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# Peak Drainage Discharge Formula Formulas

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# List of 18 Peak Drainage Discharge Formula Formulas

## Peak Drainage Discharge Formula

## Peak Drainage Discharge by Empirical Formula

## Burkli Ziegler Formula

### 1) Drainage Area for Peak Rate of Runoff

$$fx \quad A_D = \left( \frac{Q_{BZ} \cdot 455}{K' \cdot I_{BZ} \cdot \sqrt{S_o}} \right)^2$$

Open Calculator 

$$ex \quad 30ha = \left( \frac{1.34m^3/s \cdot 455}{251878.2 \cdot 7.5cm/h \cdot \sqrt{0.045}} \right)^2$$

### 2) Maximum Rainfall Intensity given Peak Rate of Runoff

$$fx \quad I_{BZ} = 455 \cdot \frac{Q_{BZ}}{K' \cdot \sqrt{S_o} \cdot A_D}$$

Open Calculator 

$$ex \quad 0.002083cm/h = 455 \cdot \frac{1.34m^3/s}{251878.2 \cdot \sqrt{0.045} \cdot 30ha}$$



### 3) Peak Rate of Runoff from Burkli-Ziegler Formula

[Open Calculator !\[\]\(4729e517bc6a7cd81c8025b9646574fb\_img.jpg\)](#)

$$\text{fx } Q_{\text{BZ}} = \left( \frac{K' \cdot I_{\text{BZ}} \cdot A_{\text{D}}}{455} \right) \cdot \sqrt{\frac{S_o}{A_{\text{D}}}}$$

$$\text{ex } 482400\text{m}^3/\text{s} = \left( \frac{251878.2 \cdot 7.5\text{cm}/\text{h} \cdot 30\text{ha}}{455} \right) \cdot \sqrt{\frac{0.045}{30\text{ha}}}$$

### 4) Runoff Coefficient for Peak Rate of Runoff

[Open Calculator !\[\]\(e474458956c9a37fbf9586ddb60a7fa1\_img.jpg\)](#)

$$\text{fx } K' = \frac{455 \cdot Q_{\text{BZ}}}{I_{\text{BZ}} \cdot \sqrt{S_o \cdot A_{\text{D}}}}$$

$$\text{ex } 251878.2 = \frac{455 \cdot 1.34\text{m}^3/\text{s}}{7.5\text{cm}/\text{h} \cdot \sqrt{0.045 \cdot 30\text{ha}}}$$

### 5) Slope of Ground Surface given Peak Rate of Runoff

[Open Calculator !\[\]\(4fe57c3593bf1b21d272ae7ac8dfaf77\_img.jpg\)](#)

$$\text{fx } S_o = \left( \frac{Q_{\text{BZ}} \cdot 455}{I_{\text{BZ}} \cdot K' \cdot \sqrt{A_{\text{D}}}} \right)^2$$

$$\text{ex } 0.045 = \left( \frac{1.34\text{m}^3/\text{s} \cdot 455}{7.5\text{cm}/\text{h} \cdot 251878.2 \cdot \sqrt{30\text{ha}}} \right)^2$$



## Dicken's Formula

### 6) Catchment Area given Peak Rate of Runoff

$$fx \quad A_{km} = \left( \frac{Q_{PD}}{x} \right)^{\frac{4}{3}}$$

[Open Calculator !\[\]\(23d9fc146e83b5c3013cfa32c784f8d5\_img.jpg\)](#)

$$ex \quad 2.5km^2 = \left( \frac{628716.7m^3/s}{10} \right)^{\frac{4}{3}}$$

### 7) Factors Dependent Constant given Peak Rate of Runoff

$$fx \quad x = \left( \frac{Q_{PD}}{(A_{km})^{\frac{3}{4}}} \right)$$

[Open Calculator !\[\]\(aa53ad6fea213b8b2226d3077e30533a\_img.jpg\)](#)

$$ex \quad 10 = \left( \frac{628716.7m^3/s}{(2.5km^2)^{\frac{3}{4}}} \right)$$

### 8) Peak Rate Runoff from Dicken's Formula

$$fx \quad Q_{PD} = x \cdot (A_{km})^{\frac{3}{4}}$$

[Open Calculator !\[\]\(626ce8ac21792b9405bfddfea8e0c96a\_img.jpg\)](#)

$$ex \quad 628716.7m^3/s = 10 \cdot (2.5km^2)^{\frac{3}{4}}$$



## Dredge or Burge's Formula

### 9) Catchment Area given Peak Rate of Runoff from Dredge Formula

$$fx \quad A_{km} = \frac{Q_d \cdot (L)^{\frac{2}{3}}}{19.6}$$

Open Calculator 

$$ex \quad 2.5km^2 = \frac{212561.2m^3/s \cdot (3.5km)^{\frac{2}{3}}}{19.6}$$

### 10) Peak Rate of Runoff from Dredge Formula

$$fx \quad Q_d = 19.6 \cdot \left( \frac{A_{km}}{(L)^{\frac{2}{3}}} \right)$$

Open Calculator 

$$ex \quad 212561.2m^3/s = 19.6 \cdot \left( \frac{2.5km^2}{(3.5km)^{\frac{2}{3}}} \right)$$

## Inglis Formula

### 11) Catchment Area given Peak Rate of Runoff from Inglis Formula

$$fx \quad A_{km} = \left( \frac{Q_I}{123} \right)^2$$

Open Calculator 

$$ex \quad 2.499998km^2 = \left( \frac{194.48m^3/s}{123} \right)^2$$



## 12) Peak Rate of Runoff from Inglis Formula Approximate

$$fx \quad Q_I = 123 \cdot \sqrt{A_{km}}$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0\_img.jpg\)](#)

$$ex \quad 194.4801m^3/s = 123 \cdot \sqrt{2.5km^2}$$

## Nawab Jung Bahadur Formula

### 13) Peak Rate of Runoff from Nawab Jung Bahadur Formula

$$fx \quad Q_{NJB} = C_2 \cdot (A_{km})^{0.93 - \left(\frac{1}{14}\right) \cdot \log_{10}(A_{km})}$$

[Open Calculator !\[\]\(73002692dd5e7a64e60946be3158e719\_img.jpg\)](#)

$$ex \quad 125.6423m^3/s = 55 \cdot (2.5km^2)^{0.93 - \left(\frac{1}{14}\right) \cdot \log_{10}(2.5km^2)}$$

## Ryve's Formula

### 14) Factors Dependent Constant from Ryve's Formula

$$fx \quad C_R = \left( \frac{Q_r}{(A_{km})^{\frac{2}{3}}} \right)$$

[Open Calculator !\[\]\(aab88c0d099e5d18d6533a97b13ec28d\_img.jpg\)](#)

$$ex \quad 6.786044 = \left( \frac{125000m^3/s}{(2.5km^2)^{\frac{2}{3}}} \right)$$



## Peak Drainage Discharge by Rational Formula

### 15) Catchment Area given Peak Rate of Runoff and Rainfall Intensity

$$fx \quad A_c = \frac{36 \cdot Q_R}{C_r \cdot P_c}$$

[Open Calculator !\[\]\(83f22ed94ec5517769dd76d702c6bfd8\_img.jpg\)](#)

$$ex \quad 14.92539ha = \frac{36 \cdot 4166.67m^3/s}{0.5 \cdot 2.01cm/h}$$

### 16) Coefficient of Runoff given Peak Rate of Runoff

$$fx \quad C_r = \frac{36 \cdot Q_R}{A_c \cdot P_c}$$

[Open Calculator !\[\]\(3cb60d42b10e53f9522bb0b392c1c4cd\_img.jpg\)](#)

$$ex \quad 0.497513 = \frac{36 \cdot 4166.67m^3/s}{15ha \cdot 2.01cm/h}$$


### 17) Critical Rainfall Intensity for Peak Rate of Runoff

$$fx \quad P_c = \frac{36 \cdot Q_R}{A_c \cdot C_r}$$

[Open Calculator !\[\]\(0d7ca0919e6c47bbd874bfa0189fe22e\_img.jpg\)](#)

$$ex \quad 2.000002cm/h = \frac{36 \cdot 4166.67m^3/s}{15ha \cdot 0.5}$$



**18) Peak Rate of Runoff in Rational Formula** [Open Calculator](#) 

$$\text{fx } Q_R = \frac{C_r \cdot A_c \cdot P_c}{36}$$

$$\text{ex } 4187.5\text{m}^3/\text{s} = \frac{0.5 \cdot 15\text{ha} \cdot 2.01\text{cm}/\text{h}}{36}$$









## Variables Used

- **$A_C$**  Area of Catchment (Hectare)
- **$A_D$**  Drainage Area (Hectare)
- **$A_{km}$**  Catchment Area in KM (Square Kilometer)
- **$C_2$**  Coefficient
- **$C_r$**  Runoff Coefficient
- **$C_R$**  Ryve's Coefficient
- **$I_{BZ}$**  Intensity of Rainfall in Burkli Zeigler (Centimeter per Hour)
- **$K'$**  Runoff Coefficient for Burkli Zeigler
- **$L$**  Length of Drain (Kilometer)
- **$P_C$**  Critical Rainfall Intensity (Centimeter per Hour)
- **$Q_{BZ}$**  Peak Rate of Runoff for Burkli Zeigler (Cubic Meter per Second)
- **$Q_d$**  Peak Rate of Runoff from Dredge Formula (Cubic Meter per Second)
- **$Q_I$**  Peak Rate of Runoff for English (Cubic Meter per Second)
- **$Q_{NJB}$**  Peak Rate of Runoff for Nawab Jung Bahadur (Cubic Meter per Second)
- **$Q_{PD}$**  Peak Rate of Runoff from Dickens Formula (Cubic Meter per Second)
- **$Q_r$**  Peak Rate of Runoff in ryves formula (Cubic Meter per Second)
- **$Q_R$**  Peak Drainage Discharge by Rational Formula (Cubic Meter per Second)
- **$S_o$**  Slope of the ground
- **$x$**  Constant



## Constants, Functions, Measurements used

- **Function:** **log10**,  $\log_{10}(\text{Number})$   
*The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.*
- **Function:** **sqrt**,  $\text{sqrt}(\text{Number})$   
*A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.*
- **Measurement:** **Length** in Kilometer (km)  
*Length Unit Conversion* 
- **Measurement:** **Area** in Hectare (ha), Square Kilometer (km<sup>2</sup>)  
*Area Unit Conversion* 
- **Measurement:** **Speed** in Centimeter per Hour (cm/h)  
*Speed Unit Conversion* 
- **Measurement:** **Volumetric Flow Rate** in Cubic Meter per Second (m<sup>3</sup>/s)  
*Volumetric Flow Rate Unit Conversion* 



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