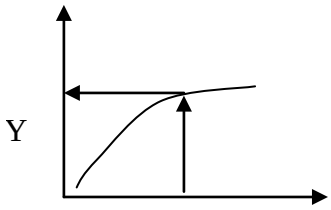
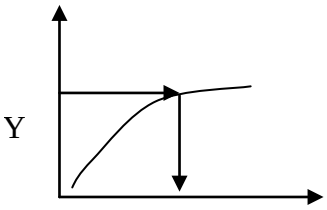
Extension of Rating Curve:



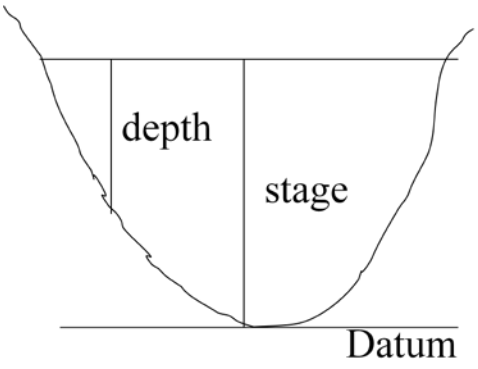
Stage Hydrograph

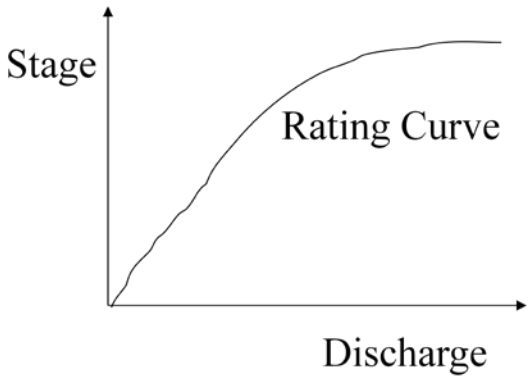


Rating Curve

- The essence of the rating curve is that when the curve is established for a particular stream, subsequent determinations of discharges are merely obtained by dipping a measuring stick to measure the stage.
- Discharge is then read from the rating curve.
- The rating curve should be checked from time to time for accurate measurements.

Rating Curve Graph





Rating Curve Types :

1. Simple Rating Curve :

   a . on arithmetic Paper : Parabolic curve as :

   $$Q = a (y - y_0) ** C$$

   b. On logarithmic paper : straight line as :

   $$\log Q = \log a + c \log (y - y_0)$$

Extension of rating curve :

used Logarithmic method to get Qp

STAGE-DISCHARGE RELATIONS

- Simultaneous measurements of stage and discharge provide a calibration graph known as stage-discharge relations or rating curve.
- Stage: Height of stream level measured from an arbitrary datum.
- Depth: Measured from the bottom of the channel.
- The datum can also be the mean sea level. A plot of stage Vs discharge is made to obtain a rating curve.

1.By Fitting an Equation:

$$Q=K(h-h_o)^X$$

Where:

Q=discharge,(m^3/sec.);

h=stage,(m);

h_o=height between zero on the gage and the elevation of zero flow,(m);أما تقاس قيمتها موقعيا أو تحدد من الجزء المتوفر من المنحني

K=constants,(dimensionless).تحدد قيمها من الجزء المتوفر من المنحني

X= slope of the rating curve

2.By Steven Method:

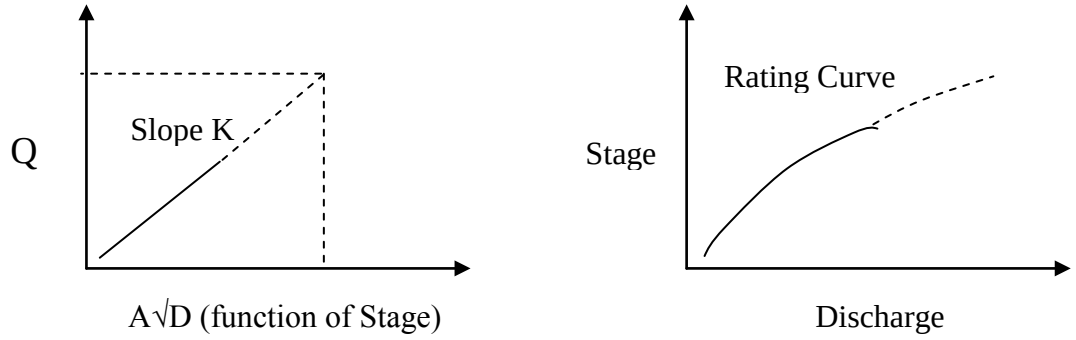
$Q=AC\sqrt{SR}$

Where:

$C\sqrt{S}$ = constant

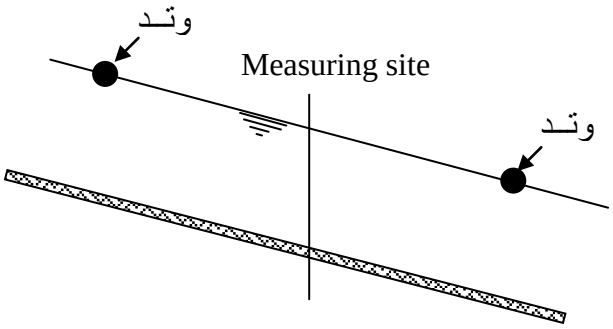
R=D

= mean depth



3.Slope - Area Method: Elevation marks are made during time of flat upstream and downstream of the measuring site.

$Q=1/nAR^{2/3}S^{1/2}$ (Manning Equation)

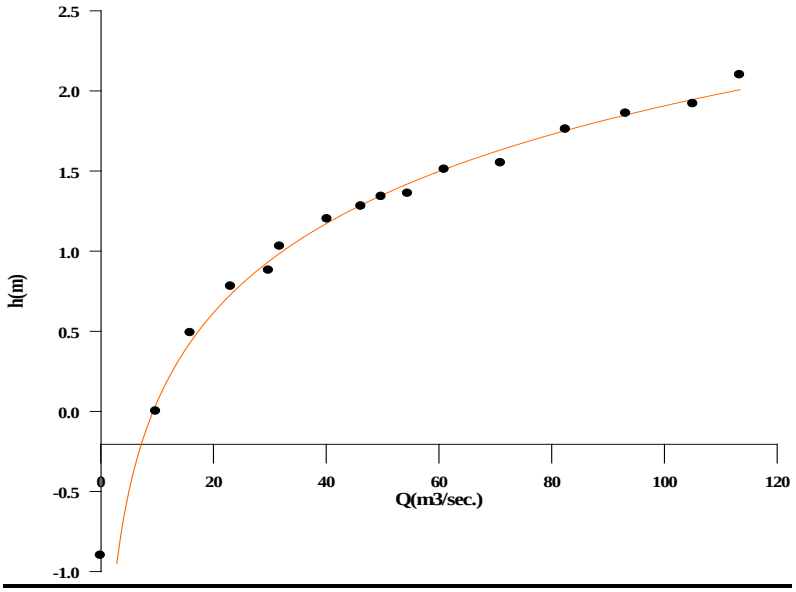


Example: At a certain gauge station in an open channel. The discharges have been measured using the current meter. The values of the water level also recorded. The data are given in the following Table.

1. Draw the rating curve;
2. Predict the relation between the stage and the discharge.

Solution:

Water Level (m)	Discharge (m^3/sec.)	Log Q	Log (h+0.9)
0.00	9.8	**0.99**	**-0.05**
0.49	15.9	**1.2**	**0.14**
0.78	23.1	**1.36**	**0.23**
0.88	29.8	**1.47**	**0.25**
1.03	31.8	**1.5**	**0.29**
1.2	40.2	**1.6**	**0.32**
1.28	46.2	**1.66**	**0.34**
1.34	49.8	**1.7**	**0.35**
1.36	54.5	**1.74**	**0.35**
1.51	61.0	**1.78**	**0.38**
1.55	71.0	**1.85**	**0.39**
1.76	82.5	**1.92**	**0.42**
1.86	93.2	**1.97**	**0.44**
1.92	105.1	**2.02**	**0.45**
2.10	113.4	**2.10**	**0.48**



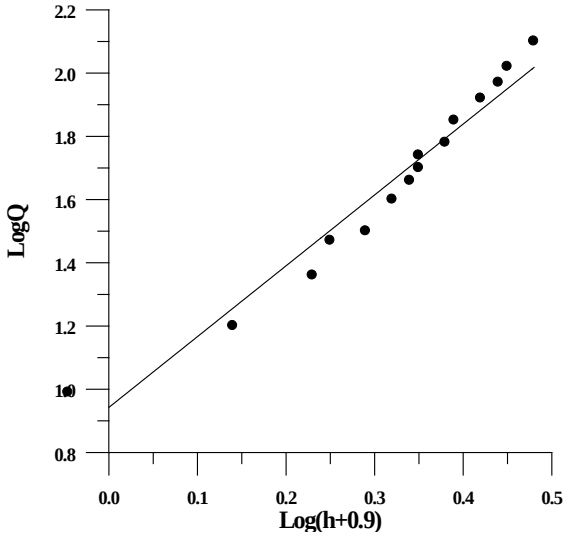
h_0=-0.9

شكل رقم (1): يمثل منحني المعايرة

$Q=K(h+0.9)^X$

لتعيين قيم الثوابت K&X نأخذ الـ(Log) لطرفي المعادلة ،ويكون الناتج كما يلي:

Log Q=Log K + X Log (h+0.9)



Log k = 0.825 k = 6.683

X= tan Θ

= 0.52/0.2

= 2.6

$Q = 6.683(h+0.9)^{2.6}$