

# DESIGN FOR Anaar Khil Village Kot District

## TRAPEZOIDAL SHAPED WATERCOURSE HYDRAULIC SECTION

At end Point of Canal

Reshaping / Cleaning

### B. Hydraulic Calculation for Trapezoidal Section of Canal

Method	b	h	T	Z	A	P	R	$R^{2/3}$	$A \cdot R^{2/3}$	$S^{0.2}$	n	V	Q	Q
Trial	(m)	(m)	(m)		(m <sup>2</sup> )	(m)	(m)					(m/sec)	(Lit/sec)	(m <sup>3</sup> /sec)
1.00	0.66	0.23	1.35	1.50	0.23	1.49	0.16	0.29	0.07	0.04	0.02	0.60	138	0.14

$$A = h (b + Z \times h)$$

$$P = b + 2h(n^2 + 1)^{0.5}$$

$$R = A / P$$

$$V = (R^{2/3} \times S^{1/2}) / n$$

$$Q = (A \times R^{2/3} \times S^{1/2}) / n$$

Q (m<sup>3</sup>/sec)

0.138

For Economical Section

n

0.020

Stipulation

Calculation

Result

Slope (m/m)

0.0017

$R / (h/2) = 1$

0.97

OK

Q (L/Sec)

138

FB = (1/3 \* h to 15 or more then that some time)

### C. Design X-Sections at Different Locations

Table A1

Location	From	To	Length (m)	Longitudinal Slope (m/m)	Bottom Width (b) (m)	Flow Depth (h) (m)	Total Depth (D) (m)	Velocity (m/sec)	Discharge (Lit/sec)	Top Width (T) (m)
Start Point Anaar Khil	0+000	4+305	4305	0.00170	0.66	0.50	0.67	0.60	138	1.35
Total Length (m)			4305							

Table A2

Table of Roughness Coefficient "n" for Small Channels					
Description		Minimum	Maximum	Recommended	
Unlined Earthen Channels					
1. new- straight and uniform		0.020	0.025	0.025	
2. aged and vegetated with;					
a. Short grass		0.030	0.040	0.035	
b. Long grass		0.050	0.080		
Lined Channels					
1. concrete		0.012	0.018	0.014	
2. brick plastered		0.012	0.018	0.013	
3. brick unplastered		0.016	0.020	0.018	
1/ Source : Engineering Design Standards Soil Conservation Service, USDA.					
2/ Source : Irrigation Canal Lining, and Water Development Series No.1 1977, Table 9					

# SUB-PROJECT NAME: KOTDISTRICT ANAAR KHIL VILLAGE

## SCOUR CALCULATION

Note: Fill the values in yellow highlighted cells

### INPUT

Location	Severity factor X	Discharge Q (m3/s)	Bed width B (m)	Flow depth y (m)	Silt factor f
Canal at sraight reach	1.25	0.14	0.66	0.23	2

### OUTPUT

Unit discharge q (m2/s)	Scour R	Factored Scour XR	Scour depth Ds	Apron length Lu and Ld
0.21	0.38	0.47	0.24	0.48

### Lacey's silt factor

Material	Average $d_{50}$ size (mm)	Silt factor f
Very fine SILT	0.05	0.4
Fine SILT	0.12	0.5
Medium SILT	0.15	0.7
Standard SILT	0.32	1
Medium SAND	0.5	1.2
Coarse SAND	0.72	1.5
Fine GRAVEL	1.3	2
Medium GRAVEL	7.3	4.7
Heavy GRAVEL	26	9
Small BOULDERS	50	12
Medium BOULDERS	72	15
Large BOULDERS	185	24

### Scour dep X \* R - y

X = severity factor

R = scour, in m  $1.35 * (q^2/f)^{1/3}$

Y = tail wate level, in m

### Severity factor

Location	Severity
Upstream of structure	1.25
Downstream of structure	1.5
Nose of spur	2.25
Transition from nose to straight	1.5
Straight reach of guide bank	1.75

# DESIGN FOR Anaar Khil Village Kot District

## TRAPEZOIDAL SHAPED WATERCOURSE HYDRAULIC SECTION

At the start point of canal

### B. Hydraulic Calculation for Trapezoidal Section of Canal

Reshaping / Cleaning

Method	b	h	T	Z	A	P	R	$R^{2/3}$	$A \cdot R^{2/3}$	$S^{0.2}$	n	V	Q	Q
Trial	(m)	(m)	(m)		(m <sup>2</sup> )	(m)	(m)					(m/sec)	(Lit/sec)	(m <sup>3</sup> /sec)
1.00	0.70	0.30	1.60	1.50	0.35	1.78	0.19	0.33	0.12	0.04	0.02	0.69	238	0.24

$A = b (b + Z \times h)$
$P = b + 2h(n^2 + 1)^{0.5}$
$R = A / P$
$V = (R^{2/3} \times S^{1/2}) / n$
$Q = (A \times R^{2/3} \times S^{1/2}) / n$

Q (m <sup>3</sup> /sec)	0.238
n	0.020
Slope (m/m)	0.0017
Q (L/Sec)	238

For Economical Section

Stipulation	Calculation	Result
$R / (h/2) = 1$	0.97	OK

FB = (1/3 \* h to 15 or more then that some time)

### C. Design X-Sections at Different Locations

**Table A1**

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Start Point Anaar Khil	0+000	4+305	4305	0.00170	0.70	0.50	0.67	0.69	238	1.60
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## SCOUR CALCULATION

Note: Fill the values in yellow highlighted cells

### INPUT

Location	Severity factor X	Discharge Q (m3/s)	Bed width B (m)	Flow depth y (m)	Silt factor f
Canal at sraight reach	1.25	0.24	0.70	0.30	2

### OUTPUT

Unit discharge q (m2/s)	Scour R	Factored Scour XR	Scour depth Ds	Apron length Lu and Ld
0.34	0.52	0.65	0.35	0.71

### Lacey's silt factor

Material	Average $d_{50}$ size (mm)	Silt factor f
Very fine SILT	0.05	0.4
Fine SILT	0.12	0.5
Medium SILT	0.15	0.7
Standard SILT	0.32	1
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Y = tail wate level, in m

### Severity factor

Location	Severity
Upstream of structure	1.25
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Nose of spur	2.25
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Straight reach of guide bank	1.75