INTRODUCTION

Occasionally a horizontal duct may contain bottom sediment that has been deposited over a period of time. The volumetric flow rate calculation may be significantly affected by this displaced cross sectional area. To determine the effective duct area, the following calculation steps are given.

**EFFECTIVE DUCT AREA CALCULATION**

1. Measure distance to sediment from top of duct "a".
2. Determine the radius of the duct "r".
3. Determine the depth of sediment "\( d \)".

\[
\begin{align*}
\text{\( \bar{d} \)} &= \text{diameter - } s \\
\text{and } a &= \text{diameter - (} j + r) \\
\end{align*}
\]

4. Determine angle \( \theta_1 \)

\[
\begin{align*}
\theta_1 &= \arccos \left( \frac{a}{c} \right) \\
\text{and } c &= r \\
\end{align*}
\]

5. Determine lengths "b" and "B":

\[
\begin{align*}
b &= c \left( \sin \theta_1 \right) \\
B &= 2 \times b \\
\end{align*}
\]

6. Determine \( \theta \)

\[
\theta = 2 \times \theta_1 \\
\]

7. Determine length of ARC (nop)

\[
\text{ARCnop} = \frac{B \theta}{180} \\
\]

8. Determine area of segment nop.

\[
\text{Area nop} = \frac{(\text{ARCnop} \times r) \times aB}{2} \\
\]

9. Determine duct area.

\[
\text{Duct area } "A" = \frac{r^2}{2} \\
\]

10. Determine effective duct area "\( A' \)".

\[
A' = A \times \text{Area nop} \\
\]