

**ЎЗБЕКИСТОН РЕСПУБЛИКАСИ ОЛИЙ ВА ЎРТА ТАЪЛИМ
ВАЗИРЛИГИ**

ТИМИ Бухоро филиали

“Гидромелиорация” факультети

“Сув хўжалиги ва мелиорация” кафедраси

КУРС ИШИ

Мавзу: “KANALDAGI INSHOOTLAR BO’G’INI”

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Бухоро-2014 йил

“KANALDAGI INSHOOTLAR BO’G’INI”
mavsusidagi kurs loyihasiga
TOPSHIRIQ

Kanallar bo'yicha ma'lumotlar:	Q, m ³ /c	b, m	h, m	i	m	n
Bosh va tashlama	55	17	2.99	0.00009	2.25	0.020
1-taqsimlovchi	40	14	2.7	0.00009	2.25	0.020
2-taqsimlovchi	15	8	1.90	0.00015	2.0	0.0225

Tutashtirish inshooti turi - *tezoqar*

Kanallardagi suv sathi otmetkalari:

Bosh kanal - 102,99m

1-taqsimlovchi - 102,7m

2-taqsimlovchi - 101,9m

Tashlama

- 95,3m

Yer yuzasi otmetkasi -

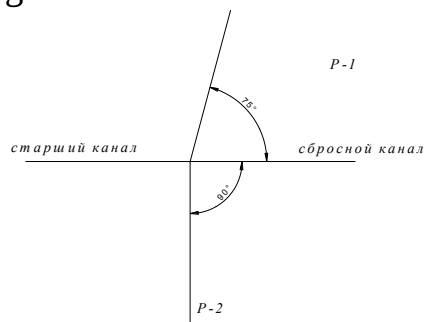
Inshootlar materiali - beton

A) Rostlash

B) Tutashtirish

Asos grunti - o'rtacha qum

Plandagi sxema



Topshiriq berildi: _____

O'qituvchi: _____

Kanallar ishchi grafigi va ko'ndalang qirqimlarini tuzish

1. Kanallarning kapitallik sinfini quyidagi jadvaldan belgilaymiz:

Inshoot xizmat qiladigan sug'oriladigan maydon, ming ga.	Kapitallik sinfi
300	I
100-300	II
50-100	III
50	IV

O'zbekiston Respublikasi sharoiti uchun sug'orish uchun suvga talabni 1 ming ga uchun $1 \text{ m}^3/\text{s}$ deb qabul qilamiz.

Demak kapitallik sinfi

Bosh kanal uchun – III

Taqsimlovchi kanallar uchun – IV

2. Quyidagi formulalardan foydalangan holda kanallarning ishchi grafiklarini tuzamiz:

$$Q_i = \omega_i \cdot v_i$$

$$\omega_i = h_i \cdot (b + m \cdot h_i)$$

$$v_i = C_i \sqrt{R_i i}$$

$$R_i = \frac{\omega_i}{\chi_i}$$

$$\chi_i = b + 2h_i \sqrt{1 + m^2}$$

$$C_i = \frac{1}{n} R_i^{\frac{1}{6}}$$

Bu yerda:

Q_i – kanaldagi suv sarfi, m^3/s ;

ω_i – jonli kesim yuzasi, m^2 ;

v_i – kanaldagi suv tezligi, m/s;

b – kanal tubi eni, m;

h_i – kanaldagi suv chuqurligi, m;

i – kanal tubi bo'ylama nishabligi;

R_i – gidravlik radius, m;

χ_i – ho'llangan perimetr, m;

m – kanal qirg'oqi qiyaligi;

C_i – Shezi koeffisienti;

n – kanal g'adir-budirlik koeffisienti.

Bosh kanal hisobi.

h uchun to'rtta ixtiyoriy qiymat belgilaymiz:

$$h_1 = 1 \text{ m}, h_2 = 2 \text{ m}, h_3 = 2,99 \text{ m}, h_4 = 4 \text{ m}.$$

$$\omega_1 = h_1 \cdot (b + m \cdot h_1) = 1 \cdot (17 + 2,25 \cdot 1) = 19,25 \text{ m}^2$$

$$\omega_2 = h_2 \cdot (b + m \cdot h_2) = 2 \cdot (17 + 2,25 \cdot 2) = 43 \text{ m}^2$$

$$\omega_3 = h_3 \cdot (b + m \cdot h_3) = 2,99 \cdot (17 + 2,25 \cdot 2,99) = 70,95 \text{ m}^2$$

$$\omega_4 = h_4 \cdot (b + m \cdot h_4) = 4 \cdot (17 + 2,25 \cdot 4) = 104 \text{ m}^2$$

$$\chi_1 = b + 2h_1\sqrt{1+m^2} = 17 + 2 \cdot 1 \cdot \sqrt{1+2,25^2} = 21,92 \text{ m}$$

$$\chi_2 = b + 2h_2\sqrt{1+m^2} = 17 + 2 \cdot 2 \cdot \sqrt{1+2,25^2} = 26,85 \text{ m}$$

$$\chi_3 = b + 2h_3\sqrt{1+m^2} = 17 + 2 \cdot 2,99 \cdot \sqrt{1+2,25^2} = 31,72 \text{ m}$$

$$\chi_4 = b + 2h_4\sqrt{1+m^2} = 17 + 2 \cdot 4 \cdot \sqrt{1+2,25^2} = 36,70 \text{ m}$$

$$R_1 = \frac{\omega_1}{\chi_1} = \frac{19,25}{21,92} = 0,88 \text{ m}$$

$$R_2 = \frac{\omega_2}{\chi_2} = \frac{43}{26,85} = 1,60 \text{ m}$$

$$R_3 = \frac{\omega_3}{\chi_3} = \frac{70,95}{31,72} = 2,24 \text{ m}$$

$$R_4 = \frac{\omega_4}{\chi_4} = \frac{104}{36,72} = 2,83 \text{ m}$$

$$C_1 = \frac{1}{n} R_1^{\frac{1}{6}} = \frac{1}{0,02} \cdot 0,88^{\frac{1}{6}} = 48,93$$

$$C_2 = \frac{1}{n} R_2^{\frac{1}{6}} = \frac{1}{0,02} \cdot 1,60^{\frac{1}{6}} = 54,08$$

$$C_3 = \frac{1}{n} R_3^{\frac{1}{6}} = \frac{1}{0,02} \cdot 2,24^{\frac{1}{6}} = 57,18$$

$$C_4 = \frac{1}{n} R_4^{\frac{1}{6}} = \frac{1}{0,02} \cdot 2,83^{\frac{1}{6}} = 59,48$$

$$v_1 = C_1 \sqrt{R_1 i} = 48,93 \cdot \sqrt{0,88 \cdot 0,00008} = 0,43 \text{ m/s}$$

$$v_2 = C_2 \sqrt{R_2 i} = 54,08 \cdot \sqrt{1,60 \cdot 0,00008} = 0,65 \text{ m/s}$$

$$v_3 = C_3 \sqrt{R_3 i} = 57,18 \cdot \sqrt{2,24 \cdot 0,00008} = 0,81 \text{ m/s}$$

$$v_4 = C_4 \sqrt{R_4 i} = 59,48 \cdot \sqrt{2,83 \cdot 0,00008} = 0,95 \text{ m/s}$$

$$Q_1 = \omega_1 \cdot v_1 = 19,25 \cdot 0,43 = 8,37 \text{ m}^3/\text{s}$$

$$Q_2 = \omega_2 \cdot v_2 = 43 \cdot 0,65 = 27,92 \text{ m}^3/\text{s}$$

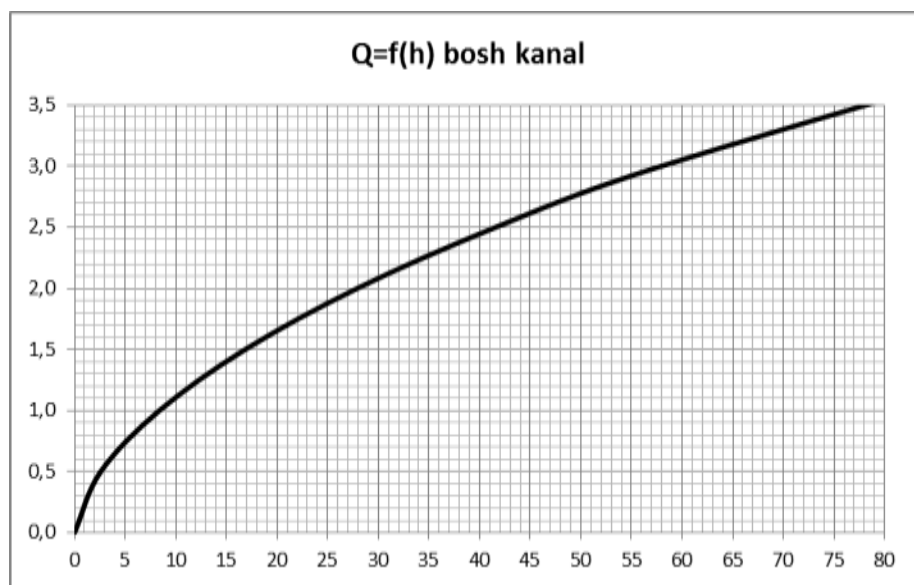
$$Q_3 = \omega_3 \cdot v_3 = 70,95 \cdot 0,81 = 57,55 \text{ m}^3/\text{s}$$

$$Q_4 = \omega_4 \cdot v_4 = 104 \cdot 0,95 = 98,79 \text{ m}^3/\text{s}$$

Hisob natijalarini jadval ko'rinishida yozamiz

h_i, m	b_i, m	m	n	i	ω_i, m^2	χ_i, m	R_i, m	C_i	$v_i, m/s$	$Q_i, m^3/s$
1	17	2.25	0.020	0.0000	19.25	21.92	0.88	48.93	0.43	8.37
2	17	2.25	0.020		43	26.85	1.60	54.08	0.65	27.92
2.99	17	2.25	0.020		70.95	31.72	2.24	57.18	0.81	57.55
4	17	2.25	0.020		104	36.70	2.83	59.48	0.95	98.79

Bosh kanal uchun $Q=f(h)$ grafigini tuzamiz



Jadvaldan,

$$K_f = 1,05$$

$$Q_f = Q_{max} \cdot K_f = 55 \cdot 1.05 = 57,75 \text{ m}^3/\text{s}$$

Grafikdan,

$$h_f = 3.1 \text{ m}$$

Maksimal sarf, m ³ /s	K _f koefitsient
1-10	1.15
10-50	1.10
50-100	1.05

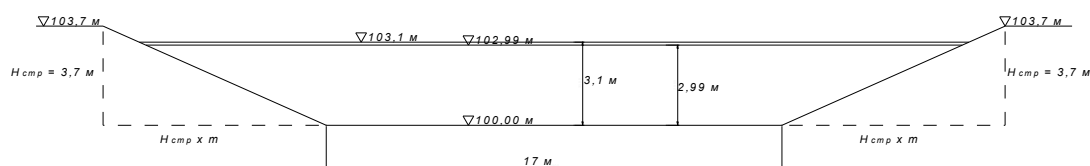
Jadvaldan,

$$a = 0,6 \text{ m}$$

$$H_{qur} = h_f + a = 3.1 + 0.6 = 3.7 \text{ m}$$

Kanal dagi suv sarfi, m ³ /s	Kanal bermalarini suv sathidan balandligi <i>a</i> , sm	
	qoplamasiz	qoplamali
1-10	30	20
10-30	40	30
30-50	50	35
50-100	60	40

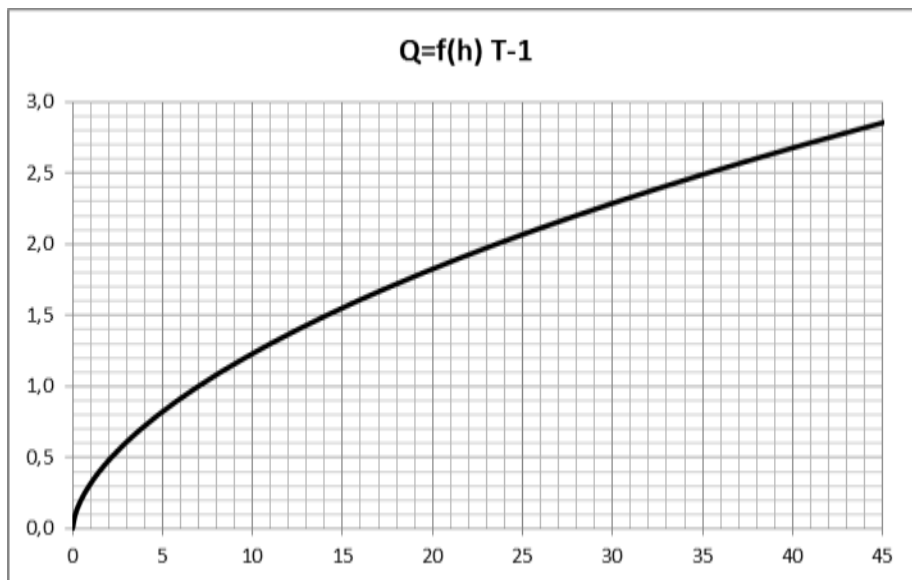
Bosh kanal bo'ylama qirqimini chizamiz va unda barcha otmetkalarni ko'rsatamiz.



Yuqoridagi amallarni T-1 va T-2 kanallar uchun ham bajaramiz

T-1 kanal hisobi

h_i, m	b_i, m	m	n	i	ω_i, m^2	χ_i, m	R_i, m	C_i	$v_i, m/s$	$Q_i, m^3/s$
1.5	14	2.25	0.020	0.00009	26,06	21,39	1,12	51,68	0,54	14,10
2.0	14	2.25	0.020		37,00	23,85	1,55	53,80	0,64	23,52
2.7	14	2.25	0.020		54,20	27,30	1,99	56,06	0,75	40,62
3.5	14	2.25	0.020		76,56	31,24	2,45	58,06	0,86	66,02



Jadvaldan,

$$K_f = 1,1$$

$$Q_f = Q_{\max} \cdot K_f = 40 \cdot 1,1 = 44 \text{ m}^3/\text{s}$$

Grafikdan,

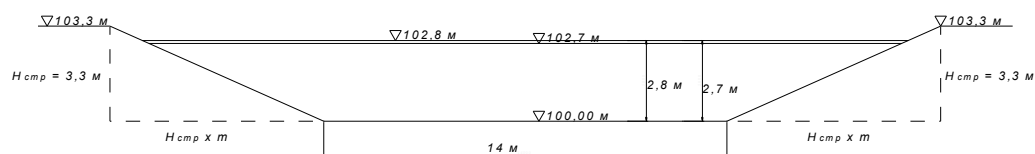
$$h_f = 2,8 \text{ m}$$

Jadvaldan,

$$a = 0,5 \text{ m}$$

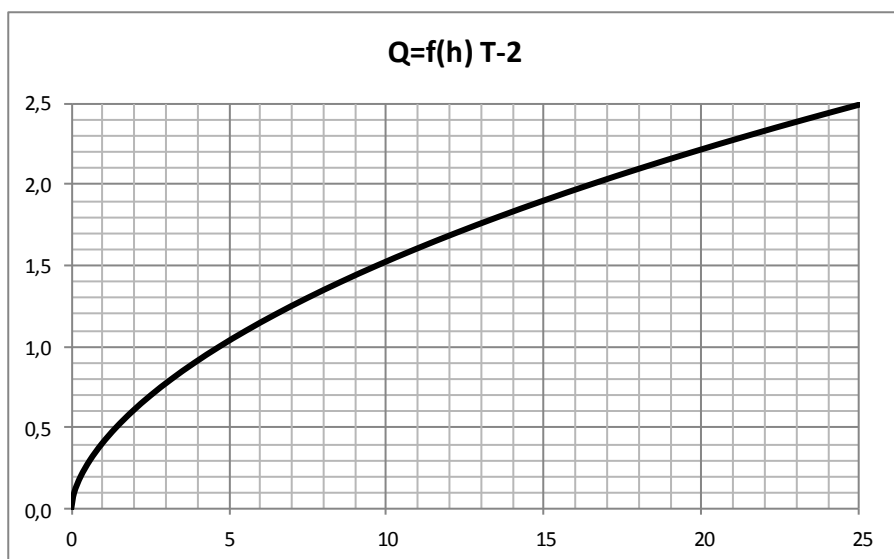
$$H_{\text{qur}} = h_f + a = 2,8 + 0,5 = 3,3 \text{ m}$$

T-1 kanal bo'ylama qirqimini chizamiz va unda barcha otmetkalar
ko'rsatamiz.



T-2 kanal hisobi

h_i, m	b_i, m	m	n	i	ω_i, m^2	χ_i, m	R_i, m	C_i	$v_i, m/s$	$Q_i, m^3/s$
1,0	8	2	0,0225	0.00015	10,00	12,47	0,80	42,84	0,47	4,70
1.5	8	2	0,0225		16,50	14,71	1,12	45,30	0,59	9,70
1.9	8	2	0,0225		22,42	16,50	1,36	46,78	0,67	14,97
2.5	8	2	0,0225		32,50	19,18	1,69	48,53	0,77	25,14



$$K_f = 1,1$$

$$Q_f = Q_{max} \cdot K_f = 15 \cdot 1,1 = 16,5 \text{ m}^3/\text{s}$$

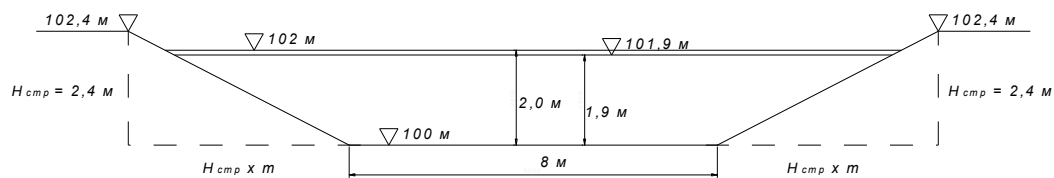
Grafikdan,

$$h_f = 2,0 \text{ m}$$

Jadvaldan,

$$a = 0,4 \text{ m}$$

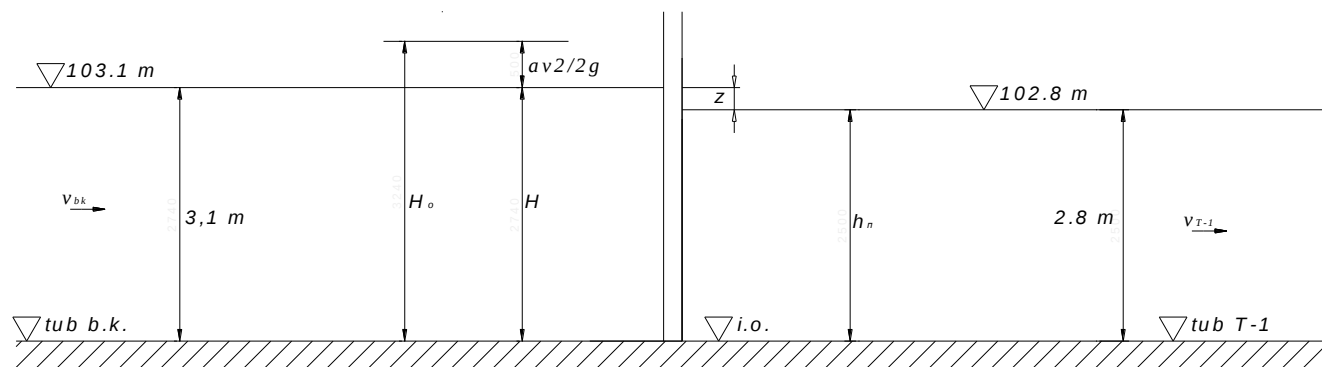
$$H_{gur} = h_f + a = 2,0 + 0,4 = 2,4 \text{ m}$$



Inshoot kirish qismi gidravilik hisobi

Teshik o'lchamlarini aniqlash

T-1 uchun hisob sxemasi:



Sxemadan quyidagilarni aniqlaymiz:

$$B = \frac{Q_{fT-1}}{m_2 \cdot \delta \cdot \sigma_{\pi} \cdot \sqrt{2g} \cdot H_o^{\frac{3}{2}}}$$

$$H_o = H + \frac{\alpha \cdot v^2}{2g}$$

H – inshoot ostonasidagi geometrik bosim

$$H = 3,1 \text{ m}$$

α – kinetik energiya koeffisienti

$$\alpha = 1,05 \dots 1,1$$

v – bosh kanaldagi oqim tezligi

$$v = 0,81 \text{ m/s}$$

$$g = 9.81 \text{ m/s}^2$$

$$H_o = H + \frac{\alpha \cdot v^2}{2g} = 3.1 + \frac{1.1 \cdot 0.81^2}{2 \cdot 9.81} = 3.14 \text{ м}$$

δ – inshoot kirish qismi burchagini hisobga oluvchi rostlovchi koeffisient, u quyidagi jadvaldan olinadi:

Kirish burchagi α°	0	30	45	60	75	90
Koeffisient δ	1	0,97	0,95	0,93	0,90	0,86

$$\delta = 0,90$$

σ_n – dimlanish koeffisienti, u h_n/H_o ga bog'liq holda quyidagi jadvaldan qabul qilinadi:

h_n/H_o	0,80	0,84	0,86	0,88	0,90	0,92	0,94	0,96	0,98
σ_n	1,0	0,97	0,95	0,90	0,84	0,72	0,70	0,59	0,40

$$h_n/H_o = 2,8 / 3,14 = 0,89$$

$$\sigma_n = 0,88$$

m_2 – sarf koeffisienti, uni dastlab $m_2 = 0,36$ qilib olamiz:

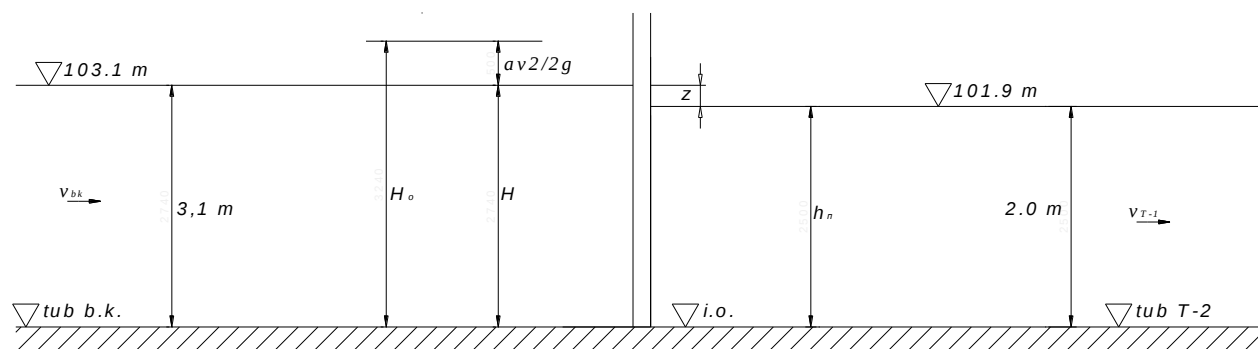
Demak,

$$B = \frac{Q_{fp-1}}{m_2 \cdot \delta \cdot \sigma_n \cdot \sqrt{2g} \cdot H_o^{\frac{3}{2}}} = \frac{44}{0.36 \cdot 0.90 \cdot 0.88 \cdot \sqrt{2 \cdot 9.81} \cdot 3.14^{\frac{3}{2}}} = 6.26 \approx 7.00 \text{ m}$$

Shunday qilib 2 ta 3,5m lik standart oraliq qabul qilamiz.

$$b = 3,5 \text{ m}; n = 2$$

T-2 uchun hisob sxemasi:



Sxemadan quyidagilarni aniqlaymiz:

$$B = \frac{Q_{fT-2}}{m_2 \cdot \delta \cdot \sigma_n \cdot \sqrt{2g} \cdot H_o^{\frac{3}{2}}}$$

$$H_o = H + \frac{\alpha \cdot v^2}{2g}$$

H – inshoot ostonasidagi geometrik bosim

$$H = 3,1 \text{ m}$$

α – kinetik energiya koeffisienti

$$\alpha = 1,05 \dots 1,1$$

v – bosh kanaldagi oqim tezligi

$$v = 0,81 \text{ m/s}$$

$$g = 9.81 \text{ m/s}^2$$

$$H_o = H + \frac{\alpha \cdot v^2}{2g} = 3.1 + \frac{1.1 \cdot 0.81^2}{2 \cdot 9.81} = 3.14 \text{ m}$$

$$\delta = 0,86$$

$$h_n/H_o = 2,0 / 3,14 = 0,64$$

$$\sigma_n = 1,0$$

$$m_2 = 0,36$$

Demak,

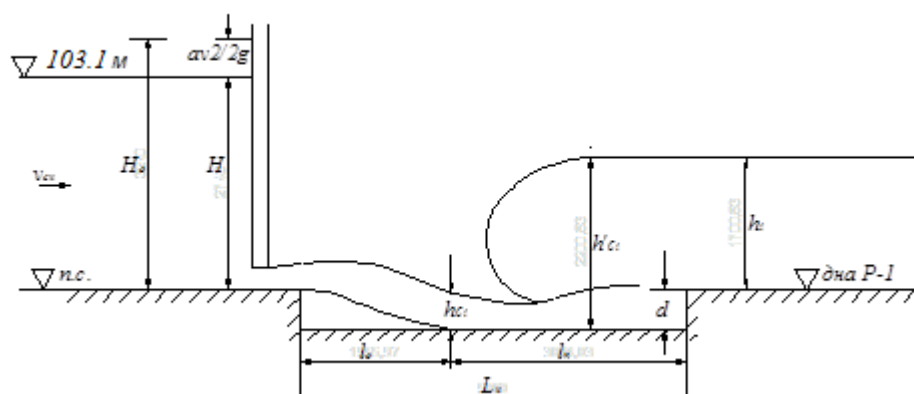
$$B = \frac{Q_{fT-2}}{m_2 \cdot \delta \cdot \sigma_n \cdot \sqrt{2g} \cdot H_o^{\frac{3}{2}}} = \frac{16,5}{0,36 \cdot 0,86 \cdot 1,0 \cdot \sqrt{2 \cdot 9,81} \cdot 3,14^{\frac{3}{2}}} = 2,16 \approx 2,5 \text{ m}$$

Shunday qilib 1 ta 2,5m lik standart oraliq qabul qilamiz.

$$b = 2,5 \text{ m}; n = 1$$

Pastki b'ef gidravlik hisobi

T-1 uchun hisob sxemasini quramiz:



Qudug chuqurligini dastlab quyidagicha qabul qilamiz

$$d = 0,5 \text{ m}$$

Bir nechta ixtiyoriy $h_{c1}, h_{c2}, h_{c3}, h_{c4}$ qiymatlar beramiz va q_1, q_2, q_3, q_4 larni aniqlaymiz:

$$q_i = \varphi \cdot h_{ci} \sqrt{2g(H_o + d + P - h_{ci})}$$

 φ – tezlik koefitsienti

$$\varphi = 0,986$$

$$h_{c1} = 0.4 \text{ m}$$

$$h_{c2} = 0.8 \text{ m}$$

$$h_{c3} = 1.2 \text{ m}$$

$$h_{c4} = 1.6 \text{ m}$$

Соответственно,

$$q_1 = \varphi \cdot h_{c1} \sqrt{2g(H_o + d + P - h_{c1})} = 0.986 \cdot 0.3 \cdot \sqrt{2 \cdot 9.81 \cdot (3.14 + 0.5 + 0 - 0.3)} = 3.15 \text{ m}^2/\text{c}$$

$$q_2 = \varphi \cdot h_{c2} \sqrt{2g(H_o + d + P - h_{c2})} = 0.986 \cdot 0.6 \cdot \sqrt{2 \cdot 9.81 \cdot (3.14 + 0.5 + 0 - 0.6)} = 5.89 \text{ m}^2/\text{c}$$

$$q_3 = \varphi \cdot h_{c3} \sqrt{2g(H_o + d + P - h_{c3})} = 0.986 \cdot 1.2 \cdot \sqrt{2 \cdot 9.81 \cdot (3.14 + 0.5 + 0 - 1.2)} = 8.19 \text{ м}^2/\text{с}$$

$$q_4 = \varphi \cdot h_{c4} \sqrt{2g(H_o + d + P - h_{c4})} = 0.986 \cdot 1.6 \cdot \sqrt{2 \cdot 9.81 \cdot (3.14 + 0.5 + 0 - 1.6)} = 9.98 \text{ м}^2/\text{с}$$

Sarflarni aniqlaymiz

$$Q_i = q_i \cdot b \cdot n$$

$b = 3 \text{ м}$ – bir oraliq eni

$n = 1$ – oraliqlar soni

$$Q_i = q_i \cdot b \cdot n$$

$$Q_1 = q_1 \cdot b \cdot n = 3,15 \cdot 3.5 \cdot 2 = 22.05 \text{ м}^3/\text{с}$$

$$Q_2 = q_2 \cdot b \cdot n = 5,89 \cdot 3.5 \cdot 2 = 41.23 \text{ м}^3/\text{с}$$

$$Q_3 = q_3 \cdot b \cdot n = 8,19 \cdot 3.5 \cdot 2 = 57.33 \text{ м}^3/\text{с}$$

$$Q_4 = q_4 \cdot b \cdot n = 9,98 \cdot 3.5 \cdot 2 = 69,86 \text{ м}^3/\text{с}$$

Siqilgan kesimdagi tutashtirilgan chuqurliklarni aniqlaymiz

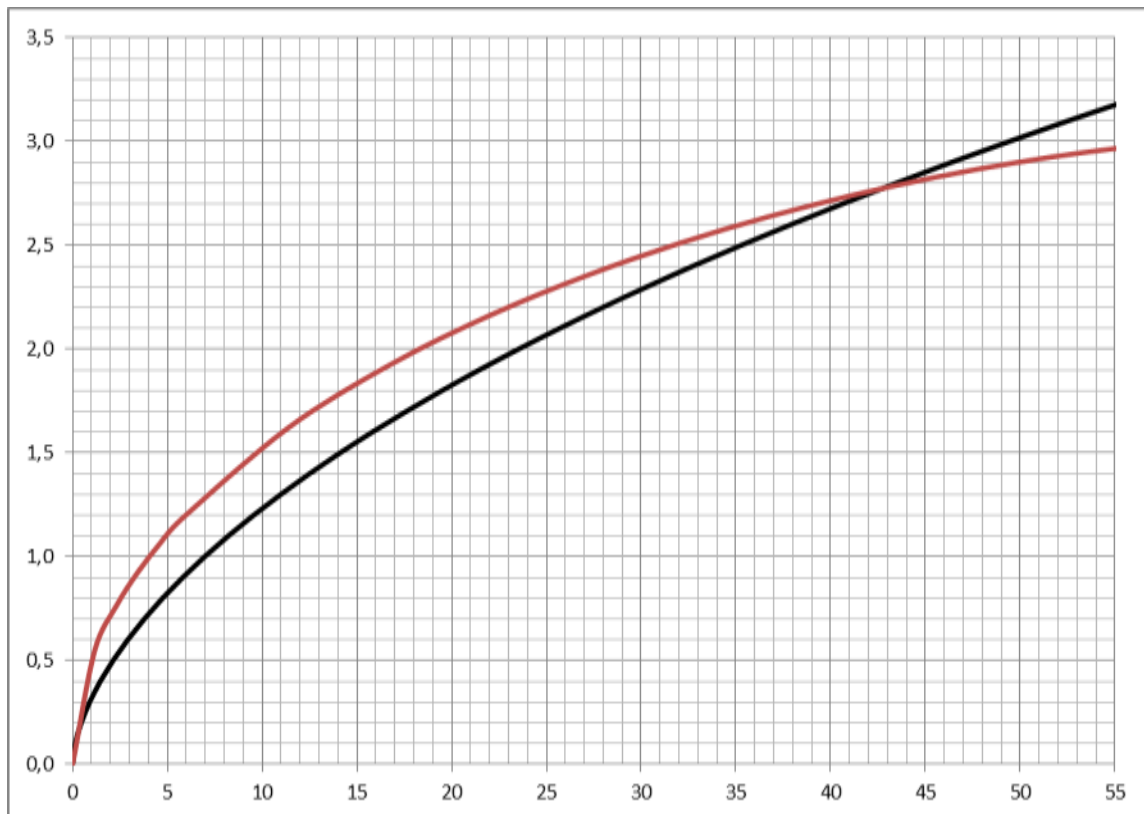
$$h'_{ci} = 0.5 h_{ci} \left(\sqrt{1 + \frac{8 \cdot \alpha \cdot q_i^2}{g \cdot h_{ci}^3}} - 1 \right)$$

$$h'_{c1} = 0.5 h_{c1} \left(\sqrt{1 + \frac{8 \cdot \alpha \cdot q_1^2}{g \cdot h_{c1}^3}} - 1 \right) = 0.5 \cdot 0.2 \cdot \left(\sqrt{1 + \frac{8 \cdot 1.1 \cdot 3.15^2}{9.81 \cdot 0.2^3}} - 1 \right) = 2.16 \text{ м}$$

$$h'_{c2} = 0.5 h_{c2} \left(\sqrt{1 + \frac{8 \cdot \alpha \cdot q_2^2}{g \cdot h_{c2}^3}} - 1 \right) = 0.5 \cdot 0.4 \cdot \left(\sqrt{1 + \frac{8 \cdot 1.1 \cdot 5.89^2}{9.81 \cdot 0.4^3}} - 1 \right) = 2.74 \text{ м}$$

$$h'_{c3} = 0.5h_{c3} \left(\sqrt{1 + \frac{8 \cdot \alpha \cdot q_3^2}{g \cdot h_{c3}^3}} - 1 \right) = 0.5 \cdot 0.6 \cdot \left(\sqrt{1 + \frac{8 \cdot 1.1 \cdot 8.19^2}{9.81 \cdot 0.6^3}} - 1 \right) = 2.99 \text{ м}$$

$$h'_{c4} = 0.5h_{c4} \left(\sqrt{1 + \frac{8 \cdot \alpha \cdot q_4^2}{g \cdot h_{c4}^3}} - 1 \right) = 0.5 \cdot 0.8 \cdot \left(\sqrt{1 + \frac{8 \cdot 1.1 \cdot 9.98^2}{9.81 \cdot 0.8^3}} - 1 \right) = 3.02 \text{ м}$$



Grafikka ko'ra, cho'ktirilgan sakrash sodir bo'lyapti.

$$\Delta h_{max} = h_{cp-1} - h_i = 1.7 - 1.3 = 0.4 \text{ м}$$

Qudiq chuqurligini

d=0.5 м deb qabul qilamiz

chunki

$$\Delta h_{max} < 0.5 \text{ м}$$

Qudug uzunligi

$$L_{\kappa} = l_{\text{нол}} + (0,8 \dots 1,0) l_{\text{нп}}$$

$l_{\text{нол}}$ – oqimcha uchish masofasi,

$$l_{\text{пол}} = 4,26 \cdot m \sqrt{H_o(P + d + 0.24 \cdot H_o)}$$

m – sarf koeffisienti

$P + d$ – tushish balandligi

$$l_{\text{пол}} = 4,26 \cdot m \sqrt{H_o(P + d + 0.24 \cdot H_o)} = 4,26 \cdot 0.36 \cdot \sqrt{3.14 \cdot (0 + 0.5 + 0.24 \cdot 3.14)} = 3.04 \text{ м}$$

Sakrash uzunligi

$$l_{\text{нп}} = (3,2 \dots 4,3) h'_{c \text{ max}}$$

$$h'_{c \text{ max}} = 3.1 \text{ м (grafikdan)}$$

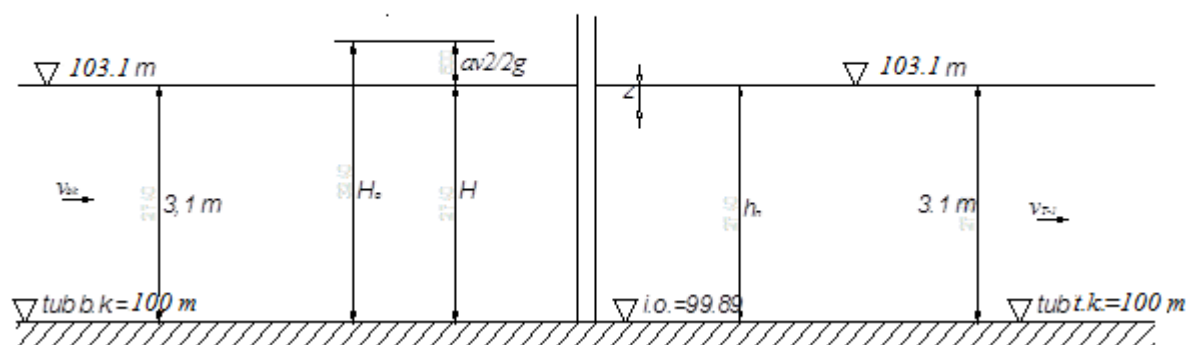
$$l_{\text{нп}} = 3,2 \cdot 3,0 = 9,6 \text{ м}$$

Demak,

$$L_{\kappa} = l_{\text{нол}} + (0,8 \dots 1,0) l_{\text{нп}} = 3,04 + 0,8 \cdot 9,6 = 10,72 \text{ м}$$

Tezoqar gidravlik hisobi

Hisob sxemasini tuzamiz



Kirish qismi enini aniqlaymiz

$$B = Q_{f.c.k.} / (m_2 \cdot (2 \cdot g)^{1/2} \cdot H_o^{3/2})$$

$$H_o = H + \alpha \cdot v^2 / (2 \cdot g)$$

H – inshoot ostonasidagi geometrik bosim

$$H = \nabla YuBSS - \nabla i.o. = 102,99 - 99,89 = 3,1 \text{ m}$$

α – коэффициент кинетической энергии

$$\alpha = 1,05 \dots 1,1$$

v – bosh kanaldagi oqim tezligi

$$v = 0,81 \text{ m/c}$$

$$g = 9.81$$

$$H_o = H + \alpha \cdot v^2 / (2 \cdot g) = 3,1 + 1,1 \cdot 0,81^2 / (2 \cdot 9,81) = 3,14 \text{ m}$$

$$m_2 = 0,36$$

Koefficient m_2 standart oraliqlar soni belgilanganidan keyin aniqlashtiriladi.

Demak,

$$B = Q_{f.c.k.} / (m_2 \cdot (2 \cdot g)^{(1/2)} \cdot H_o^{(3/2)}) =$$

$$= 57,5 / (0,36 \cdot (2 \cdot 9,81)^{(1/2)} \cdot 3,14^{(3/2)}) = 6,5 \text{ m}$$

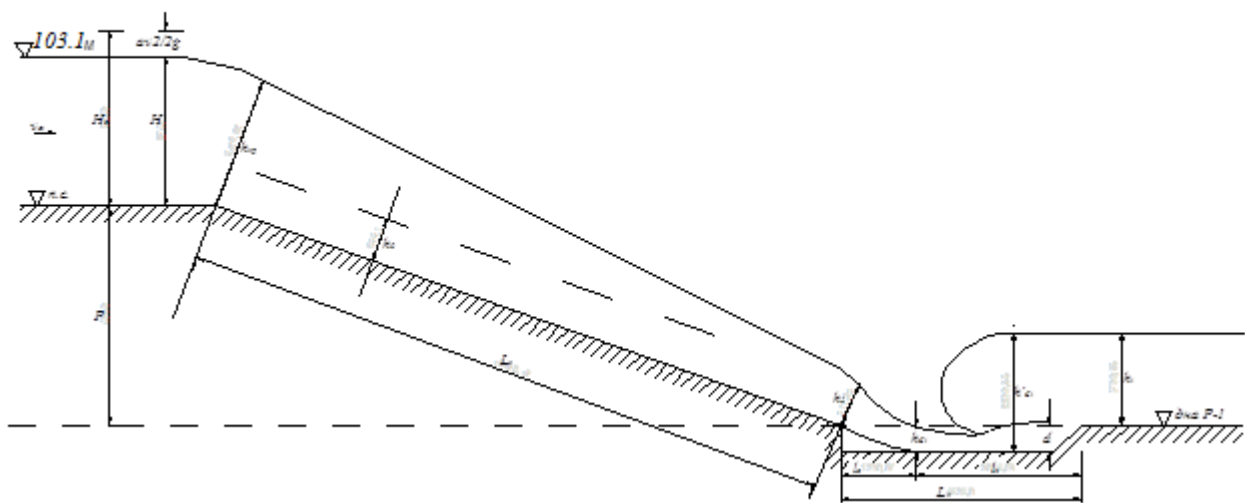
$n=2$ standart oraliq qabul qilamiz, har birini eni $3,5 \text{ m}$.

$$b = 3,5 \text{ m}; n = 2.$$

Segmentli zatvorli kesma konstruksiyali suv urilma qabul qilamiz va ustunlar eni $t_b = 1 \text{ m}$

$$B_c = b \cdot n + t_b \cdot (n - 1) = 3,5 \cdot 2 + 1 \cdot (2 - 1) = 8 \text{ m}$$

Hisob sxemasini tuzamiz



Solishtirma sarfni aniqlaymiz

$$q = Q / (n \cdot b_c) = 57,5 / (2 \cdot 3,5) = 8,2 \text{ m}^2/\text{s}$$

Kritik chuqurlikni aniqlaymiz

$$h_{kr} = (\alpha \cdot q^2 / g)^{(1/3)} = (1,1 \cdot 8,2^2 / 9,81)^{(1/3)} = 1,96 \text{ m}$$

asos grundi bo'yicha nov nishabligini i belgilaymiz. O'rtacha qum uchun

$$i = 0.30$$

nov uzunligini hisoblaymiz

$$L_n = P/i$$

$$P = 7,69 \text{ m}$$

$$L_n = P/i = 7,69 / 0,30 = 25,6 \text{ m}$$

$Q_c = \omega C \sqrt{Ri}$ formuladan tanlash yo'li bilan tekis oqim rejimi chuqurligini topamiz. Bunda

$m=0, n=0.014, i=0.30$ va bir oqimcha sarfi $Q_c = Q/2 = 57,5/2 = 28,75 \text{ m}^3/\text{c}$.

h, m	b, m	m	n	i	w	x	R	C	v	Q, m ³ /c
0,400	3,5	0	0,014	0,3	1,40	4,30	0,33	59,24	18,52	25,92
0,405	3,5	0	0,014	0,3	1,42	4,31	0,33	59,34	18,64	26,42
0,410	3,5	0	0,014	0,3	1,44	4,32	0,33	59,44	18,76	26,93
0,415	3,5	0	0,014	0,3	1,45	4,33	0,34	59,54	18,89	27,43
0,420	3,5	0	0,014	0,3	1,47	4,34	0,34	59,64	19,01	27,94
0,425	3,5	0	0,014	0,3	1,49	4,35	0,34	59,73	19,13	28,46
0,430	3,5	0	0,014	0,3	1,51	4,36	0,35	59,82	19,25	28,97
0,435	3,5	0	0,014	0,3	1,52	4,37	0,35	59,92	19,37	29,49
0,440	3,5	0	0,014	0,3	1,54	4,38	0,35	60,01	19,49	30,01
0,445	3,5	0	0,014	0,3	1,56	4,39	0,35	60,10	19,61	30,54
0,450	3,5	0	0,014	0,3	1,58	4,40	0,36	60,19	19,72	31,06
0,455	3,5	0	0,014	0,3	1,59	4,41	0,36	60,28	19,84	31,59
0,460	3,5	0	0,014	0,3	1,61	4,42	0,36	60,36	19,95	32,13
0,465	3,5	0	0,014	0,3	1,63	4,43	0,37	60,45	20,07	32,66
0,470	3,5	0	0,014	0,3	1,65	4,44	0,37	60,53	20,18	33,20
0,475	3,5	0	0,014	0,3	1,66	4,45	0,37	60,62	20,29	33,74
0,480	3,5	0	0,014	0,3	1,68	4,46	0,38	60,70	20,41	34,28
0,485	3,5	0	0,014	0,3	1,70	4,47	0,38	60,78	20,52	34,83
0,490	3,5	0	0,014	0,3	1,72	4,48	0,38	60,87	20,63	35,37
0,495	3,5	0	0,014	0,3	1,73	4,49	0,39	60,95	20,74	35,92
0,500	3,5	0	0,014	0,3	1,75	4,50	0,39	61,03	20,84	36,48

Jadvaldan quyidagilarni aniqlaymiz

$$h_o = 0.43 \text{ m} \quad Q_c = 28.97 \text{ m}^3/\text{s} \quad (28.75)$$

nov oxiridagi chuqurlikni quyidagi formuladan aniqlaymiz

$$\frac{i_{\pi} \cdot L_{\pi}}{h_o} = \eta_2 - \eta_1 - (1 - \gamma_{cp})[\varphi(\eta_1) - \varphi(\eta_2)]$$

$$\eta_1 = h_{kp} / h_o = 1.96 / 0.43 = 4.56$$

$$\eta_2 = h_2 / h_o$$

$\varphi(\eta_1)$ u $\varphi(\eta_2)$ funksiyalar qiymatlarini jadvaldan aniqlaymiz. Jadvaldan foydalanish uchun o'zan ko'rsatkichi X ni hisblab topish kerak.

№	η	X					
		2,0	2,5	3,0	3,5	4,0	5,0
1	1,005	2,997	2,139	1,647	1,329	1,107	0,826
2	1,02	2,307	1,591	1,193	0,940	0,766	0,546
3	1,04	1,966	1,320	0,967	0,747	0,600	0,415
4	1,06	1,768	1,164	0,838	0,640	0,506	0,343
5	1,08	1,629	1,053	0,749	0,565	0,441	0,292
6	1,10	1,522	0,969	0,680	0,506	0,392	0,258
7	1,12	1,436	0,901	0,626	0,461	0,354	0,223
8	1,14	1,363	0,846	0,581	0,424	0,322	0,200
9	1,16	1,301	0,797	0,542	0,391	0,295	0,181
10	1,18	1,247	0,755	0,510	0,364	0,272	0,165
11	1,20	1,199	0,718	0,480	0,341	0,252	0,151

12	1,25	1,098	0,643	0,420	0,292	0,212	0,121
13	1,30	1,018	0,582	0,373	0,254	0,181	0,099
14	1,40	0,896	0,492	0,304	0,199	0,137	0,070
15	1,45	0,847	0,456	0,278	0,179	0,122	0,060
16	1,50	0,805	0,426	0,255	0,162	0,108	0,052
17	1,60	0,733	0,376	0,218	0,134	0,087	0,039
18	1,70	0,675	0,366	0,189	0,113	0,072	0,030
19	1,80	0,626	0,303	0,166	0,096	0,060	0,023
20	1,90	0,585	0,276	0,147	0,083	0,050	0,018
21	2,0	0,550	0,258	0,132	0,073	0,043	0,015
22	2,1	0,518	0,233	0,119	0,064	0,037	0,012
23	2,2	0,490	0,216	0,108	0,057	0,032	0,010
24	2,3	0,466	0,201	0,098	0,051	0,028	0,008
25	2,4	0,444	0,188	0,090	0,046	0,024	0,007
26	2,5	0,424	0,176	0,082	0,041	0,021	0,006
27	2,6	0,405	0,165	0,076	0,037	0,019	0,005
28	2,7	0,389	0,155	0,070	0,033	0,017	0,0045
29	2,8	0,374	0,146	0,065	0,030	0,015	0,004
30	2,9	0,360	0,138	0,060	0,027	0,013	0,0085
31	3,0	0,346	0,131	0,056	0,025	0,0125	0,008
32	3,5	0,294	0,104	0,041	0,017	0,0075	0,002
33	4,0	0,255	0,084	0,031	0,012	0,005	0,001
34	5,0	0,208	0,059	0,020	0,007	0,0025	0,0000
35	6,0	0,168	0,047	0,014	0,004	0,0015	0,0000
36	8,0	0,126	0,029	0,009	0,002	0,001	0,0000
37	10,0	0,100	0,021	0,005	0,001	0,0005	0,0000

$$x = 3,4 - \frac{2,8}{\beta + 2}$$

$$\beta = \frac{2b_c}{h_1 + h_2}$$

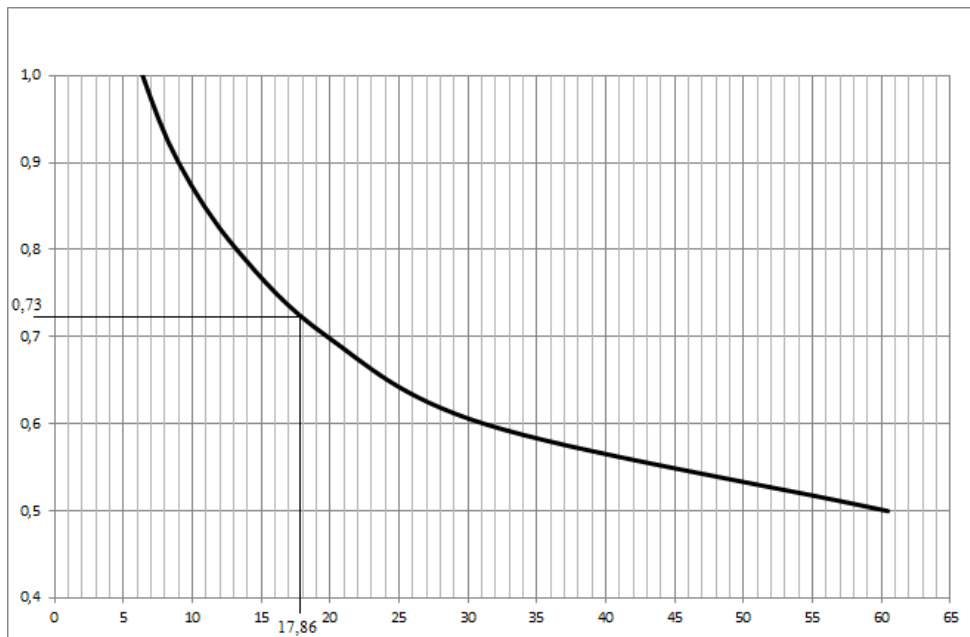
$$h_1 = h_{kp}$$

$$\frac{i_{\pi} \cdot L_{\pi}}{h_o} = A$$

Hisobni jadval ko'rinishida olib boramiz

h_2	β	X	X_{cp}	R_{cp}	C_{cp}	γ_{cp}	η_1	η_2	$\varphi(\eta_1)$	$\varphi(\eta_2)$	$i_{\pi}L_{\pi}/h_o$
0,50	2,85	2,82	4,73	0,95	70,76	124,64	4,56	1,16	0,0255	0,5420	60,4629
0,60	2,73	2,81	4,78	0,97	71,09	124,47	4,56	1,40	0,0255	0,3040	31,2233
0,70	2,63	2,80	4,83	1,00	71,40	124,26	4,56	1,63	0,0255	0,2100	19,8117
0,80	2,54	2,78	4,88	1,02	71,70	124,02	4,56	1,86	0,0255	0,1550	13,2335
0,90	2,45	2,77	4,93	1,05	71,98	123,75	4,56	2,09	0,0255	0,1190	9,0117
1,00	2,36	2,76	4,98	1,07	72,26	123,44	4,56	2,33	0,0255	0,0960	6,3998
1,10	2,29	2,75	5,03	1,10	72,52	123,12	4,56	2,56	0,0255	0,0790	4,5332
1,20	2,22	2,74	5,08	1,12	72,78	122,77	4,56	2,79	0,0255	0,0650	3,0423
1,30	2,15	2,72	5,13	1,14	73,03	122,39	4,56	3,02	0,0255	0,0560	2,1676
1,40	2,08	2,71	5,18	1,16	73,26	122,00	4,56	3,26	0,0255	0,0490	1,5412
1,50	2,02	2,70	5,23	1,19	73,49	121,59	4,56	3,49	0,0255	0,0410	0,7994

A va h_2 bog'liqlik grafigini quramiz.



Grafikdan quyidagilarni aniqlaymiz

$$A = i_l \cdot L_l / h_o = 0,3 \cdot 25,6 / 0,43 = 17,86$$

Nov oxiridagi chuqurlik

$$h_2 = 0,73 \text{ m}$$

nov oxiridagi oqim tezligini aniqlaymiz

$$v_2 = Q_c / q \cdot h_2 = 28,75 / 3,5 \cdot 0,73 = 11,25 \text{ m/s}$$