What is AHS™?

AHS™, the Automated Horn System, is an innovative railroad signaling device that significantly improves safety for motorists and pedestrians at railroad-highway grade crossings while dramatically reducing the amount of noise pollution created by train horns along rail corridors in populated areas.

Reduces Noise by up to 98%

<table>
<thead>
<tr>
<th>Sound Level (dBA)</th>
<th>Train Horn Area (acres)</th>
<th>AHS Horn Area (acres)</th>
<th>Percent Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;70</td>
<td>265</td>
<td>37</td>
<td>86%</td>
</tr>
<tr>
<td>&gt;80</td>
<td>171</td>
<td>5</td>
<td>97%</td>
</tr>
<tr>
<td>&gt;90</td>
<td>31</td>
<td>&lt;1</td>
<td>98%</td>
</tr>
</tbody>
</table>

The Technology

AHS™ is a stationary horn system activated by the railroad-highway grade crossing warning system. The Automated Horn System is mounted at the crossing, rather than on the locomotive, to deliver a longer, louder, more consistent audible warning to motorists and pedestrians while eliminating noise pollution in neighborhoods for more than one-half (1/2) mile along the rail corridor.

AHS™ is designed to sound like a train horn. The tone modules in the Automated Horn System horns were digitally recorded from an actual locomotive horn. Upon receipt of the signal from the railroad’s track circuit warning system AHS™ mimics the train horn warning by cycling through the standard railroad whistle pattern until the train reaches the crossing. Once the train has entered the crossing AHS™ stops sounding its horn. A confirmation signal notifies the locomotive engineer that the Automated Horn System is functioning properly. When the locomotive engineer sees that the confirmation signal is flashing, he will not be required to sound his horn unless he detects an unsafe condition at the grade crossing. Coordination with the railroad operating company is essential since the Automated Horn System is directly connected to the railroad’s crossing signal-warning system. Additionally, the railroad operating company must issue instructions to their train crews regarding the sounding or non-sounding of the train’s horn.
AHSTM Research

The Automated Horn System has been studied since 1995. The initial study was conducted by John A. Volpe National Transportation Systems Center for the United States Department of Transportation. Since then studies have been conducted by the Iowa Department of Transportation, Association of American Railroads, Texas Transportation Institute and the City of Richardson, TX.

All the research to date has proven the Automated Horn System to be an effective solution for mitigating train horn without compromising driver safety.

Roseville, CA

AHSTM Study Conclusions

“The results from the evaluation show a significant 70% decrease in violations of highway-rail crossing law with the AHS. Noise levels in areas near the tracks decreased by up to 85%.” - Evaluation of the Automated Wayside Horn System in Mundelein, Illinois Final Report, by Northwestern University Center for Public Safety, January 2003

“Wayside horns are a viable alternative to locomotive horns for audible warning at grade crossings. Wayside horns have the advantage of being closer to the motorist. In addition, they have a more focused radiation pattern and produce less community noise exposure.” -Wayside Horn Sound Radiation and Motorist Audibility Evaluation, Prepared for: Association of American Railroads, Prepared by: Mike Fann & Associates, May 2000

“For nearby residents, the automated horn system greatly reduces the negative impacts resulting from the loud train horns; the automated horns are well accepted by both motorists and locomotive engineers; and the automated system appears to provide an equivalent level of safety at the crossings.” -Evaluation of an Automated Horn Warning System at Three Highway-Railroad Grade Crossings in Ames, Iowa, by Steve Gent, P.E. (Iowa DOT), Scott Logan, P.E.(City of Ames Iowa), David Evans (Iowa State University), 1998

“The wayside horn provided an equal or significantly louder audible warning at the point at which motorists most need the warning.” - Automated Wayside Train Horn Warning System Evaluation, Prepared for: The City of Richardson, Texas, Prepared by: PB Farradyne Inc., May 2001

“The AHS appears to be, after almost 5 years of operation, an effective alternative to the locomotive horn at the Tenth Street crossing in Gering, Nebraska, with a violation rate no greater than that observed during pretest monitoring.” -A Safety Evaluation of the RCL Automated Horn System, by Stephen S. Roop, Ph.D. Texas Transportation Institute, May 2000

“The safety evaluation suggests that the wayside horn will not result in behavior that puts the driver at increased risk compared to the use of the train horn. The frequency of violations was lower for the wayside horn than the train horn, while the time to collision and violation time was not statistically or practically different for either warning system.” - Field evaluation of a Wayside Horn at a Highway-Railroad Grade Crossing, by U.S. Department of Transportation Research and Special Programs Administration John A. Volpe National Transportation Systems Center, June 1998
Improved Audible Warning for High Speed Rail Lines

AHS provides improved audible warning for drivers approaching crossings located on high speed rail lines. The new FRA train horn rule requires that locomotives traveling faster than 45mph to sound the horn 1/4 mile in advance of the crossing. This results in reduced audible warning time for trains traveling 60 mph or faster.

<table>
<thead>
<tr>
<th>Train Speed (mph)</th>
<th>Warning Time (seconds)</th>
<th>AHS Minimum (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>18.0</td>
<td>20</td>
</tr>
<tr>
<td>60</td>
<td>15.0</td>
<td>20</td>
</tr>
<tr>
<td>70</td>
<td>12.9</td>
<td>20</td>
</tr>
<tr>
<td>80</td>
<td>11.3</td>
<td>20</td>
</tr>
<tr>
<td>90</td>
<td>10.0</td>
<td>20</td>
</tr>
<tr>
<td>100</td>
<td>9.0</td>
<td>20</td>
</tr>
</tbody>
</table>

For example, an 80-mph train would provide approximately 11.3 seconds of audible warning, if the driver could hear the horn when it was first sounded 1/4 mile away.

AHS, when installed at locations equipped with constant warning circuitry, provides a minimum of 20 seconds of warning regardless of the approaching train speed. Since AHS is positioned at the crossing and focused on the roadway approach, the audible warning is louder than the train horn until the train is very near the crossing.

How AHS\textsuperscript{TM} Connects to the Railroad

AHS\textsuperscript{TM} connects with the railroad’s crossing warning system in a manner similar to traffic signal preemption connections. Typically AHS\textsuperscript{TM} horns and control cabinets are mounted on their own pole assemblies. The confirmation signal is attached to the top of one of the pole assemblies and must provide a clear line of sight to approaching trains from 1/4 mile away. Power is typically provided by the city.
Sound Comparison
Train Horn vs. AHS™

Locomotive engineers are required by the new FRA train horn rule to begin sounding the locomotive horn at a minimum of 15 seconds prior to the train’s arrival at the grade crossing. They are also required to continue to sound the horn until the train arrives at the crossing.

If the train horn is to be an effective warning device for the motorist, it must provide a sound level capable of initiating a response from the driver when the train is approaching the crossing. Unfortunately the sound level required to achieve that response and the location of the train relative to the crossing creates a significant noise impact on the community.

The two noise footprints to the left depict the area impacted by the sound of the train horn and AHS™ respectively. The comparison of the train horn and AHS™ shows a dramatic difference between the areas that are impacted at specific decibel levels. By examining the 80 decibel contour on the two footprints it can be seen that the area impacted by the AHS™ is a fraction of the size of the 80 decibel contour produced by the train horn.

What the Residents say:

“We had thought about selling our home because the train horns bothered us so much. Then, Glory be to God, you installed the automated horn systems and we have a new life.” – Citizen, Ames, IA

“The City has done a good job. Keep up the good work…” – Citizen, Roseville, CA

“The automated horn system has greatly reduced the train noise in my home. With the automated system I can sleep through the night and that really improves my quality of life. Thank You!” – Citizen, Riverside, CA

“…analysis of the effectiveness of automated horns as a safety feature and as a method of reducing noise from train horns. On both counts the automated horn proved extremely successful .” – Mayor, Mundelein, IL