Kansas
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Re-Purposing Railroad Cars as Culverts

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Railroad Yard, Inc.

A railroad tank car prepared for placement as a culvert.

Need a strong and low-cost solution for a low-volume culvert? A re-purposed railroad tank car might be just the ticket. A railroad tank car culvert can range in size from a width of 7.5 to 10 feet. Such a structure can carry over 50 tons, can span from 20 to 80 feet and can carry a continuous flow of water. This article will provide you with a snapshot for how to install a railroad tank car culvert, along with the advantages and disadvantages of using this type of drainage system. Such culverts have been installed in many locations in rural areas of Kansas and surrounding states.

Pros and cons

Bob Strait, a retired county road official and now material and construction service specialist for Railroad Yard Inc., said that there are many advantages to using a railroad car culvert.

- ***Longevity.*** "They are going to last a long time because a railroad tank car is 1/2 inch steel all the way around," Strait said. Although the life varies based on the environmental conditions such as runoff, Strait knows of one culvert that has been in service for 30 years and counting.
- ***Strength.*** "The tank cars are strong and solid because of all the steel, so when you put one in place you don't have damage such as bending," Strait said.
- ***Good flow capacity.*** Strait said the culverts can carry significant water flows. The flow opening of a rail car culvert can range from 50-75 square feet.
- ***Conserves a resource.*** Re-purposing a railroad tank car is a good way for the railroads to recycle.
- ***Fast turnaround.*** According to the Texas bridge manufacturer Lone Star Bridges, it takes a manufacturer one week to prep a railroad car for use in a bridge or culvert. At the site, installation typically takes just 1-2 days for a single-pipe structure, said Strait.

While the advantages to using railroad car culverts are clear, they can't be used in every location. Field runoff will affect how long these products will last. "It's really up to the outdoor conditions to dictate the life of these culverts," Strait said. Strait also pointed out that since the culverts are made out of steel, they will rust, but the metal is thick enough that the possibility of rusting-through is remote.

Typical users of these culverts

An article titled "Old Railroad Tank Cars Make Great Culverts," (see Sources) states that the main customers who purchase railroad tank cars for culverts are counties seeking to replace older culverts in constant need of repair. Strait said that the counties he has worked with really enjoy using railroad car culverts. "Some counties have railroad car culverts that were installed more than 30 years ago," Strait said. "They have never had a problem with them and they are still looking good."

One Kansas county that has been installing railroad tank car culverts for a long time—for almost 40 years—is Osage County. Glen Tyson, road and bridge supervisor, said the main reason the county installs these culverts is because they provide a strong structure with a quick installation time.

"We have 16 railroad-car culverts in Osage County, mostly on very low volume township roads" Tyson said. The first one was installed in 1973 and the last one was installed this summer.

Railroad Yard, Inc.

This culvert in Phillips County uses a half tank car and the sides are faced with galvanized metal to protect against erosion in high flows.

Railroad Yard, Inc.

Thirteen counties in Kansas have installed railroad tank car culverts that Strait knows about, include Ness and Phillips and Jackson counties as well as Osage. They are getting a lot of use in counties in Iowa, too, Strait said.

From tank car to culvert component

Tank cars must be cleaned, inspected and prepped before they are used in culverts, and there are companies that specialize in this. Each railroad car is carefully inspected for damage, and after it is determined that the railroad car is safe to use, the manufacturer patches the opening from the car's access area and continues the process of turning the railroad car into a durable culvert component.

Some counties prefer using a "half-round," which is a tank cut in half along its length. Tyson prefers using half-rounds that come manufactured with a floor and also a header wall welded onto it. "We really like those," he said. "They go up especially fast and they can carry a lot of water."

Design and construction

The basic steps for installing a railroad tank car culvert are simple. They include placing abutments on each bank of the stream, placing the railroad tanks car(s) on top of them, building approach ramps, adding guardrails if needed, and stabilizing the soil against erosion or scour. Specific steps will depend on the site conditions.

Agencies should consider both the environmental conditions and expected traffic volume at the culvert site when designing the structure. Strait said most counties want rail car culverts to be placed on low traffic-volume roads over streams with low water volume, but some will want them on a higher volume road or over a higher volume stream. In those cases, the culverts will need a larger span and should have head-walls to protect against erosion.

Strait said it is up to the local agencies to determine exactly how they want their drainage structure constructed with the tank car component. "I show them photos of the different structures and they decide what they want," he said.

Tyson says tank car culverts install very quickly. "We usually can have the road open to one lane of traffic in one day, then finish the structure with 2-ft side toeholds and header walls the following day," he said. The county places toe-holds under the culvert to keep water from channeling underneath the structure.

Most of the rail-car culverts in Osage county are faced with rip-rap to help prevent swirling water from damaging the structure. "We take a track-hoe and stair-step a wall with 24-inch blocks. It holds the dirt in place well," he said.

Cost

Strait said that the cost of railroad tank car culverts varies based on the distance traveled from the rail car component manufacturer to the culvert site and it's hard to put an exact number on how much they cost. But they are priced competitively to other similar products, he said.

For more information, consult the sources for this article or contact a railroad car vendor in your area. ■

Iowa DOT

Flatbeds as Bridges

Tank cars are not the only railroad components used for drainage structures. Flat cars, which are longer than tank cars, are used for decks on low volume bridges. A study in 1999 by the Iowa DOT looked at the feasibility of flat car bridges on low volume roads (see Sources). The study found that with some responsible engineering control RRFC bridges can be a viable and economical bridge replacement alternative. Care should be taken in choosing the kind of flatbed car to use, and the study recommends obtaining flatcars through businesses with experience in supplying flatbed bridges. The study contains other tips for successful installation. Check it out.

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Sources:

- Railroad Car, Steel, and Prestressed Concrete Bridges. Forest Management Practices Fact Sheet Crossing Options Series #6. University of Minnesota Extension. http://www.extension.umn.edu/distribution/naturalresources/DD7006.html.
- Railroad Car and other short span bridges an alternative for stream simulation. Porior Engineering, LLC. http://porior.com/homepage/chapter%20nine-bridges.pdf.
- T.J. Wipf, F.W. Klaiber, J. Witt, T.L. Threadgold Use of Railroad Flat Cars for Low-Volume Road Bridges. Iowa Department of Transportation. August 1999. http://www.iowadot.gov/operationsresearch/reports/reports_pdf/hr_and_tr/reports/tr421.pdf.
- Lone Star Bridges website. http://lonestarbridge.com/.
- "Old Railroad Tank Cars Make Great Culverts" Article. http://www.farmshow.com/view_articles.php?a_id=406.
- Interview with Bob Strait, Railroad Yard Inc., May 30, 2012.
- Interview with Glen Tyson, Osage County, June 20, 2012.