For increased speed with the crusher mounted solid to foundation the unbalanced force transmitted to the foundation will increase proportional to the square of the speed. The unbalanced force for normal speed can be found in TD7-013.

If an analysis of the foundation shows that it is not adequate for the increased level of force then isolation mounts should be used to limit the force transmitted to the foundation.

If the increase in speed is in the range of 25 to 50 percent then air type isolation mounts may be needed. For increased speeds above 50 percent it may be possible to use a solid rubber mount. A good criteria for isolation design is:

> The force on the foundation should not exceed the force due to normal speed listed in TD7-013.

When using air mounts it is recommended that the crusher and drive motor be mounted on a common subbase with the isolation mounts between the subbase and the foundation. The isolation mounts must be spaced based on the weight distribution of the crusher, drive motor and subbase. The drive can be located at any position with the use of a subbase. The motion of the subbase must be limited during the start-up and shut down when the system is going through it's natural frequency.

When using solid rubber mounts the drive must be located in the vertical position.

The values listed in table 1 can be used to calculate the unbalanced force on the foundation for any given speed.

See example 1.

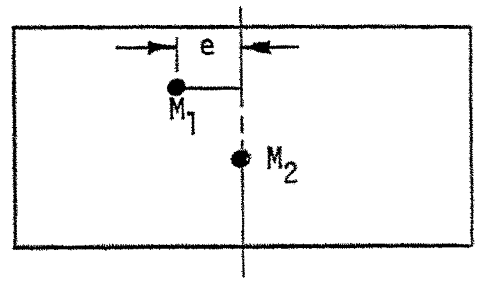
TABLE 1
ISOLATION MOUNT VALUES

CRUSHER SIZE & TYPE	MAINSHAFT AND DISTRIBUTOR ASSEMBLY	ECCENTRIC ASSEMBLY	M_1 (kg)	e (mm)	M_2 (kg)
3 FT. STD	9443 0733 9442 9247	9442 7582	1800	.5	10000
3 FT. SH HD	9443 8112 9443 5726	9443 6493	2500	1.2	10500
4 FT. STD	9444 8376 9446 2366	9445 6112	7700	1.6	16800
4 FT. SH HD	9445 8327 9446 1601	9445 6112	3700	1.0	17600
4 1/4 FT. STD	9446 2143 9446 1658	9446 2875	4700	2.5	22500
4 1/4 FT. SH HD	9446 2154 9446 1658	9446 2875	4800	3.3	22600
5 1/2 FT. STD	9447 1015 9447 0107	9447 6770	10000	4.7	43300
5 1/2 FT. SH HD	9447 8387 9447 0107	9447 6770	10800	2.0	43900
7 FT. STD (Heavy Duty)	9449 3556 9449 2336	9448 7434	17700	2.3	67400
7 FT. SH HD (Heavy Duty)	9450 1820 9449 8998	9448 7434	22500	5.4	70100
7 FT. STD (Extra Heavy Duty)	9449 3559 9449 2336	9448 7435	17700	2.3	86800
7 FT. SH HD (Extra Heavy Duty)	9450 1815 9449 8997	9448 7435	22500	5.4	89500

M_1 - unbalanced mass

e - eccentricity

M_2 - **total** crusher mass – must include mass of subbase and motor if used.



EXAMPLE 1

A 4 1/4 FT. Short Head using either air or solid rubber mounts at 420 RPM eccentric speed which is a 65 percent increase over the normal eccentric speed of 255 RPM. Normal speed from TD7-013, Page 8.

Criteria for isolation device is to limit force on foundation to normal speed value for which foundation was designed.

To calculate force on foundation we must:

1. Calculate estimate of lateral stiffness (k) required by first assuming $\omega/\omega_\eta=2$ (to obtain any degree of isolation ω/ω_η must be greater than 1.4)

$$\omega_\eta = \sqrt{k/M} = 1/2\ \omega_{cr} = 1/2\ (44) = 22 \text{ rad/sec}$$

2. Using value of k, M_1, M_2, e and ω the lateral deflection (x) can be calculated. From Table 1 obtain mass of crusher (M_2), include motor drive and subbase when applicable.

$$k = M_2\omega_\eta^2 = (22600)\ (22)^2 = 10938400 \text{ kg}_m/\text{sec}^2$$

$$\frac{\text{kg}_m}{\text{sec}^2} \bullet \frac{\text{N}}{\text{kg}_m} \frac{\text{sec}^2}{\text{m}} = 10938400 \text{ N/m}$$

$$x = \frac{M_1 e \omega^2}{\sqrt{(k - M_2\omega^2)^2}}$$

$$x = \frac{(4800)\ (.0033)\ (44)^2}{\sqrt{\{10938400 - (22600)\ (44)^2\}^2}}$$

$$x = .0009 \text{ m}$$

3. Using k and x calculate force on foundation.

   F = kx = (10938400) (.0009) = 9845 N

4. Select isolation device (air or rubber mount) to provide a similar total lateral stiffness. Mount must also support weight of crusher and where applicable also the motor drive and subbase. In an actual test it was found that 8 air mounts would reasonably support the crusher mass.

   Calculate k for the mount selected.

   k = 226000 N/m for vertical stiffness of one mount. A typical value of lateral stiffness is .25 of the vertical stiffness.

   k = (226000) (8) (.25) = 452000 N/m

   This value of k is less than the need value of k and therefore this mount is acceptable.

5. Calculate x and force on foundation and check against normal speed force for suitability. It may be advantageous to perform calculations on a few different isolation devices to bring the force closer to the allowable value, thus obtaining the most economical design.

   x = .0007m

   F = kx = (452000) (.0007) = 316 N