# **Exploring Alternatives**

## **Solution A – Sensor-Driven Decision Logic**

This system works on two real-time input signals. One that determines the presence of a train and the other that monitors the presence of a car on the crossing. When any of the inputs is active (a train is approaching or a vehicle is still on track) then the system lowers the gates. After both signals go inactive, system raises the gates. This technique is foolproof, and extremely dependable because it is a constant checking of inputs regardless of the estimation of time or a retention of information. It has been found that it is the most efficient solution to real-world safety applications.

## **Solution B – Sequence Timer with Memory Logic**

This solution also starts closing the gates as soon as a train is sensed, but it does not require continuously verifying the presence of a vehicle: a countdown timer is used to wait a given amount of time (e.g. 60s) before reopening the gates. In this period, it presumes that the car will have crossed the road. The design minimizes sensor dependency, yet may cause premature reopening due to a remaining vehicle on the track or unnecessary stalled reopening due to a vehicle-free track. It can be easier to apply in systems where sensors are not reliable enough, though it is comparatively less flexible and less reliable.

## **Real-World System Research**

The embedded track sensor-based automatic level crossing system is utilized in the Victorian railway system in Australia. These detectors detect approaching trains at a distance and output signals to the control unit to close a gate, flash lights, and activate warning sounds for drivers and pedestrians. The system stays in its active position until the train completely crosses and the track clears. Such a logic system operates without human involvement and ensures reliable and safe operation in urban and rural conditions. This use of live sensor data closely matches the logic in Solution A.