

Lake State Railway Company, Saginaw Yard Improvements

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Rail industry senior design projects are an excellent way to provide students with an initial experience working with industry and the public to develop plans for future project work. Civil engineering projects can be accomplished on a wide variety of projects, with clients that range from Class 1 railroads to local municipalities. They provide an excellent opportunity for communities to explore “what if” scenarios with only a small economic investment.

Introduction

Michigan Technological University has been involved in rail related undergraduate student projects since the earliest days of the Rail Transportation Program (RTP). Although many of the projects have been in the civil engineering discipline, RTP has reached out across campus to the mechanical and electrical departments as well as the School of Business, and the fine arts department. Since 2012 these projects have often been at least partially funded from the NURail grant, and in 2014 and 2015 supplemental funding was provided by MDOT.

During the 2015-16 school year, 32 senior civil and environmental engineering students conducted “*Planning and Design Services for Improvements to the Lake State Railway Company (LSRC) Saginaw Yard*” as their senior design project.

Background

The project was divided to two semesters and each group worked for a single semester. In general, the fall groups were responsible for conceptual designs while the spring groups concentrated on providing more detail to the preferred alternatives. The yard is a facility inherited from CSX, and has long suffered from drainage issues that make track maintenance and operations difficult. The yard has a locomotive wash

facility, but that facility is an open air operation, which creates operational issues during the winter months. While the yard is quite large, it is constrained on the west by Washington Ave, on the east by N. 23rd St, and on the south by Lapeer and Janes Avenues. LSRC is following the industry trend towards longer unit trains, but the constrained yard layout lacks a lead track long enough to build a unit train. The student project provided a “first look” at some alternatives for improving the track layout, creating an enclosed wash facility, and improving the drainage across the site. The four objectives for student work included:

- improvements to the rail system to allow storage of a 9,000-foot unit train in the yard;
- drainage improvements throughout the yard complex;
- design of a covered locomotive wash facility; and site work in the rail yard and the neighboring communities to improve yard access and allow LSRC to park the previously mentioned unit train

Scope Changes

As the work progressed the student team discovered that a 9,000-foot lead track would not be possible, so the scope was altered to look for the longest possible lead track within the confines of the existing yard. Closure of grade crossings at Lapeer Ave and N. 23rd St were investigated as alternatives to provide a longer lead.

The initial site visits confirmed the scope outlined in the project description. In addition, LSRC asked the team to look for potential to reuse the floor slab of an old warehouse facility on site, and to take a

preliminary look at improvements to the locomotive turntable.

The following paragraphs summarize project activities and final outcomes of each team’s work. Complete technical reports have been submitted to LSRC to be used at their discretion. It must be remembered that the work was done by students and the main objective was to allow them to apply their engineering education to a real world project. Thus, the findings and outcomes should not be considered as professional documents, but rather information provide a solid foundation for LSRC in the continuing development of their project.

Track Improvements

After investigation of the site and available options, it was recognized that a 9,000-foot storage track was not possible without closing either N. Washington Ave or Janes Ave, leading into revision of scope that attempted to maximize the length of storage track within the remaining yard area. During the conceptual phase, the best option provided 7,600 feet of storage in the East Yard between Janes Ave and Washington Ave after track modifications, but this was reduced to 7,300 feet during the detailed design phase. 7,300 feet meets the current LSRC needs, and allows them to handle over 110 car trains, while providing room for storage of two trains. The plan also allows for continuous rail operations, even during construction. A schematic drawing was developed to illustrate the East and Receiving yard tracks and operations (Figure 1). Total project costs for rail work were estimated at \$1.4 million during the conceptual phase and later revised to \$1.6 million. The final report includes cost estimates for the planned work, and a phasing plan showing how the work could be accomplished over an extended period of time if necessary.

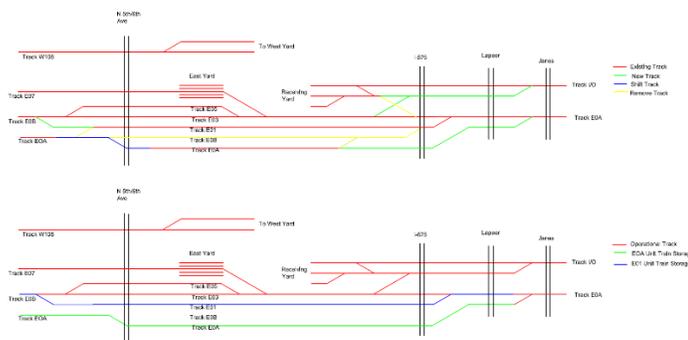


Figure 1: East Yard Rail Schematic

Structural Improvements

This group investigated several options for the wash facility, including pre-engineered steel buildings and individual design/construction packages. They found that a pre-engineered facility would be the preferred option. As preliminary design efforts progressed the LSRC staff expressed an interest in including several improvements, including an inspection pit for minor maintenance activities and an elevated wash platform to provide access to the upper sides and top of the locomotive during the wash operations. The preliminary plan that included the layout for a basic wash facility was estimated to cost nearly \$1 million, constructed over two or more years. The final plan increased the cost to just over \$2 million, but included inspection pits for both tracks in the wash bay, drainage improvements to support the inspection pits, heating, and the wash platform and associated wash equipment. It also included costs for providing more separation between the tracks which allowed better access to the locomotives during the wash process (Figure 2).

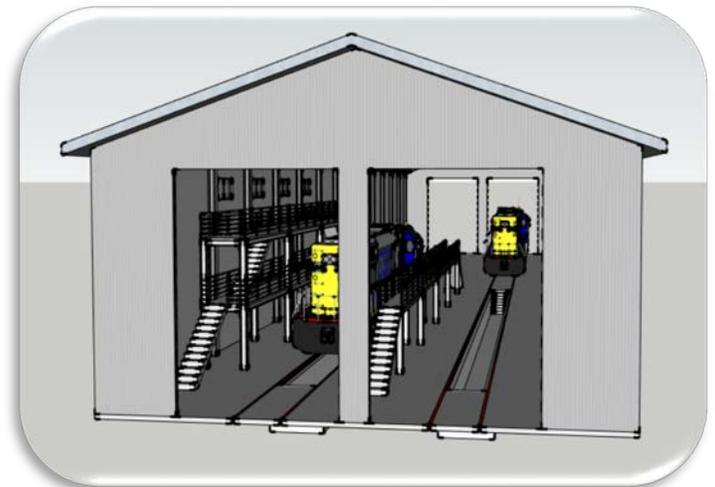


Figure 2: Locomotive Wash Facility Rendering

The preliminary analysis of the old warehouse determined the facility’s current condition was beyond repair and recommended that the building and floor slab be demolished, crushed, and used as fill inside the existing foundation walls. A floor cap on top of this would allow use as a loading dock for rail operations and addition of a pre-engineered steel warehouse could provide covered storage. Conceptual level costs indicated a total cost for a pre-

engineered warehouse on the slab would run nearly \$1 million.

Drainage Improvements

The drainage group investigated ways to remove the standing water that collects on the site after major rain events, and during the spring snow melt. They devised a preliminary plan that would provide surface drainage to catch basins established within the yard. The catch basins would be connected to the existing Saginaw combined sewer system at points around the perimeter of the yard. Surface drainage would take place on the existing access roads within the yard that would be regraded to improve surface flow. Preliminary costs for this work ran approximately \$400,000 (maintained in final cost estimate) and could be phased over a period of years to gradually improve the drainage with a reduced annual capital expenditure. Final plans included directional boring from the street side to minimize operational impacts in the yard, grading and drainage for a new access route between the two unit train tracks, and installation of under-drains where possible (Figure 3). A phasing plan was provided that would allow construction over a period of years with recognition that costs would increase as project length was extended.

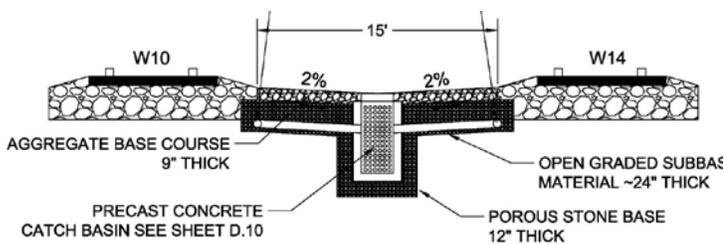


Figure 3: Proposed Drainage Detail

Site Improvements

This team focused on improvements to yard access, and to work required to support the proposed unit train operation. Early on the rail and site teams recognized that the rail crossing at either Lapeer or N. 23rd street would need to be closed to allow a parked unit train operation. They conducted traffic counts during the field trip, reviewed traffic data from the City and Michigan DOT (MDOT), and concluded that one or both could be closed with minimal impact on current traffic operations as both crossings have low traffic volumes. As MDOT provides a payment to communities that close rail crossings, with a bonus for

closing more than one, the team recommended closing both crossings. Their preliminary design work focused on the infrastructure changes needed to successfully close either location. They also proposed a set of local infrastructure improvements that might help secure support for the closures from the local community. Conceptual level costs for the work associated with the crossing closures was a little over \$400,000, which could be offset somewhat by the MDOT incentives that could be as much as \$300,000. As plans were refined the team also reviewed safety issues related to the existing crossings, the crossing closure areas, and local pedestrian traffic. This team recommended closure of two crossings, the first at Lapeer St, the second at N. 23rd St. Although only the Lapeer St closure is required for the current unit train proposal, the N. 23rd closure would allow more flexibility in the yard operations and advancing both in a single public process may save time and resources. The team's work also revealed a level of trespassing activity in the yard area which could be addressed through infrastructure changes, combined with coordination with local police and stepped up law enforcement. Proposed infrastructure improvements include fencing like that illustrated by the red line in Figure 4, vegetative barriers at crossing closure locations, creation of park areas with parking on some of the abandoned street pavement, and installation of vehicle gates at yard entrances. Final estimated costs for the site work associated with the crossing closures is a little over \$300,000.

The fall structures and spring site teams also took a preliminary look at the work required to rehab the existing locomotive turntable. They recommended a two-phase approach that would allow continued access to at least two stalls in the round house during construction. Turntable work should take place after the construction of the new locomotive wash and inspection facility, as that facility could be used for some locomotive maintenance activities during rehab of the turntable.



Figure 4: Proposed Site Security Upgrades

In conclusion, the students provided a first look toward various improvements at the LSRC property. Overall, the project would be dependent on the closing of the Lapeer St crossing, which would require a public process to get buy in from the City of Saginaw. The student work could be provided as a starting point to an engineering firm for final design work, and eventual construction if LSRC and the City agree, and if funding is available.

Conclusion and Statement by the Lake State Railway Company on project outcomes

Overall, this project was considered a win-win situation. LSRC got a valuable first look at some alternatives for yard improvements and the students got an excellent opportunity to work through the issues associated with developing a project “from the ground up”. The following is a statement by the LSRC on their perspective to the project outcomes.

“The collaboration with Michigan Tech student teams encouraged our company to put serious consideration for the planned improvements. While the company didn’t proceed with all recommendations, an immediate outcome was to use the work as a foundation for detailed analysis on improvement needs and opportunities with an engineering consultant. This analysis resulted in an approximately \$2 million investment that concentrates on track modifications and improvements and results in significantly better track utilization and operational efficiencies in the yard. The project is in progress and may continue in the

form of drainage improvements, as also recommended by the students.”

Acknowledgements

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