GENIVAR

WASTE DIVERSION ONTARIO
Continuous Improvement Fund

LEED CERTIFICATION
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CIF Project 219

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1. Introduction

Waste Diversion Ontario under the Continuous Improvement Fund (CIF) Project #219 retained GENIVAR Inc. to review current LEED measures for reducing the environmental impact from buildings and recommend new measures to help obtain LEED certification/credits.

This is Part 2 of our mandate. Part 1 included the review of the municipal multi-residential building design requirements. Our review concluded buildings are constructed without optimum facilities to maximize waste diversion. One of the main difficulties in multi-family buildings was the lack of space on every floor and/or in a centralized location within the building. A "Best Practices" Guide for the storage and collection of recyclables in multi-residential buildings was submitted. The recommendations of Part 1 form the basis for this report.

2. Scope of Work

The scope of work for this investigation included the following:

- Review the current LEED measures for reducing the environmental impact from buildings.
- Recommend new measures for the blue box recyclables management system in multi-unit residential buildings for the collection and storage of recyclables.

3. Project Team

The following individuals comprise the investigation team for this study:

Table 3-1 Project Team

Phil Jensen	GENIVAR Inc.
Patricia Paz-Soldan, P. Eng., LEED AP.	GENIVAR Inc.
Cara Sloat, P. Eng., LEED AP.	GENIVAR Inc.

Patricia Paz-Soldan prepared the report. Cara Sloat and Phil Jensen reviewed the report.

4. Reference Material

The following reference materials were provided for use or have been utilized in the preparation of this investigation:

Table 4-1 Reference Materials

Mayor's Tower Renewal - Pilot Feasibility Study – GENIVAR Inc. – March 30, 2010.

5. LEED Measures for Recycling

5.1 General

Canada Green Buildings Council (CGBC) is a not-for-profit association that is providing leadership for the building industry to promote green building practices.

The current Canadian LEED Green Buildings Rating System applicable for multi-unit residential buildings is as follows:

a) LEED Canada Reference Guide for Green Building Design and Construction 2009, applicable for new construction (LEED NC) and

b) LEED Canada for Existing Buildings: Operations and Maintenance 2009 (LEED EB:O&M) applicable for existing residential buildings of four or more habitable stories.

c) LEED Canada for Homes – Mid-Rise, certified by the USA Green Buildings Council (USGBC), may be used for residential buildings in the 4-6 story range and is recommended by the CAGBC for this purpose. *However there are no credits for storage and collection of recyclables in this program.*

Credits can be obtained in several categories as follows:

- Sustainable Sites (SS)
- Water Efficiency (WE)
- Energy and Atmosphere (EA)
- Materials and Resources (MR)
- Indoor Environmental Quality (IEQ)
- Innovation in Design (ID)
- Regional Priority (RP)

Under the Materials and Resources (MR) category, there are credits that focus both on waste from the construction process and waste generated by building occupants. Waste from the construction process is beyond the scope of work of this report.

Credits from waste generated by building occupants are intended to reduce the quantity of waste disposal and also focus on waste reduction. The requirements differ for new buildings and existing buildings.

No other credits are available under any other categories that relate to recycling/waste reduction.

5.2 New Buildings-LEED NC

5.2.1 MR-Pre-Requisite 1- Storage & Collection of Recyclables

For new buildings a mandatory pre-requisite(s) is the provision of an "*easily accessible dedicated area or areas for the collection and storage of materials for recycling for the entire building*". The current storage and collection prerequisite requires the provision of an easily accessible dedicated area or areas for the collection and storage of materials for recycling for the entire building. The materials listed as mandatory are:

- Paper & Corrugated Cardboard
- Glass
- Plastics
- Metals
- Organic Waste (if a municipal program is available)

According to the U.S. Environmental Protection Agency 2006, these 5 materials make up approximately 59% of the waste stream generation.

This prerequisite also provides guidance on the size of the recycling area; however the requirements of this pre-requisite do not regulate the recycling area. The guidelines are based on the overall building floor area size only.

The prerequisite also requires providing recycling collection points within common areas. However no guidelines are included. A copy of the Prerequisite has been included in Appendix A.

5.2.2 Innovation and Design - Storage & Collection of Recyclables – 1 Point

Under the Innovation and Design category, projects that achieve exceptional performance can obtain up to 3 credits if the results double the credit requirements above the threshold of an existing credit.

To earn recognition for "exceptional performance", it must be demonstrated that the initiative proposed at least doubles the effectiveness of the original process. In Part 1 of our mandate, although the size of our sampling was relatively small, we concluded that chutes for separate recycling significantly improved the amount of recycling. Our study also established the base using information of collection using the standard single chute systems with and without tri-sorters, however all information will have to be reviewed and approved by a CaGBC team.

The process to obtain approval is through a CIR (Credit Interpretation Requests). CIRs are the process that LEED have put into place to obtain clarification or propose an innovation. Submitting a CIR takes several months to go through the process and obtain a review. To submit a CIR, it has to be submitted on an actual project, and by the main contact for that registered project.

The information required to submit a CIR is:

- Rating system and version
- Credit Category
- Credit or prerequisite number
- Subject
- Summary question
- Context and Arguments (do not include confidential information)

Although the current requirements do not assign a credit specifically for the implementation of a recycling system, we have learned that "Exceptional Performance" was previously obtained using "Double/Triple Chute Waste, Compost and Recycling Systems". Please refer to attached list of Design Strategies used on past LEED Canada for New Construction (NC) in Appendix B. It shows that 2 projects have already been recognized and merit a LEED point for Innovation in Design.

5.3 Existing Buildings – LEED EB:O&M - Several Credits

For existing buildings several pre-requisite and/or credits are applicable regarding reduction of waste as follows:

a) MR-Prerequisite 2 – Solid Waste Management Policy

b) MR-Credit 6 - Solid Waste Management – Waste Stream Audit – 1 Point

c) MR-Credit 7 – Solid Waste Management – On Going Consumables – 50% reduction – The program should include a battery and a toxic waste program diverting at least 80% reduction = 1 Point

d) MR-Credit 7 - Solid Waste Management – On Going Consumables - 95% reduction. The program should include a battery and a toxic waste program diverting at least 80% reduction = 1 Point

e) MR-Credit 8 – Solid Waste Management – Durable Goods - 75% reduction – 1 Point

f) MR-Credit 8 - Additional credit by reducing to 95% as exemplary performance = 1 Point

The materials included under Credits 7 and 8 are

- Paper & Corrugated Cardboard
- Glass
- Plastics
- Metals
- Organic Waste (if a municipal program is available)
- Toner cartridges, batteries, computer equipment and fluorescent lamps.

A copy of all the MR prerequisite and credits has been included in Appendix C.

6. Recommendations - LEED Measures for Recycling

During our building review and data analysis (Part 1) we identified the systems that appear to provide a higher rate of diversion as follows:

a) Dual and potentially triple chute systems,

b) Single chute and floor-to-floor collection.

c) Single chute system with a tri-sorter and lockable doors; the lockable doors appear to decrease the level of contamination,

d) No chute collection system, or closing the chute for existing buildings, no compactor and combined garbage and recycling room.

Measures a) to c) must include a separate recycling room that accommodates larger bins for collection of cardboard and other materials.

In addition we provided several Optimize Waste Diversion options including diagrams showing the chute/intake room layouts.
The Options were as follows:

Option 1 Triple or Higher Disposal Chute Systems – Stream Sorted - Three different layouts suggested.

Option 2 Dual Chute System – Three different layouts, one allowing some floor-to-floor storage.

Option 3 Single Chute System with tri-sorter and lock-out system, to prevent contamination, small refuse room.

Option 4 Single chute with large chute intake rooms for floor to floor recycling. This option was one of the Waste Diversion Strategies recommended in the GENIVAR's Waste Diversion study with the Mayor's Tower Renewal Pilot project

Option 5 No chute system and combined garbage/recycling room in the main floor.

6.1 New Buildings – LEED NC

We recommend that new buildings being certified under LEED NC, could adapt or implement the following measures as applicable to their requirements:

a) Triple or Higher Disposal Chute Systems

b) Dual Chute Systems

c) Single chute with large chute intake rooms for floor to floor recycling. This option was one of the Waste Diversion Strategies recommended in the GENIVAR's Waste Diversion study with the Mayor's Tower Renewal Pilot project. *This option however has not yet been approved under the Innovation Leed Credit.*

For option a) and b) a separate recycling room: The size of the room could follow the recommended sizes presented in Part 1 of our report:

- Carts - One semi-automated 360L cart for each 7 units (approximately 50 litres per unit).

Building Size	Minimum Number of Carts-240L	Minimum Number of Carts-360L
Up to 40 units	9	6
41-100 units	9-21	6-14
101-160 units	21-34	14-23

- Front-end Bins - Recycling room must provide a minimum floor space for bins of 10m² for the first 40 units plus an additional 5m² for each additional 60 units.

Building Size	Minimum Size of Recycling Room Front-end Bins	Minimum Size of Recycling Room Carts
up to 40 units	10 sq m	4.2-6.3 sq m
41-100 units	15 sq m	4.2- 14.7 sq m
101-160 units	20 sq m	14.7-24 sq m
161-220 units	25 sq m	
221-280 units	30 sq m	
281-340 units	40 sq m	

For new buildings, the process will involve the submission of a CIR, in order to qualify for innovation credits. The CIR should be submitted early in the design process by the team, allowing time for feedback from the CAGBC. This interpretation process need to be undertaken once, and should be valid for all future projects going forward which use the same approach.

6.2 Existing Buildings – LEED EB:O&M

All buildings being certified under LEED EB: O&M must have a Solid Waste Management Policy to meet the MR Pre-requisite . *Waste Diversion Ontario may wish to develop a Prototype Policy to be used by multi-family building managers.*

We recommend that existing buildings being certified under LEED EB:O&M, could adapt or implement the following measures as applicable to their requirements.

a) Existing buildings have the opportunity to earn 1 Point by implementing
   - Credit 6 - Solid Waste Management – Waste Stream Audit – 1 Point

b) Existing buildings may have the opportunity to earn up to 4 Points under Credits 7 and Credit 8 by implementing one of the following measures:
   - Single chute system with a tri-sorter and lockable doors.
   - No chute collection system, closing the chute for existing buildings, no compactor and combined garbage and recycling room.
   - A baseline of existing diversion will be required in order to demonstrate the 50% and 95% targets required to obtain the Leed points. From the data in Part 1 of our mandate, this target are reachable.

APPENDIX A

LEED NC- Pre-Requisite 1 – Storage & Collection of Recyclables

	MR
NC	Prerequisite 1
CS	Prerequisite 1

STORAGE AND COLLECTION OF RECYCLABLES

	NC	CS
Prerequisite	MR Prerequisite 1	MR Prerequisite 1
Points	Required	Required

INTENT

To facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

REQUIREMENTS: NC & CS

Provide an easily-accessible dedicated area or areas for the collection and storage of materials for recycling for the entire building. Materials must include, at a minimum, paper, corrugated cardboard, glass, plastics, metals, and, if a municipal collection program is available, organic wastes (including landscaping waste).

INTERPRETATIONS

There are no interpretations for this prerequisite.

APPENDIX B

LEED NC - Innovation in Design

Past Credits

Innovation in Design Strategies used on past LEED Canada for New Construction (NC) or LEED-BC projects

Last Updated: 31 Mar 2011

Number of LEED Canada-NC and LEED-BC projects 215

Concept	Credit	Percentage Attained	No. Achieved	% Achieved
Exceptional Performance	SSc4 - Alternative Transportation		2	1%
	SSc5.1 - Reduced Site Disturbance: Protect or Restore Open Space	74%	2	1%
	SSc5.2 - Reducted Site Disturbance: Development Footprint		3	1%
	SSc6.1 - Stormwater Management: Rate and Quantity		1	0%
	SSc7.1 - Heat Island Effect (Non-Roof)		27	13%
	WEc2 - Innovative Wastewater Technologies	98 - 100%	23	11%
	WEc3 - Water Use Reduction	40 - 80%	147	68%
	EAc1 - Optimize Energy Performance (energy cost savings)	69 - 75%	4	2%
	EAc2 - Renewable Energy		1	0%
	EAc6 - Green Power	100%	40	19%
	MRp1 - Storage and Collection of Recyclables		1	0%
	MRc2 - Construction Waste Management	95 - 100%	12	6%
	MRc3 - Resource Reuse	25%	2	1%
	MRc4 - Recycled Content	22.5 - 45%	44	20%
	MRc5 - Regional Materials	30 - 60%	71	33%
	EQc8.1 - Daylighting	95 - 100%	9	4%
Credits from another Rating System	LEED Canada-CI - EQc4.5: Low Emitting Material: Systems Furniture & Seating		24	11%
	LEED-EB, SSc1.1-Green Site & Building Exterior Mgmt		2	1%
	LEED Canada-EB:O&M, MRc4 Sustainable Purchasing Reduced Mercury in Lamps		9	4%
Green Education Program	--		124	58%
Green Housekeeping	--		120	56%
Innovative Strategies not addressed under LEED	Adaptable/De-constructible Building Systems		3	1%
total = 79	Alternative Rainwater Usage with Tool		1	0%
37%	Beetle Killed Timber and Excavated Clay		1	0%
	Best Management Practices - Protection of Birds		1	0%
	Bio-Digester for Biological Waste Disposal		1	0%
	Bundled Green Initiatives		1	0%
	Carbon Sequestration Project		1	0%
	Closed-loop Woodwaste Management		1	0%
	Comprehensive Transportation Management Plan		2	1%
	Concrete Cores used as ductwork		1	0%
	Connection to Nature / Areas of Respite		1	0%
	Contractor Innovation		1	0%
	Design for Disassembly		1	0%
	Design for Flexibility		1	0%
	Document Sustainable Building Impacts		1	0%
	Embodied Energy		1	0%
	Environmentally Appropriate Exterior Paints and Sealants		1	0%
	Exceptional Employment Equity (Community Development)		1	0%
	Exceptional Performance - Double/Triple Chute Waste, Compost, Recycling		2	1%
	Excluded Energy Savings Measures		1	0%
	Exemplary Tree Protection		2	1%
	Firing Range Hazard Management		1	0%
	Green Loan		1	0%
	Helping Out New Technologies		1	0%
	Indoor Air Biofiltration		2	1%
	Infection Control in Hospitals		1	0%
	Innovation in Project Delivery		1	0%
	Insuite Thermal Metering		3	1%
	Integrated Pest Management Policy		2	1%
	Landscape - Teamed Approach & Living Laboratory		1	0%
	Life Cycle Analysis		1	0%
	Living (biofilter) Wall		1	0%
	Mandatory Tenant Lease Agreement		4	2%
	Marine Habitat Restoration		1	0%
	Market Transformation: Eco-Schools Certification		2	1%
	Market Transformation - Heat Recovery Ventilators for MURBs		1	0%
	Monitoring of Green Roof		1	0%
	Natural / Hybrid Ventilation		1	0%
	Natural ventilation strategy for eliminating mechanical cooling		1	0%
	No Parking & Traffic Demand Study		1	0%
	Occupant Composting Plan		6	3%
	Passive Geothermal		1	0%
	Plant Process Innovation		1	0%
	Pre-Cast Core as Return Air Duct		1	0%
	Process Water Use Reduction		2	1%
	Rainwater Treatment System for Potable Drinking Water		1	0%
	Real Time Energy Monitoring and Display		1	0%
	Re-use of Existing Trees for Finishing Building Products		1	0%
	Site Restoration and Rezoning		1	0%
	Smart Scent Policy		2	1%
	Partenering Green Features with Student Education		2	1%
	Support of a Green Building Enabling Program		1	0%
	Toxic Material Source Reduction		2	1%
	Trillium Plan Relocation and Restoration		1	0%
	Use of Glass - Geothermic Systems		1	0%
	Use of Waste Heat		1	0%
	Water Management Advocacy		1	0%

This list of strategies is meant as a brainstorming tool to assist project teams in the development of new ID credits. It does not set any precedent to be upheld during a LEED Certification Review. Credits can only be granted through the LEED Certification Review process and are based on the quality and comprehensive of a particular project's innovation attempt. For more direction in advance of a LEED Certification Review, customers should utilize the Credit Interpretation Ruling (CIR) procedure.

APPENDIX C

Existing Building – LEED EB:O&M - Credits

SS | WE | EA | MR | EQ | IO | RP

Prerequisite 2

Required

MATERIALS & RESOURCES (MR)

SOLID WASTE MANAGEMENT POLICY

INTENT

Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills or incineration facilities.

REQUIREMENTS

Have in place a solid waste management policy for the building and site addressing the requirements of the waste management credits listed below as well as recycling of all mercury-containing lamps. This policy must adhere to the LEED® Canada for Existing Buildings: O&M policy model (see Introduction).

At a minimum, the policy must cover the waste streams that are within the building and site management's control.

- MR Credit 7: Solid Waste Management – Ongoing Consumables
- MR Credit 8: Solid Waste Management – Durable Goods
- MR Credit 9: Solid Waste Management – Facility Alterations and Additions

This prerequisite requires only policies, not ongoing actual sustainable performance.

POTENTIAL TECHNOLOGIES & STRATEGIES

Evaluate the building's waste stream and establish policies to divert materials from disposal in landfills or incineration facilities by encouraging the reuse and recycling of items, where possible.

SS	WE	EA	MR	EQ	IO	RP

Credit 6

1 Point

MATERIALS & RESOURCES

SOLID WASTE MANAGEMENT: WASTE STREAM AUDIT

INTENT

Facilitate the reduction of ongoing waste and toxins generated by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

REQUIREMENTS

Conduct a waste stream audit of the building's entire ongoing consumables waste stream (not durable goods or construction waste for facilities alterations and additions). Use the audit's results to establish a baseline that identifies the types of waste making up the waste stream and the amounts of each type by weight or volume. Identify opportunities for increased recycling and waste diversion. The audit must be conducted during the performance period.

POTENTIAL TECHNOLOGIES & STRATEGIES

Understanding waste production patterns in a building is an important first step to waste reduction. Work with your waste hauler or service provider to collect and analyze information on the amounts and types of waste generated by the facility.

SS | WE | EA | MR | EQ | IO | RP

Credit 7

1 Point

MATERIALS & RESOURCES

SOLID WASTE MANAGEMENT: ONGOING CONSUMABLES

INTENT

Facilitate the reduction of waste and toxins generated from the use of ongoing consumable products by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

REQUIREMENTS

Maintain a waste reduction and recycling program that addresses materials with a low cost per unit that are regularly used and replaced through the course of business. These materials include, but are not limited to, paper, toner cartridges, glass, plastics, cardboard and old corrugated cardboard, food and packaging waste and metals. Materials that may be considered either ongoing consumables or durable goods (see MR Credit 8) can be counted under either category provided consistency is maintained with MR Credit 8, with no contradictions, exclusions or double-counting. Consistency must also be maintained with MR Credits 1 and 5.

Reuse, recycle or compost 50% of the ongoing consumables waste stream (by weight or volume).

Have a battery recycling and toxic waste management program in place consistent with the policy adopted in MR Prerequisite 2. The program must have a target of diverting at least 80% of discarded batteries and all toxic waste from the trash, and actual diversion performance must be verified at least annually. The program must cover all portable dry-cell types of batteries, including single-use and/or rechargeable batteries used in radios, phones, cameras, computers and other devices or equipment.

Collect and appropriately dispose of all discarded fluorescent lamps used in the building, including those that contain mercury and other hazardous waste.

SS	WE	EA	MR	EQ	IO	RP

Credit 7

1 Point

POTENTIAL TECHNOLOGIES & STRATEGIES

Maintain a waste reduction and recycling program that addresses materials with a low cost per unit that are regularly used and replaced through the course of business. Encourage a high level of recycling by building occupants.

SS	WE	EA	MR	EQ	IO	RP

Credit 8

1 Point

MATERIALS & RESOURCES

SOLID WASTE MANAGEMENT: DURABLE GOODS

INTENT

Facilitate the reduction of waste and toxins generated from the use of durable goods by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

REQUIREMENTS

Maintain a waste reduction, reuse and recycling program that addresses durable goods that are replaced infrequently and/or may require capital program outlays to purchase. Examples include, but are not limited to, office equipment (computers, monitors, copiers, printers, scanners, and fax machines), appliances (refrigerators, dishwashers, and water coolers), external power adapters, televisions and other audiovisual equipment. Materials that may be considered either ongoing consumables (see MR Credit 7) or durable goods can be counted under either category provided consistency is maintained with MR Credit 7, with no contradictions, exclusions or double-counting. Consistency must also be maintained with MR Credit 2.

Reuse or recycle 75% of the durable goods waste stream (by weight, volume or replacement value) during the performance period.

Consistent with the policy developed in MR prerequisite 2, all materials deemed toxic waste or unsuitable for landfill by the local municipality shall be disposed of as required.

POTENTIAL TECHNOLOGIES & STRATEGIES

Maintain a waste reduction, reuse and recycling program that addresses durable items that are replaced infrequently and/or may require capital program outlays to replace. Consider taking part in a leasing or donation program to help maintain waste reduction. In addition to any government run electronic recycling efforts, consider using StEP (http://www.step-initiative.org/) for guidance in disposing of electronic waste or for manufacturer and provider take back options.