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HYDRAULIC ACCOUNTING OF RAIN SEWERAGE NETWORKS

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Annotation: In this article, methods and principles of hydraulic calculation of storm drainage networks are investigated for the purpose of effective wastewater disposal in urbanized areas. Within the framework of the study, the influence of precipitation intensity, surface infiltration coefficient, and relief features on the pipeline capacity was analyzed using mathematical models. Issues of reducing the risk of turbidity and flooding in pipelines by optimizing the permissible values of the hydraulic slope and water flow velocity in the system were considered. Also, a comparative analysis of modern hydrological calculation methods with traditional formulas is presented, and recommendations for increasing the accuracy of engineering projects are developed. As a result of the calculations, the optimal diameter and slope indicators, ensuring stable network operation, were determined.

Keywords: collector, flow rate, water discharge, slope, equivalent diameter, hydraulic radius, resistance coefficient.

Аннотация: В данной статье рассматриваются методы и принципы гидравлического расчета ливневых канализационных сетей для эффективного удаления поверхностного стока в урбанизированных районах. В рамках исследования было проанализировано влияние интенсивности осадков, коэффициента инфильтрации поверхности и особенностей рельефа на пропускную способность трубопровода с использованием математических моделей. Рассмотрены вопросы снижения риска заиления и затопления трубопроводов за счет оптимизации допустимых нормативных значений гидравлического уклона и скорости течения воды в системе. Также представлен сравнительный анализ современных методов гидрологических расчетов с традиционными формулами и разработаны рекомендации по повышению точности инженерных проектов. В результате расчетов были определены оптимальные показатели диаметра и уклона, обеспечивающие стабильную работу сети.

Ключевые слова: коллектор, расход, расход воды, уклон, эквивалентный диаметр, гидравлический радиус, коэффициент сопротивления.

ENTRANCE. The purpose of the hydraulic calculation of the storm drainage network is to determine the pipe diameters and slopes necessary to control the approximate velocity of the storm water flow. In objects where rainwater flows into the collector, part of the collector is calculated for the flow velocity formed at its beginning. Only in rare cases, when calculations are necessary at the stage of collector design, when the location of rainwater intakes is unknown and calculations are based on large sections, their drainage capacity is selected based on the flow velocity formed in the final section. [1, 2]

Methodology. To determine the approximate flow velocity using the methods discussed above, it is necessary to know the duration of the flow passing through the collector. The duration of this flow is easily determined by sequential calculation of collector sections starting from the upper flow section, depending on the lengths and flow velocities in the previous sections.

Hydraulic calculation of pipelines is determined by the following formulas:

$$Q = \omega \cdot v \,, m^3/s \text{Water consumption:;} \qquad (1)$$

$$J = \frac{\lambda \cdot v^2}{d \cdot 2g} = \frac{\lambda \cdot v^2}{8Rg} \text{Slope:.} \qquad (2)$$

$v\omega J\lambda$Here: Q - water discharge, m^3/s; - flow velocity, m/s; - flow area, m^2; - slope; d - pipe diameter, m; R - hydraulic radius, m; g - acceleration due to gravity, 9.81 m/s^2; - coefficient of resistance[12]

To determine the resistance coefficient, we use the following formula proposed by N.F.Federov:

$$\frac{1}{\sqrt{\lambda}} = -2g\left(\frac{\Delta_э}{3.42\ d} + \frac{a_2}{Re}\right). \qquad (3)$$

$\Delta_э a_2$Here: - absolute equivalent roughness, cm; - dimensionless value, depending on the roughness and structure of the pipes; Re - Reynolds number.[3,4,5]

Pipelines carrying only industrial wastewater must have a diameter of at least 150 mm. Full filling of such pipes (h/D) is permitted only for short-term wastewater discharge. In other cases, the replenishment is carried out in accordance with the standards for local networks.

For pipes with a diameter of 150 - 300 mm................0.6
350 - 400 mm..0.7
500 - 900 mm..0.75

The flow velocity should ensure the self-cleaning of the pipes. Therefore, they should be taken in the range of 1-1.5 m/s. Minimum permissible speeds (critical) diameter 150 - 200 mm..........................0.7 m/s
300 - 400 mm..........................0.8 m/s
450 - 500 mm..........................0.9 m/s
600 - 800 mm..........................0.95 m/s
900 - 1200 mm.........................1.25 m/s

In other cases, the critical velocity of wastewater of normal composition can be determined by the formula of N.F. Fedorov:

$$v_{kp} = 1.57\sqrt[n]{R}, m/s. \qquad (4)$$

Where: R - hydraulic radius; n=3.5+0.5R

For pipes with a small diameter, the minimum slopes, regardless of the flow velocity, are taken as follows; diameter:

150 mm.................0.007

200 mm..................0.005 [6,7,8]

According to the Construction Norms and Regulations, the maximum calculated flow rate of wastewater is 8 m/s for metal pipes and 4 m/s for non-metallic pipes. Taking into account the short duration of the flow in storm drainage networks, in some cases, high speeds may be allowed. For example, 10 m/s for metal pipes, 6 m/s for reinforced concrete pipes.[9]

Conclusion. As a result of hydraulic calculations and analysis, it was proven that the capacity of storm sewerage networks directly depends on the correct choice of hydraulic coefficients and the hydrological characteristics of the territory. The final conclusions show that the implementation of modern calculation methods serves as an important foundation for protecting urban infrastructure from floods and achieving economic efficiency.

References

1. J.T.Orzimatov, D.M.Davronova, Fergana State Technical University jaxongirorzimatovfarpi@gmail.com, HYPERLINK "mailto:dvrnvdrdn@gmail.com" dvrnvdrdn@gmail.com "Calculation of a Pressurized Storm Drainage Network," page 197. Scientific-technical journal (STJ FerSTU, FarDTU ITJ. 2025, 14)
2. Shygorin G. R. "Selection of Sewerage Systems for Settlements." 1961
3. Molokov M. V., Shygorin G. R. "Rain and Public Sewerage." 1954
4. Pao Hsue-Liu, Wang Wen-Longe. "On the Precipitation Formula for Designing Industrial and Urban Rain Drainage." 1961
5. Dobryakov B. "Technical and Economic Indicators of Rainwater Wastewater."
6. Molokov M. V. "Direction of rainwater from urban areas." 1958
7. Surin A. A. "Taking into account network capacity when calculating storm sewerage." 1960
8. Razumov E. S., Medrin G. L., Kazaryan V. A. "Purification and disinfection of wastewater of settlements." (2nd edition, revised and expanded). 1986
9. Karelin Ya. A., Yaromskiy V. N., Yevseeva O. Ya. "Tables for the hydraulic calculation of sewer networks made of circular plastic pipes."1986.