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INSTALLATION MAINTENANCE, OPERATING INSTRUCTIONS

IM-520

Fan Foundation Guidelines

A. Soil Preparation and Loading

A rigid, level foundation is essential for every fan installation. This insures quiet operation, good performance, and reduced excess vibration and maintenance costs. The sub-foundation (soil, stone, rock, etc.) should be firm enough to prevent uneven settlement of the structure, and have adequate stiffness characteristics to avoid rocking or translational vibration resonance. The following guidelines will assist with sub-foundation preparation:

1. Because fans place dynamic loads on foundation and soil, the pressure load on the soil should not exceed 65% of the soil bearing capacity.
2. In areas where the water table is higher or the soil is incapable of bearing sufficient pressure, piling should be driven and/or soil stiffeners added to the soil to increase its bearing strength.
3. Fan foundations should always be “dug-in” such that the bottom of the foundation is always below the frost line and soil should always be packed around sides of the foundation such that the top of the foundation does not protrude more then 6 to 8 inches above grade.
4. In cases where the properties of the soil in the area near the foundation are unknown or “fill” has been used, its always wise to test the soil in accordance with local standard building code practice. Installing a fan where the land has been filled in always requires caution.

B. Concrete and Foundations

An improperly constructed foundation can cause vibration and misalignment of the rotating assembly. Poured concrete under the fan and all drive components is the preferred foundation. If the fan is mounted with sole plates under the bearing supports, make allowances for dimensions of sole plates and grouting when preparing the foundation. Fan foundation must be flat, level, and rigid.

Very large fans and/or variable speed drive fans required special foundation considerations. The purchaser may elect to perform a system forced analysis to determine the natural frequencies and expected vibration amplitudes with reasonable rotor unbalance force, (See AMCA Publication 801).

On all larger fans, foundations should be keyed to bedrock, and use of pilings may be necessary. A civil engineer should be consulted before such a foundation is constructed. The following guidelines will assist with a concrete foundation design:

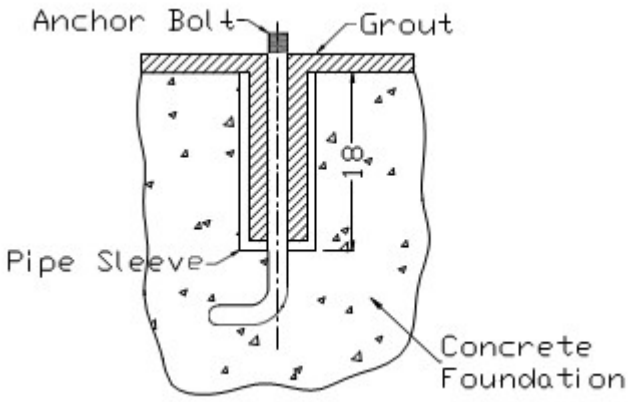
1. Concrete strength should be a minimum of 3,000 PSI.
2. The mass of the foundation immediately surrounding the fan, excluding the attached “housekeeping” pads and other adjacent foundation, should always be a minimum of ten (10) times the mass of the rotating element (fan rotor and motor) or a minimum of five (5) times the total weight of the equipment (fan + driver) it will support, whichever is greater. This weight acts as an inertia block to stabilize the foundation.
3. In cases where the fan is not centered on the foundation, the vertical centerline of the shaft should never be closer to the edge of the foundation than the height of the centerline of the shaft above the top of the foundation.
4. The width of the foundation (that is the dimension perpendicular to axial centerline of the shaft) should always be at least twice the height of the centerline above the top of the foundation.
5. The top of the foundation should extend at least 6” outside the outline of the fan based and should be beveled on the edge to prevent chipping.

6. When concrete pedestals are used, they should either be monolithically poured into the foundation base or at least keyed with steel tie-ins to the base pads. Also, it is a good idea to design the inboard bearing pedestal & motor pedestal as one piece to aid in alignment. The plan view of the top of the concrete pedestal should extend outside the steel pedestal 3" ± 1/4" in direction on the fan housing. This will prevent interference.
7. When viewed looking down the axial centerline of the shaft, concrete pedestal should always have a height to width ratio of less than 1.5.
8. The drive end and opposite drive end pedestals should each have a minimum weight equal to that of the wheel and shaft assembly. The three sides not adjacent to the fan of the pedestals should slope away a minimum of 15° starting at the top, unless the drive end pedestal is common with the motor pedestal. In that case, the side may by vertical. This is especially true when the thickness of the pedestal along a line parallel to the centerline of the shaft is small.
9. In all foundations, appropriate sized rebar should be used in the base pad and also in poured concrete pedestals.
10. Stiffness of the foundation should be minimum of 5 x 10-6 #/IN in the axial direction & 7 x 10-6 in the horizontal and vertical directions.

C. Anchor Bolts

Foundation bolts are found on the assembly drawing.

1. Anchor bolts on concrete should be "L" or "T" shaped (see Figure 1), and should be placed in a pipe or sheet metal sleeves roughly 2" larger in diameter than the anchor bolt to allow for adjusting the bolts in case they move slightly when concrete is poured.
2. Foundation must be level, and allowance must be made for a minimum of 1" of shimming and grouting when determining the top surface of the foundation.
3. Jacking bolts must be loosened and hold-down bolts tightened prior to grouting. All space under the base angles should be grouted.



4. Foundation bolt should be tightened and base rechecked for level.

D. Structural Steel

1. When a structural steel foundation is necessary, it must be sufficiently rigid to assure permanent alignment. It must be designed to carry, with a minimum deflection, the weight of the equipment plus the load imposed by centrifugal force from the rotating element (minimum 25% of rotating weight).
2. Fans installed above ground on structural steel should be located near to or above a rigid wall or heavy columns. An overhead platform or support must be rigidly constructed level and securely braced independently from the fan in all directions.
3. In any above ground installation, design of the structure should permit field revision (e.g.: knee braces) if initial operation indicates a need for increased stiffness. Spring mounted vibration isolation braces are recommend for many fans mounted on structural steel to avoid vibration transmission problems.