***General notes for POSt-INSTALLED ANCHORING to hollow core slab***

1. POST-INSTALLED ANCHORING TO HOLLOW CORE SLAB SHALL BE DESIGNED AS PER MS EN 1992-4 FOR STATIC/QUASI STATIC LOADS. ALL PRODUCTS USED SHALL HAVE EUROPEAN TECHNICAL ASSESSMENT (ETA) IN ACCORDANCE WITH THE RELEVANT VERIFICATION AND ASSESSMENT DOCUMENTS INCLUDING AN ASSUMED MINIMUM 50-YEAR WORKING LIFE OF THE ANCHOR AS DETAILED BELOW:

|  |  |  |  |
| --- | --- | --- | --- |
| **TYPE OF FASTENING** | **TYPE OF ANCHOR** | **ETA APPROVAL** | **ASSESSMENT DOCUMENT(S)** |
| LIGHT DUTY | HILTI HRD | ETA 07/0219 | EUROPEAN TECHNICAL APPROVAL GUIDELINE (ETAG) 020 |
| MEDIUM DUTY | HILTI HKD | ETA 06/0047 | * EUROPEAN ASSESSMENT DOCUMENT (EAD) 330747
* TECHNICAL REPORT (CEN/TR) 17079
 |
| HILTI HUS3-H/I/A/P/C | ETA 10/0005 |
| HILTI HUS4-HR/CR |

1. THE STRUCTURAL SYSTEM MUST HAVE SUFFICIENT RESISTANCE TO TRANSFER THE LOAD FROM ONE FASTENER TO NEIGHBOURING FASTENERS SHOULD EXCESSIVE SLIPPAGE OR FAILURE OF ANY ONE ANCHOR OCCURS. SERVICEABILITY AND ULTIMATE LIMIT STATE OF THE SYSTEM SHOULD NOT BE EXCEEDED SIGNIFICANTLY DUE TO THE LOAD TRANSFER.

**Key**

SF one fastener per fixing point

MF two or more fasteners per fixing point

FIGURE 1 – STATICALLY INDETERMINATE NON-STRUCTURAL SYSTEMS WITH ONE OR MORE FASTENERS PER FIXING POINT - EXAMPLES

1. RECOMMENDED VALUES FOR REDUNDANT FASTENING DESIGN (LIMITING DESIGN ACTION, FEd,lim, NUMBER OF FIXING POINTS, n1 AND NUMBER OF FASTENERS PER FIXING POINT n2) ARE TO BE REFERRED TO THE TABLES 1, 2 AND 3 PROVIDED IN THE FOLLOWING PAGES.
2. RECOMMENDED LOADS USED IN DESIGN SHALL BE BASED ON THE TECHNICAL DATA PUBLISHED BY HILTI OR SUCH OTHER METHOD AS APPROVED BY THE STRUCTURAL ENGINEER OF RECORD. SUBSTITUTION REQUESTS FOR ALTERNATE PRODUCTS MUST BE APPROVED IN WRITING BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO USE. CONTRACTOR SHALL PROVIDE ALL RELEVANT RECORDS THAT HAVE BEEN SEALED BY ANOTHER LICENSED ENGINEER DEMONSTRATING THAT THE SUBSTITUTED PRODUCT IS CAPABLE OF MEETING THE PERFORMANCE OF THE SPECIFIED PRODUCT. SUBSTITUTIONS WILL BE EVALUATED BY THEIR HAVING AN ETA SHOWING COMPLIANCE WITH THE RELEVANT BUILDING CODE, LOAD RESISTANCE, INSTALLATION CATEGORY, AND AVAILABILITY OF COMPREHENSIVE INSTALLATION INSTRUCTIONS.
3. INSTALL POST-INSTALLED ANCHOR PER THE MANUFACTURER PRINTED INSTALLATION INSTRUCTIONS (MPII), AS INCLUDED IN THE ANCHOR PACKAGING OR TECHNICAL DATA SHEET.
4. CONTRACTOR IS ADVISED TO IDENTIFY OR TO LOCATE THE POSITION OF PRESTRESSING STEEL IN THE CONCRETE STRUCTURE PRIOR TO POST-INSTALLING ANCHORS. POSITIONS OF PRESTRESSING STEEL SHALL BE LOCATED USING HILTI FERROSCAN PS300 OR X-RAY OR CONCRETE PENETRATING RADAR OR OTHER MEANS AND DULY MARKED FOR COMPLIANCE WITH INSTALLATION PARAMETERS.
5. SETTING TOOLS AS PER INSTRUCTIONS FOR USE (IFU) SHALL BE ADOPTED FOR ANCHOR INSTALLATION WITH CLOSE ATTENTION TO SETTING REQUIREMENTS.
6. FOR HILTI HRD:
	* ENSURE THAT THE ANCHOR IS FLUSH WITH THE SURFACE OF THE BASE MATERIAL AFTER INSERTION INTO DESIRED HOLE
7. FOR HILTI HKD:
	* MANUAL SETTING TOOL HSD-G – PROPER INSTALLATION OF ANCHOR IS CONFIRMED WHEN 4 MARKS FROM THE SETTING TOOL ARE VISIBLE ON THE LIPS OF THE ANCHOR
	* MACHINE SETTING TOOL HKD-TE CX, HSD M – ANCHOR IS SET SUCH THAT THE SETTING TOOL TOUCHES THE RIM OF THE ANCHOR
8. FOR HILTI HUS3 / HUS4-HR,-CR:
	* DRILLED BOREHOLE TO BE CLEANED AND ANCHOR INSTALLED WITHOUT ANY VISIBLE GAP BETWEEN THE HEAD OF ANCHOR AND INSTALLED SURFACE
9. OVERHEAD ANCHOR INSTALLATION USING HILTI JAIBOT OR ANY OTHER FORM OF SEMI-AUTONOMOUS INSTALLATION METHOD IS RECOMMENDED FOR SAFER AND MORE EFFICIENT INSTALLATION.
10. ON-SITE PULL-OUT TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH BRITISH STANDARD (BS) 8539 Clause 9 AND ANNEX B.3 OR OTHER CLAUSES ACCORDINGLY. ON-SITE PULL-OUT TEST LOAD SHOULD FOLLOW DESIGN LOAD UNLESS OTHERWISE SPECIFIED.
* Clause 9 à PROOF TESTING, TO VALIDATE THE QUALITY OF INSTALLATION, MIGHT NOT BE NECESSARY IF APPROVED ANCHORS ARE INSTALLED BY TRAINED OPERATIVES WORKING UNDER SUPERVISION. IF THIS CONDITION IS NOT SATISFIED THEN PROOF TESTING MIGHT BE REQUIRED.
* Annex B.3. à PROOF TEST LOAD = CHARACTERISTIC ACTION\* MULTIPLIED BY A FACTOR OF 1.5, ≥ 2.5% OF ALL ANCHORS OF THE TOTAL NUMBER OF ANCHORS INSTALLED ON A JOB; MINIMUM 3 ANCHORS OF THE SAME TYPE INSTALLED ON SAME BASE MATERIAL, ETC. PROOF TEST LOAD SHOULD NEVER EXCEED 1.5 TIMES OF THE MANUFACTURER’S RECOMMENDED RESISTANCE.

*\*ACCORDING TO BS 8539 Clause 3.1.1.3 CHARACTERISTIC ACTION REFERS TO UNFACTORED LOAD. IF THE CHARACTERISTIC ACTION IS NOT DEFINED, MANUFACTURER’S RECOMMENDED RESISTANCE SHOULD BE TAKEN.*

1. ANY ASSISTIVE TOOLS THAT CAN BE USED TO SUPPLEMENT/ SUPPORT BS 8539 CLAUSE 9 (E.G. HILTI ADAPTIVE TORQUE MODULE AND HILTI SAFESET SYSTEM) CAN BE ADOPTED FOR CONSIDERATION OF MEETING BS 8539 CLAUSE 9 EXEMPTION.

LIGHT DUTY FASTENING USING HILTI HRD

MINIMUM SPACING AND EDGE DISTANCE OF ANCHORS AND DISTANCE BETWEEN ANCHOR GROUPS IN PRECAST PRE-STRESSED HOLLOW CORE SLABS

|  |  |
| --- | --- |
| c1, c2 | edge distance |
| s1, s2 | anchor spacing |
| a1, a2 | distances between anchor groups |

Minimum edge distance

cmin ≥ 100 mm

Minimum anchor spacing

smin ≥ 100 mm

Minimum anchor spacing between groups

amin ≥ 100 mm

ADMISSIBLE ANCHOR POSITIONS IN PRECAST PRE-STRESSED HOLLOW CORE SLABS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Anchor** | **Embedment Depth (mm)** | **Hole size (mm)** | **Min Spacing, smin (mm)** | **Fastener Location Away from Prestressing Steel, ap (mm)** | **Flange thickness, db (mm)** | **Recommended Load (kN)** |
| HRD 10 | 50 | 10 | 100 | 50 | ≥25 | 0.2 |
| ≥30 | 0.6 |
| ≥35 | 1.0 |
| ≥40 | 1.4 |

TABLE 1: RECOMMENDED VALUES FOR FEd,lim, n1 AND n2 FOR LIGHT DUTY FASTENING (HILTI HRD)

|  |
| --- |
| THE VALUES FOR n1, n2, and FEd,lim ARE OBTAINED FROM ETAG 020. THESE VALUES MAY BE TAKEN IN ABSENCE OF A DEFINITION WITHIN THE NATIONAL ANNEX. |
| number of fixing points$$n\_{1}$$ | number of fastenings per fixing point$$n\_{2}$$ | limiting design action$$F\_{Ed, lim}$$ |
| $$\geq 4$$ | $$\geq 1$$ | $$4.5 kN$$ |
| $$3$$ | $$\geq 1$$ | $$3.0 kN$$ |

*THIS TABLE IS A DETAILED REFERENCE FOR REDUNDANT FASTENING DESIGN FROM POINT 2 AND 3 IN THE FIRST PAGE*

MEDIUM DUTY FASTENING USING HILTI HKD

MINIMUM SPACING AND EDGE DISTANCE OF ANCHORS AND DISTANCE BETWEEN ANCHOR GROUPS IN PRECAST PRE-STRESSED HOLLOW CORE SLABS

|  |  |
| --- | --- |
| c1, c2 | edge distance |
| s1, s2 | anchor spacing |
| a1, a2 | distances between anchor groups |

Minimum edge distance

cmin ≥ 200 mm

Minimum anchor spacing

smin ≥ 400 mm

Minimum anchor spacing between groups

amin ≥ 400 mm

ADMISSIBLE ANCHOR POSITIONS IN PRECAST PRE-STRESSED HOLLOW CORE SLABS



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Anchor** | **Embedment Depth (mm)** | **Hole size (mm)** | **Min Spacing, smin (mm)** | **Fastener Location Away from Prestressing Steel, ap (mm)** | **Flange thickness, db (mm)** | **Recommended Load (kN)** |
| HKD M6 x 25 | 25 | 8 | 400 | 50 | ≥35 | 1.0 |
| HKD M8 x 25 | 25 | 10 | 400 | 50 | ≥35 | 1.4 |
| HKD M10 x 25 | 25 | 12 | 400 | 50 | ≥40 | 1.6 |

TABLE 2: RECOMMENDED VALUES FOR FEd,lim, n1 AND n2 FOR MEDIUM DUTY FASTENING (HILTI HKD)

|  |
| --- |
| THE VALUES FOR n1, n2, and FEd,lim ARE OBTAINED FROM EN 1992-4 AND CEN/TR 17079. THESE VALUES MAY BE TAKEN IN ABSENCE OF A DEFINITION WITHIN THE NATIONAL ANNEX.  |
| number of fixing points$$n\_{1}$$ | number of fastenings per fixing point$$n\_{2}$$ | limiting design action$$F\_{Ed, lim}$$ |
| $$\geq 4$$ | $$\geq 1$$ | $$3.0 kN$$ |
| $$3$$ | $$\geq 1$$ | $$2.0 kN$$ |

*THIS TABLE IS A DETAILED REFERENCE FOR REDUNDANT FASTENING DESIGN FROM POINT 2 AND 3 IN THE FIRST PAGE*

MEDIUM DUTY FASTENING USING HILTI HUS3 H/I/A/P/C, HILTI HUS4 HR/CR

MINIMUM SPACING AND EDGE DISTANCE OF ANCHORS AND DISTANCE BETWEEN ANCHOR GROUPS IN PRECAST PRE-STRESSED HOLLOW CORE SLABS

|  |  |
| --- | --- |
| c1, c2 | edge distance |
| s1, s2 | anchor spacing |
| a1, a2 | distances between anchor groups |

Minimum edge distance

cmin ≥ 100 mm

Minimum anchor spacing

smin ≥ 100 mm

Minimum anchor spacing between groups

amin ≥ 100 mm

ADMISSIBLE ANCHOR POSITIONS IN PRECAST PRE-STRESSED HOLLOW CORE SLABS





|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Anchor** | **Embedment Depth (mm)** | **Hole size (mm)** | **Min Spacing, smin (mm)** | **Fastener Location Away from Prestressing Steel, ap (mm)** | **Flange thickness, db (mm)** | **Recommended Load (kN)** |
| HUS3 H/I/A/P/CSize 6 | ≥35 | 6 | 100 | 50 | ≥25 | 0.5 |
| HUS4 HR/CR 6x60, 6x70 | ≥30 | 1.0 |
| ≥35 | 1.4 |
| HUS4 HR 6x45 | ≥30 | 6 | 100 | 50 | ≥25 | 0.5 |
| HUS4 CR 6x40 | ≥30 | 1.0 |

*DATA FOR ANCHORS OF OTHER SIZES AND THICKNESS OF FIXTURES TO BE REFERRED TO ETA 10/0005*

TABLE 3: RECOMMENDED VALUES FOR FEd,lim, n1 AND n2 FOR MEDIUM DUTY FASTENING (HILTI HUS3 H/I/A/P/C, HUS4 HR/CR)

|  |
| --- |
| THE VALUES FOR n1, n2, and FEd,lim ARE OBTAINED FROM EN 1992-4 AND CEN/TR 17079. THESE VALUES MAY BE TAKEN IN ABSENCE OF A DEFINITION WITHIN THE NATIONAL ANNEX |
| number of fixing points$$n\_{1}$$ | number of fastenings per fixing point$$n\_{2}$$ | limiting design action$$F\_{Ed, lim}$$ |
| $$\geq 4$$ | $$\geq 1$$ | $$3.0 kN$$ |
| $$3$$ | $$\geq 1$$ | $$2.0 kN$$ |

*THIS TABLE IS A DETAILED REFERENCE FOR REDUNDANT FASTENING DESIGN FROM POINT 2 AND 3 IN THE FIRST PAGE*