

Design Alert 26-08 Pump, Blower and Rotating Machinery Fixing Methodologies

The following Design Alert contains content from internal MWHT advice.

Summary:

This Design Alert details the mandatory requirements for the fixing methodologies of all pumps, blowers, and rotating machinery. The aim is to ensure consistent, safe and durable installations across all projects. Chemical adhesive (resin) anchors and correctly specified HD (Holding Down) bolts should be used and must be suitable for cyclic dynamic loading.

Overview:

This alert will cover the fixing down of rotating machinery, and suitable plinth design/construction. This alert was created due to past issues particularly with rotating machinery installations, which have historically shown inconsistency in both plinth design and fixing methodology.

Rotating Machinery – Fixing/Resin Anchor Guidance

The HD (Holding Down) bolts used should be:

- **Specified by the pump supplier/manufacturer as part of their supply package** (Calling upon the Structures Team to design fixings for machinery is time consuming and distracting from core design duties).
- Suitable for cyclic dynamic (fatigue) loading.
- HD bolts should generally be resin anchors.

Hilti manufactures some suitable resin anchors that can support dynamic loading such as:

HIT-HY 200-A V3 + HIT-Z
 HIT-HY 200-A V3 + HAS-D
 HVU2 + HAS-U
 (Other suppliers are available)

HIT-HY 200-A V3 + HAS-U
 HIT-RE 500 V4 + HAS-U
 HVZ

For dynamic loading, the annulus between the HD bolt and the baseplate should be filled (a Hilti filling set could be used) – See Figure 2.

The baseplate of the piece of rotating machinery should be mounted directly onto the reinforced concrete plinth, and therefore construction quality assurance is essential.

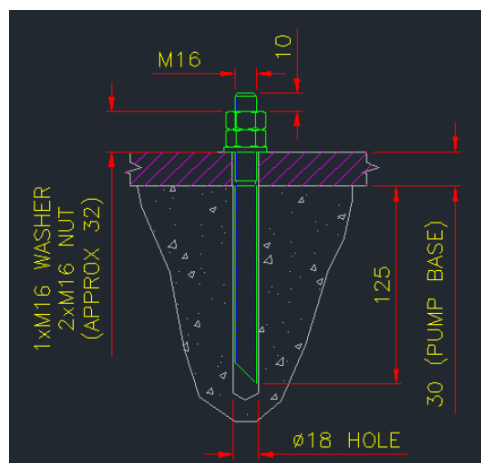


Figure 1 - Diagram of typical HD bolt arrangement.

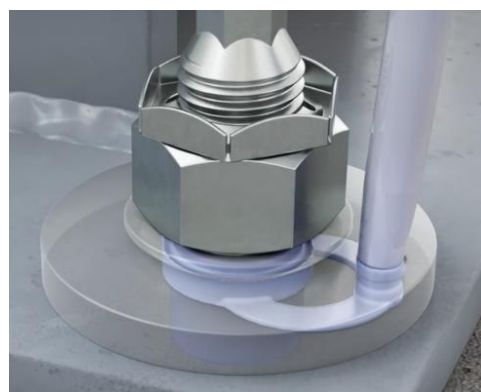


Figure 2 - An image of the internal workings of a Hilti filling set

However, a shimmed and grouted baseplate is permitted where the following conditions are satisfied (refer to BSEN1992-4 cl 6.2.2.3):

- The baseplate is made from steel and is in contact with the anchor (Figure 2).
- The baseplate is fixed using a levelling mortar with a grouting thickness $\leq 0.5D$ (D = anchor diameter) under the full baseplate and the strength of the mortar is at least that of the base concrete but not less than 30 N/mm².

Note - The minimum permissible thickness of most grouts used for this purpose is 10mm suggesting that where grout is used the minimum HD bolt diameter is 20mm.

Cast-in HD bolts can be used as an alternative to using drill and fix chemical anchors. Although intrinsically robust, they require pre-planning, procurement and additional installation work which can be time consuming.



Figure 3 - Cast in HD bolt

Rotating Machinery - Supporting Plinth Design Guidance:

- Pump plinths should be designed and detailed with fully caged rebar.
- Medium to large pump plinths should preferably be constructed using cast-in starter bars.
- For small, light duty pumps properly designed drill-and-fix starters are acceptable.
- Where cast-in starter bars are not feasible (e.g. existing slabs or lack of early pump location info) then properly designed drill-and-fix starters are acceptable.
- Plinths must be sized to ensure adequate edge distance is maintained for the specified HD bolts

