2016 EXCELLENCE AWARD ENTRY

NAME OF CATEGORY: TRANSFER STATION EXCELLENCE AWARD
NAME OF ENTRANT ORGANIZATION: EASTERN REGIONAL SERVICE BOARD
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TITLE OF ENTRY FOR WEBSITE:
CLARENVILLE TRANSFER STATION, INNOVATIVE AND MODERN WASTE MANAGEMENT
JURISDICTION: REGIONAL
APPROXIMATE POPULATION OF JURISDICTION: 18,000
APPROXIMATE COST PER HOUSEHOLD FOR THE PROJECT: $550 CAD
APPROXIMATE BUDGET: $3.9 MILLION CAD.
The Eastern Regional Service Board has implemented an integrated solid waste management system which includes residential solid waste collection and disposal, material recovery and recycling programs in approximately 189 communities located in Eastern Newfoundland, Canada. As the closure assessment of unlined landfills progressed throughout the region, it was determined that unconsolidated transport of material from the Clarenville area to the Regional Landfill was not environmentally or financially sound. A modern transfer station was designed with the potential to receive up to 24,251 ton (22,000 tonne) of material annually. An innovative clean floor at grade facility was designed to minimize the footprint on the site. A conveyor system is used to achieve the required height differential to load municipal solid waste, recyclables, and construction and demolition material. Material is broken down in a rotary screw auger compactor and is compressed into walking floor transport trailers to achieve maximum density and payload.

**EXECUTIVE SUMMARY**
In 2011, the Provincial Government of Newfoundland and Labrador (Canada) created the Eastern Regional Service Board (ERSB) to advance the modernization of waste management in the eastern region of the province. The region has approximately 189 communities, a population of 270,000 people and several areas with one-way hauling distances to the regional landfill in excess of 120 miles (200 kilometers). The regional landfill is located near the majority of the provincial population. This regional landfill is located at the opposite end of the region served by the Clarenville Transfer Station.

One aspect of modernizing waste management began with the closure of local unlined landfills and the development of recycling and resource recovery options for a wide range of materials. Discussion regarding the closure of unlined landfills in the Clarenville area began in 2010. The site of the existing unlined landfill was chosen as the best location for a transfer station. Design and procurement began in 2014 and construction of the facility commenced in May of 2015.

The Clarenville Transfer Station opened to the public on January 2, 2016. The facility is a steel-clad building with 5,285 square foot (491 square meter) of space dedicated to waste transfer, and an additional 861 square foot (80 square meter) for administration—including scale system management, kitchenette, lunchroom, restroom facilities, general storage, and electrical room. The building is located on a 2.2 acre (0.9 hectare) site, which includes a residential drop for bulky items such as construction and demolition materials and material recovery, as well as, a future area for composting.

The site handles municipal solid waste, commercial solid waste, residential bulk waste, and recycling for transfer to the regional landfill. Clarenville Transfer Station will receive approximately 12,125 ton (11,000 tonne) annually of municipal solid waste, commercial and recycling waste from approximately 5,000 local households and 200 businesses. The facility is scalable and can grow to receive 24,251 ton (22,000 tonne) if parameters within the service area change. The construction of the transfer site facilitated the closure of several unlined landfills in the surrounding area by providing cost effective transfer to the regional landfill, located approximately 119 miles (193 kilometers) away.

The Clarenville Transfer Station is a unique clean floor facility; waste and recyclables are loaded from collection vehicles directly onto a conveyor system through an auger compactor and into high capacity transfer trailers. In comparison to dirty floor or
traditional waste transfer facilities, the clean floor facility results in reduced at grade construction costs, lower environmental impacts, improved health and safety conditions for staff and public, and operational cost savings for instance by reducing the double handling of waste.

The original design utilized grade differences at the landfill site, to create a 13 foot (4 meter) concrete wall to facilitate the use of Haul-All Transtor modular transfer devices which would top-load NexGen ram compaction trailers with a 23 ton (20.8 tonne) payload. However, the construction costs of utilizing the grade separation at the site proved to be prohibitively high. So NexGen provided an innovative optional compaction system utilizing Komar rotary compactor auger units to handle the compression of municipal solid waste, commercial material and recyclables into conventional walking floor trailers. NexGen and the Eastern Regional Service Board collaborated with the Government of Newfoundland and Labradors’ Service NL Department to gain approval to utilize an inboard steerable lift axle on the compaction trailers to increase the payloads to 31 ton (28 tonne).

Additional design challenges encountered in constructing the facility included the geography of the site, which resulted in a less than ideal location for the weigh scale in relation to the building. This challenge was successfully overcome through technology such as cameras and an administrative policy of mandatory stops on the scale.

To date, no changes are planned to the station. Any additional upgrades will be assessed after one full year of operation has been observed.

By opening the Clarenville Transfer Facility, the Eastern Regional Service Board was able to provide a standardized curbside collection program which includes municipal solid waste and recycling, and a material recovery site in an area that previously did not have access to these services, aligning them with the rest of the region. The facility also allows the environmentally responsible closure of several unlined landfills in the area.
The Clarenville Transfer Station is a rural facility, built at an existing unlined landfill site. The site had an initial capacity design of 12,125 ton (11,000 tonne) annually, with growth potential for municipal solid waste, commercial material and recyclables.

The site was designed with other service considerations in mind, including:

- Enabling both residence and local collection vehicles to deliver material on a clean floor;
- Maximizing outgoing payloads on highway transport vehicles;
- Minimizing life cycle costs of labour, operation, transportation and maintenance; and
- Providing residents with additional services such as recycling, bulk item pick-up, material recovery programs and a household hazardous waste program.

The design is a compact, at-grade facility that uses 2 pit-mounted conveyors to create a clean floor, direct off-loading facility that accommodates both residential and commercial vehicles. The design incorporates the following key elements and features:

- 6,146 square foot (571 square meter) at-grade space dedicated to waste transfer and administration.
- Clean tipping floor design, with all municipal solid waste, commercial and recyclables deposited directly onto dedicated indoor conveyors.
- Dedicated indoor conveyors can load two transport trailers carrying different materials at the same time while maintaining 100% separation of the municipal solid waste and recyclables.
- By staging the acceptance of recyclable materials, the Clarenville Transfer Station can compact and
load more than one type of recycling material into a walking floor transport trailer which allows the trailers to serve multiple purposes and still offload only one product at a time at the end disposal location. This facilitates the collection and transport of the volume of commercial old corrugated cardboard (OCC) and curbside recyclable streams collected in an area of low population.

• Three 16 foot high by 14 foot wide (4.9 meter x 4.3 meter) main overhead doors allow access to dedicated bays for municipal solid waste, recycling and storage. Dedicated processing lines: one for municipal solid waste and one for recyclables which can be interchanged if one line is down for maintenance.

• Indoor material off-loading directly onto dedicated feed conveyors.

  » Each conveyor system includes a 72 inch wide (1.8 meter) by 17 foot long (5.2 meter) horizontal acceptance conveyor and a 72 inch wide (1.8 meter) incline conveyor with an upper elevation of 167 inch (4.2 meter). These conveyors deposit material directly into Komar auger compactors.

  » Horizontal and vertical conveyors are powered by variable speed frequency drives, which provide a metered feed rate into the compactors. Operators can manually adjust conveyor speeds as required to optimize loading speed.
The horizontal conveyor unit operates at a slower speed than the incline conveyor to singulate municipal solid waste after it has been highly compacted during local collection.

¼ inch thick (0.6 centimeter) Z pan conveyor plates with underside impact bars handle the off-loading of highly compacted municipal solid waste.

- Compaction and trailer units are located outside the building to reduce facility costs.

Municipal solid waste is compacted by an EM60G 60 horse power Komar rotary screw compactor, operating at a constant speed of 11 rpm. The EM60G unit generates thrust up to 95.5 ton (86.6 tonne) and auger pressure of 668 psi.

Recyclables are compacted by an EM40G 40 horse power Komar rotary screw compactor, operating at a constant speed of 8 rpm. The EM40G unit generates thrust up to 89 ton (81 tonne) and auger pressure of 620 psi.

The conveyor loading speed is adjustable and the operator can monitor the auger feed rate via a closed circuit television. Speeds can be adjusted to suit the size of collection vehicles, depending on the level of compaction. Side loading municipal solid waste trucks can be processed in 6-8 minutes, highly compacted 40 yard front loader trucks can be processed in 10-15 minutes.

- The system can load a 53 foot (16 meter) compaction trailer to a maximum weight of 31 ton (28 tonne) in less than one hour.
- Augers also provide material shearing while direct loading the compaction trailer.
- Compaction trailers are equipped with a tridem axle and air ride rear suspension as well as an inside steerable lift axle. The lift axle is automatically lowered when a load is detected on the trailer. Load sensor and axle position switches transmit monitoring information via an automatic vehicle location system link for Government of Newfoundland and Labradors’ Service NL Department compliance monitoring.

- Automatic weighing sensors on the trailers allow the trailer to be weighed in place during the loading process to maximize in-place weights and track weight balances during various seasons.
- Trailers are equipped with Keith RFII walking floors with 3.5 inch (8.9 centimeter) cylinders to provide reliable operation of the floor during alternating wet and freeze/thaw conditions.
- Walking floors are power take-off (PTO) powered by the highway tractors for off-loading. During loading the walking floor can be reversed to improve payloads and allow balancing of the trailer centre of gravity.
The new facility is located at the site of an existing unlined landfill. For almost 50 years residents have been dropping material at the site, so the transition to a transfer station was easy for them to make. The majority of the materials collected are contained within the facility, which reduces the issue of windblown materials. Bulky items are contained within earthen berm cells at the waste recovery facility located adjacent to the transfer station. The transfer station’s clean floor design allows all residents clean and easy access to the transfer station without the risk of depositing material between loader operating cycles, or safety issues due to slippery floors. This clean floor design also minimizes odour, while a water wash and floor drain system further ensures cleanliness.

The operation of a clean tipping floor is a significant departure from the typical “drop and go” or dirty floor transfer station concept. Rotary compactor technology provides superior compaction of municipal solid waste and bulky materials by breaking down items through a pre-shredding process to provide a more consistent loading of the transport trailers. The auger compactor and conveyor system is all-electric, which eliminates the burning of fossil fuels and emissions from heavy equipment along with the risk of a hydraulic oil spill which could contaminate land fillable or recyclable materials. The direct drive auger compaction technology also significantly reduces maintenance cycles and the risk of downtime associated with hydraulic oil contamination in standard compactor units.
ENVIRONMENTAL CONTROLS

The clean floor design makes the Clarenville Transfer Station unique. By ensuring waste is not deposited onto the floor, the facility can be kept safe, clean and tidy. Facility cleanliness is also facilitated by a wash-down system that includes:

- Sloped concrete floors to promote positive drainage and collection of wash-down waters in the trench drains and catch basins;
- Grated trench drains to collect wash-down water and sediment;
- Catch basins and sediment traps installed at the end of each of the two trench drains to intercept sediment and larger debris;
- A double-walled, 25 gallon (95 liter) per second oil interceptor with a 55 gallon (208 liter) holding tank and sediment bucket; and
- A disposal field to filter and disperse wash waters into the environment.

The Clarenville Transfer Station is a fully enclosed facility which contains wind-blown debris and reduces access by vectors. In addition, all clients are required to cover loads in an effort to decrease debris and blown materials both on site, and on route to the site. The daily volume received in the first month of operation of the site was 23 ton (21 tonne), projected to be 5,879 ton (5,334 tonne) annually. This volume is expected to increase as additional local landfills are closed, the service area increases, and the construction season peaks.

The facility includes an extensive odour control system which consists of the following:

- General ventilation through a wall-mounted 106 cubic foot per second (3,020 liter per second) centrifugal fan;
- Supply air in the waste transfer area is provided by two wall mounted louvres with washable, rather than disposable filters; and
- Material storage is limited to two days in the summer and one week in the winter, all within the closed compaction trailers.

Surface run-off external to the Clarenville Transfer Station site is intercepted by ditches around the perimeter of the site and directed away from the building.

The Clarenville Transfer Station is an extremely environmentally conscious facility. The clean floor design reduces health and safety concerns associated with machine operation and exposure to waste and...
vectors. The high levels of compaction results in fewer trips for transportation of waste to the regional landfill located 119 miles (193 kilometers) away, reducing diesel emissions and greenhouse gases. Most importantly, implementation of the Clarenville Transfer Station resulted in the environmentally responsible closure of several unlined local dumps in the transfer station service area.

REGULATORY COMPLIANCE

The Clarenville Transfer Station operates under an annual Certificate of Approval issued by the Department of Environment and Conservation, Government of Newfoundland and Labrador. Legislative standards and guidelines to which the facility is required to adhere are mandated through the provincial government. The Certificate of Approval requires annual reporting which summarize the activity over the previous year.

Highway equipment operators are required to follow all weight restrictions and speed limits. They are equipped with automatic vehicle location (AVL) systems for monitoring of such activities as seat belt use and governors to prevent speeding. Trailers are also equipped with an automatic weight system to ensure tractor and trailer axle loading compliance with the provincial Department of Transportation and Works.
4 PERFORMANCE, ECONOMICS AND COST EFFECTIVENESS

The goal of the design was to minimize construction costs and to maximize payload. The site has a limited amount of useable land and it was a working landfill that had to remain operational during construction. Due to the availability of land in the target area and the permitting process, it was the most economical option to reuse the existing landfill site and road infrastructure.

An initial request for proposal was issued for a Design Build procurement process. The preferred option had a projected cost of $6.1 million CAD. The grade separation and the soil conditions on site required an extensive civil works investment for any design that included grade separation. We opted to divide the project into separate components and issue tenders through a Design Bid Build procurement process for the site preparation and building. The auger and conveyor system remove the requirement for grade separation. The processing equipment was procured directly from the vendor. The completed project had a cost of $3.9 million CAD including all processing equipment and rolling stock (highway tractors, trailers, and shunt truck).

The utility cost for the first three months of operation which includes the electricity for the processing equipment (augers and conveyors), as well as, the entire facility (heating, exhaust fans, lighting) is averaging $1,330 CAD per month or $4,000 CAD for the quarter. The facility has processed 1,110 ton (1,007 tonne) for a processing cost of $3.90 CAD per tonne. There are two full time staff at the facility for processing with a quarterly cost of $35,000 CAD with full payroll burden. This is a labour cost of $34.75 CAD per tonne for management and labour for the facility. This is a new facility servicing an area that is consolidating waste collection and disposal operations. Within the next year the service area will be expanded to encompass another area with a population equivalent to that which is currently served. This will increase the volume processed to about 2,425 ton (2,200 tonne) for an equivalent time frame. We expect the cost per ton (tonne) for processing will be reduced by half at that point as the salary and utility cost will be spread over a larger volume of material. The unit cost for transport is expected to remain constant.

Our payloads are 30% higher than loads carried in traditional grade separated transfer station configurations. We are exceeding payloads that are transported in our neighbouring administrative area by 30% for municipal solid waste and even greater if the payload is construction and demolition material that has not been shredded or compacted.
The auger and conveyor system allows us to consistently achieve road legal payload with a minimum amount of processing cost. This is helping us to control the overall cost of transportation for disposal of material.

Staff perform daily visual checks of the equipment within the facility and more in depth monthly inspection. Preventative maintenance of equipment is performed as per manufactures recommendations. Road equipment is checked on a daily bases as required under Provincial legislation as well as regular manufacture recommended maintenance and annual Motor Vehicle Inspections are conducted.

Depending on the nature of service interruptions related to equipment, there are several options to ensure waste is transported to the regional landfill as required. These include: using the alternate conveyor auger system to load transport trailers; multi use of trailers such that the designated recycling trailer could be used to carry waste or vice-versa; portable generation sets in case of a electrical outage; and using equipment from other Eastern Regional Service Board operations. In the event of a natural disaster the distance to the regional landfill is not outside the allowable time for a garbage truck to travel and waste could be direct hauled or diverted to another landfill on the island. As operations mature should alternate methods of managing waste transportation during emergencies become clear they will be identified within the annual report that is submitted to Government of Newfoundland and Labrador’s Service NL Department as part of the annual Certificate of Approval report and application to operate the facility.
Employee and visitor health and safety are always of the utmost importance to the Eastern Regional Service Board. The facility was designed to contain all municipal solid waste within the facility to reduce windblown materials. The clean floor design reduces the risk of slipping and falling due to slippery floors and direct conveyor loading to eliminate resident interaction around rolling stock such as loaders. The clean floor design addresses health and safety concerns associated with odours, loader exhaust and exposure to waste and vectors.

An initial hazard assessment for the operation identified any hazards and was shared with staff in addition to the control procedures implemented to mitigate and reduce such hazards.

Training is provided to new employees and all staff will undergo annual training to ensure they are current. Specific areas for training include review of the employee safety handbook and Certificate of Approval, power line safety training, first aid and cardiopulmonary resuscitation (CPR), Workplace Hazardous Materials Information System (WHMIS),
fall arrest training, scissor lift training, and training for
the specific features and equipment at the site.

After four months of operation the facility is proud to
have no reported injuries, a testament to its strong
safety practices, which include:

- Site employees wear CSA Group approved
  personnel protective equipment including high
  visibility safety vests, safety glasses, steel-toe
  boots, hearing protection, rain gear (when
  necessary), hard hats (for certain tasks), and
  International Safety Equipment Association
  (ISEA) puncture, tear, abrasion and cut
  resistant gloves.

- Residents delivering material are accompanied at
  all times by a trained staff member.

- A permit system is in place and each load is
  inspected to ensure only acceptable materials are
  brought to the site. This is enforced through load
  inspections and camera monitoring.

- Trailers are equipped with automatic vehicle
  location (AVL) systems for monitoring of seat
  belt use, excessive speed and location of vehicle
  which can be very important in the case of an
  emergency, particularly during inclement weather.

- Governors are installed on tractors to prevent
  speeding.

- Trailers are always enclosed combined with the
  facilities clean floor design reduces peoples
  exposure to waste.

- In the event of an emergency, the fire services for
  the nearby Town of Clarenville are fully briefed
  on the building and operations, and are trained to
  respond accordingly.

- The site includes a four gas alarm system,
  standard operating procedures, along with site
  inspections and a trained employee occupational
  health and safety committee member.
Public concerns surrounding the use of the facility were primarily around cost, accessibility and accepted materials. Historically, the landfill operated without a tipping fee and both residents and commercial service providers could access the site seven days a week, with little attention to what materials were being placed in the landfill.

The new Clarenville Transfer Station site has new stricter controls. Public concerns have been addressed through educating the community that a modern environmentally sustainable site carries an increased cost. This includes a tipping fee that is consistent with the regional landfill and a transport fee to cover costs associated with bringing materials from the Clarenville Transfer Station to the regional facility. The services offered at the facility have increased with access to curb side recycling, annual hazardous waste drop off event and material recovery programs for electronics, cell phones, metals and tires.

Communication and education has been key in this process. Eastern Regional Service Board produces an annual guidebook that outlines the facility, time of operations, accepted materials, contact information, and general updates, which is delivered to every property in the service area (and is also available for pick up at the site). Eastern Regional Service Board also has a website and social channels that are maintained with important and timely information that customers require regarding the services they provide. Any customers’ complaints or concerns are logged and a policy ensures they are contacted within one business day.

When Eastern Regional Service Board initially launched its waste management services, the public expressed concerns with not knowing about the changes. But with increased education and awareness efforts, these complains have dropped considerably. The Mayor of Clarenville was quoted at the facility’s grand opening by remarking that “The closure of so many landfill sites, the commencement of curbside recycling and the safe disposal of household hazardous waste will have valuable health and economic benefits to our residents now and for future generations.”