**“ d “ Exponent**

The “d” exponent is derived from the general drilling equation :

*R : N = a (Wd ÷ D)*

Where, R = penetration rate  
 N = rotary speed (rpm)  
 a = a constant, dimensionless  
 W = weight on bit (lb)  
 d = exponent in general drilling equation, dimensionless

**“d” exponent equation :**

*“d” = log (R : 60N) : log (12W ÷ 1000D)*

Where, d = d exponent, dimensionless  
 R = penetration rate (ft/hr)  
 N = rotary speed (rpm)  
 W = weight on bit. 1,000 lb  
 D = bit size, in.

Sample Case : R = 30 ft/hr  
 N = 120 rpm  
 W = 35,000 lb  
 D = 8.5 in.

Solution : d = log [30 : (60 x 120)] : log [(12 x 35) ÷ (1000 x 8.5)]  
 = log (30 ÷ 7200) : log (420 : 8500)  
 = log 0.0042 ÷ log 0.0494  
 = —2.377 ÷ —1.306  
 = 1.82

**Corrected “d” exponent :**

The “d” exponent is influenced by mud weight variations, so modifications have to be made to correct for changes in mud weight :

*dc = d (MW1 ÷ MW2)*

Where, dc = corrected “d” exponent  
 MW1 = normal mud weight — 9.0 ppg  
 MW2 = actual mud weight (ppg)

Sample Case : d = 1.64  
 MW1 = 9.0 ppg  
 MW2 = 12.7 ppg

Solution : dc = 1.64 (9.0 : 12.7)  
 = 1.64 x 0.71  
 = 1.16