

structures must be checked daily.

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2.2 SNOW REMOVAL

Introduction

In areas where winter weather affects the operation of a parking structure, removal of snow and ice is necessary, if not paramount, for functional performance, the public's safety, and the long-term durability of the structure. Snow and ice removal can be difficult depending on the size, timing, and type of storm, and also the area to be maintained. For these reasons, knowing with what and how to remove snow and ice can greatly affect the operation of the structure. The basic parameters for snow and ice removal include planning, proper equipment, chemical deicers, written procedures, and how-to instruction for snow removal personnel.

A. Planning

When removing snow and ice, planning plays an important role for a successful operation. Basic planning and specifications for snow removal begins during the initial design phase of the parking structure. The owner, architect, engineer, contractor, and precast/prestress concrete manufacturer must all be involved in determining how snow and ice will be removed. Operations such as removal of snow and ice from the deck surface, storage of snow and ice, and the use of certain types of equipment can cause major functional and performance problems to the structure if not properly addressed during the initial design phase.

When an architect begins considering the location and layout of a parking structure, snow and ice removal operations should be based on local climate conditions. Anticipated maximum snow fall and frequency will influence planning strategies. Once parameters for snow and ice removal have been established, features for storage or removal must be designed into the structure.

Removal of snow is typically handled by moving the snow to a snow chute or snow melting equipment, or by moving to and through a gate opening in exterior spandrels.

Storage of snow requires strict operating procedures and protected dumping zones to ensure the safety of workers, pedestrians, and vehicles. Multi-level parking structures also require special procedures to prevent the penetration of falling snow onto lower structure levels. The number of dumping locations depends on the parking structure size, anticipated snow fall rate, and adjacent property locations.

When snow is stored on the top level of a parking structure, it is essential that equipment operators be provided with detailed storage guidelines before each clearing operation. If guidelines are not provided in the original design, a structural engineer must generate guidelines for maximum storage-pile size, location, and height. Consideration should also be given to obstruction of sight lines, loss of parking spaces, and the deleterious effects of concentrated salts and deicers.

Snow melting equipment comes in various forms. Before a piece of equipment is chosen, the structure needs to be checked to ensure that structural components can safely support the equipment's maximum

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working weight. Typically, if wheel loads are larger than 3000 lbs or the total distributed equipment weight exceeds 50 lbs per sq ft, a structural engineer must verify the structural adequacy of the building components. Sufficient floor drainage is required to properly dispose of melted snow without the formation of ice patches on the deck surface.

Once a plan is developed, discussions with the owner/operator of the parking structure regarding responsibility for snow and ice removal is recommended. Contracted services and/or in-house maintenance are the common options for accomplishing the removal. The developed procedures should be conveyed to the proper personnel so there is no confusion regarding removal procedures.

One-level parking structures may provide accessibility for snow equipment that is heavier than the support systems allow. It is very important that rigid enforcement restricting heavy equipment be maintained.

Once the structure is in use, planning should also occur prior to the snow and ice season. Having personnel, equipment, and deicing materials available must be setup before the season begins. A written procedure is necessary for successful snow and ice removal planning. Included in the written plan should be a checklist of pre-season preparations. The snow removal guidelines and maintenance log should be easily accessible. Records of previous years' operations can facilitate answering future questions that may arise.

Obstacles to snow and ice removal such as the structure's expansion joints, joint sealants, membranes, signage, lighting, and floor drains should be identified and emphasized to operations personnel. They must be made aware of potential damage that may be caused when removing snow and ice. Markers highlighting obstacles may be setup prior to the beginning of the winter season and then removed when the season is over.

Adequate drainage is a critical component of proper snow and ice removal. Prior to the arrival of freezing weather, water-ponding areas on the deck must be eliminated. Drains should be cleaned of debris. Water lines used for surface cleaning should be drained of all water to prevent freezing and breakage.

B. Equipment

Removing snow and ice is typically accomplished by using equipment especially designed for the operation. Determining the type of equipment to use affects operation and the longevity of the structure. For example, a pick-up truck with a plow may not be the right equipment to use for all jobs.

Snow removal equipment comes in many sizes, weights, and systems. The selection of this equipment along with its accessories will determine the efficiency of the snow and ice removal operation. The weight of the vehicle and type of attachments also impacts the amount, if any, of potential damage the structure may incur. Typically, parking structures are designed for 3000 lb wheel loads. Higher loads must be approved by a structural engineer. Plows and other snow removal implements that come in contact with the driving surface should have well-maintained rubber blades to minimize damage to the deck surface.

