BLAST DESIGN RULES OF THUMB
(Given: Hole depth, Rock type, and Distance to structure)

HOLE DIAMETER \( (d) \) = hole depth \( (H) \) divided by 5 to 10.

\[ d(\text{in}) = \frac{H(\text{ft})}{(5 \text{ to } 10)} \quad \text{(Typically 7)} \]

BURDEN \( (B) \) = 2 to 3 times the diameter.

\[ B(\text{ft}) = (2 \text{ to } 3) \times d \quad \text{(Typically 2.5 X d)} \]

SPACING \( (S) \) = 1 to 2 times the burden.

\[ S(\text{ft}) = (1 \text{ to } 2) \times B \quad \text{(Typically 1.5 X B)} \]

STEMMING \( (T) \) = 0.5 to 1.0 times the burden.

\[ T(\text{ft}) = (0.5 \text{ to } 1.0) \times B \quad \text{(Typically 0.7 X B)} \]

POWDER COLUMN \( (PC) \) = hole depth minus stemming \( (T) \), backfill \( (F) \) and decking \( (T_d) \).

\[ PC(\text{ft}) = H - T - F(\text{ft}) - T_d(\text{ft}) \]

LOADING DENSITY \( (LD) \) = 0.3405 times the explosive density \( (\rho) \) times the hole diameter squared.

\[ LD(\text{lb/ft}) = 0.3405 \times \rho \text{ (g/cc)} \times d^2 \quad \text{(or Mfg design guide)} \]

CHARGE WEIGHT \( (CW) \) = powder column times the loading density.

\[ CW(\text{lb}) = PC \times LD \]

POWDER FACTOR \( (PF) \) = powder per hole divided by rock volume per hole.

\[ PF(\text{lb/yd}^3) = \frac{CW}{(B \times S \times H / 27)} \]

SCALED DISTANCE \( (SD) \) = Distance to structure divided by square root of the charge weight.

\[ SD(\text{ft/lb}^{1/2}) = \frac{\text{Distance(ft)}}{CW^{1/2}} \quad \text{(Greater than 55)} \]

PEAK PARTICLE VELOCITY \( (PPV) \) = 438 times scaled distance to the -1.52 power.

\[ PPV(\text{in/s}) = 438 \times (SD)^{1.52} \quad \text{(Maximum expected)} \]
Electric Circuit Formulas

**RESISTANCE OF SERIES**

Total Cap Resistance = \( R_1 + R_2 + R_3 + \ldots + R_n \)
Total Cap Resistance = Resistance of one cap \( \times \) number of caps in circuit (if all caps are the same)

**RESISTANCE OF PARALLEL CIRCUIT**

Total Cap Resistance = \( \frac{\text{Resistance of one cap}}{\text{Number of caps in circuit}} \)

**RESISTANCE OF SERIES PARALLEL**

Total Cap Resistance = \( \text{Resistance of series} \times \frac{1}{\text{Number of series}} \)

**RESISTANCE OF WIRE**

Wire Resistance = \( \frac{\text{length of wire (ft)}}{1000 \text{ ft}} \) \( \times \) Resistance from table

**TOTAL RESISTANCE OF CIRCUIT**

Total Circuit Resistance = Cap Resistance + Wire Resistance

**OHM’S LAW**

Current = \( \frac{\text{Voltage}}{\text{Resistance}} \) or Voltage = Current \( \times \) Resistance or Resistance = \( \frac{\text{Voltage}}{\text{Current}} \)

**Nominal resistance of EB caps with copper leg wires**

<table>
<thead>
<tr>
<th>Wire length (ft)</th>
<th>Resistance (ohms)</th>
<th>Wire length (ft)</th>
<th>Resistance (ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1.4</td>
<td>24</td>
<td>2.3</td>
</tr>
<tr>
<td>6</td>
<td>1.6</td>
<td>28</td>
<td>2.4</td>
</tr>
<tr>
<td>8</td>
<td>1.7</td>
<td>30</td>
<td>2.2</td>
</tr>
<tr>
<td>10</td>
<td>1.8</td>
<td>40</td>
<td>2.3</td>
</tr>
<tr>
<td>12</td>
<td>1.8</td>
<td>50</td>
<td>2.6</td>
</tr>
<tr>
<td>16</td>
<td>1.9</td>
<td>60</td>
<td>2.8</td>
</tr>
<tr>
<td>20</td>
<td>2.1</td>
<td>80</td>
<td>3.3</td>
</tr>
</tbody>
</table>

**Resistance of copper wire per 1000’ @ 68 degrees (ohms)**

<table>
<thead>
<tr>
<th>Gauge</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance</td>
<td>.395</td>
<td>.628</td>
<td>.999</td>
<td>1.59</td>
<td>2.53</td>
<td>4.02</td>
<td>6.39</td>
<td>10.15</td>
<td>16.1</td>
</tr>
</tbody>
</table>