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FAILURE ANALYSIS



Where is all this water coming from?

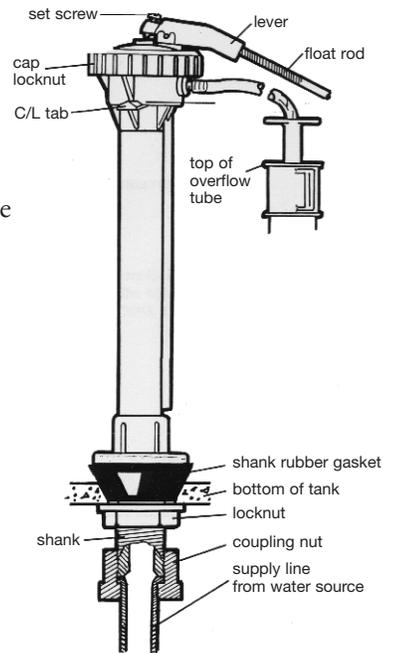
In the aftermath of flooding in Edmonton in July 2004, water damage is an area of concern to many insurance companies. While freak summer rainstorms are an obvious cause, a less conspicuous but potential source of water damage to the household can be the result of a leaking toilet.

One of the more common causes of a leaking toilet is a failed ballcock. So what exactly is this troublesome part? What does it do? And most importantly, why does it leak?

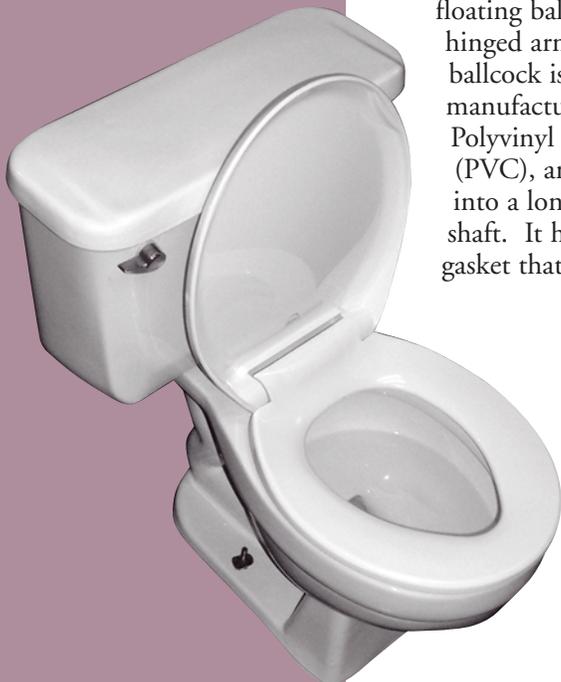
A ballcock is a valve in the toilet tank that controls the water level by means of a floating ball on a hinged arm. The ballcock is primarily manufactured from Polyvinyl Chloride (PVC), and is shaped into a long cylindrical shaft. It has a rubber gasket that acts as a

seal at the base of the cylinder where it connects to the base of the toilet tank. The ballcock is secured to the base of the toilet tank by a locknut and coupling nut that are tightened on the exterior of the tank. The coupling nut is then connected to the supply line from the water source to fill the toilet tank.

Since the ballcock acts as the barrier between the tank full of water and the floor, a tight seal is of utmost importance. Fortunately, many toilet tanks now come with all of the interior components preassembled. This leaves the plumber installing the toilet with the task of connecting the water supply line to the ballcock, and setting the water level with the set screw on the top of the ballcock. In the instances where the ballcock in a pre-existing toilet must be replaced, the installation procedure becomes more complicated as it involves draining the tank, removing the original ballcock and assembling the replacement. Yet proper and careful installation will ensure a tight seal at the base of the tank.



When ballcocks do fail, it is typically in the threaded region of the shank, where the ballcock is fastened to the base of the toilet. This area is the weakest, as the threads on the shank produce stress concentrations and locations for fractures to occur more easily. The fracture itself can occur for many reasons including faulty installation (i.e. locknut and coupling are over tightened), a bumped or impacted ballcock, or a manufacturer's or materials defect (i.e. areas of the PVC are not properly fused).

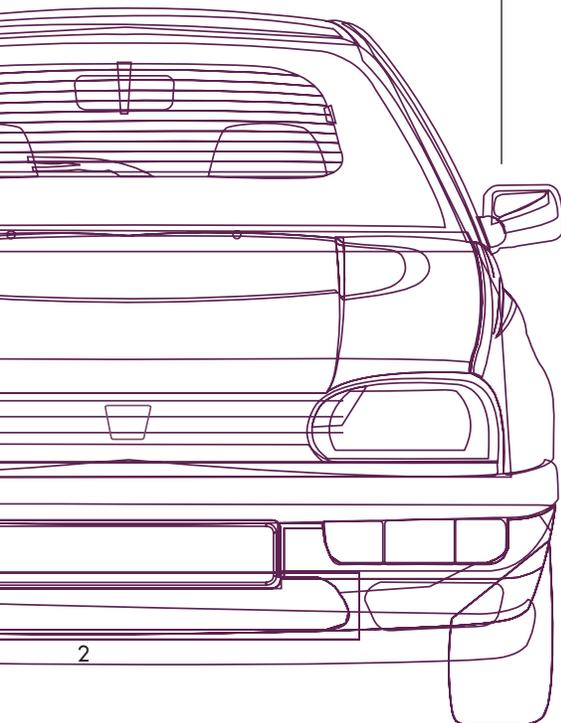


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Yet another mode of failure can be the use of strong chemicals or cleaning products within the toilet tank that cause the plastic ballcock to degrade, and eventually lead to the premature failure of the ballcock.

Sintra Engineering has investigated many of these types of failures, answering the important questions: why did it fail and what was the source of the failure? While failures and, in the case of toilets, water damage, will continue to occur, a proper failure analysis can solve the mystery behind the failure.



ACCIDENT INVESTIGATION



Child Seat Assessments

A Voice for the Smallest Accident Victims

In low speed impact injury claims, one of the most commonly asked question is: were the reported injuries plausible? As minor collisions involve primarily soft tissue injuries, these injuries can only be assessed based upon the subjective evaluation of the injured person. There is no objective method of evaluating the validity of the injuries. When the injured party is an adult, answers can be gathered through statements of what the party experienced during the collision, and the resulting symptoms.

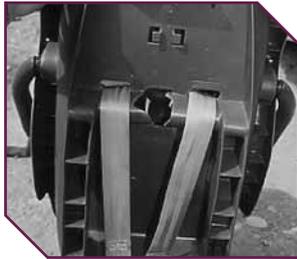
Yet when the individual is a young child or infant, the task becomes more difficult: how do you assess the subjective symptoms from an individual who cannot communicate? Similarly, how does one know that the possible injury to an infant or toddler, often reported by a parent, is linked to the collision, or whether it is a result of an unrelated illness, injury or source of distress? Rather than making a judgment call on the claim, answers may be found by examining the child's environment during the incident and, in particular, by examining the child seat system.



In assessing the possibility of injury in a low speed collision, it is important to determine if the child seat was properly installed at the time of the incident. To assess the mounting of the child seat, the location of the child seat within the vehicle (front seat, back seat, position on rear bench), how it was mounted (secured with a seat belt, Iso-Latch system, tether strap usage), if the vehicle seat belt webbing was twisted, and whether a locking clip was used in conjunction with the seat belt must be known. This information is cross-referenced with Transport Canada, who issues notices of difficulties that may be encountered when mounting child seats in given vehicles.

Ultimately, the best results of this assessment are obtained if the child seat is examined while it is still mounted in the vehicle.

Examining the actual child seat is another important element in assessing the possibility of injury in a collision. This examination will assess whether the child seat conforms to Canadian Motor Vehicle Safety Standards, and whether Transport



Canada has issued any recalls or notices of defects for that particular child seat. In addition to manufacturer's defects, signs of wear on the components, and the overall condition of the child seat will also be checked. The engineer will also look for indications that the child seat may have been involved in previous collisions. Finally, information including the height and weight of the child, medical reports, the settings on the child seat components, and the amount of clothing (snowsuits, blankets, etc.) worn by the child at the time of the incident assists in the analysis.

In low speed impacts, the main difficulty in assessing injury and injury symptoms for children in child seats is their inability to vocalize their experience or describe any resulting injuries. As most symptoms from minor collisions are transient, a true assessment will consider any other potential causal factors for behavior change. To recognize their potential for injury, an assessment of the restraint system may provide some insight into what the child would have experienced in the collision, reducing some of the guesswork associated with resolving these types of claims.

After Market Products

Third party after market products for child seats are those that are not made by the child seat manufacturer and/or are not supplied with the child seat at the time of purchase. Parents must be aware that these products are not regulated by Transport Canada and can pose a hazard, as the devices can prevent the seat belt from functioning in its intended manner.

As an example, for toddlers, the devices that pull the shoulder belt away from the child's neck can pull the lap belt up onto the child's soft abdomen instead of remaining on the pelvis. The pelvis is significantly stronger and more resistant to injury than the abdomen, so improper placement can lead to more substantial injuries in a collision. These third party devices may also reduce the effectiveness of the seat belt in avoiding the partial or full ejection of a child from a vehicle during a collision.

PROFILE



MICHAEL PECK
ACCIDENT RECONSTRUCTION

Michael (Mike) Peck is a Professional Engineer at Sintra Engineering who specializes in Accident Reconstruction. Mike is the Calgary office manager and deals with all types of vehicle collisions including semi-tractor trailers, passenger vehicles, motorcycles, bicycles, and pedestrians.

A native of Halifax, he graduated from the Technical University of Nova Scotia (now Dalhousie Faculty of Engineering) in 1996 with a degree in Mechanical Engineering. Mike has been living in Alberta and working in the field of accident reconstruction for the past eight years.

Mike is an avid outdoor enthusiast who enjoys snowboarding, mountain biking, scrambling, camping, and swimming. When Mike has to be indoors, he enjoys playing the drums.

FIRE INVESTIGATION



When Can Water Start Fires?

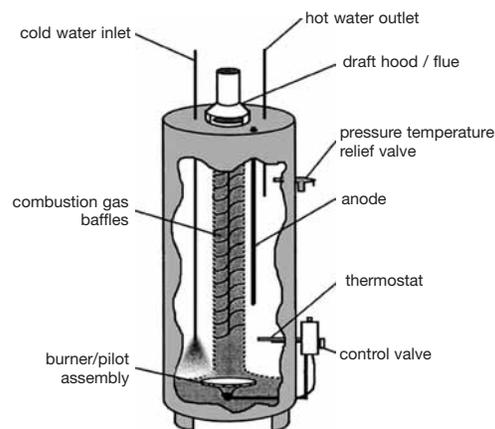
Water heaters, particularly gas-burning water heaters, are a fixture in most Alberta homes. They provide the hot water for dishes and a soak in a nice warm tub. Many people know very little about how these indispensable appliances work until the heater fails and they are hit with an icy blast from the shower head. This lack of awareness can be dangerous primarily because an improperly maintained hot water heater has the potential to cause a fire.

A remarkably simple appliance, the gas-burning water heater consists of two main components: a burner assembly and a reservoir. The burner sits inside a combustion chamber at the base of the unit, underneath the water reservoir. Cold water enters the bottom of the reservoir where it is heated by the burner. As the water is heated, it rises to the top of the appliance where it is drawn out to meet demand.

The heating system consists of a gas supply, a gas valve with an integrated safety shutoff, a burner, and an exhaust flue that extends up the center of the tank. The gas valve is

controlled by the temperature of the water: if the water's too cold, the gas valve opens, providing gas to the burner. The gas is ignited by a pilot light and as long as the pilot is lit, the safety shutoff valve remains in the open position. If the pilot light goes out, the shutoff valve closes, halting the flow of gas and preventing it from pooling inside the building.

There are two ways in which a gas-burning water heater represents a hazard: as an ignition source and as a fuel source. When combustible materials such as laundry, garbage or flammable chemicals are stored too close, they can be ignited by flames from the combustion chamber or by the various hot components of the heater. This usually occurs when there is delayed burner ignition or a backdraft condition caused by inadequate air supply. Similarly, if minimum clearances between the water heater and combustible floors or walls are not maintained, those materials can ignite. Faulty installation, poor maintenance practices and improper storage of combustibles can all contribute to the water heater's role as a fire ignition source.



A gas fired water heater can also be a fuel source for a fire or explosion. Fortunately, the safety systems make gas leaks from these devices very rare. The gas valve safety shutoff mechanism can fail, but the failure puts the valve in a safe mode: off. The rare instances when a gas leak from a water heater occurs can usually be explained by the presence of debris that prevents the gas valve from closing, by someone tampering with the valve, or by an improperly installed gas fitting.

While it is pretty rare for water heaters to cause fires, it is possible. Knowing how they function allows for a better understanding of the ways in which the risks can be reduced. Have a good long soak in that tub confident that your house is secure, at least as far as your water heater is concerned... We didn't talk about the furnace...

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