The XXXVI International School of Hydraulics, 23-26 May 2017, Jachranka, Poland

Ice concerns for hydraulic engineering in cold, mountainous terrain

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ABSTRACT

This chapter discusses and illustrates ice concerns associated with hydraulic engineering for water conveyance systems in cold, mountainous terrain, and aims to draw attention to the potential problems that may occur when water changes from liquid to solid. Hydraulic engineering involves liquid water, and commonly comprises the design of open-water channels (or reservoirs) linked to pressurized conduits (pumplines, penstocks, siphons, and tunnels) that pass water down, up, over, or through mountainous terrain. The topics covered herein address fundamental aspects of ice formation and behavior. An important consideration is the relationship between the freezing temperature of water and flow pressure. Flow pressure can vary substantially in closed-conduit portions of hydraulic systems. The primary engineering concern is that ice formation should not hamper the operation of the system or its component parts. Should a concern arise about the operation of the system, the concern should be mitigated by re-designing the system or its parts, and managing the system by adjusting flow rates, and by monitoring water temperature at key locations.