Notes on Rail Relocation

Undesired Emergency Braking

An 'Undesired Emergency' or ‘Emergency Application’ occurs when a train comes to an abrupt stop caused by the activation of the emergency brake. In some cases the emergency application of brakes is engaged by the locomotive engineer to prevent collisions or accidents.

However, sometimes a train will spontaneously go into 'emergency' such as in the attached video, where a Canadian Pacific freight train was descending the Hamilton Subdivision and lost air.

At 1:53 in the below video, the air release can be detected, signalling the beginning of a train entering an emergency application. In this instance the engineer did not brake; rather the emergency application originated with a train occurrence, such as a broken pipeline, itself caused by events such as extreme cold; slack action due to poor car positioning (train marshalling) or undulating territory (grades and curves). These events can result in air leakage, which in turn, causes the train hoses to separate, initiating a UDE.
https://www.youtube.com/watch?v=ldF6tug8ykg

At 13:50 in the below video, the air release can again be detected signalling the train entering an emergency application. Following a series of undulating terrain, the train went into emergency due to a broken knuckle. The air release preceding the emergency can be detected. In this video the train, carrying explosives, split apart.
https://www.youtube.com/watch?v=_jSNcB4yoAU

An Undesired Emergency braking can be without incident, as in the attached videos. When combined with an undetected wheel break, however, as occurred in Transportation Safety Board Investigation ROOWO253, the UDE can be disastrous. In that investigation, a CN train headed towards Thunder Bay at 34 mph derailed 17 cars, two of which were loaded with methane, which released into a nearby stream. With extreme cold, brakes aren’t fully operational and a broken pipeline to a hopper car generated the undesired emergency braking. “The forces generated by the emergency brake application on a piece of rail exhibiting marginal ductility and high internal tensile stresses and a pre-existing crack led to rail failure.”

Improper car positioning (marshalling), reports Transport Canada, can also trigger a UDE leading to a serious derailment. Heavier (loaded) cars tend to brake

slower than the lighter cars and should be placed towards the head end of the train. If they are placed behind the lighter cars, a “run-in” can occur which can lead to a derailment, reports Transport Canada. Steep grades and sharp curves are especially prone to build-ups of lateral forces, with the result that a train begins to straighten, causing a derailment.

In the 2005 Cheakamus River derailment, more than 40,000 litres of caustic soda were spilled into the Cheakamus River, killing more than 500,000 fish, including Rainbow Trout and Chinook Salmon, Coho Salmon and Pink Salmon. Before the accident, the train negotiated heavy curvature and while crossing the Cheakamus River, went into emergency braking, derailing the nine cars. The Transportation Safety Board said that the condition of the track and rolling stock did not contribute to the accident, laying blame with car positioning, causing a UDE.

> When operating in high degree curvature, excessive longitudinal forces can produce critical lateral forces on any rail car. The severity increases with lightweight cars, longer cars and for short-long combinations. (See Transportation Safety Board Report: R05V0141)

In Brighton, Ontario in 2009, the Transportation Safety Board found that despite the reasonable condition of the track and rolling stock, train marshalling, leading to a broken knuckle had caused the derailment. “With the significant increase in the average train length and weight,” noted the Board, “there has been associated increases in normal in-train forces.”

Another form of braking, known as dynamic braking, carries with it its own problems. With dynamic braking, the retarding force is applied to the locomotive only and the rest of the train opposes the retarding force and begins to run in. The American Association of Railroads describes what can occur when braking.

> When loaded trains are braking on down grades with curves, the lateral forces of wheel on rail can become extreme due to the front of the train slowing while the middle is not and continues to push forward thus forcing the train to curve laterally.

The numerous UDEs in the Surrey area (8 in four years), all immediately following the bend at Crescent Beach, are deserving of explanation. In light of the fact that over 10,000 rail cars of dangerous goods transit this track every year and that Canadian rail traffic has doubled over the past ten years, an examination of the cause of the UDEs should be deemed urgent.