Estimation of \( Re \) for a flow over the Clark-Y

Assume that the flow through the test channel is 2D. Then the cross-sectional flow rate \( Q(x) \) at an \( x \) position can be written as:

\[
Q(x) = \int_0^h u(x, y) \, dy = \sum_{j=1}^{N} u_j(x) \Delta y
\]

where \( \Delta y = h/N \) then,

\[
Q(x) = \frac{h}{N} \sum_{j=1}^{N} u_j(x)
\]

The mean flow rate \( \bar{Q} \) along the test section \( L \) is defined as:

\[
\bar{Q} = \frac{1}{L} \int_0^L Q(x) \, dx = \frac{1}{L} \sum_{i=1}^{M} Q_i \Delta x
\]

where \( Q_i = Q(x_i) \) and \( L = M \Delta x \) then,

\[
\bar{Q} = \frac{1}{M \Delta x} \sum_{i=1}^{M} Q_i \Delta x = \frac{1}{M} \sum_{i=1}^{M} Q_i
\]

The mean velocity through the test channel \( U_{av} \) is obtained as:

\[
U_{av} = \frac{\bar{Q}}{h}
\]

Consequently, the flow \( Re \) based on \( U_{av} \) and Clark-Y chord length \( C \) is given as:

\[
Re = \frac{U_{av} \cdot C}{\nu}
\]