Wheel Detachment: Improper Spindle Nut Installation

FIGURE 1

Determining the cause of an automobile accident is often encountered by the claims analyst. Was the accident a result of driver error, actions by another party or a mechanical failure of the vehicle? Detachment of a wheel from a vehicle, which is the subject matter of this case study, is known to cause severe accidents. **Figure 1** shows the result of wheel detachment which caused a vehicle to roll over with severe injuries suffered by the occupants.

The left front wheel became detached, causing loss of control of the vehicle. **Figures 2a** & **2b** are views of a typical wheel spindle which secures the wheel, bearings and hub to the vehicle. A castle nut (also called a castellated nut or slotted nut) with cotter pin is used to secure the wheel hub to the vehicle. (**Figure 2a**)

Figures 3a & **3b** show photos of the spindle from the left front of the vehicle in **Figure 1**. The hub, castle nut and cotter pin were not connected to the spindle after the accident. Deformation patterns on the spindle nut threads show evidence of wear (including one separated thread that has sheared from the spindle), consistent with the nut working outboard and becoming disengaged from the threaded section of the spindle. This suggests that no cotter pin had been installed or that the cotter pin had been improperly installed.

With the loss of a castle nut, a wheel will quickly become detached, causing loss of vehicle control. A question often arises as to whether the driver should have noticed the problem prior to wheel detachment. This depends on the degree of awareness of the wheel problem by the driver. Some drivers may notice the problem, while others may not. Road conditions (such as rough roads) could mask the symptoms of an impending wheel detachment. Subrogation potential is governed by the determination of who worked on the spindle previously or the existence of a recall regarding this failure mode.

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FIGURE 2a

FIGURE 2b

FIGURE 3a

FIGURE 3b