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10.1 EROSION CONTROL

Hydraulic structures are used in storm drainage design to control the flow of the runoff. The energy associated with flowing water has the potential to create damage to the drainage infrastructure, especially in the form of erosion. Hydraulic structures, which include rock riprap revetment, energy dissipators, check structures, bridges, and irrigation ditch crossings, all control the energy and minimize the damage potential of storm runoff.

The criteria to be used in the design of hydraulic structures shall be in accordance with the USDCM, Volume 1, "Major Drainage" and Volume 2, "Hydraulic Structures". The specific criteria to be used within the City of Greeley are summarized in the following information.

10.2 ROCK RIPRAP REVETMENT

The design of the riprap protection for culverts, channel bottom and banks, check drops, bridges, gabions, or other areas subject to erosion, shall be in accordance with the latest revisions of the USDCM, Volume 1, "Major Drainage."

10.3 ENERGY DISSIPATORS

Where riprap structures are insufficient to control the storm runoff, concrete energy dissipator structures (stilling basins) shall be provided in accordance with the USDCM, Volume 2 "Hydraulic Structures."

For culverts or storm drains where the Froude Number at the outlet is in excess of 2.5, the USBR Type VI impact-stilling basin shall be used.

10.4 CHECK STRUCTURES AND DROP STRUCTURES

As discussed in Section 5-Open Channels, there is a maximum permissible velocity for major design storm runoff in grass-lined channels. One of the more common methods of controlling the flow velocity is to reduce the channel invert slope. This requires a drop structure to make up for the elevation difference when the channel slope is reduced.

Design criteria for drop structures shall be in accordance with the USDCM, Volume 2, "Hydraulic Structures."

10.5 BRIDGES

Design of bridges within the City shall be in accordance with the USDCM, Volume 2, "Hydraulic Structures." The design capacity of the bridge shall be determined by the method presented in Section 9.4 of these Criteria. Overtopping of a bridge during the Major Storm Event is not allowed.

Breakaway type bridges are required for pedestrian bridges within floodplains with maximum loading of 10,000 pounds or less. They shall have a tether six times the strength of the total bridge weight plus its maximum loading to keep the bridge from floating away. Reference the City of Greeley Parks Department for Pedestrian Trail Specifications and Guidelines, latest edition.

10.6 IRRIGATION DITCH CROSSINGS

Any proposed developments in the vicinity of irrigation ditches and canals, crossing or utilizing the ditches or canals for surface drainage, shall have the plans approved by the controlling ditch company prior to acceptance by the City.