Rail Crossing Violation Warning (RCVW)

# Content for Application Page

## Tab 1: Summary

Vehicle to Infrastructure (V2I) Highway Rail Intersection (HRI) safety applications represent one of the latest additions to the U.S. DOT Connected Vehicle Program. This program is “a multimodal initiative that aims to enable safe, interoperable networked wireless communications among vehicles, the infrastructure, and portable personal communication devices to provide mobile related data services .” The suite of Intelligent Transportation Systems (ITS) elements incorporated within the Connected Vehicle concept aim to improve safety, facilitate mobility within the national transportation system, and reduce vehicle emissions via more efficient routing. A focus of this project was on development and application of ITS concepts appropriate for HRIs that employ track-circuit based signaling technology for train detection.

The RCVW application provides a means for equipped roadway-vehicles on approach to a HRI be warned of an imminent violation of an HRI active warning/protective system. A warning, that is both timely and effective in alerting vehicle operators, who otherwise may be unaware of potential danger in their surroundings, is critical in the prevention of avoidable incidents.

The application is deployable at any HRI where benefit would be accrued by increasing situational awareness to minimize safety related incidents or improving the flow of roadway traffic.

## Tab 2: Description

RCVW is a Vehicle-to-Interface (V2I) application that leverages the latest developments in connected vehicle components and technologies developed under previous U.S. DOT connected vehicle deployment projects, as well as expected deployment of connected vehicle technology in new cars. It consists of two physically separate subsystems: A Vehicle-Based Subsystem (VBS) installed in connected vehicles and a Roadside-Based Subsystem (RBS) integrated with roadside infrastructure at highway-railroad intersections (HRIs). Both subsystems are comprised of the same hardware and software components, such as a Computing Platform (CP) on which the RCVW software application executes, Dedicated Short-Range Communication (DSRC) radios, and a Global Positioning System (GPS) module. A unique component to the VBS is the Driver Visual Interface (DVI), which provides RCVW alerts and warnings to the vehicle operator.

The RCVW system provides real-time condition-based audible and visual alerting to vehicle operators to predict and warn drivers of predicted and imminent rail crossing violations for vehicles approaching or stopped within active rail crossings, respectively. The primary intended benefit for the RCVW application is the reduction in the frequency and severity of HRI safety-related incidents. However, the scalable and flexible design of the RCVW system affords potential future safety and mobility-related operational improvements, including reductions in emergency vehicle response times, improved traffic flow and routing efficiency with nearby traffic control devices, a reduction in energy consumption, and improved air quality.

Rail Crossing Violation Warning contains software for both infrastructure and in-vehicle components of the system. Both the in-vehicle and infrastructure based software packages run inside the USDOT’s V2I Hub. You will need to obtain the latest V2I Hub from itsforge. Follow the instructions on compiling and running the V2I Hub before running the RCVW applications.

V2I Hub ITS Forge URL: <https://www.itsforge.net/community/explore-applications#/40/125>

**Prerequisites**

1. Linux machine (real or virtual) setup for V2I Hub development
2. Linux machine for roadside with V2I Hub installed, running the MAP and DSRC Immediate Forward plugin packaged with V2I Hub.
3. OBU for in-vehicle attached to a Linux machine running the V2I Hub installed. An all-in-one solution like the Battelle CCP can be used instead of multiple devices.

**RCVW Package Contents**

* RCVWPlugin:
  + The RCVWPlugin runs on the in-vehicle’s V2I Hub.
  + This plugin receives SPAT and MAP information from the roadside, and generates rail crossing violation alerts, and stopped on track warnings.
* HRIStatusPlugin:
  + The HRIStatusPlugin runs on the roadside’s V2I Hub
  + The HRIStatusPlugin receives the Highway-Rail Intersection(HRI) preemption signal from an USB digital I/O board.
    - The ACCES I/O USB-IDIO-16T was used for testing
  + The HRIStatusPlugin creates J2735 SPAT messages containing the HRI status

## Tab 2: Release Notes:

* Version 1.0
* Uses J2735 R41 (2015) message set
* Contains plugins that run on V2I Hub in-vehicle and roadside

**Hardware Requirements**

See Hardware Requirements from V2I Hub OSADP documentation

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### Installation and Removal Instructions

* Installation and removal of the RCVW plugins will be done using the V2I Hub admin portal, and following instructions from the *V2I Hub Sample Set-up Guide,* which is provided by the V2I Hub OSADP release in itsforge.

### Operating requirements

* Installation and removal of the RCVW plugins will be done using the V2I Hub admin portal, and following instructions from the *V2I Hub Sample Set-up Guide,* which is provided by the V2I Hub OSADP release in itsforge.

### Related web sites

The software is distributed through the USDOT's JPO Open Source Application Development Portal (OSADP), <http://itsforge.net/>

## Tab 3: Documentation

Documents that are not published are included in the release

* **FHWA-JP-17-TBD** – *Vehicle-to-Infrastructure Prototype Rail Crossing Violation Warning Application Project Report*
* **FHWA-JP-17-TBD** – *Vehicle-to-Infrastructure Rail Crossing Violation Warning Field Test & Evaluation Report*
* **FHWA-JP-16-408** – *Vehicle-to-Infrastructure Rail Crossing Violation Warning Concept of Operations*
* **FHWA-JP-16-410** – *Vehicle-to-Infrastructure Rail Crossing Violation Warning Architecture and Design Specifications*