



**Celebrating 30 years  
in business serving  
our customers needs.  
From 1979 - 2009,  
McCrory Engineering,  
Inc. has provided  
sensible solutions for  
office building owners  
and managers.  
Offering consulting  
and engineering  
services related to  
solutions.**



Don McCrory

» ENGINEERING

## The Life Cycle of a Concrete Garage

**T**he most common garages being built for commercial buildings are concrete structures using prefabricated columns, beams, and deck panels. Constructed properly, these garages will last for many years and require little maintenance.

Columns are set on foundation piers; cross beams are mounted on the columns to support the loads of the deck beams and traffic. The decks are “Double T” shaped beams, forty to sixty feet long, and eight to ten feet wide, with two stems protruding downward. The bottoms of the stems have rebars or cables which provide tension support, resulting in very high strength to weight ratios. Every structural member is set in place to allow for expansion and contraction with changes in temperature.

The biggest enemy of concrete garages, like steel garages, is water. Concrete topping slabs are poured over T-sections to form a smooth driving surface and to seal the seams between the sections. Even though drains are placed throughout the deck areas, water ponding is inevitable, even on intermediate levels under the roof deck. Water seeps through poorly sealed seams and expansion joints, to finally be absorbed into the porous concrete. Once the moisture contacts the reinforcing steel within the deck members and support beams, corrosion develops, resulting in spalling of the concrete as the rust expands. Strength of the affected concrete member is rapidly diminished.

Spalled areas are repaired by first removing loose concrete to expose the rusted steel reinforcing. The rust must be killed or converted to a iron phosphate by coating with a

phosphoric acid based solution. It is best to coat the treated steel with an epoxy and leave the area exposed. Covering with a concrete patch material may be a visually better, but usually encourages further rusting and continued spalling under the patch.

Timely treatment of the rust and reinforcing of the concrete is important, but unless the water penetration is eliminated, or at least reduced, spalling will continue its relentless progression.

The most direct approach to water intrusion is to seal cracks in the deck surfaces, and add small drains through the deck at the points of deepest ponding. This can be done at most any horizontal location of the Double-T deck, where there is little critical reinforcing with which to contend, when drilling two to three inch holes for drains.

The edges of Double-T deck sections are strong, but exhibit some flexibility. At particularly flexible seams, this flexibility can result in differential movement of the adjoining edges as autos pass over the seams. At times, steel reinforcing rods, installed at edges to protect the Double-T sections during installation, will bang together, resulting in a loud noise as a car passes that spot.

Movement at such seam can be controlled by the addition of steel channels attached across the seam at three to five foot intervals. One end is tightly secured, while the other end is allowed to slide horizontally to allow for expansion and contraction.

As with any structure, prompt attention to a known problem will prevent expensive repairs, including major structural reinforcement. Your garage investment is worth your attention. •

*Don McCrory is a licensed professional engineer and president of McCrory Engineering, Inc., which has served the high rise building industry for 30 years.*