# HIT-HY 200 Adhesive Anchoring System 3.2.3

## 3.2.3.1 Product description

Hilti HIT-HY 200 adhesive is an injectable, two-component, hybrid adhesive. The two components are separated by means of a dual-cylinder foil pack attached to a manifold. The two components combine and react when dispensed through a static mixing nozzle attached to the manifold.

Hilti HIT-HY 200 adhesive is available in two options, Hilti HIT-HY 200-A, and Hilti HIT-HY 200-R. Both options utilize the same technical data. Hilti HIT-HY 200-A will have shorter working times and curing times than Hilti HIT-HY 200-R. The packaging for each is different which helps the user distinguish between the two adhesives.

Hilti HIT-HY 200 adhesive comes with three hole cleaning options:

- The traditional hole cleaning method uses steel wire brushes and compressed air
- The self-cleaning method uses the Hilti TE-CD or TE-YD Hollow Drill Bits in conjunction with a Hilti vacuum to remove the dust as you drill. The hole is clean and ready for anchor installation.
- The no-cleaning method requires the use of Hilti HIT-Z and HIT-Z-R anchor rods (when drilled with hammer-drilled holes). If the base material temperature is less than 5° C or if diamond core drilling is used, then the drilled hole must be cleaned.

Elements that are suitable for use with this system are threaded steel rods, Hilti HIS-(R)N steel internally threaded inserts, steel reinforcing bars and Hilti HIT-Z and HIT-Z-R threaded rods.

**Product features**

- Two great products with equal performance data
- User can select product gel time suitability based on temperature of the base material and jobsite time requirements
- No hole cleaning requirement when installed SafeSet™ hollow drill bit technology
- No hole cleaning requirement when installing HIT-Z anchor rods in dry conditions with hammer-drilled holes
- ICC-ES approved for cracked concrete and seismic service
- May be installed in diamond cored holes with HIT-Z anchor rod only when addition cleaning steps are employed

**Guide specifications**

Injectable adhesive shall be used for installation of threaded rods (rebar) (inserts) into existing concrete. Adhesive shall be furnished in containers which keep component A and component B separate. Containers shall be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection of the mixed adhesive directly into the drilled hole. Only injection tools and static mixing nozzles supplied by the manufacturer may be used. Injection adhesive shall be formulated to include the resin and hardener to provide optimal curing speed, high strength and stiffness. Injection adhesive anchor system shall be Hilti HIT-HY 200 installed using Hilti Safe Set™ Technology. HIT-HY 200 System shall be supplied by Hilti.



HIT-HY 200-A

HIT-HY 200-R

**Listings/Approvals**

**ICC-ES (International Code Council)**
ESR-3187
**NSF/ANSI Std 61**
certification for use in potable water
**European Technical Approval**
ETA-11/0492, ETA-11/0493
ETA-12/0006, ETA-12/0028
ETA-12/0083, ETA-12/0084
**City of Los Angeles**
Research Report No. 25964

**Independent Code Evaluation**

**IBC®/IRC® 2015 (ICC-ES AC308/ACI 355.4)**
**IBC®/IRC® 2012 (ICC-ES AC308/ACI 355.4)**
**IBC®/IRC® 2009 (ICC-ES AC308)**
**IBC®/IRC® 2006 (ICC-ES AC308)**
**Abu Dhabi International Building Code (ADIBC) 2013**

**LEED® Credit 4.1-Low Emitting Materials**

The Leadership in Energy and Environmental Design (LEED®) Green Building Rating system™ is the nationally accepted benchmark for the design, construction and operation of high performance green buildings.

**Department of Transportation**

Contact Hilti to get a current list of State Departments of Transportation that have added HIT-HY 200 to their qualified product listing.

# 3.2.3 HIT-HY 200 Adhesive Anchoring System

## 3.2.3.2 Material specifications

For material specifications for anchor rods and inserts, please refer to section 3.2.8.

## 3.2.3.3 Technical data

The following document is a supplement to the Hilti North American Product Technical Guide, Volume 2: Anchor Fastening Technical Guide, Edition 16. Specific sections in this supplement will refer to the aforementioned document.

Please refer to the publication in its entirety for complete details on this product including data development, product specifications, general suitability, installation, corrosion and spacing and edge distance guidelines.

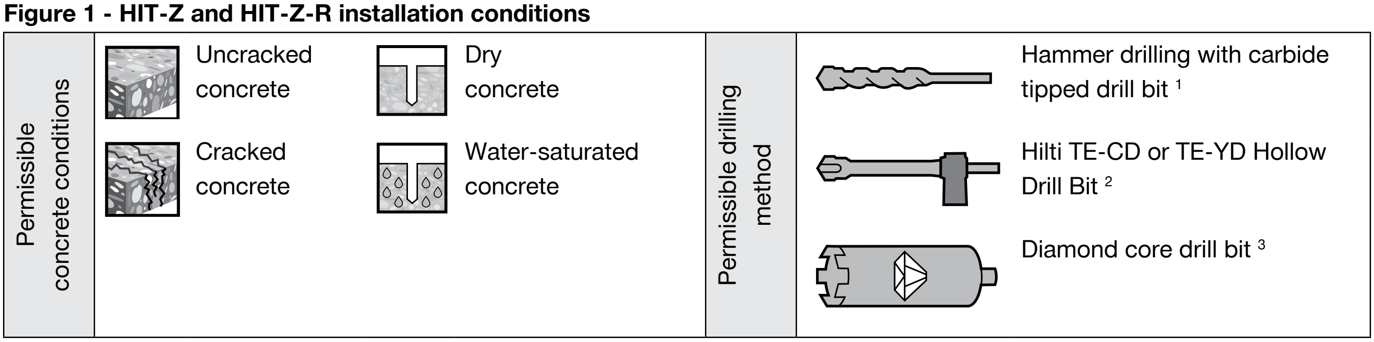
To consult directly with a team member regarding our anchor fastening products, contact Hilti's team of technical support specialists on the following mail address ae.technicalsupport@hilti.com.

## 3.2.3.3.1 ACI 318-14 Chapter 17 design

The load values contained in this section are Hilti Simplified Design Tables. The load tables in this section were developed using the Strength Design parameters and variables of ESR-3187 and the equations within ACI 318-14 Chapter 17. For a detailed explanation of the Hilti Simplified Design Tables, refer to section 3.1.8. Data tables from ESR-3187 are not contained in this section, but can be found at www.icc-es.org or at www.us.hilti.com.

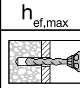
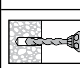
## HIT-HY 200 adhesive with HIT-Z and HIT-Z-R anchor rods

**Figure 1 - HIT-Z and HIT-Z-R installation conditions**




1 Anchor may be installed in a hole drilled with a carbide-tipped bit without cleaning the drilling dust from the hole. Temperature must be 5°C or higher. Drilling dust must be removed from the hole if the temperature is below 5°C. See Manufacturer's Published Installation Instructions (MPII).
2 When temperatures are below 5°C, TE-CD or TE-YD Hollow Drill Bits used with a Hilti vacuum cleaner are viable methods for removing drilling dust from the hole.
3 Holes drilled by diamond coring require cleaning with a wire brush, a water hose and compressed air. See MPII.

**Table 1 - Specifications for HIT-Z and HIT-Z-R installed with HIT-HY 200 adhesive**

| Setting information | | Symbol | Units | Nominal anchor diameter | | | |
|---|---|---|---|---|---|---|---|
| | | | | 10 | 12 | 16 | 20 |
| Nominal bit diameter | | $d_o$ | mm | 12 | 14 | 18 | 22 |
| Effective embedment | minimum | $h_{ef,min}$ | mm | 60 | 70 | 96 | 100 |
| | maximum | $h_{ef,max}$ | mm | 120 | 144 | 192 | 220 |
| Diameter of fixture hole | through-set |  | mm | 14 | 16 | 20[1] | 24[1] |
| | preset |  | mm | 12 | 14 | 18 | 22 |
| Installation torque | | $T_{inst}$ | Nm | 25 | 40 | 80 | 150 |

1 Install using (2) washers. See Figure 3.

**Figure 2 - HIT-Z and HIT-Z-R specfications**

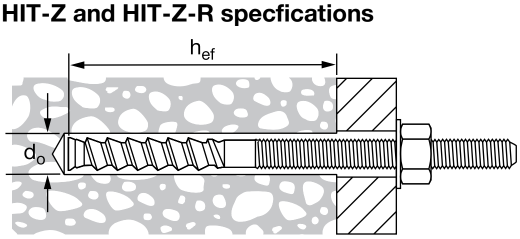
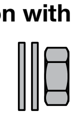



**Figure 3 - Installation with (2) washers**

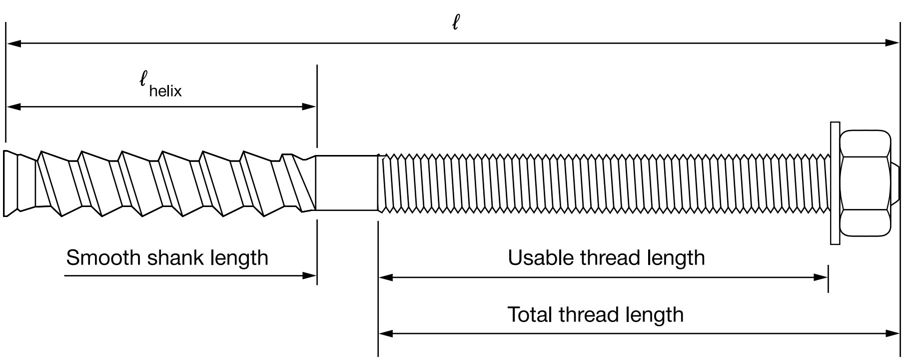


# HIT-HY 200 Adhesive Anchoring System 3.2.3

**Table 2 - HIT-Z and HIT-Z-R anchor rod length and thread dimension**

| Size | $\ell$ Anchor length mm | $\ell_{helix}$ Helix length mm | Smooth shank length mm | Total thread length mm | Usable thread length mm | HIT-Z Length Code |
|---|---|---|---|---|---|---|
| HIT-Z(-R) M10x95 | 95 | 60 | 8 | 27 | 14 | E |
| HIT-Z(-R) M10x115 | 115 | 60 | 8 | 47 | 34 | G |
| HIT-Z(-R) M10x135 | 135 | 60 | 8 | 67 | 54 | H |
| HIT-Z(-R) M10x160 | 160 | 60 | 8 | 92 | 79 | J |
| HIT-Z(-R) M12x105 | 105 | 60 | 8 | 37 | 21 | F |
| HIT-Z(-R) M12x140 | 140 | 60 | 8 | 72 | 56 | I |
| HIT-Z(-R) M12x155 | 155 | 60 | 8 | 87 | 71 | J |
| HIT-Z(-R) M12x196 | 196 | 60 | 8 | 128 | 112 | M |
| HIT-Z(-R) M16x155 | 155 | 93 | 11 | 51 | 30 | J |
| HIT-Z(-R) M16x175 | 175 | 93 | 11 | 71 | 50 | K |
| HIT-Z(-R) M16x205 | 205 | 93 | 11 | 101 | 80 | N |
| HIT-Z(-R) M16x240 | 240 | 93 | 32 | 115 | 94 | P |
| HIT-Z(-R) M20x215 | 215 | 100 | 13 | 102 | 78 | N |
| HIT-Z(-R) M20x250 | 250 | 100 | 48 | 102 | 78 | Q |

**Figure 4 - HIT-Z and HIT-Z-R anchor rod length and thread dimension**



# 3.2.3 HIT-HY 200 Adhesive Anchoring System

**Table 3 - HIT-HY 200 design strength with concrete/pullout failure for HIT-Z(-R) rods in uncracked concrete [1,2,3,4,5,6,7,8,9,10]**

| Nominal anchor diameter mm | Effective embed. mm | Tension — $\Phi N_n$ | | | | Shear — $\Phi V_n$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN |
| 10 | 60 | 15.1 | 16.5 | 19.1 | 21.4 | 16.3 | 17.8 | 20.6 | 23.0 |
| | 90 | 25.4 | 25.4 | 25.4 | 25.4 | 59.8 | 65.5 | 75.6 | 84.5 |
| | 120 | 25.4 | 25.4 | 25.4 | 25.4 | 92.0 | 100.8 | 116.4 | 130.1 |
| 12 | 70 | 19.0 | 20.9 | 24.1 | 26.9 | 41.0 | 44.9 | 51.9 | 58.0 |
| | 108 | 30.5 | 30.5 | 30.5 | 30.5 | 78.6 | 86.1 | 99.4 | 111.1 |
| | 144 | 30.5 | 30.5 | 30.5 | 30.5 | 121.0 | 132.5 | 153.0 | 171.1 |
| 16 | 96 | 30.6 | 33.5 | 38.7 | 43.2 | 65.8 | 72.1 | 83.3 | 93.1 |
| | 144 | 56.2 | 61.5 | 63.7 | 63.7 | 121.0 | 132.5 | 153.0 | 171.1 |
| | 192 | 63.7 | 63.7 | 63.7 | 63.7 | 186.2 | 204.0 | 235.6 | 263.4 |
| 20 | 100 | 32.5 | 35.6 | 41.1 | 46.0 | 70.0 | 76.7 | 88.5 | 99.0 |
| | 180 | 78.5 | 84.7 | 84.7 | 84.7 | 169.0 | 185.2 | 213.8 | 239.1 |
| | 220 | 84.7 | 84.7 | 84.7 | 84.7 | 228.4 | 250.2 | 288.9 | 323.0 |

**Table 4 - HIT-HY 200 design strength with concrete/pullout failure for HIT-Z(-R) rods in cracked concrete [1,2,3,4,5,6,7,8,9,10]**

| Nominal anchor diameter mm | Effective embed. mm | Tension — $\Phi N_n$ | | | | Shear — $\Phi V_n$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN |
| 10 | 60 | 10.7 | 11.7 | 13.6 | 15.2 | 11.5 | 12.7 | 14.6 | 16.3 |
| | 90 | 19.7 | 21.6 | 24.9 | 25.4 | 42.4 | 46.5 | 53.7 | 60.0 |
| | 120 | 25.4 | 25.4 | 25.4 | 25.4 | 65.3 | 71.6 | 82.6 | 92.4 |
| 12 | 70 | 13.5 | 14.8 | 17.1 | 19.1 | 29.1 | 31.9 | 36.8 | 41.2 |
| | 108 | 25.9 | 28.4 | 28.5 | 28.5 | 55.8 | 61.1 | 70.6 | 78.9 |
| | 144 | 28.5 | 28.5 | 28.5 | 28.5 | 85.9 | 94.1 | 108.6 | 121.5 |
| 16 | 96 | 21.7 | 23.8 | 27.5 | 30.7 | 46.7 | 51.2 | 59.1 | 66.1 |
| | 144 | 39.9 | 43.7 | 50.4 | 56.4 | 85.9 | 94.1 | 108.6 | 121.5 |
| | 192 | 61.4 | 63.7 | 63.7 | 63.7 | 132.2 | 144.8 | 167.3 | 187.0 |
| 20 | 100 | 23.1 | 25.3 | 29.2 | 32.6 | 49.7 | 54.4 | 62.9 | 70.3 |
| | 180 | 55.7 | 61.0 | 70.5 | 78.8 | 120.0 | 131.5 | 151.8 | 169.7 |
| | 220 | 75.3 | 82.5 | 83.1 | 83.1 | 162.2 | 177.7 | 205.1 | 229.4 |

1 Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that pullout is the controlling failure mode. Compare to the steel values in Table 5. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55°C, max. long term temperature = 43°C.
For temperature range B: Max. short term temperature = 80°C, max. long term temperature = 43°C multiply above values by 1.0.
For temperature range C: Max. short term temperature = 120°C, max. long term temperature = 72°C multiply above values by 0.90.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long-term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry and water saturated concrete conditions.
7 Tabular values are for short-term loads only. For sustained loads, see section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength (factored resistance) by $\lambda_a$ as follows:
For sand-lightweight, $\lambda_a$ = 0.51. For all-lightweight, $\lambda_a$ = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension only by the following reduction factors:
12 mm diameter - $\alpha_{N,seis}$ = 0.67
10 mm, 16 mm, and 20 mm diameter - $\alpha_{N,seis}$ = 0.75
See Section 3.1.8.7 for additional information on seismic applications.
10 Diamond core drilling with Hilti HIT-Z(-R) rods is permitted with no reduction in published data above.

**Table 5 - Steel design strength for Hilti HIT-Z and HIT-Z-R rods [1,2]**

| Nominal anchor diameter mm | HIT-Z carbon steel rod Tensile[3] $\phi N_{sa}$ kN | HIT-Z carbon steel rod Shear[4] $\phi V_{sa}$ kN | HIT-Z carbon steel rod Seismic Shear[5] $\phi V_{sa,eq}$ kN | HIT-Z-R stainless steel rod Tensile[3] $\phi N_{sa}$ kN | HIT-Z-R stainless steel rod Shear[4] $\phi V_{sa}$ kN | HIT-Z-R stainless steel rod Seismic Shear[5] $\phi V_{sa,eq}$ kN |
|---|---|---|---|---|---|---|
| 10 | 24.5 | 10.0 | 10.0 | 24.5 | 13.6 | 13.6 |
| 12 | 35.6 | 15.0 | 10.0 | 35.6 | 19.7 | 14.8 |
| 16 | 62.3 | 25.0 | 15.0 | 62.3 | 34.5 | 22.4 |
| 20 | 94.8 | 40.0 | 25.0 | 94.8 | 52.5 | 34.1 |

1 See section 3.1.8.6 to convert design strength value to ASD value.
2 HIT-Z and HIT-Z-R rods are to be considered brittle steel elements.
3 Tensile = $\phi\ A_{se,N}\ f_{uta}$ as noted in ACI 318-14 Chapter 17.
4 Shear values determined by static shear tests with $\phi V_{sa} \leq \phi\ 0.60\ A_{se,V}\ f_{uta}$ as noted in ACI 318-14 Chapter 17.
5 Seismic Shear = $\alpha_{V,seis}\ \phi V_{sa}$ : Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

## Hilti HIT-Z(-R) rod permissible combinations of edge distance, anchor spacing, and concrete thickness

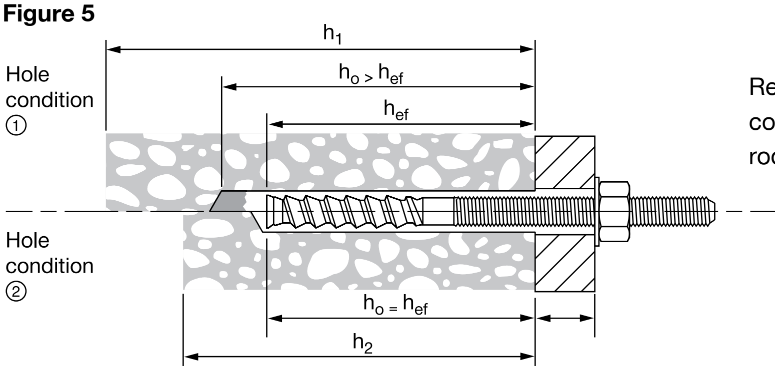
The Hilti HIT-Z and HIT-Z-R anchor rods produce higher expansion forces in the concrete slab when the installation torque is applied. This means that the anchor must be installed with larger edge distances and spacing when compared to standard threaded rod, to minimize the likelihood that the concrete slab will split during installation.

The permissible edge distance is based on the concrete condition (cracked or uncracked), the concrete thickness, and anchor spacing if designing for anchor groups. The permissible concrete thickness is dependent on whether or not the drill dust is removed during the anchor installation process.

**Step 1: Check concrete thickness**

When using Hilti HIT-Z and HIT-Z-R anchor rods, drilling dust does not need to be removed for optimum capacity when base material temperatures are greater than 5° C and a hammer drill with a carbide tipped drill bit is used. However, concrete thickness can be reduced if the drilling dust is removed. The figure below shows both drilled hole conditions. Drilled hole condition 1 illustrates the hole depth and concrete thickness when drilling dust is left in the hole. Drilled hole condition 2 illustrates the corresponding reduction when drill dust is removed by using compressed air, Hilti TE-CD or TE-YD Hollow Drill Bits with a Hilti vacuum.

**Figure 5**




Refer to tables 6 to 9 in this section for the minimum concrete thicknesses associated with the Hilti HIT-Z(-R) rods based on diameter and drilled hole condition.

**Step 2: Check edge distance and anchor spacing**

Tables 6 to 9 in this section show the minimum edge distance and anchor spacing based on a specific concrete thickness and whether or not the design is for cracked or uncracked concrete. There are two cases of edge distance and anchor spacing combinations for each embedment and concrete condition (cracked or uncracked). **Case 1** is the minimum edge distance needed for one anchor or for two anchors with large anchor spacing. **Case 2** is the minimum anchor spacing that can be used, but the edge distance is increased to help prevent splitting. Linear interpolation can be used between **Case 1** and **Case 2** for any specific concrete thickness and concrete condition. See the following figure and calculation which can be used to determine specific edge distance and anchor spacing combinations.

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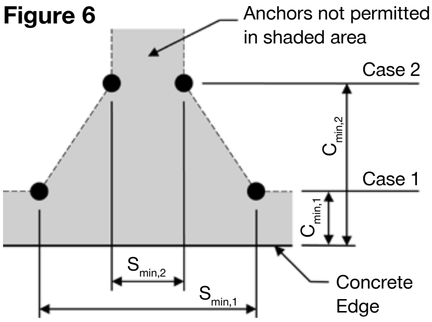
**Figure 6**




For a specific edge distance, the permitted spacing is calculated as follows:

$$s \geq s_{min,2} + \frac{(s_{min,1} - s_{min,2})}{(c_{min,1} - c_{min,2})}(c - c_{min,2})$$

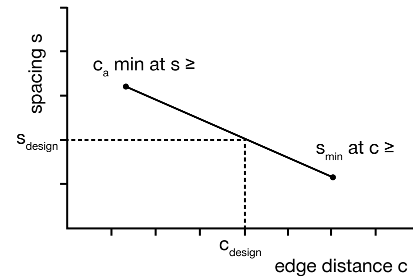



**Table 6 - Minimum edge distance, spacing, and concrete thickness for M10 diameter Hilti HIT-Z and HIT-Z-R rods**

| Design information | | Symbol | Units | Nominal rod diameter | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rod O.D. | | d | mm | 10 | | | | | | | | |
| Effective embedment | | $h_{ef}$ | mm | 60 | | | 90 | | | 120 | | |
| Drilled hole condition | | - | - | 2[2] | 1 or 2 | | 2[2] | 1 or 2 | | 2[2] | 1 or 2 | |
| Minimum concrete thickness | | h | mm | 100 | 120 | 156 | 120 | 150 | 176 | 150 | 180 | 197 |
| Uncracked concrete | Minimum edge and spacing **Case 1**[1] | $c_{min,1}$ | mm | 99 | 83 | 64 | 83 | 66 | 57 | 66 | 55 | 51 |
| | | $s_{min,1}$ | mm | 295 | 244 | 187 | 244 | 197 | 166 | 197 | 164 | 148 |
| | Minimum edge and spacing **Case 2**[1] | $c_{min,2}$ | mm | 181 | 148 | 110 | 148 | 115 | 96 | 115 | 93 | 84 |
| | | $s_{min,2}$ | mm | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Cracked concrete | Minimum edge and spacing **Case 1**[1] | $c_{min,1}$ | mm | 71 | 59 | 52 | 59 | 50 | 50 | 50 | 50 | 50 |
| | | $s_{min,1}$ | mm | 209 | 174 | 150 | 174 | 131 | 106 | 131 | 84 | 66 |
| | Minimum edge and spacing **Case 2**[1] | $c_{min,2}$ | mm | 124 | 101 | 74 | 101 | 77 | 64 | 77 | 62 | 55 |
| | | $s_{min,2}$ | mm | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |

**Table 7 - Minimum edge distance, spacing, and concrete thickness for M12 diameter Hilti HIT-Z and HIT-Z-R rods**

| Design information | | Symbol | Units | Nominal Rod Diameter | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rod O.D. | | d | mm | 12 | | | | | | | | |
| Effective embedment | | $h_{ef}$ | mm | 70 | | | 108 | | | 144 | | |
| Drilled hole condition | | - | - | 2[2] | 1 or 2 | | 2[2] | 1 or 2 | | 2[2] | 1 or 2 | |
| Minimum concrete thickness | | h | mm | 100 | 130 | 184 | 138 | 168 | 209 | 174 | 204 | 234 |
| Uncracked concrete | Minimum edge and spacing **Case 1**[1] | $c_{min,1}$ | mm | 139 | 107 | 76 | 101 | 83 | 67 | 80 | 68 | 60 |
| | | $s_{min,1}$ | mm | 416 | 320 | 225 | 300 | 247 | 199 | 239 | 204 | 176 |
| | Minimum edge and spacing **Case 2**[1] | $c_{min,2}$ | mm | 258 | 194 | 131 | 181 | 146 | 114 | 140 | 116 | 99 |
| | | $s_{min,2}$ | mm | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Cracked concrete | Minimum edge and spacing **Case 1**[1] | $c_{min,1}$ | mm | 101 | 78 | 62 | 74 | 61 | 60 | 60 | 60 | 60 |
| | | $s_{min,1}$ | mm | 303 | 232 | 186 | 217 | 178 | 126 | 168 | 117 | 79 |
| | Minimum edge and spacing **Case 2**[1] | $c_{min,2}$ | mm | 182 | 136 | 90 | 127 | 101 | 77 | 96 | 79 | 67 |
| | | $s_{min,2}$ | mm | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |

1 Linear interpolation is permitted to establish an edge distance and spacing combination between Case 1 and Case 2.
Linear interpoloation for a specific edge distance c, where $c_{min,1} < c < c_{min,2}$, will determine the permissible spacing s as follows:

$$s \geq s_{min,2} + \frac{(s_{min,1} - s_{min,2})}{(c_{min,1} - c_{min,2})}(c - c_{min,2})$$

2 For shaded cells, drilling dust must be removed from drilled hole to justify minimum concrete thickness.

### Table 8 - Minimum edge distance, spacing, and concrete thickness for M16 diameter Hilti HIT-Z and HIT-Z-R rods

| Design information | | Symbol | Units | Nominal rod diameter | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rod O.D. | | d | mm | 16 | | | | | | | | |
| Effective embedment | | $h_{ef}$ | mm | 96 | | | 144 | | | 192 | | |
| Drilled hole condition | | - | - | 2[2] | 1 or 2 | | 2[2] | 1 or 2 | | 2[2] | 1 or 2 | |
| Minimum concrete thickness | | h | mm | 141 | 196 | 237 | 189 | 244 | 269 | 237 | 292 | 312 |
| Uncracked concrete | Minimum edge and spacing **Case 1**[1] | $c_{min,1}$ | mm | 158 | 114 | 94 | 118 | 92 | 83 | 94 | 80 | 80 |
| | | $s_{min,1}$ | mm | 473 | 339 | 281 | 352 | 271 | 248 | 281 | 217 | 188 |
| | Minimum edge and spacing **Case 2**[1] | $c_{min,2}$ | mm | 289 | 201 | 161 | 209 | 156 | 139 | 161 | 126 | 116 |
| | | $s_{min,2}$ | mm | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Cracked concrete | Minimum edge and spacing **Case 1**[1] | $c_{min,1}$ | mm | 116 | 83 | 80 | 86 | 80 | 80 | 80 | 80 | 80 |
| | | $s_{min,1}$ | mm | 343 | 248 | 211 | 258 | 160 | 129 | 171 | 94 | 81 |
| | Minimum edge and spacing **Case 2**[1] | $c_{min,2}$ | mm | 204 | 139 | 111 | 146 | 107 | 95 | 111 | 85 | 80 |
| | | $s_{min,2}$ | mm | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |

### Table 9 - Minimum edge distance, spacing, and concrete thickness for M20 diameter Hilti HIT-Z and HIT-Z-R rods

| Design information | | Symbol | Units | Nominal Rod Diameter | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rod O.D. | | d | mm | 20 | | | | | | | | |
| Effective embedment | | $h_{ef}$ | mm | 100 | | | 180 | | | 220 | | |
| Drilled hole condition | | - | - | 2[2] | 1 or 2 | | 2[2] | 1 or 2 | | 2[2] | 1 or 2 | |
| Minimum concrete thickness | | h | mm | 145 | 200 | 282 | 225 | 280 | 335 | 265 | 320 | 370 |
| Uncracked concrete | Minimum edge and spacing **Case 1**[1] | $c_{min,1}$ | mm | 235 | 170 | 121 | 152 | 122 | 103 | 129 | 107 | 100 |
| | | $s_{min,1}$ | mm | 702 | 511 | 362 | 451 | 363 | 301 | 383 | 317 | 252 |
| | Minimum edge and spacing **Case 2**[1] | $c_{min,2}$ | mm | 436 | 307 | 209 | 269 | 210 | 170 | 224 | 180 | 151 |
| | | $s_{min,2}$ | mm | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Cracked concrete | Minimum edge and spacing **Case 1**[1] | $c_{min,1}$ | mm | 176 | 128 | 102 | 114 | 100 | 100 | 100 | 100 | 100 |
| | | $s_{min,1}$ | mm | 526 | 380 | 298 | 337 | 246 | 163 | 277 | 178 | 113 |
| | Minimum edge and spacing **Case 2**[1] | $c_{min,2}$ | mm | 318 | 222 | 148 | 193 | 149 | 119 | 159 | 126 | 105 |
| | | $s_{min,2}$ | mm | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

1 Linear interpolation is permitted to establish an edge distance and spacing combination between Case 1 and Case 2.
Linear interpoloation for a specific edge distance c, where $c_{min,1} < c < c_{min,2}$, will determine the permissible spacing s as follows:

$$s \geq s_{min,2} + \frac{(s_{min,1} - s_{min,2})}{(c_{min,1} - c_{min,2})} (c - c_{min,2})$$

2 For shaded cells, drilling dust must be removed from drilled hole to justify minimum concrete thickness.

# 3.2.3 HIT-HY 200 Adhesive Anchoring System

## Hilti HIT-HY 200 adhesive with deformed reinforcing bars (rebar)

**Figure 7 - Rebar installation conditions**

| Permissible concrete conditions | | | Permissible drilling method | |
|---|---|---|---|---|
| | Uncracked concrete | Dry concrete | | Hammer drilling with carbide tipped drill bit |
| | Cracked concrete | Water-saturated concrete | | Hilti TE-CD or TE-YD Hollow Drill Bit |

**Figure 8 - Rebar installed with HIT-HY 200 adhesive**

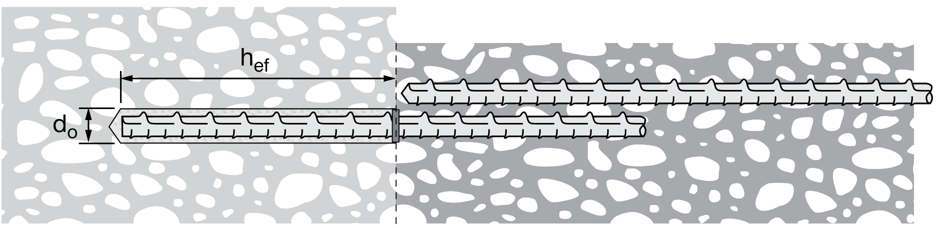



**Table 10 - Specifications for rebar installed with HIT-HY 200 adhesive**

| Setting information | | Symbol | Units | Rebar size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |
| Nominal bit diameter | | $d_o$ | mm | 14 | 16 | 18 | 20 | 25 | 32 | 35 | 40 |
| Effective embedment | minimum | $h_{ef,min}$ | mm | 60 | 70 | 75 | 80 | 90 | 100 | 112 | 128 |
| | maximum | $h_{ef,max}$ | mm | 200 | 240 | 280 | 320 | 400 | 500 | 560 | 640 |
| Minimum concrete member thickness | | $h_{min}$ | mm | $h_{ef}$ + 30 | | $h_{ef}$ + $2d_o$ (4) | | | | | |
| Minimum edge distance[1] | | $c_{min}$ | mm | 50 | 60 | 70 | 80 | 100 | 125 | 140 | 160 |
| Minimum anchor spacing | | $s_{min}$ | mm | 50 | 60 | 80 | 100 | 120 | 135 | 140 | 160 |

1 Edge distance of 44mm is permitted provided the rebar remains un-torqued.

Note: The installation specifications in table 10 above and the data in tables 11 through 13 pertain to the use of Hilti HIT-HY 200 with rebar designed as a post-installed anchor using the provisions of ACI 318-14 Chapter 17. For the use of Hilti HIT-HY 200 with rebar for typical development calculations according to ACI 318-14 Chapter 25 (formerly ACI 318-11 Chapter 12), refer to section 3.1.8.14 for the design method and table 22 at the end of this section.

# HIT-HY 200 Adhesive Anchoring System 3.2.3

**Table 11 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for metric rebar in uncracked concrete [1,2,3,4,5,6,7,8,9]**

| Nominal rebar diameter mm | Effective embedment mm | Tension — $\phi N_n$ | | | | Shear — $\phi V_n$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN |
| 10 | 60 | 13.7 | 14.0 | 14.4 | 14.7 | 14.8 | 15.1 | 15.5 | 15.9 |
| | 90 | 20.6 | 21.0 | 21.6 | 22.1 | 44.4 | 45.2 | 46.5 | 47.6 |
| | 120 | 27.5 | 28.0 | 28.8 | 29.4 | 59.2 | 60.3 | 62.0 | 63.4 |
| | 200 | 45.8 | 46.6 | 48.0 | 49.1 | 98.6 | 100.4 | 103.4 | 105.7 |
| 12 | 70 | 19.0 | 19.6 | 20.2 | 20.6 | 41.0 | 42.2 | 43.4 | 44.4 |
| | 108 | 29.7 | 30.2 | 31.1 | 31.8 | 63.9 | 65.1 | 67.0 | 68.5 |
| | 144 | 39.6 | 40.3 | 41.5 | 42.4 | 85.2 | 86.8 | 89.3 | 91.3 |
| | 240 | 65.9 | 67.1 | 69.1 | 70.7 | 142.0 | 144.6 | 148.8 | 152.2 |
| 14 | 75 | 21.1 | 23.1 | 25.2 | 25.8 | 45.5 | 49.8 | 54.3 | 55.5 |
| | 126 | 40.4 | 41.1 | 42.3 | 43.3 | 87.0 | 88.6 | 91.2 | 93.2 |
| | 168 | 53.8 | 54.8 | 56.4 | 57.7 | 116.0 | 118.1 | 121.6 | 124.3 |
| | 280 | 89.7 | 91.4 | 94.1 | 96.2 | 193.3 | 196.9 | 202.6 | 207.2 |
| 16 | 80 | 23.3 | 25.5 | 29.4 | 31.4 | 50.1 | 54.9 | 63.4 | 67.6 |
| | 144 | 52.7 | 53.7 | 55.3 | 56.5 | 113.6 | 115.7 | 119.1 | 121.8 |
| | 192 | 70.3 | 71.6 | 73.7 | 75.4 | 151.5 | 154.3 | 158.8 | 162.4 |
| | 320 | 117.2 | 119.4 | 122.9 | 125.6 | 252.5 | 257.1 | 264.6 | 270.6 |
| 20 | 90 | 27.7 | 30.4 | 35.1 | 39.2 | 59.8 | 65.5 | 75.6 | 84.5 |
| | 180 | 78.5 | 83.9 | 86.4 | 88.3 | 169.0 | 180.8 | 186.1 | 190.3 |
| | 240 | 109.9 | 111.9 | 115.2 | 117.8 | 236.7 | 241.0 | 248.1 | 253.7 |
| | 400 | 183.2 | 186.5 | 192.0 | 196.3 | 394.5 | 401.7 | 413.5 | 422.8 |
| 25 | 100 | 32.5 | 35.6 | 41.1 | 46.0 | 70.0 | 76.7 | 88.5 | 99.0 |
| | 225 | 109.7 | 120.2 | 135.0 | 138.0 | 236.3 | 258.8 | 290.7 | 297.3 |
| | 300 | 168.9 | 174.9 | 180.0 | 184.0 | 363.7 | 376.6 | 387.6 | 396.4 |
| | 500 | 286.2 | 291.4 | 300.0 | 306.7 | 616.4 | 627.7 | 646.0 | 660.6 |
| 28 | 112 | 38.5 | 42.2 | 48.7 | 54.5 | 83.0 | 90.9 | 105.0 | 117.3 |
| | 252 | 130.0 | 142.4 | 164.5 | 173.1 | 280.0 | 306.8 | 354.2 | 372.9 |
| | 336 | 200.2 | 219.3 | 225.8 | 230.8 | 431.1 | 472.3 | 486.2 | 497.2 |
| | 560 | 359.0 | 365.6 | 376.3 | 384.7 | 773.2 | 787.4 | 810.4 | 828.7 |
| 32 | 128 | 47.1 | 51.6 | 59.5 | 66.6 | 101.4 | 111.0 | 128.2 | 143.4 |
| | 288 | 158.8 | 174.0 | 200.9 | 224.6 | 342.1 | 374.8 | 432.8 | 483.8 |
| | 384 | 244.6 | 267.9 | 294.9 | 301.5 | 526.7 | 577.0 | 635.1 | 649.4 |
| | 640 | 468.9 | 477.5 | 491.4 | 502.5 | 1,009.9 | 1,028.5 | 1,058.5 | 1,082.4 |

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 13. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55° C, max. long term temperature = 43° C.
For temperature range B: Max. short term temperature = 80° C, max. long term temperature = 43° C multiply above values by 0.92.
For temperature range C: Max. short term temperature = 120° C, max. long term temperature = 72° C multiply above values by 0.78.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by $\lambda_a$ as follows:
For sand-lightweight, $\lambda_a$ = 0.51. For all-lightweight, $\lambda_a$ = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

# 3.2.3 HIT-HY 200 Adhesive Anchoring System

**Table 12 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for metric rebar in cracked concrete[1,2,3,4,5,6,7,8,9]**

| Nominal rebar diameter mm | Effective embedment mm | Tension — $\phi N_n$ | | | | Shear — $\phi V_n$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN |
| 10 | 60 | 9.4 | 9.6 | 9.9 | 10.1 | 10.1 | 10.3 | 10.6 | 10.9 |
| | 90 | 14.1 | 14.4 | 14.8 | 15.1 | 30.4 | 31.0 | 31.9 | 32.6 |
| | 120 | 18.8 | 19.2 | 19.7 | 20.2 | 40.5 | 41.3 | 42.5 | 43.5 |
| | 200 | 31.4 | 32.0 | 32.9 | 33.6 | 67.6 | 68.8 | 70.8 | 72.4 |
| 12 | 70 | 13.4 | 13.6 | 14.0 | 14.3 | 28.8 | 29.3 | 30.1 | 30.8 |
| | 108 | 20.6 | 21.0 | 21.6 | 22.1 | 44.4 | 45.2 | 46.5 | 47.6 |
| | 144 | 27.5 | 28.0 | 28.8 | 29.4 | 59.2 | 60.3 | 62.0 | 63.4 |
| | 240 | 45.8 | 46.6 | 48.0 | 49.1 | 98.6 | 100.4 | 103.4 | 105.7 |
| 14 | 75 | 15.0 | 16.4 | 17.5 | 17.9 | 32.3 | 35.4 | 37.7 | 38.5 |
| | 126 | 28.0 | 28.6 | 29.4 | 30.1 | 60.4 | 61.5 | 63.3 | 64.7 |
| | 168 | 37.4 | 38.1 | 39.2 | 40.1 | 80.5 | 82.0 | 84.4 | 86.3 |
| | 280 | 62.3 | 63.5 | 65.3 | 66.8 | 134.2 | 136.7 | 140.7 | 143.9 |
| 16 | 80 | 16.5 | 18.1 | 20.9 | 21.8 | 35.6 | 39.0 | 45.0 | 47.0 |
| | 144 | 36.6 | 37.3 | 38.4 | 39.3 | 78.9 | 80.3 | 82.7 | 84.6 |
| | 192 | 48.8 | 49.7 | 51.2 | 52.3 | 105.2 | 107.1 | 110.3 | 112.7 |
| | 320 | 81.4 | 82.9 | 85.3 | 87.2 | 175.3 | 178.6 | 183.8 | 187.9 |
| 20 | 90 | 19.7 | 21.6 | 24.9 | 27.9 | 42.4 | 46.5 | 53.7 | 60.0 |
| | 180 | 55.7 | 58.3 | 60.0 | 61.3 | 120.0 | 125.5 | 129.2 | 132.1 |
| | 240 | 76.3 | 77.7 | 80.0 | 81.8 | 164.4 | 167.4 | 172.3 | 176.2 |
| | 400 | 127.2 | 129.5 | 133.3 | 136.3 | 273.9 | 279.0 | 287.1 | 293.6 |
| 25 | 100 | 23.1 | 25.3 | 29.2 | 32.6 | 49.7 | 54.4 | 62.9 | 70.3 |
| | 225 | 69.2 | 70.4 | 72.5 | 74.1 | 149.0 | 151.7 | 156.1 | 159.7 |
| | 300 | 92.2 | 93.9 | 96.7 | 98.8 | 198.6 | 202.3 | 208.2 | 212.9 |
| | 500 | 153.7 | 156.5 | 161.1 | 164.7 | 331.0 | 337.1 | 347.0 | 354.8 |
| 28 | 112 | 27.4 | 30.0 | 34.6 | 38.7 | 58.9 | 64.5 | 74.5 | 83.3 |
| | 252 | 86.8 | 88.4 | 90.9 | 93.0 | 186.9 | 190.3 | 195.8 | 200.3 |
| | 336 | 115.7 | 117.8 | 121.2 | 124.0 | 249.1 | 253.7 | 261.1 | 267.0 |
| | 560 | 192.8 | 196.3 | 202.1 | 206.6 | 415.2 | 422.9 | 435.2 | 445.0 |
| 32 | 128 | 33.4 | 36.6 | 42.3 | 47.3 | 72.0 | 78.8 | 91.0 | 101.8 |
| | 288 | 112.8 | 117.4 | 120.8 | 123.5 | 242.9 | 252.8 | 260.2 | 266.1 |
| | 384 | 153.7 | 156.5 | 161.1 | 164.7 | 331.0 | 337.1 | 346.9 | 354.8 |
| | 640 | 256.1 | 260.9 | 268.5 | 274.5 | 551.7 | 561.8 | 578.2 | 591.3 |

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 13. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55° C, max. long term temperature = 43° C.
For temperature range B: Max. short term temperature = 80° C, max. long term temperature = 43° C multiply above values by 0.92.
For temperature range C: Max. short term temperature = 120° C, max. long term temperature = 72° C multiply above values by 0.78.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by $\lambda_a$ as follows:
For sand-lightweight, $\lambda_a$ = 0.51. For all-lightweight, $\lambda_a$ = 0.45.
9 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by the following reduction factors:
10 to 20 mm - $\alpha_{seis}$ = 0.60, 25 mm - $\alpha_{seis}$ = 0.64, 28 mm - $\alpha_{seis}$ = 0.68, 32 mm - $\alpha_{seis}$ = 0.75
See section 3.1.8.7 for additional information on seismic applications.

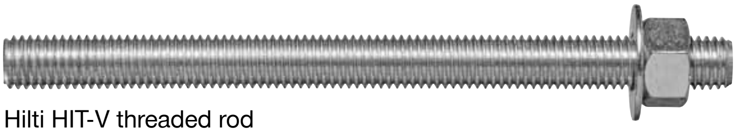
**Table 13 - Steel design strength for rebar[1]**

| Nominal rebar diameter mm | BS 4449 Grade B 500B | | |
|---|---|---|---|
| | Tensile[2] $\phi N_{sa}$ kN | Shear[3] $\phi V_{sa}$ kN | Seismic Shear[4] $\phi V_{sa,eq}$ kN |
| 10 | 28.0 | 15.6 | 10.9 |
| 12 | 40.3 | 22.5 | 15.8 |
| 14 | 54.9 | 30.6 | 21.4 |
| 16 | 71.8 | 39.9 | 27.9 |
| 20 | 112.5 | 61.8 | 43.3 |
| 25 | 175.5 | 97.2 | 68.0 |
| 28 | 220.0 | 121.8 | 85.3 |
| 32 | 287.6 | 159.3 | 111.5 |

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 BS 4449 Grade 500B rebar are considered brittle steel elements.
3 Tensile = $\phi\ A_{se,N}\ f_{uta}$ as noted in ACI 318-14 Chapter 17
4 Shear = $\phi\ 0.60\ A_{se,N}\ f_{uta}$ as noted in ACI 318-14 Chapter 17
5 Seismic Shear = $\alpha_{V,seis}\ \phi\ V_{sa}$ : Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

# 3.2.3 HIT-HY 200 Adhesive Anchoring System

## Hilti HIT-HY 200 adhesive with Hilti HIT-V threaded rod



Hilti HIT-V threaded rod

**Figure 9 - HIT-V threaded rod installation conditions**

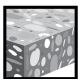
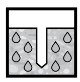
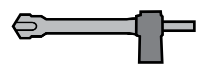
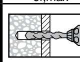
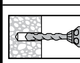
| Permissible concrete conditions | | | | | Permissible drilling method | | |
|---|---|---|---|---|---|---|---|
| |  | Uncracked concrete |  | Dry concrete | |  | Hammer drilling with carbide tipped drill bit |
| |  | Cracked concrete |  | Water saturated concrete | |  | Hilti TE-CD or TE-YD Hollow Drill Bit |

**Table 14 - HIT-V threaded rod specifications**

| Setting information | | Symbol | Units | Nominal rod diameter, d | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| Nominal bit diameter | | $d_o$ | mm | 12 | 14 | 18 | 22 | 28 | 30 | 35 |
| Effective embedment | minimum | $h_{ef,min}$ | mm | 60 | 70 | 80 | 90 | 96 | 108 | 120 |
| | maximum | $h_{ef,max}$ | mm | 200 | 240 | 320 | 400 | 480 | 540 | 600 |
| Diameter of fixture hole | through-set |  | mm | 14 | 16 | 20[1] | 24[1] | 30[1] | 32[1] | 37[1] |
| Diameter of fixture hole | preset |  | mm | 12 | 14 | 18 | 22 | 26 | 30 | 33 |
| Installation torque | | $T_{inst}$ | Nm | 20 | 40 | 80 | 150 | 200 | 270 | 300 |
| Minimum concrete member thickness | | $h_{min}$ | mm | $h_{ef}+30$ | $h_{ef}+2d_o$ | | | | | |
| Minimum edge distance[1] | | $c_{min}$ | mm | 50 | 60 | 80 | 100 | 120 | 135 | 150 |
| Minimum anchor spacing | | $s_{min}$ | Nm | 50 | 60 | 80 | 100 | 120 | 135 | 150 |

1 Install using (2) washers. See Figure 11.

2 Edge distance of 44mm is permitted provided the installation torque is reduced to 0.30 $T_{inst}$ for 5d < s < 406 mm and to 0.5 $T_{inst}$ for s > 406 mm

**Figure 10 - HIT-V threaded rods**

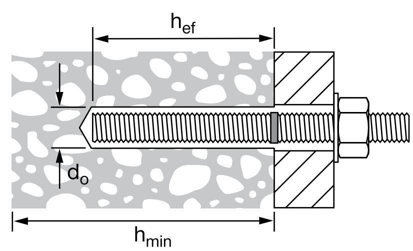



**Figure 11 - Installation with (2) washers**

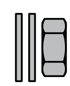


**Table 15 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete [1,2,3,4,5,6,7,8,9]**

| Nominal anchor diameter mm | Effective embedment mm | Tension — $\phi N_n$ | | | | Shear — $\phi V_n$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN |
| 10 | 60 | 14.6 | 14.9 | 15.3 | 15.7 | 15.8 | 16.0 | 16.5 | 16.9 |
| | 90 | 21.9 | 22.3 | 23.0 | 23.5 | 47.3 | 48.1 | 49.5 | 50.6 |
| | 120 | 29.3 | 29.8 | 30.7 | 31.4 | 63.0 | 64.2 | 66.0 | 67.5 |
| | 200 | 48.8 | 49.7 | 51.1 | 52.3 | 105.0 | 106.9 | 110.1 | 112.6 |
| 12 | 70 | 19.0 | 20.9 | 21.5 | 21.9 | 41.0 | 44.9 | 46.2 | In I |
| | 108 | 31.6 | 32.2 | 33.1 | 33.9 | 68.0 | 69.3 | 71.3 | 72.9 |
| | 144 | 42.1 | 42.9 | 44.2 | 45.1 | 90.7 | 92.4 | 95.1 | 97.2 |
| | 240 | 70.2 | 71.5 | 73.6 | 75.2 | 151.2 | 154.0 | 158.5 | 162.1 |
| 16 | 80 | 23.3 | 25.5 | 29.4 | 32.9 | 50.1 | 54.9 | 63.4 | 70.8 |
| | 144 | 56.2 | 57.2 | 58.9 | 60.2 | 121.0 | 123.2 | 126.8 | 129.7 |
| | 192 | 74.9 | 76.3 | 78.5 | 80.3 | 161.3 | 164.3 | 169.1 | 172.9 |
| | 320 | 124.8 | 127.1 | 130.8 | 133.8 | 268.8 | 273.8 | 281.8 | 288.1 |
| 20 | 90 | 27.7 | 30.4 | 35.1 | 39.2 | 59.8 | 65.5 | 75.6 | 84.5 |
| | 180 | 78.5 | 86.0 | 92.0 | 94.1 | 169.0 | 185.2 | 198.1 | 202.6 |
| | 240 | 117.0 | 119.2 | 122.6 | 125.4 | 252.0 | 256.7 | 264.2 | 270.1 |
| | 400 | 195.0 | 198.6 | 204.4 | 209.0 | 420.1 | 427.8 | 440.3 | 450.2 |
| 24 | 96 | 30.6 | 33.5 | 38.7 | 43.2 | 65.8 | 72.1 | 83.3 | 93.1 |
| | 216 | 103.2 | 113.0 | 130.5 | 135.4 | 222.2 | 243.4 | 281.1 | 291.7 |
| | 288 | 158.8 | 171.6 | 176.6 | 180.6 | 342.1 | 369.6 | 380.4 | 389.0 |
| | 480 | 280.8 | 286.0 | 294.4 | 301.0 | 604.9 | 616.0 | 634.0 | 648.3 |
| 27 | 108 | 36.5 | 40.0 | 46.1 | 51.6 | 78.6 | 86.1 | 99.4 | 111.1 |
| | 243 | 123.1 | 134.9 | 155.7 | 171.4 | 265.2 | 290.5 | 335.4 | 369.2 |
| | 324 | 189.5 | 207.6 | 223.5 | 228.6 | 408.2 | 447.2 | 481.4 | 492.3 |
| | 540 | 355.4 | 362.0 | 372.5 | 380.9 | 765.6 | 779.6 | 802.4 | 820.5 |
| 30 | 120 | 42.7 | 46.8 | 54.0 | 60.4 | 92.0 | 100.8 | 116.4 | 130.1 |
| | 270 | 144.2 | 158.0 | 182.4 | 203.9 | 310.6 | 340.2 | 392.8 | 439.2 |
| | 360 | 222.0 | 243.2 | 276.0 | 282.2 | 478.1 | 523.8 | 594.4 | 607.8 |
| | 600 | 438.8 | 446.9 | 459.9 | 470.3 | 945.1 | 962.5 | 990.6 | 1,013.0 |

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 17. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55° C, max. long term temperature = 43° C.
For temperature range B: Max. short term temperature = 80° C, max. long term temperature = 43° C multiply above values by 0.92.
For temperature range C: Max. short term temperature = 120° C, max. long term temperature = 72° C multiply above values by 0.78.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by $\lambda_a$ as follows:
For sand-lightweight, $\lambda_a$ = 0.51. For all-lightweight, $\lambda_a$ = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

# 3.2.3 HIT-HY 200 Adhesive Anchoring System

**Table 16 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in cracked concrete [1,2,3,4,5,6,7,8,9]**

| Nominal anchor diameter mm | Effective embedment mm | Tension — $\phi N_n$ | | | | Shear — $\phi V_n$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN |
| 10 | 60 | 8.1 | 8.3 | 8.5 | 8.7 | 8.8 | 8.9 | 9.2 | 9.4 |
| | 90 | 12.2 | 12.4 | 12.8 | 13.1 | 26.3 | 26.8 | 27.6 | 28.2 |
| | 120 | 16.3 | 16.6 | 17.1 | 17.4 | 35.1 | 35.7 | 36.8 | 37.6 |
| | 200 | 27.1 | 27.6 | 28.4 | 29.1 | 58.4 | 59.5 | 61.3 | 62.6 |
| 12 | 70 | 11.4 | 11.6 | 11.9 | 12.2 | 24.5 | 25.0 | 25.7 | 26.3 |
| | 108 | 17.6 | 17.9 | 18.4 | 18.8 | 37.9 | 38.6 | 39.7 | 40.6 |
| | 144 | 23.4 | 23.9 | 24.6 | 25.1 | 50.5 | 51.4 | 52.9 | 54.1 |
| | 240 | 39.1 | 39.8 | 41.0 | 41.9 | 84.2 | 85.7 | 88.2 | 90.2 |
| 16 | 80 | 16.5 | 18.0 | 18.5 | 18.9 | 35.6 | 38.7 | 39.8 | 40.7 |
| | 144 | 31.7 | 32.3 | 33.3 | 34.0 | 68.4 | 69.6 | 71.7 | 73.3 |
| | 192 | 42.3 | 43.1 | 44.4 | 45.4 | 91.2 | 92.8 | 95.6 | 97.7 |
| | 320 | 70.5 | 71.8 | 73.9 | 75.6 | 152.0 | 154.7 | 159.3 | 162.9 |
| 20 | 90 | 19.7 | 21.6 | 24.9 | 26.6 | 42.4 | 46.5 | 53.7 | 57.3 |
| | 180 | 49.6 | 50.5 | 52.0 | 53.2 | 106.8 | 108.8 | 112.0 | 114.5 |
| | 240 | 66.1 | 67.4 | 69.3 | 70.9 | 142.5 | 145.1 | 149.3 | 152.7 |
| | 400 | 110.2 | 112.3 | 115.5 | 118.1 | 237.4 | 241.8 | 248.8 | 254.5 |
| 24 | 96 | 21.7 | 23.8 | 27.5 | 28.8 | 46.7 | 51.2 | 59.1 | 62.0 |
| | 216 | 60.4 | 61.6 | 63.3 | 64.8 | 130.2 | 132.6 | 136.4 | 139.5 |
| | 288 | 80.6 | 82.1 | 84.5 | 86.4 | 173.6 | 176.8 | 181.9 | 186.0 |
| | 480 | 134.3 | 136.8 | 140.8 | 144.0 | 289.3 | 294.6 | 303.2 | 310.1 |
| 27 | 108 | 25.9 | 28.4 | 32.8 | 36.6 | 55.8 | 61.1 | 70.6 | 78.9 |
| | 243 | 77.9 | 79.3 | 81.6 | 83.5 | 167.8 | 170.8 | 175.8 | 179.8 |
| | 324 | 103.8 | 105.8 | 108.8 | 111.3 | 223.7 | 227.8 | 234.4 | 239.7 |
| | 540 | 173.1 | 176.3 | 181.4 | 185.5 | 372.8 | 379.6 | 390.7 | 399.5 |
| 30 | 120 | 30.3 | 33.2 | 38.4 | 42.9 | 65.3 | 71.6 | 82.6 | 92.4 |
| | 270 | 96.2 | 97.9 | 100.8 | 103.1 | 207.1 | 210.9 | 217.1 | 222.0 |
| | 360 | 128.2 | 130.6 | 134.4 | 137.4 | 276.1 | 281.2 | 289.4 | 296.0 |
| | 600 | 213.7 | 217.6 | 224.0 | 229.0 | 460.2 | 468.7 | 482.4 | 493.3 |

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 17. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55° C, max. long term temperature = 43° C.
For temperature range B: Max. short term temperature = 80° C, max. long term temperature = 43° C multiply above values by 0.92.
For temperature range C: Max. short term temperature = 120° C, max. long term temperature = 72° C multiply above values by 0.78.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by $\lambda_a$ as follows:
For sand-lightweight, $\lambda_a$ = 0.51. For all-lightweight, $\lambda_a$ = 0.45.
9 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by the following reduction factors:
10 mm to 20 mm diameter - $\alpha_{seis}$ = 0.60, 25 mm diameter $\alpha_{seis}$ = 0.64, 28 mm - $\alpha_{seis}$ = 0.68
32 mm diameter - $\alpha_{seis}$ = 0.75
See section 3.1.8.7 for additional information on seismic applications.

# HIT-HY 200 Adhesive Anchoring System 3.2.3

**Table 17 - Steel design strength for Hilti HIT-V threaded rods[1]**

| Nominal anchor diameter mm | HIT-V ISO 898-1 Class 5.8[5] | | | HIT-V ISO 898-1 Class 8.8[5] | | | HIT-V-R ISO 3506-1 Class A4 stainless[5] | | | HIT-V-HCR High corrosion resistant steel[5] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tensile[2] $\phi N_{sa}$ kN | Shear[3] $\phi V_{sa}$ kN | Seismic Shear[4] $\phi V_{sa,eq}$ kN | Tensile[2] $\phi N_{sa}$ kN | Shear[3] $\phi V_{sa}$ kN | Seismic Shear[4] $\phi V_{sa,eq}$ kN | Tensile[2] $\phi N_{sa}$ kN | Shear[3] $\phi V_{sa}$ kN | Seismic Shear[4] $\phi V_{sa,eq}$ kN | Tensile[2] $\phi N_{sa}$ kN | Shear[3] $\phi V_{sa}$ kN | Seismic Shear[4] $\phi V_{sa,eq}$ kN |
| 10 | 18.9 | 8.7 | 6.1 | 30.2 | 13.8 | 9.7 | 26.4 | 12.2 | 8.5 | 30.2 | 13.9 | 9.7 |
| 12 | 27.3 | 15.3 | 10.7 | 43.9 | 24.3 | 17.0 | 38.4 | 21.2 | 14.9 | 43.8 | 24.3 | 17.0 |
| 16 | 51.0 | 28.2 | 19.7 | 81.6 | 45.3 | 31.7 | 71.4 | 39.5 | 27.7 | 81.6 | 45.2 | 31.7 |
| 20 | 79.6 | 44.1 | 30.9 | 127.4 | 70.5 | 49.4 | 111.5 | 61.7 | 43.2 | 127.4 | 70.6 | 49.4 |
| 25 | 114.7 | 63.6 | 44.5 | 183.6 | 101.7 | 71.2 | 160.6 | 89.0 | 62.3 | 160.6 | 89.0 | 62.3 |
| 28 | 149.2 | 82.5 | 57.8 | 238.6 | 132.3 | 92.6 | 119.0 | 65.9 | 46.2 | 208.8 | 115.7 | 81.0 |
| 30 | 182.3 | 101.1 | 70.8 | 291.9 | 161.7 | 113.2 | 145.5 | 80.6 | 56.4 | 255.3 | 141.4 | 99.0 |

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17
3 Shear = $\phi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318-14 Chapter 17.
4 Seismic Shear = $\alpha_{V,seis}\ \phi\ V_{sa}$ : Reduction for seismic shear only. See ACI 318-14 Chapter 17 for additional information on seismic applications
5 HIT-V threaded rods are considered brittle steel elements.

# 3.2.3 HIT-HY 200 Adhesive Anchoring System

## Hilti HIT-HY 200 with Hilti HIS-N inserts

**Figure 12 - HIS-N and HIS-RN internally threaded insert installation conditions**

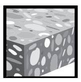
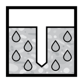
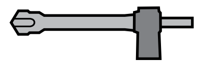
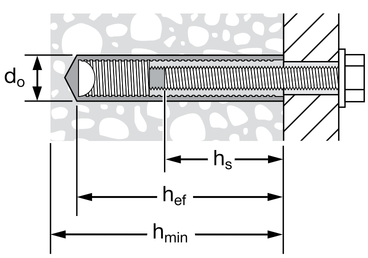
| Permissible concrete conditions | | | | | Permissible Drilling Method | | |
|---|---|---|---|---|---|---|---|
| |  | Uncracked concrete |  | Dry concrete | |  | Hammer drilling with carbide tipped drill bit |
| |  | Cracked concrete |  | Water saturated concrete | |  | Hilti TE-CD or TE-YD Hollow Drill Bit |

**Table 18 - HIS-N and HIS-RN specifications**

| Setting information | | Symbol | Units | Nominal bolt/cap screw diameter | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 8 | 10 | 12 | 16 | 20 |
| Outside diameter of insert | | | mm | 12.5 | 16.5 | 20.5 | 25.4 | 27.6 |
| Nominal bit diameter | | $d_o$ | mm | 14 | 18 | 22 | 28 | 32 |
| Effective embedment | | $h_{ef}$ | mm | 90 | 110 | 125 | 170 | 205 |
| Thread engagement | minimum | $h_s$ | mm | 8 | 10 | 12 | 16 | 20 |
| | maximum | | mm | 20 | 25 | 30 | 40 | 50 |
| Installation torque | | $T_{inst}$ | Nm | 10 | 20 | 40 | 80 | 150 |
| Minimum concrete member thickness | | $h_{min}$ | mm | 120 | 150 | 170 | 230 | 270 |
| Minimum edge distance | | $c_{min}$ | mm | 63 | 83 | 102 | 127 | 140 |
| Minimum anchor spacing | | $s_{min}$ | mm | 63 | 83 | 102 | 127 | 140 |

**Figure 13 - HIS-N and HIS-RN specifications**



# HIT-HY 200 Adhesive Anchoring System 3.2.3

**Table 19 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for Hilti HIS-N and HIS-RN internally threaded inserts in uncracked concrete[1,2,3,4,5,6,7,8]**

| Internal thread diameter mm | Effective embed depth mm | Tension - $\phi N_n$ or $N_r$ | | | | Shear - $\phi V_n$ or $V_r$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN |
| 8 | 90 | 27.4 | 27.9 | 28.7 | 29.4 | 59.1 | 60.2 | 61.9 | 63.3 |
| 10 | 110 | 37.5 | 41.1 | 46.4 | 47.4 | 80.8 | 88.5 | 99.9 | 102.1 |
| 12 | 125 | 45.4 | 49.8 | 57.5 | 64.2 | 97.8 | 107.2 | 123.7 | 138.3 |
| 16 | 170 | 72.0 | 78.9 | 91.1 | 101.9 | 155.2 | 170.0 | 196.3 | 219.4 |
| 20 | 205 | 95.4 | 104.5 | 120.7 | 134.9 | 205.5 | 225.1 | 259.9 | 290.6 |

**Table 20 - Hilti HIT-HY 200 adhesive design strength with concrete / bond Failure for Hilti HIS-N and HIS-RN internally threaded inserts in cracked concrete[1,2,3,4,5,6,7,8,9]**

| Internal thread diameter mm | Effective embed. depth mm | Tension - $\phi N_n$ or $N_r$ | | | | Shear - $\phi V_n$ or $V_r$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN | $f'_c$ = 25 MPa kN | $f'_c$ = 30 MPa kN | $f'_c$ = 40 MPa kN | $f'_c$ = 50 MPa kN |
| 8 | 90 | 15.3 | 15.5 | 16.0 | 16.4 | 32.9 | 33.5 | 34.5 | 35.2 |
| 10 | 110 | 25.0 | 25.5 | 26.2 | 26.8 | 53.9 | 54.9 | 56.5 | 57.7 |
| 12 | 125 | 32.2 | 35.3 | 37.0 | 37.8 | 69.5 | 76.1 | 79.7 | 81.5 |
| 16 | 170 | 50.3 | 51.3 | 52.8 | 54.0 | 108.4 | 110.4 | 113.7 | 116.2 |
| 20 | 205 | 67.2 | 68.4 | 70.4 | 72.0 | 144.7 | 147.3 | 151.6 | 155.1 |

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Tabular values represent a single anchor without reductions for edge distance, anchor spacing, or concrete thickness. Shaded cells indicate that bond strength is the controlling failure mode. Compare to the steel values in Table 21. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 55° C, max. long term temperature = 43° C.
For temperature range B: Max. short term temperature = 80° C, max. long term temperature = 43° C multiply above values by 0.92.
For temperature range C: Max. short term temperature = 120° C, max. long term temperature = 72° C multiply above values by 0.78.
Short-term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength (factored resistance) by $\lambda_a$ as follows:
For sand-lightweight, $\lambda_a$ = 0.51. For all-lightweight, $\lambda_a$ = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension and shear by $\alpha_{seis}$ = 0.60.
See section 3.1.8.7 for additional information on seismic applications.

**Table 21 - Steel design strength for steel bolt / cap screw for Hilti HIS-N and HIS-RN internally threaded inserts[1,2,3]**

| Internal thread diameter mm | ISO 898-1 Class 8.8 | | | ISO 3056-1 Class A4-70 Stainless Steel | | |
|---|---|---|---|---|---|---|
| | Tensile[4] $\phi N_{sa}$ kN | Shear[5] $\phi V_{sa}$ kN | Seismic Shear[4] $\phi V_{sa,eq}$ kN | Tensile[4] $\phi N_{sa}$ kN | Shear[5] $\phi V_{sa}$ kN | Seismic Shear[4] $\phi V_{sa,eq}$ kN |
| 8 | 19.2 | 10.5 | 7.4 | 16.6 | 9.3 | 6.5 |
| 10 | 30.2 | 16.8 | 11.8 | 26.3 | 14.7 | 10.3 |
| 12 | 43.9 | 24.3 | 17.0 | 38.4 | 21.3 | 14.9 |
| 16 | 81.6 | 45.3 | 31.7 | 71.5 | 39.6 | 17.7 |
| 20 | 125.5 | 70.5 | 49.4 | 111.5 | 61.8 | 43.3 |

1 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
2 Hilti HIS-N and HIS-RN inserts with steel bolts are to be considered brittle steel elements.
3 Table values are the lesser of steel failure in the HIS-N insert or inserted steel bolt.
4 Tensile = $\phi A_{se,N}$ $f_{uta}$ as noted in ACI 318-14 Chapter 17.
5 Shear values determined by static shear tests with $\phi V_{sa} \leq \phi$ 0.60 $A_{se,V}$ $f_{uta}$ as noted in ACI 318-14 Chapter 17.
6 Seismic Shear = $\alpha_{V,seis}$ $\phi V_{sa}$ : Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

# 3.2.3 HIT-HY 200 Adhesive Anchoring System

## 3.2.3.3 Development and splicing of post-installed reinforcement

Calculations for post-installed rebar for typical development lengths may be done according to ACI 318-14 Chapter 25 (formerly ACI 318-11 Chapter 12) adhesive anchors tested and approved in accordance with AC 308. This section contains tables for the data provided in ICC Evaluation Services ESR-3187. Refer to section 3.1.14 and the Hilti North America Post-Installed Reinforcing Bar Guide for the design method.

**Table 22 - Calculated tension development and Class B splice lengths for BS 4449 Grade B 500B in walls, slabs, columns, and footings per ACI 318-14 Chapter 25 for Hilti HIT-HY 200 - SDC A and B only[3,4,5,6,7]**

| Rebar size | System | | $\frac{c_b + K_{tr}}{d_b}$ | Minimum edge dist. mm[1] | Minimum spacing mm[2] | $f'_c$ = 25 Mpa | | $f'_c$ = 30 Mpa | | $f'_c$ = 40 Mpa | | $f'_c$ = 50 Mpa | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HIT-HY 200-A | HIT-HY 200-R | | | | $\ell_d$ mm | Class B splice mm | $\ell_d$ mm | Class B splice mm | $\ell_d$ mm | Class B splice mm | $\ell_d$ mm | Class B splice mm |
| 8 | ◐ | ◐ | 2.5 | 50 | 40 | 310 | 310 | 310 | 310 | 310 | 310 | 310 | 310 |
| 10 | ◐ | ◐ | | 60 | 50 | 310 | 380 | 310 | 350 | 310 | 310 | 310 | 310 |
| 12 | ◐ | ◐ | | 60 | 60 | 350 | 460 | 320 | 420 | 310 | 360 | 310 | 310 |
| 16 | ◐ | ◐ | | 70 | 80 | 470 | 610 | 430 | 550 | 370 | 480 | 330 | 430 |
| 20 | ◐ | ◐ | | 90 | 100 | 730 | 940 | 660 | 860 | 580 | 750 | 520 | 670 |
| 25 | ■ | ◐ | | 110 | 125 | 910 | 1180 | 830 | 1080 | 720 | 930 | 640 | 840 |
| 32 | ■ | ◐ | | 130 | 160 | 1160 | 1510 | 1060 | 1380 | 920 | 1190 | 820 | 1070 |

◐ Applicable for use with special installation provisions and installation temperature restrictions to account for short gel time with deep embedment depth. See the Instruction For Use (IFU), packaged with the product for special installation parameters.

■ Not recommended due to limited gel time of adhesive.

1 Edge distances are determined using the minimum cover specified by ESR-3187 with an additional 6% of the development length per suggestions for drilling without an aid per Hilti Post-Installed Reinforcing Bar Guide Section 3.3. Smaller edge distances may be possible, for which development and splice lengths may need to be recalculated. For further information on required cover see ACI 318-14, Sec. 20.6.1.3; see Sec. 2.2 for determination of $c_b$.

2 Spacing values represent those producing $c_b$ =5 $d_b$ rounded up to the nearest 10 mm. Smaller spacing values may be possible, for which development and splice lengths may need to be recalculated. For further information on required spacing see ACI 318-14 Sec. 25.2; see Sec. 2.2 for determination of $c_b$.

3 $\psi_t$ = 1.0 See ACI 318-14, Sec. 25.4.2.4.

4 $\psi_e$ = 1.0 for non-epoxy coated bars. See ACI 318-14, Sec. 25.4.2.4.

5 $\psi_s$ = 0.8 for 16 mm bars and smaller bars, 1.0 for 20 mm and larger bars. See ACI 318-14, Sec. 25.4.2.4.

6 Values are for normal weight concrete. For sand-lightweight concrete, multiply development and splice lengths by 1.18, for all-lightweight concrete multiply development and splice lengths by 1.33. See ACI 318-14 Sec. 19.2.4.

7 Development and splice length values are for static design. Seismic design development and splice lengths can be found in ACI 318-14 18.8.5 for special moment frames and ACI 318-14 18.10.2.3 for special structural walls. For further information about reinforcement in seismic design, see ACI 318-14 Ch. 18.

8 Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for further explanation, background information, and design examples.

## 3.2.3.4 Installation instructions

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.us.hilti.com (US). Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

**Figure 14 - HIT-HY 200 adhesive cure time and working time (approx.)**

| HIT-HY 200-A | | | | | |
|---|---|---|---|---|---|
| | | HAS / HIS-N / Rebar | | HIT-Z[1] | |
| [°C] | [°F] | $t_{work}$ | $t_{cure}$ | $t_{work}$ | $t_{cure}$ |
| -10...-5 | 14...23 | 1.5 h | 7 h | – | – |
| -4...0 | 24...32 | 50 min | 4 h | – | – |
| 1...5 | 33...41 | 25 min | 2 h | – | – |
| 6...10 | 42...50 | 15 min | 1.25 h | 15 min | 1.25 h |
| 11...20 | 51...68 | 7 min | 45 min | 7 min | 45 min |
| 21...30 | 69...86 | 4 min | 30 min | 4 min | 30 min |
| 31...40 | 87...104 | 3 min | 30 min | 3 min | 30 min |

| HIT-HY 200-R | | | | | |
|---|---|---|---|---|---|
| | | HAS / HIS-N / Rebar | | HIT-Z[1] | |
| [°C] | [°F] | $t_{work}$ | $t_{cure}$ | $t_{work}$ | $t_{cure}$ |
| -10...-5 | 14...23 | 3 h | 20 h | – | – |
| -4...0 | 24...32 | 2 h | 8 h | – | – |
| 1...5 | 33...41 | 1 h | 4 h | – | – |
| 6...10 | 42...50 | 40 min | 2.5 h | 40 min | 2.5 h |
| 11...20 | 51...68 | 15 min | 1.5 h | 15 min | 1.5 h |
| 21...30 | 69...86 | 9 min | 1 h | 9 min | 1 h |
| 31...40 | 87...104 | 6 min | 1 h | 6 min | 1 h |

1 It is permitted to install Hilti HIT-HY 200 with HIT-Z anchor rod down to 14° F (-10° C) provided the drilled hole has the drilling dust fully removed. This can be done with Hilti TE-CD or TE-YD hollow drill bit or with cleaning procedures used with standard threaded rod.

**Resistance of cured Hilti HIT-HY 200 to chemicals**

| Chemical | | Behavior |
|---|---|---|
| Acetic acid | 10% | + |
| Acetone | | ● |
| Ammonia | 5% | + |
| Benzyl alcohol | | – |
| Hydrochloric acid | 10% | ● |
| Chlorinated lime | 10% | + |
| Citric acid | 10% | + |
| Concrete plasticizer | | + |
| De-icing salt (Calcium chloride) | | + |
| Demineralized water | | + |
| Diesel fuel | | + |
| Drilling dust suspension pH 13.2 | | + |
| Ethanol | 96% | |
| Ethylacetate | | – |
| Formic acid | 10% | + |
| Formwork oil | | + |
| Gasoline | | + |
| Glycole | | ● |
| Hydrogen peroxide | 10% | ● |
| Lactic acid | 10% | + |
| Maschinery oil | | + |
| Methylethylketon | | ● |
| Nitric acid | 10% | ● |
| Phosphoric acid | 10% | + |
| Potassium Hydroxide pH 13.2 | | + |
| Sea water | | + |
| Sewage sludge | | + |
| Sodium carbonate 10% | 10% | + |
| Sodium hypochlorite 2% | 2% | + |
| Sulphuric acid | 10% | + |
| | 30% | + |
| Toluene | | ● |
| Xylene | | ● |

Key: – non-resistant
\+ resistant
● limited resistance

Samples of the HIT-HY 200 adhesive were immersed in the various chemical compounds for up to one year. At the end of the test period, the samples were analyzed. Any samples showing no visible damage and having less than a 25% reduction in bending (flexural) strength were classified as "Resistant." Samples that had slight damage, such as small cracks, chips, etc. or reduction in bending strength of 25% or more were classified as "Limited Resistance" (i.e. exposed for 48 hours or less until chemical is cleaned up). Samples that were heavily damaged or destroyed were classified as "Non-Resistant."

Note: In actual use, the majority of the adhesive is encased in the base material, leaving very little surface area exposed.

# 3.2.3.5 Ordering information

HIT-HY 200-R

### Hilti HIT-Z anchor rod

| Description | Base plate clearance hole | Anchor length | Qty | Item number |
|---|---|---|---|---|
| **HIT-Z M8x80** | 9 mm | 80 mm | 40 pc | 2018364 |
| **HIT-Z M8x100** | 9 mm | 100 mm | 40 pc | 2018365 |
| **HIT-Z M8x120** | 9 mm | 120 mm | 40 pc | 2018366 |
| **HIT-Z M10x95** | 12 mm | 95 mm | 40 pc | 2018367 |
| **HIT-Z M10x115** | 12 mm | 115 mm | 40 pc | 2018368 |
| **HIT-Z M10x135** | 12 mm | 135 mm | 40 pc | 2018369 |
| **HIT-Z M10x160** | 12 mm | 160 mm | 40 pc | 2018410 |
| **HIT-Z M12x105** | 14 mm | 105 mm | 20 pc | 2018411 |
| **HIT-Z M12x140** | 14 mm | 140 mm | 20 pc | 2018412 |
| **HIT-Z M12x155** | 14 mm | 155 mm | 20 pc | 2018413 |
| **HIT-Z M12x196** | 14 mm | 196 mm | 20 pc | 2018415 |
| **HIT-Z M16x155** | 18 mm | 155 mm | 12 pc | 2018416 |
| **HIT-Z M16x175** | 18 mm | 175 mm | 12 pc | 2018417 |
| **HIT-Z M16x205** | 18 mm | 205 mm | 12 pc | 2018418 |
| **HIT-Z M16x240** | 18 mm | 240 mm | 12 pc | 2018419 |
| **HIT-Z M20x215** | 22 mm | 215 mm | 6 pc | 2018420 |
| **HIT-Z M20x250** | 22 mm | 250 mm | 6 pc | 2018421 |

### HIT-HY 200-R adhesive

| Description | Package contents | Qty | Item number |
|---|---|---|---|
| **HIT-HY 200-R 500/2/EE** | Includes (1) foil pack with (2) mixer and (1) mixer extension | 1 pc | 2045032 |

### TE-CD hollow drill bits

| Order Description | Working length | Item number |
|---|---|---|
| **Hollow drill bit TE-CD 12/33** | 200 mm | 2018940 |
| **Hollow drill bit TE-CD 16/37** | 240 mm | 2018945 |
| **Hollow drill bit TE-CD 18/37** | 240 mm | 2018946 |

### TE-YD hollow drill bits

| Order Description | Working length | Item number |
|---|---|---|
| **Hollow drill bit TE-YD 16/59** | 400 mm | 2018956 |
| **Hollow drill bit TE-YD 18/59** | 400 mm | 2018957 |
| **Hollow drill bit TE-YD 20/59** | 400 mm | 2018959 |
| **Hollow drill bit TE-YD 22/59** | 400 mm | 2018960 |
| **Hollow drill bit TE-YD 25/59** | 400 mm | 2018962 |
| **Hollow drill bit TE-YD 28/59** | 400 mm | 2018964 |
| **Hollow drill bit TE-YD 32/59** | 400 mm | 2018966 |

For ordering information on anchor rods and inserts, dispensers, hole cleaning equipment and other accessories, see section 3.2.9.