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Circular Sewer Section Running Full Formulas

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List of 37 Circular Sewer Section Running Full Formulas

Circular Sewer Section Running Full

1) Area of Cross-Section given Discharge

Open Calculator

fx $$A = \frac{Q}{V}$$

ex $$5.407654\text{m}^2 = \frac{32.5\text{m}^3/\text{s}}{6.01\text{m/s}}$$

2) Diameter of pipe given Area of Cross-section

Open Calculator

fx $$D_{pipe} = \left(\frac{a}{\left(\frac{\pi}{4}\right) \cdot \left(\left(\frac{\angle_{central}}{360 \cdot \frac{\pi}{180}} \right) - \left(\frac{\sin(\angle_{central})}{2 \cdot \pi} \right) \right)} \right)^{\frac{1}{2}}$$

ex $$4.974761\text{m} = \left(\frac{3.8\text{m}^2}{\left(\frac{\pi}{4}\right) \cdot \left(\left(\frac{120^\circ}{360 \cdot \frac{\pi}{180}} \right) - \left(\frac{\sin(120^\circ)}{2 \cdot \pi} \right) \right)} \right)^{\frac{1}{2}}$$

3) Diameter of Pipe using Hydraulic Mean Depth

Open Calculator

fx $$D_{pipe} = \frac{r_{pf}}{\left(\frac{1}{4}\right) \cdot \left(1 - \left(\frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(\angle_{central})}{2 \cdot \pi \cdot \angle_{central}} \right) \right)}$$

ex $$21.82426\text{m} = \frac{3.2\text{m}}{\left(\frac{1}{4}\right) \cdot \left(1 - \left(\frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(120^\circ)}{2 \cdot \pi \cdot 120^\circ} \right) \right)}$$

4) Discharge when Pipe is Running Full

Open Calculator

fx $$Q = V \cdot A$$

ex $$32.454\text{m}^3/\text{s} = 6.01\text{m/s} \cdot 5.4\text{m}^2$$

5) Hydraulic Mean Depth using Central Angle

Open Calculator

$$r_{pf} = \left(\frac{D_{pipe}}{4}\right) \cdot \left(1 - \left(\frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(\angle_{central})}{2 \cdot \pi \cdot \angle_{central}}\right)\right)$$

$$0.387092\text{m} = \left(\frac{2.64\text{m}}{4}\right) \cdot \left(1 - \left(\frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(120^\circ)}{2 \cdot \pi \cdot 120^\circ}\right)\right)$$

6) Velocity while Running Full given Discharge

Open Calculator

$$V = \frac{Q}{A}$$

$$6.018519\text{m/s} = \frac{32.5\text{m}^3/\text{s}}{5.4\text{m}^2}$$

Proportionate Area

7) Area of Cross-section given Proportionate Area

Open Calculator

$$A = \frac{a}{P_a}$$

$$5.405405\text{m}^2 = \frac{3.8\text{m}^2}{0.703}$$

8) Proportionate Area given Area of Cross-section

Open Calculator

$$P_a = \frac{a}{A}$$

$$0.703704 = \frac{3.8\text{m}^2}{5.4\text{m}^2}$$

9) Proportionate Area given Central Angle

Open Calculator

$$P_a = \left(\left(\frac{\angle_{central}}{360 \cdot \frac{\pi}{180}}\right) - \left(\frac{\sin(\angle_{central})}{2 \cdot \pi}\right)\right)$$

$$0.195501 = \left(\left(\frac{120^\circ}{360 \cdot \frac{\pi}{180}}\right) - \left(\frac{\sin(120^\circ)}{2 \cdot \pi}\right)\right)$$

Proportionate Depth

10) Depth of Partial Flow given Proportionate Depth

Open Calculator

$$d = P_d \cdot D_{pipe}$$

$$2.19912\text{m} = 0.833 \cdot 2.64\text{m}$$

11) Diameter of Pipe given Proportionate Depth

Open Calculator

$$D_{pipe} = \frac{d}{P_d}$$

$$2.641056\text{m} = \frac{2.2\text{m}}{0.833}$$

12) Proportionate Depth given Central Angle

Open Calculator

$$P_d = \left(\frac{1}{2}\right) \cdot \left(1 - \cos\left(\frac{\angle_{central}}{2}\right)\right)$$

$$0.25 = \left(\frac{1}{2}\right) \cdot \left(1 - \cos\left(\frac{120^\circ}{2}\right)\right)$$

13) Proportionate Depth given Diameter of Pipe

Open Calculator

$$P_d = \frac{d}{D_{pipe}}$$

$$0.833333 = \frac{2.2\text{m}}{2.64\text{m}}$$

Proportionate Discharge

14) Area of Cross-section while Running Full given Proportionate Discharge

Open Calculator

$$A = \frac{a \cdot V_s}{V \cdot P_q}$$

$$5.406108\text{m}^2 = \frac{3.8\text{m}^2 \cdot 4.6\text{m/s}}{6.01\text{m/s} \cdot 0.538}$$

15) Discharge when Pipe is Running Full using Proportionate Discharge

Open Calculator

$$Q = \left(\frac{q}{P_q}\right)$$

$$32.49071\text{m}^3\text{/s} = \left(\frac{17.48\text{m}^3\text{/s}}{0.538}\right)$$

16) Proportionate Discharge given Area of Cross-Section

Open Calculator

$$P_q = \frac{V_s \cdot a}{V \cdot A}$$

$$0.538608 = \frac{4.6\text{m/s} \cdot 3.8\text{m}^2}{6.01\text{m/s} \cdot 5.4\text{m}^2}$$

17) Proportionate Discharge given Central Angle

Open Calculator

$$P_q = \left(\left(\frac{\angle_{central}}{360 \cdot \frac{\pi}{180}}\right) - \left(\frac{\sin(\angle_{central})}{2 \cdot \pi}\right)\right) \cdot \left(1 - \frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(\angle_{central})}{2 \cdot \pi \cdot \angle_{central}}\right)$$

$$0.114662 = \left(\left(\frac{120^\circ}{360 \cdot \frac{\pi}{180}}\right) - \left(\frac{\sin(120^\circ)}{2 \cdot \pi}\right)\right) \cdot \left(1 - \frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(120^\circ)}{2 \cdot \pi \cdot 120^\circ}\right)$$

18) Proportionate Discharge using Discharge when Pipe Running Full

Open Calculator

$$P_q = \frac{q}{Q}$$

$$0.537846 = \frac{17.48\text{m}^3/\text{s}}{32.5\text{m}^3/\text{s}}$$

19) Velocity while Running Full given Proportionate Discharge

Open Calculator

$$V = \frac{V_s \cdot a}{P_q \cdot A}$$

$$6.016797\text{m/s} = \frac{4.6\text{m/s} \cdot 3.8\text{m}^2}{0.538 \cdot 5.4\text{m}^2}$$

Proportionate Hydraulic Mean Depth

20) Hydraulic Mean Depth while Running Full given Proportionate Hydraulic Mean Depth

Open Calculator

$$R_{rf} = \left(\frac{r_{pf}}{P_{hmd}}\right)$$

$$5.203252\text{m} = \left(\frac{3.2\text{m}}{0.615}\right)$$

21) Proportionate Hydraulic Mean Depth given Central Angle

Open Calculator

$$P_{hmd} = \left(1 - \frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(\angle_{central})}{2 \cdot \pi \cdot \angle_{central}}\right)$$

$$0.586503 = \left(1 - \frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(120^\circ)}{2 \cdot \pi \cdot 120^\circ}\right)$$

22) Proportionate Hydraulic Mean Depth given Hydraulic Mean Depth while Running Partially Full

Open Calculator

fx $$P_{hmd} = \frac{r_{pf}}{R_{rf}}$$

ex $$0.615385 = \frac{3.2\text{m}}{5.2\text{m}}$$

Proportionate Perimeter

23) Central Angle given Proportionate Perimeter

Open Calculator

fx $$\angle_{central} = \left(P_p \cdot \left(360 \cdot \frac{\pi}{180}\right)\right)$$

ex $$187.2^\circ = \left(0.520 \cdot \left(360 \cdot \frac{\pi}{180}\right)\right)$$

24) Proportionate Perimeter given Central Angle

Open Calculator

fx $$P_p = \left(\frac{\angle_{central}}{360 \cdot \frac{\pi}{180}}\right)$$

ex $$0.333333 = \left(\frac{120^\circ}{360 \cdot \frac{\pi}{180}}\right)$$

25) Proportionate Perimeter given Wetted Perimeter

Open Calculator

fx $$P_p = \frac{P_w}{P}$$

ex $$0.520833 = \frac{6.25\text{m}}{12\text{m}}$$

Proportionate Velocity

26) Hydraulic Mean Depth while Running Full given Proportionate Velocity

Open Calculator

fx $$R_{rf} = \left(\frac{(r_{pf})^{\frac{2}{3}}}{P_v} \right)^{\frac{3}{2}}$$

ex $$4.782531\text{m} = \left(\frac{(3.2\text{m})^{\frac{2}{3}}}{0.765} \right)^{\frac{3}{2}}$$

27) Proportionate Velocity given Central Angle

Open Calculator

fx $$P_v = \left(1 - \frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(\angle_{central})}{2 \cdot \pi \cdot \angle_{central}} \right)^{\frac{2}{3}}$$

ex $$0.70067 = \left(1 - \frac{\left(360 \cdot \frac{\pi}{180}\right) \cdot \sin(120^\circ)}{2 \cdot \pi \cdot 120^\circ} \right)^{\frac{2}{3}}$$

28) Proportionate Velocity given Roughness Coefficient

Open Calculator

fx $$P_v = \left(\frac{N}{n_p} \right) \cdot \left(\frac{r_{pf}}{r_{pf}} \right)^{\frac{2}{3}}$$

ex $$0.822222 = \left(\frac{0.74}{0.9} \right) \cdot \left(\frac{3.2\text{m}}{3.2\text{m}} \right)^{\frac{2}{3}}$$

29) Proportionate Velocity given Velocity while Running Partially Full

Open Calculator

fx $$P_v = \frac{V_s}{V}$$

ex $$0.765391 = \frac{4.6\text{m/s}}{6.01\text{m/s}}$$

30) Proportionate Velocity when Roughness Coefficient does not Vary with Depth

Open Calculator

fx $$P_v = \left(\frac{r_{pf}}{R_{rf}}\right)^{\frac{2}{3}}$$

ex $$0.723488 = \left(\frac{3.2\text{m}}{5.2\text{m}}\right)^{\frac{2}{3}}$$

31) Roughness Coefficient while Running Full given Proportionate Velocity

Open Calculator

fx $$N = \frac{P_v \cdot n_p}{\left(\frac{r_{pf}}{R_{rf}}\right)^{\frac{2}{3}}}$$

ex $$0.95164 = \frac{0.765 \cdot 0.9}{\left(\frac{3.2\text{m}}{5.2\text{m}}\right)^{\frac{2}{3}}}$$

32) Velocity while Running Full given Proportionate Velocity

Open Calculator

fx $$V = \frac{V_s}{P_v}$$

ex $$6.013072\text{m/s} = \frac{4.6\text{m/s}}{0.765}$$

Wetted Perimeter

33) Central Angle given Wetted Perimeter

Open Calculator

fx $$\angle_{central} = \frac{P_w \cdot \left(360 \cdot \frac{\pi}{180}\right)}{\pi \cdot D_{pipe}}$$

ex $$271.2868^\circ = \frac{6.25\text{m} \cdot \left(360 \cdot \frac{\pi}{180}\right)}{\pi \cdot 2.64\text{m}}$$

34) Diameter of Pipe given Wetted Perimeter

Open Calculator

$$D_{pipe} = \frac{P_w \cdot \left(360 \cdot \frac{\pi}{180}\right)}{\pi \cdot \angle_{central}}$$

$$5.96831\text{m} = \frac{6.25\text{m} \cdot \left(360 \cdot \frac{\pi}{180}\right)}{\pi \cdot 120^\circ}$$

35) Wetted Perimeter given Central Angle

Open Calculator

$$P_w = \frac{\pi \cdot D_{pipe} \cdot \angle_{central}}{360 \cdot \frac{\pi}{180}}$$

$$2.764602\text{m} = \frac{\pi \cdot 2.64\text{m} \cdot 120^\circ}{360 \cdot \frac{\pi}{180}}$$

36) Wetted Perimeter given Proportionate Perimeter

Open Calculator

$$P_w = P_p \cdot P$$

$$6.24\text{m} = 0.520 \cdot 12\text{m}$$

37) Wetted Perimeter while Running Full given Proportionate Perimeter

Open Calculator

$$P = \frac{P_w}{P_p}$$

$$12.01923\text{m} = \frac{6.25\text{m}}{0.520}$$

Variables Used

- $\angle_{central}$ Central Angle *(Degree)*
- **a** Area of Partially Full Sewers *(Square Meter)*
- **A** Area of Running Full Sewers *(Square Meter)*
- **d** Depth at Partial Flow *(Meter)*
- D_{pipe} Diameter of Pipe *(Meter)*
- **N** Roughness Coefficient for Running Full
- n_p Roughness Coefficient Partially Full
- **P** Wetted Perimeter *(Meter)*
- P_a Proportionate Area
- P_d Proportionate Depth
- P_{hmd} Proportionate Hydraulic Mean Depth
- P_p Proportionate perimeter
- P_q Proportionate Discharge
- P_v Proportionate Velocity
- P_w Wetted Perimeter for Partial Flow *(Meter)*
- **q** Discharge when Pipe is Running Partially Full *(Cubic Meter per Second)*
- **Q** Discharge when Pipe is Running Full *(Cubic Meter per Second)*
- r_{pf} Hydraulic Mean Depth for Partially Full *(Meter)*
- R_{rf} Hydraulic Mean Depth while Running Full *(Meter)*
- **V** Velocity While Running Full *(Meter per Second)*
- V_s Velocity in a Partially Running Sewer *(Meter per Second)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Function: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
  Volumetric Flow Rate Unit Conversion

Check other formula lists

- **Circular Sewer Section Running Full Formulas**
- **Circular Sewer Section Running Partially Full Formulas**

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