracked concrete with Grade A36 threaded rod (or stronger)

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1.63	3-1/2	5	5	192	387	543	349	312	298	232	174	246	302

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1.11	2-3/4	3-1/2	5	161	279	300	244	173	240	232	202	122	173	211	236
1/2	1.63	3-1/2	5	5	283	485	519	425	299	417	408	359	213	301	368	412
5/8	1.90	4-3/4	5-3/4	5	372	658	708	571	408	560	532	452	286	404	494	553
3/4	1.83	4-1/4	5-1/2	5	351	622	670	539	386	529	503	427	270	382	467	523

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1.11	2-3/4	3-1/2	5	142	252	337	298	194	214	219	199	149	211	258	289
1/2	1.63	3-1/2	5	5	250	438	582	516	335	373	385	354	258	365	447	500
5/8	1.90	4-3/4	5-3/4	5	327	590	803	704	461	497	501	446	352	497	609	682
3/4	1.83	4-1/4	5-1/2	5	309	558	759	666	436	470	474	422	333	470	576	644

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	1.63	3-1/2	5	5	280	487	421	302	414	346	211	299	365

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	1.63	3-1/2	5	5	189	331	516	272	292	269	257	365	447
5/8	1.90	4-3/4	5-3/4	5	241	438	704	368	385	339	351	497	609
3/4	1.83	4-1/4	5-1/2	5	227	414	666	348	364	320	332	470	576

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	1.63	3-1/2	5	5	278	482	531	324	408	380	265	375	457
5/8	1.90	4-3/4	5-3/4	5	365	654	725	444	547	495	362	512	625
3/4	1.83	4-1/4	5-1/2	5	345	619	686	420	517	468	342	484	591

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCS-WF in 6,000 psi normal weight cracked concrete with Grade A36 threaded rod (or stronger)

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	1.63	3-1/4	5	5	206	410	567	371	326	318	254	185	262	321

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	1.11	2-1/2	3-1/2	5	172	294	314	258	181	253	249	221	129	182	223	250
1/2	1.63	3-1/4	5	5	302	509	543	448	313	441	438	393	225	317	388	434
5/8	1.90	4-3/4	5-3/4	5	407	721	776	625	447	613	583	495	313	442	541	606
3/4	1.83	4-1/4	5-1/2	5	385	681	733	591	423	580	551	468	296	418	512	573

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	1.11	2-1/2	3-1/2	5	153	266	352	313	202	227	235	218	156	221	270	302
1/2	1.63	3-1/4	5	5	268	462	606	541	349	396	413	388	270	382	468	523
5/8	1.90	4-3/4	5-3/4	5	358	647	879	771	506	545	549	488	386	545	667	747
3/4	1.83	4-1/4	5-1/2	5	339	611	831	729	478	515	519	462	365	515	631	706

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	1.63	3-1/4	5	5	300	512	444	316	437	372	223	315	385

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	1.63	3-1/4	5	5	204	352	541	286	312	295	270	382	468
5/8	1.90	4-3/4	5-3/4	5	264	480	771	403	421	371	385	545	667
3/4	1.83	4-1/4	5-1/2	5	249	453	729	381	398	351	363	515	631

Nominal anchor dia.	Effective embed.	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	1.63	3-1/4	5	5	297	507	555	338	432	409	277	392	479
5/8	1.90	4-3/4	5-3/4	5	400	717	795	487	599	542	396	561	685
3/4	1.83	4-1/4	5-1/2	5	378	678	751	460	567	512	374	530	647

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCM-WF and KCM-PD in 3,000 psi normal weight cracked concrete [1]

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
3/8 - 1/2	1/2	4-1/4	5	5	151	318	457	285	263	241	180	142	201	247
3/8 - 1/2 - 5/8	1/2 [1]	5-1/4	6-1/4	5	211	445	641	399	368	338	251	199	282	345
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	7-1/2	9	5	376	777	1107	698	636	593	448	348	493	604

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
1/4 - 3/8	3/8	3	3-1/2	5	130	231	248	200	143	196	187	158	100	142	173	194
3/8 - 1/2	1/2	4-1/4	5	5	229	405	436	351	251	345	327	278	176	249	304	340
3/8 - 1/2 - 5/8	1/2 [1]	5-1/4	6-1/4	5	320	567	610	492	352	483	459	390	246	348	426	477
	5/8	5-1/4	6-1/4	5	320	567	610	492	352	483	459	390	246	348	426	477
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	7-1/2	9	5	562	984	1057	856	609	841	807	695	429	606	742	830
	5/8 [1]	11-3/4	9	5	618	1169	1273	993	734	972	843	695	498	703	860	963
	3/4	16-1/2	9	5	619	1272	1397	1067	805	1042	843	695	535	755	924	1035

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
1/4 - 3/8	3/8	3	3-1/2	5	115	207	281	247	162	174	176	156	123	174	214	239
3/8 - 1/2	1/2	4-1/4	5	5	201	363	494	433	284	306	308	274	217	306	375	420
3/8 - 1/2 - 5/8	1/2 [1]	5-1/4	6-1/4	5	282	509	692	607	398	429	432	384	303	429	525	587
	5/8	5-1/4	6-1/4	5	282	509	692	607	398	429	432	384	303	429	525	587
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	7-1/2	9	5	496	885	1193	1051	686	749	761	685	525	742	909	1017
	5/8 [1]	11-3/4	9	5	526	1032	1476	1264	848	851	783	685	632	893	1094	1224
	3/4	16-1/2	9	5	526	1111	1645	1386	944	905	783	685	693	979	1199	1343

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
3/8 - 1/2	1/2	4-1/4	5	5	227	407	348	254	341	274	174	247	302
3/8 - 1/2 - 5/8	1/2 [1]	5-1/4	6-1/4	5	317	570	487	355	478	384	244	346	422
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	7-1/2	9	5	557	989	848	615	833	682	425	602	736

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
3/8 - 1/2	1/2	4-1/4	5	5	148	269	433	227	237	209	216	306	375
3/8 - 1/2 - 5/8	1/2 [1]	5-1/4	6-1/4	5	207	377	607	317	332	292	303	429	525
	5/8	5-1/4	6-1/4	5	207	377	607	317	332	292	303	429	525
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	7-1/2	9	5	370	661	1051	551	582	521	524	742	909
	5/8 [1]	11-3/4	9	5	370	739	1264	651	642	521	630	893	1094
	3/4	16-1/2	9	5	370	771	1385	706	648	521	690	979	1199

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
3/8 - 1/2	1/2	4-1/4	5	5	225	403	446	274	337	305	223	315	385
3/8 - 1/2 - 5/8	1/2 [1]	5-1/4	6-1/4	5	314	564	625	383	472	426	312	441	539
	5/8	5-1/4	6-1/4	5	314	564	625	383	472	426	312	441	539
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	7-1/2	9	5	552	978	1081	661	822	751	539	764	932
	5/8 [1]	11-3/4	9	5	605	1161	1309	811	947	771	652	924	1127
	3/4	16-1/2	9	5	605	1263	1440	898	1014	771	717	1017	1239

1 Only ASTM A193 Grade B7, ASTM A325, or ASTM F1554 Grade 105 threaded rod is permitted with smaller interior thread diameter. A36 threaded rod (or stronger) can be used with largest thread diameter per insert.

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCM-WF and KCM-PD in 4,000 psi normal weight cracked concrete [1]

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
3/8 - 1/2	1/2	4-1/4	5	5	174	367	528	329	303	279	207	164	232	285
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	244	514	740	461	425	390	290	230	326	399
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	6-1/2	9	5	425	853	1190	770	684	658	518	384	544	666

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
1/4 - 3/8	3/8	3	3-1/2	5	150	266	287	231	165	227	215	183	116	164	200	224
3/8 - 1/2	1/2	4-1/4	5	5	264	468	503	405	290	398	378	321	203	287	351	393
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	370	655	705	568	406	557	529	450	285	402	492	551
	5/8	5	6-1/4	5	370	655	705	568	406	557	529	450	285	402	492	551
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	6-1/2	9	5	626	1066	1139	935	657	919	904	802	469	662	810	906
	5/8 [1]	10-1/4	9	5	696	1286	1395	1101	804	1078	973	802	552	779	953	1067
	3/4	16-1/2	9	5	715	1469	1613	1232	929	1204	973	802	618	872	1067	1195

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
1/4 - 3/8	3/8	3	3-1/2	5	132	239	325	285	187	201	203	181	143	201	247	276
3/8 - 1/2	1/2	4-1/4	5	5	232	419	570	500	328	354	356	317	250	353	433	484
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	326	587	799	701	459	495	499	444	350	495	606	678
	5/8	5	6-1/4	5	326	587	799	701	459	495	499	444	350	495	606	678
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	6-1/2	9	5	554	965	1275	1133	733	823	853	791	567	801	981	1097
	5/8 [1]	10-1/4	9	5	608	1142	1605	1386	922	949	904	791	693	979	1199	1342
	3/4	16-1/2	9	5	608	1283	1899	1601	1090	1045	904	791	800	1130	1385	1550

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
3/8 - 1/2	1/2	4-1/4	5	5	262	470	402	293	394	317	201	285	348
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	366	658	563	410	552	444	282	399	488
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	6-1/2	9	5	620	1071	927	663	910	767	464	658	804

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
3/8 - 1/2	1/2	4-1/4	5	5	171	311	500	262	273	241	249	353	433
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	239	436	701	367	383	337	349	495	606
	5/8	5	6-1/4	5	239	436	701	367	383	337	349	495	606
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	6-1/2	9	5	419	730	1133	598	646	602	565	801	981
	5/8 [1]	10-1/4	9	5	427	828	1386	718	722	602	691	979	1199
	3/4	16-1/2	9	5	427	890	1599	816	748	602	797	1130	1385

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
3/8 - 1/2	1/2	4-1/4	5	5	259	465	515	316	389	352	257	364	444
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	363	651	722	442	545	492	360	510	622
	5/8	5	6-1/4	5	363	651	722	442	545	492	360	510	622
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	6-1/2	9	5	615	1060	1164	709	900	843	581	822	1004
	5/8 [1]	10-1/4	9	5	682	1278	1433	884	1052	890	714	1012	1234
	3/4	16-1/2	9	5	698	1459	1663	1037	1171	890	828	1174	1431

1 Only ASTM A193 Grade B7, ASTM A325, or ASTM F1554 Grade 105 threaded rod is permitted with smaller interior thread diameter. A36 threaded rod (or stronger) can be used with largest thread diameter per insert.

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCM-WF and KCM-PD in 5,000 psi normal weight cracked concrete [1]

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"									
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
3/8 - 1/2	1/2	4-1/4	5	5	194	411	591	368	339	312	232	184	260	318
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	272	575	827	515	475	436	325	257	364	446
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-3/4	9	5	465	914	1254	828	721	712	579	413	585	716

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
1/4 - 3/8	3/8	3	3-1/2	5	168	298	321	258	185	253	241	205	129	183	224	250
3/8 - 1/2	1/2	4-1/4	5	5	295	523	563	453	324	445	423	359	227	321	393	440
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	413	732	788	635	454	623	592	503	318	449	550	615
	5/8	5	6-1/4	5	413	732	788	635	454	623	592	503	318	449	550	615
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-3/4	9	5	678	1130	1204	998	694	981	984	897	500	706	864	967
	5/8 [1]	9-1/4	9	5	761	1381	1493	1189	861	1165	1083	897	596	841	1029	1152
	3/4	16	9	5	800	1598	1750	1346	1008	1316	1088	897	675	953	1166	1305

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
1/4 - 3/8	3/8	3	3-1/2	5	148	267	363	319	209	225	227	202	159	225	276	308
3/8 - 1/2	1/2	4-1/4	5	5	260	469	638	559	367	395	398	354	280	395	484	542
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	364	657	893	783	513	554	557	496	392	553	678	758
	5/8	5	6-1/4	5	364	657	893	783	513	554	557	496	392	553	678	758
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-3/4	9	5	603	1028	1339	1198	770	883	931	885	599	846	1037	1159
	5/8 [1]	9-1/4	9	5	667	1231	1706	1484	981	1030	1011	885	742	1048	1284	1437
	3/4	16	9	5	679	1401	2050	1737	1177	1146	1011	885	869	1227	1503	1682

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
3/8 - 1/2	1/2	4-1/4	5	5	293	526	449	328	441	354	225	319	390
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	410	736	629	459	617	496	315	446	545
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-3/4	9	5	672	1135	989	700	973	839	496	702	858

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
3/8 - 1/2	1/2	4-1/4	5	5	191	348	559	293	306	269	279	395	484
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	268	487	783	410	428	377	391	553	678
	5/8	5	6-1/4	5	268	487	783	410	428	377	391	553	678
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-3/4	9	5	459	787	1198	635	700	672	597	846	1037
	5/8 [1]	9-1/4	9	5	477	902	1484	772	788	673	740	1048	1284
	3/4	16	9	5	477	989	1737	888	837	673	865	1227	1503

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
3/8 - 1/2	1/2	4-1/4	5	5	290	520	576	353	435	393	287	407	497
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	406	728	807	494	609	551	402	570	695
	5/8	5	6-1/4	5	406	728	807	494	609	551	402	570	695
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-3/4	9	5	666	1124	1229	746	962	920	613	868	1060
	5/8 [1]	9-1/4	9	5	747	1373	1531	942	1138	995	763	1081	1319
	3/4	16	9	5	781	1587	1803	1122	1281	995	898	1273	1552

1 Only ASTM A193 Grade B7, ASTM A325, or ASTM F1554 Grade 105 threaded rod is permitted with smaller interior thread diameter. A36 threaded rod (or stronger) can be used with largest thread diameter per insert.

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCM-WF and KCM-PD in 6,000 psi normal weight cracked concrete [1]

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
					A	B	C		D	E	F	G	H	I
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
3/8 - 1/2	1/2	4-1/4	5	5	213	450	647	403	372	341	254	201	285	349
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	298	630	905	564	520	478	356	282	399	488
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-1/4	9	5	500	964	1306	877	751	758	634	438	620	759

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
1/4 - 3/8	3/8	3	3-1/2	5	184	326	351	283	202	278	264	224	142	200	245	274
3/8 - 1/2	1/2	4-1/4	5	5	323	573	616	497	355	487	463	393	249	352	430	482
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	453	802	863	695	498	683	648	551	349	492	602	674
	5/8	5	6-1/4	5	453	802	863	695	498	683	648	551	349	492	602	674
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-1/4	9	5	722	1182	1256	1050	724	1032	1053	982	526	743	909	1017
	5/8 [1]	8-1/4	9	5	817	1460	1574	1263	908	1239	1168	982	633	894	1094	1224
	3/4	14-1/2	9	5	876	1705	1862	1442	1073	1411	1192	982	723	1021	1249	1399

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
					A	B	C		D	E	F		G	H	I	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
1/4 - 3/8	3/8	3	3-1/2	5	162	293	398	349	229	247	248	221	175	247	302	338
3/8 - 1/2	1/2	4-1/4	5	5	285	513	699	613	402	433	436	388	306	433	530	593
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	399	719	978	858	562	606	611	544	429	606	743	831
	5/8	5	6-1/4	5	399	719	978	858	562	606	611	544	429	606	743	831
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-1/4	9	5	644	1080	1389	1250	799	933	997	969	625	883	1082	1210
	5/8 [1]	8-1/4	9	5	718	1307	1790	1565	1029	1098	1099	969	782	1105	1354	1515
	3/4	14-1/2	9	5	744	1500	2172	1849	1247	1231	1107	969	925	1306	1600	1791

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
3/8 - 1/2	1/2	4-1/4	5	5	320	576	492	359	483	388	247	349	427
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	449	806	689	503	676	544	345	489	598
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-1/4	9	5	716	1188	1041	730	1025	901	522	739	903

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
3/8 - 1/2	1/2	4-1/4	5	5	209	381	613	321	335	295	306	433	530
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	293	534	858	449	469	413	428	606	743
	5/8	5	6-1/4	5	293	534	858	449	469	413	428	606	743
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-1/4	9	5	493	835	1250	665	745	724	624	883	1082
	5/8 [1]	8-1/4	9	5	523	965	1565	817	846	737	780	1105	1354
	3/4	14-1/2	9	5	523	1066	1849	949	916	737	921	1306	1600

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
					A	B	C	D	E	F	G	H	I
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
3/8 - 1/2	1/2	4-1/4	5	5	318	570	631	387	476	431	315	446	544
3/8 - 1/2 - 5/8	1/2 [1]	5	6-1/4	5	445	798	884	542	667	603	441	624	762
	5/8	5	6-1/4	5	445	798	884	542	667	603	441	624	762
3/8 - 1/2 - 5/8 - 3/4	1/2 [1]	5-1/4	9	5	710	1177	1281	776	1013	986	639	905	1105
	5/8 [1]	8-1/4	9	5	802	1452	1613	990	1210	1085	804	1139	1390
	3/4	14-1/2	9	5	855	1694	1917	1190	1374	1090	955	1353	1651

1 Only ASTM A193 Grade B7, ASTM A325, or ASTM F1554 Grade 105 threaded rod is permitted with smaller interior thread diameter. A36 threaded rod (or stronger) can be used with largest thread diameter per insert.

Maximum allowable pipe horizontal load, F_{pw} (lb) Hilti KCM-MD in the soffit of 3,000 psi or 4,000 psi lightweight concrete over metal deck 2-in W-deck profiles [2]

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2" [1]							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.100	1.580	0.870	1.850	4.100	1.580	0.870	1.850
3/8 - 1/2	1/2	11/16	6	2-1/2	116	283	437	250	135	317	479	280
3/8 - 1/2 - 5/8	1/2	7/8	7-1/2	3-1/4	134	332	517	292	154	372	570	328

1 Anchor may be placed in upper or lower flute. Prying factors noted assume the seismic swivel brace has its full bearing area in contact with the metal deck.

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.490	1.100	1.050	1.360	2.490	1.100	1.050	1.360
1/4 - 3/8	3/8	1-1/8	5-1/2	2-1/2	145	288	297	245	168	319	329	273
3/8 - 1/2	3/8	1-1/8	6	2-1/2	188	346	357	299	211	380	391	330
	1/2	1-1/8	6	2-1/2	192	372	384	318	221	411	424	354
3/8 - 1/2 - 5/8	1/2	1-1/8	7-1/2	3-1/4	220	438	453	373	254	486	502	416
	5/8	1-1/8	7-1/2	3-1/4	220	441	456	376	254	490	506	419
5/8 - 3/4	5/8	1-1/8	7-1/2	3-1/4	220	423	438	363	252	468	483	403
	3/4	1-1/8	7-1/2	3-1/4	220	441	456	376	254	490	506	419

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	3.070	1.320	0.960	1.070	3.070	1.320	0.960	1.070
1/4 - 3/8	3/8	1-1/8	6	2-1/2	118	251	317	293	136	280	350	325
3/8 - 1/2	3/8	1-1/8	6	2-1/2	156	305	378	352	178	337	413	386
	1/2	1-1/8	6	2-1/2	156	325	409	379	180	362	450	419
3/8 - 1/2 - 5/8	1/2	1-1/8	7-1/2	3-1/4	178	382	483	447	206	426	534	495
	5/8	1-1/8	7-1/2	3-1/4	178	384	487	450	206	429	538	499
5/8 - 3/4	5/8	1-1/8	7-1/2	3-1/4	178	371	465	432	206	412	512	477
	3/4	1-1/8	7-1/2	3-1/4	178	384	487	450	206	429	538	499

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.520	1.160	1.380	2.520	1.160	1.380
3/8 - 1/2	1/2	1-1/4	6	2-1/2	190	358	315	218	396	350

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	4.170	2.000	0.960	4.170	2.000	0.960
3/8 - 1/2	1/2	1-1/4	6	2-1/2	114	235	409	132	264	450
3/8 - 1/2 - 5/8	1/2	1-1/4	7-1/2	3-1/4	131	274	483	152	308	534
	5/8	1-1/4	7-1/2	3-1/4	131	274	487	152	310	538
5/8 - 3/4	5/8	1-1/4	7-1/2	3-1/4	131	268	465	152	301	512
	3/4	1-1/4	7-1/2	3-1/4	131	274	487	152	310	538

Anchor size	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	in	2.550	1.090	1.140	2.550	1.090	1.140
3/8 - 1/2	1/2	1 1/4	6	2-1/2	187	374	362	216	413	401
3/8 - 1/2 - 5/8	1/2	1 1/4	8	3-1/4	215	441	427	248	489	474
	5/8	1 1/4	8	3-1/4	215	444	430	248	493	477
5/8 - 3/4	5/8	1 1/4	8	3-1/4	215	426	413	247	471	457
	3/4	1 1/4	8	3-1/4	215	444	430	248	493	477

2 Only ASTM A193 Grade B7, ASTM A325, or ASTM F1554 Grade 105 threaded rod is permitted with smaller interior thread diameter. A36 threaded rod (or stronger) can be used with largest thread diameter per insert.

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCC-WF in 3,000 psi normal weight cracked concrete

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
				A	B	C		D	E	F	G	H	I
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	5-1/4	6-1/4	5	211	445	641	399	368	338	251	199	282	345

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
				A	B	C		D	E	F		G	H	I	
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	4-1/4	5	5	229	405	436	351	251	345	327	278	176	249	304	340
1/2	5-1/4	6-1/4	5	320	567	610	492	352	483	459	390	246	348	426	477

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
				A	B	C		D	E	F		G	H	I	
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	4-1/4	5	5	201	363	494	433	284	306	308	274	217	306	375	420
1/2	5-1/4	6-1/4	5	282	509	692	607	398	429	432	384	303	429	525	587

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	5-1/4	6-1/4	5	317	570	487	355	478	384	244	346	422

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	5-1/4	6-1/4	5	207	377	607	317	332	292	303	429	525

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	5-1/4	6-1/4	5	314	564	625	383	472	426	312	441	539

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCC-WF in 4,000 psi normal weight cracked concrete

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
				A	B	C		D	E	F	G	H	I
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	5	6-1/4	5	244	514	740	461	425	390	290	230	326	399

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
				A	B	C		D	E	F		G	H	I	
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	4-1/4	5	5	264	468	503	405	290	398	378	321	203	287	351	393
1/2	5	6-1/4	5	370	655	705	568	406	557	529	450	285	402	492	551

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
				A	B	C		D	E	F		G	H	I	
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	4-1/4	5	5	232	419	570	500	328	354	356	317	250	353	433	484
1/2	5	6-1/4	5	326	587	799	701	459	495	499	444	350	495	606	678

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	5	6-1/4	5	366	658	563	410	552	444	282	399	488

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	5	6-1/4	5	239	436	701	367	383	337	349	495	606

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	5	6-1/4	5	363	651	722	442	545	492	360	510	622

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCC-WF in 5,000 psi normal weight cracked concrete

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
				A	B	C		D	E	F	G	H	I
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	5	6-1/4	5	272	568	813	510	467	432	325	254	360	441

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
				A	B	C		D	E	F		G	H	I	
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	4-1/4	5	5	295	522	561	452	324	444	422	359	227	320	392	439
1/2	5	6-1/4	5	410	721	776	627	447	615	588	503	314	444	543	608

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
				A	B	C		D	E	F		G	H	I	
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	4-1/4	5	5	260	468	636	558	366	395	398	354	279	394	483	540
1/2	5	6-1/4	5	361	648	877	771	504	547	554	496	386	545	667	746

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	5	6-1/4	5	406	725	621	452	610	496	311	441	539

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	5	6-1/4	5	268	482	771	404	424	377	384	545	667

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	5	6-1/4	5	403	717	794	486	601	547	396	561	684

Maximum allowable pipe horizontal load, F_{pw} (lb)
Hilti KCC-WF in 6,000 psi normal weight cracked concrete

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2"								
				A	B	C		D	E	F	G	H	I
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	4.100	1.580	0.870	1.850	1.520	2.320	3.440	3.710	2.620	2.140
1/2	4-3/4	6-1/4	5	296	604	852	543	490	463	356	271	384	470

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace											
				A	B	C		D	E	F		G	H	I	
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.490	1.080	0.950	1.360	1.650	1.400	1.830	2.220	2.710	1.920	1.570	1.400
3/8	3-3/4	5	5	316	550	590	479	340	471	454	393	240	339	415	465
1/2	4-3/4	6-1/4	5	439	760	815	664	470	652	632	551	333	470	575	643

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace											
				A	B	C		D	E	F		G	H	I	
				30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.930	1.290	0.750	0.960	1.310	1.670	1.970	2.250	1.920	1.360	1.110	0.990
3/8	3-3/4	5	5	279	495	665	587	382	420	428	388	293	414	508	568
1/2	4-3/4	6-1/4	5	388	685	916	810	527	582	596	544	405	572	701	784

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.520	1.070	1.380	1.620	1.420	2.250	2.750	1.940	1.590
1/2	4-3/4	6-1/4	5	435	764	658	474	646	535	330	467	570

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	4.170	2.000	0.960	1.970	2.380	2.960	1.930	1.360	1.110
1/2	4-3/4	6-1/4	5	292	515	810	426	454	413	404	572	701

Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace								
				A	B	C	D	E	F	G	H	I
				30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
				Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
in	in	in	in	2.550	1.090	0.910	1.410	1.450	2.000	1.830	1.290	1.060
1/2	4-3/4	6-1/4	5	431	756	833	509	638	589	415	588	718

Maximum allowable pipe horizontal load, F_{pw} (lb) Hilti KCC-MD in the soffit of 3,000 psi or 4,000 psi lightweight concrete over metal deck 2-in W-deck profiles

Anchor type	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Hilti MQS-SP-L-1/2" and MQS-SP-T-1/2" [1]							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
	in	in	in	in	4.100	1.580	0.870	1.850	4.100	1.580	0.870	1.850
KCC-MD-SP	1/2	7/8	7-1/2	3-1/4	134	315	477	279	154	350	521	312
KCC-MD-LP	1/2	1/2	7-1/2	3-1/4	352	689	944	625	352	689	944	625

1 Anchor may be placed in upper or lower flute. Prying factors noted assume the seismic swivel brace has its full bearing area in contact with the metal deck.

Anchor type	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 909 seismic brace							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
	in	in	in	in	2.490	1.100	1.050	1.360	2.490	1.100	1.050	1.360
KCC-MD-SP	3/8	1-1/8	6	2-1/2	189	350	361	302	213	384	396	334
	1/2	1-1/8	7-1/2	3-1/4	219	409	422	352	247	450	464	390
KCC-MD-LP	3/8	1-1/8	6	2-1/2	381	625	640	558	381	625	640	558
	1/2	1-1/8	7-1/2	3-1/4	512	843	863	752	512	843	863	752

Anchor type	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Tolco™ Figure 910/980 seismic brace							
					3,000 psi				4,000 psi			
					A	B	C		A	B	C	
					30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
					Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr
	in	in	in	in	3.070	1.320	0.960	1.070	3.070	1.320	0.960	1.070
KCC-MD-SP	3/8	1-1/8	6	2-1/2	156	308	382	356	179	341	418	391
	1/2	1-1/8	7-1/2	3-1/4	178	360	448	417	206	398	491	458
KCC-MD-LP	3/8	1-1/8	6	2-1/2	328	567	668	634	328	567	668	634
	1/2	1-1/8	7-1/2	3-1/4	440	765	902	855	440	765	902	855

Anchor type	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF075/AF076/AF077 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
	in	in	in	in	2.520	1.160	1.380	2.520	1.160	1.380
KCC-MD-SP	1/2	1-1/4	7-1/2	3-1/4	217	394	348	244	435	386
KCC-MD-LP	1/2	1-1/4	7-1/2	3-1/4	508	820	746	508	820	746

Anchor type	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF771 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
	in	in	in	in	4.170	2.000	0.960	4.170	2.000	0.960
KCC-MD-SP	1/2	1-1/4	7-1/2	3-1/4	131	262	448	152	294	491
KCC-MD-LP	1/2	1-1/4	7-1/2	3-1/4	348	595	902	348	595	902

Anchor type	Nominal rod diameter	Min. edge distance	Min. spacing distance	Min. concrete thickness	Afcon™ AF700 seismic brace					
					3,000 psi			4,000 psi		
					A	B	C	A	B	C
					30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
					Pr	Pr	Pr	Pr	Pr	Pr
	in	in	in	in	2.550	1.090	1.140	2.550	1.090	1.140
KCC-MD-SP	1/2	1-1/4	7-1/2	3-1/4	215	412	399	242	453	440
KCC-MD-LP	1/2	1 1/4	7-1/2	3-1/4	504	847	828	504	847	828

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