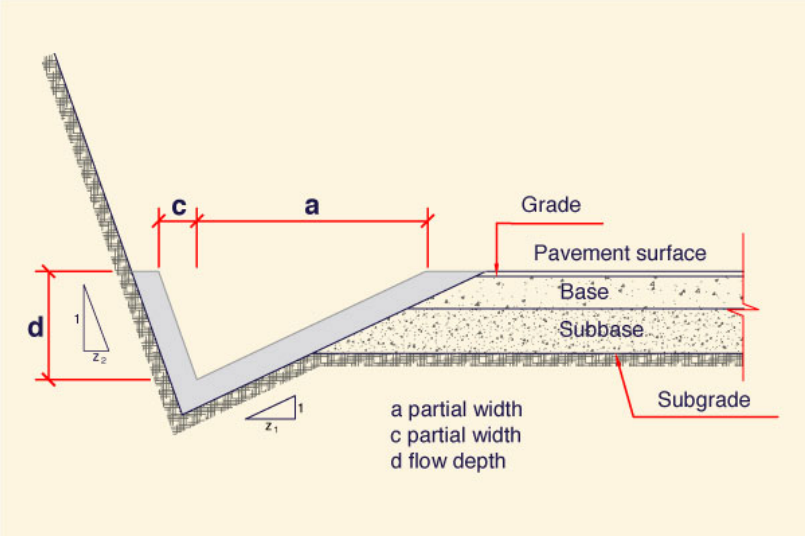

Fig. 1 Definition sketch.

HOW TO CALCULATE ONLINE THE NORMAL DEPTH IN A ROADSIDE DITCH?

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ABSTRACT. In this article we show how to calculate the normal depth in a roadsize ditch using **ONLINE_SIDE_DITCH**, an online calculator developed in 2023 by the **Visualab**, a hydraulic engineering computational laboratory of the Department of Civil Engineering, San Diego State University, San Diego, California. This design tool may be used to find the geometric dimensions of a roadside ditch, or culvert, given the cognizant hydraulic input variables.

1. INTRODUCTION

The computation of the normal depth in a roadside ditch is not very straigthforward. The computation requires the iterative use of the Manning equation (**Ponce, 2014**). A source of possible complexity is that the typical

triangular cross-section of the roadsize ditch has different side slopes (Fig. 1). In this article, we expedite the solution by providing an online calculator specifically developed for sizing a roadside ditch.

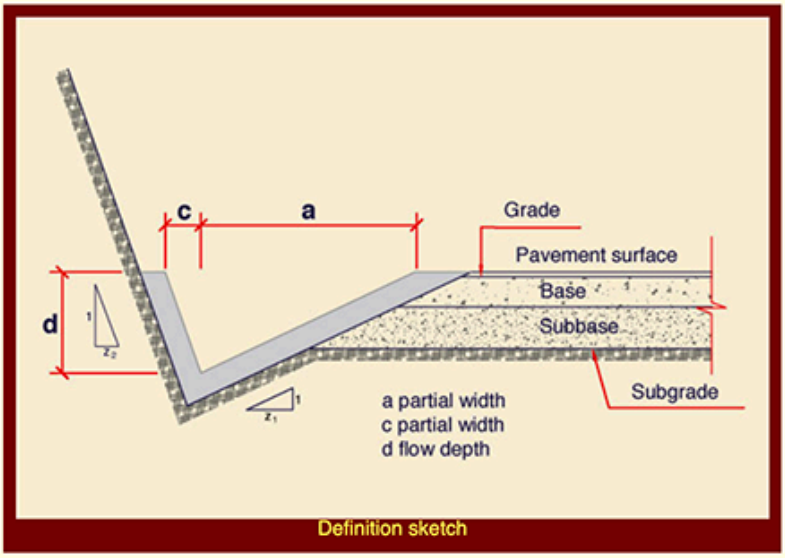
2. EXAMPLE

We use the calculator **ONLINE_SIDE_DITCH** to run the following typical example:

- Units: SI Units.
- Discharge Q = 0.08 m^3/s.
- Side slope z_1 = 4.
- Side slope z_2 = 0.5.
- Bottom slope S = 0.005.
- Manning's n coefficient = 0.015.

3. RESULTS

onlinesideditch.php: Normal depth in a roadside ditch using the Manning equation



Definition sketch

Formulas:

$z = 0.5\ (z_1 + z_2)$

$A = y(zy)$

$P = y(1 + z_1^2)^{1/2} + y(1 + z_2^2)^{1/2}$

$T = 2zy$

$R = A/P$

$D = A/T$

$Q = (k/n)\ AR^{2/3}S^{1/2}$

$V = Q/A$

$F = V/(gD)^{1/2}$

INPUT DATA:

Select:

SI units (m3/s)
U.S. Customary units (cfs)

Discharge Q: 0.08 $m^3\ s^{-1}$

Side slope z_1: 4

Side slope z_2: 0.5

Bottom slope S: 0.005

Manning's n coefficient: 0.015

INTERMEDIATE CALCULATIONS:

Units: SI units

Gravitational acceleration g: 9.81 $m\ s^{-2}$

Constant k: 1

Wetted perimeter P: 1.036 m

Top width T: 0.889 m

Flow area A: 0.09 m^2

Hydraulic radius R: 0.085 m

Hydraulic depth D: 0.099 m

Normal depth y_n: 0.198 m

Mean velocity V_n: 0.91 $m\ s^{-1}$

Froude number F_n: 0.924

OUTPUT:

Flow depth
d = 0.198 m

Partial width
a = 0.791 m

Partial width
c = 0.099 m

Calculate Reset

Your request was processed at 240302 at 19:01:50.

Thank you for running onlinesideditch. [230124]

REFERENCES

Ponce, V. M. 2014. **Fundamentals of Open-channel Hydraulics**. Online edition.

Ponce, V. M. 2023. **ONLINE_SIDE_DITCH**. *https://ponce.sdsu.edu/onlinesideditch.php*

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