

Construction Waste Best Practices Guide

April 2023

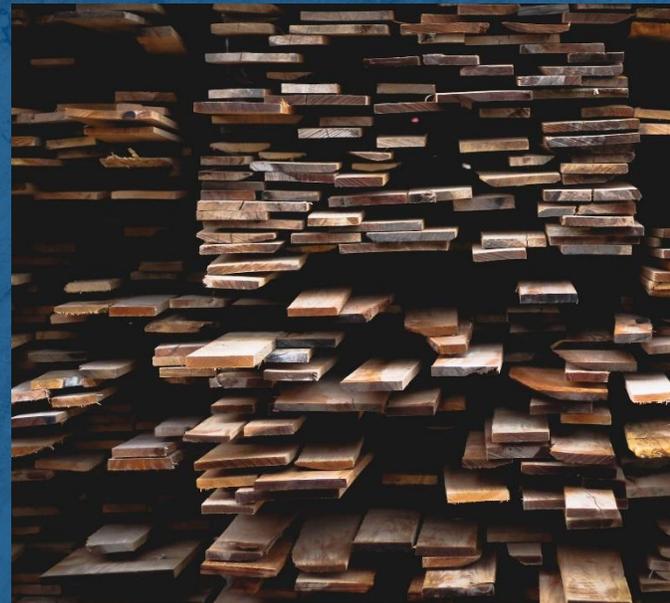




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Synergy Foundation prepared this document for the Regional District of Nanaimo (RDN). Feedback is included from the construction and demolition industry.



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1. OVERVIEW

The Regional District of Nanaimo’s (RDN) 2020 Solid Waste Management Plan establishes a target to divert **90% of the region’s waste away from landfill by 2030**. To achieve this goal, the RDN has updated its Zero Waste Strategy to include the introduction of two critical solid waste bylaws. The Mandatory Waste Source Separation bylaw will require all commercial, institutional and multi-family buildings to sort their waste into three streams: garbage, recycling and organics. The Waste Hauler Licensing bylaw encourages the private waste industry to take part in diversion by making it more profitable to divert materials than to landfill them¹.



This Zero Waste Hierarchy promotes the highest and best uses of materials to support a circular economy.

The RDN’s construction sector is one of the region’s most significant employers, accounting for **9.5% of the labour force**². This robust sector continues to flourish, and with this growth comes pressure on local landfills to absorb the waste generated from construction and demolition activities.

A recent landfill composition study showed that **58% of materials being landfilled can be readily reused, recycled or composted** and many of these materials are from the construction and demolition, commercial and multi-family sectors. In fact, **7% of all commercial waste is from building materials** with another 32% from paper, plastics, glass and metals combined¹.

Reducing building material waste by 50% would equate to 295 garbage trucks of waste and 1,185 tonnes of green house gas (GHG) emissions saved.

The construction and demolition industry has the potential to make a significant impact on the RDN’s waste diversion targets through deconstruction and salvaging practices, material reuse, recycling and procurement.

This guide has been created as a resource to identify upstream and downstream opportunities to reduce waste and improve environmental performance.

Construction at a glance:

| | | | | |
|---|---|---|--|---|
|  |  |  |  |  |
| Goal of 90% waste diversion by 2030 | Employs 9.5% of RDN labour force | 58% of materials can be diverted from landfill | Accounts for 7% of commercial waste | 50% building waste reduction = 1,185 tCO2 avoided |

1 Regional District of Nanaimo, Solid Waste Management Plan Summary, Planning for the Future of Our Waste

2 Statistics Canada, Nanaimo Regional District, Labour Counts

2. THE BUSINESS CASE

The construction industry is under pressure from customers, local government and the workforce to build and operate with a lower environmental impact to enhance sustainability. While proper waste management is one component of a sustainable job site, it represents a huge opportunity for the environment and your business.



Why should you care about implementing more sustainable practices within your company?

- 1 **Reduce your environmental impact** - reducing the waste sent to landfill through deconstruction, structural moving, reuse and recycling will reduce your environmental impact, benefit your community, create local jobs and result in lowered GHG emissions.
- 2 **Position your business as a leader** – make a statement with green practices that go beyond regulations and create a positive brand image and work environment.
- 3 **Attract and retain top talent** – workers are seeking value-aligned employers; in a competitive industry this gives you an edge.
- 4 **Reduce operational costs and recover valuable materials** – only bring materials that are not recyclable to the landfill to receive a reduced tipping rate for waste haulers and avoid surcharges. Receive tax credits from donating recovered materials to charitable organizations.
- 5 **Get ahead of the curve before it becomes required compliance** – many bylaws have come into effect across B.C. to promote deconstruction and waste diversion onsite. Municipalities have also started moving towards more sustainable purchasing practices, requiring a degree of compliance to secure a contract.



3. DECONSTRUCTION AND SALVAGE

If there is an existing structure onsite that needs to be removed, consider deconstruction over demolition. When full deconstruction is not feasible, a salvager can recover a portion of valuable materials before demolition, significantly reducing waste generated and extending the life of these materials.

WHY DECONSTRUCT?



Reduce **4 million tons** of construction, renovation and demolition waste that is generated annually in Canada. Of that, **37% is old growth lumber**⁴.



Salvage valuable materials including old growth lumber, windows, cabinetry, copper piping and appliances.



Divert **95% of material** by volume from landfill. In a typical deconstruction, 70% of materials can be recycled and 25% can be reused⁵.



Receive **federal and provincial tax credits** for materials donated, making deconstruction cost comparative and often more cost effective than demolition.



Retain and attract top talent in a highly competitive industry while supporting local job creation. **For every 1 job created through demolition, 6 are created through deconstruction**⁴.



CREDIT: TECTONICA

Homes built before 1950 are the best candidates for deconstruction as they contain a more significant quantity of high-quality building materials and old growth lumber. **11% of homes in the RDN were built before 1960**⁶.

4 Unbuilders, How it Works
 5 Delta Institute, Deconstruction & Building Material Reuse
 6 Regional District of Nanaimo, Regional Housing Needs Report



CASE STUDY: TECTONICA MANAGEMENT DECONSTRUCTION PROJECT

Based in Nanaimo, Tectonica Management is one of Vancouver Island’s leading construction and project management companies. Tectonica specializes in the development of commercial, educational, government, institutional and residential projects of all sizes.

In 2021, Hirst Avenue Townhouses, in partnership with Tectonica Management, opted to deconstruct rather than demolish the existing structures at the DUO Townhomes construction site **achieving a 94% diversion rate by weight.**

Deconstruction location: Parksville, B.C.
Building type: Three Single Family Homes
Area deconstructed: 6,000 square feet
Age of deconstructed buildings: 1970s
Duration of deconstruction: Three months

| Material Diversion | Weight (kg) | Percentage (%) |
|--------------------|-------------|----------------|
| Reused onsite | 616,132 | 82% |
| Donated for reuse | 10,864 | 1% |
| Recycled | 80,317 | 11% |
| Landfilled | 43,300 | 6% |



CREDIT: TECTONICA

Project Highlights

- ✓ Deconstructed dimensional lumber reused in the new build for concrete forms and back framing
- ✓ Concrete foundation reused onsite as road base
- ✓ Materials donated for reuse included light fixtures, lumber, bricks and offcuts of wood
- ✓ Metals, oil, paint, asphalt roofing shingles and drywall were among the recycled items
- ✓ Construction was able to start onsite while deconstruction was still taking place
- ✓ Trees felled onsite were processed into lumber

In this collaborative deconstruction project, partners including Unbuilders, the Nanaimo Recycling Exchange and John Howard Society were engaged to:



Effectively deconstruct the original buildings



Successfully reuse materials onsite and divert materials to other reuse organizations



Create low-barrier full-time employment opportunities⁷



CREDIT: TECTONICA



4. REUSE

Reusing materials both onsite and offsite can significantly reduce waste, tipping fee expenses and operational costs, all while keeping valuable materials in circulation.

Sites with a sufficient footprint can reuse materials onsite when feasible, which will minimize emissions associated with transportation to another processing site. When the construction site has a restrictive footprint, reuse materials offsite instead of sending them to landfill.

Reuse Opportunities:

| Material | Examples | Opportunity | Where |
|--|---|--|----------------|
| Appliances in working order | Stoves, dryers | Donate to charitable reuse centres for tax credit | Offsite |
| Asphalt, aggregates and concrete | Cinder blocks, concrete, pavement, bricks | Crush for fill or road base | Offsite/Onsite |
| Finishings | Doors, cabinets, hardwood flooring, railings, gates | Refurbish to use in new build | Offsite/Onsite |
| Landscaping debris | Trees, stumps | Chip for mulch for landscaping or biofuel | Offsite/Onsite |
| Large wood beams | Framing, decks | Use in finishings of new build or furniture construction | Offsite/Onsite |
| Lighting and electrical equipment | Products in good working order or rewired | Donate to charitable reuse centres for tax credit | Offsite |
| Plumbing fixtures and fittings | Bathtub, kitchen sinks, faucets | Donate to charitable reuse centres for tax credit, reuse in new builds or sell for reuse | Offsite |
| Windows | Window in good condition | Donate to charitable reuse centres for tax credit | Offsite/Onsite |



CREDIT: STOCK

Adaptive Reuse is the process of reusing an existing building for a purpose other than what it was originally built or designed for. This can include structural moving from one location to another.

A **1,600 sq. ft.** home represents about **60 trees worth of lumber** and each discarded home adds 60-80 tons of building waste to landfills⁸!

5. RECYCLING

Setting up a recycling station to divert waste from your local landfill is a great step in your sustainability journey! **Waste diversion can reduce disposal costs by up to 30%**⁹, yet most construction sites still use a single-bin system, sending over 90% of waste generated to the landfill.

By setting up a recycling station with clear signage at each site and a dedicated green lead team member, your organization can cut costs and recycle more than 50% of waste.

In a study conducted by researchers at the University of British Columbia, placing a recycling station 1.5 metres away from a point of entry or exit can **drastically boost recycling and composting rates by 141%**¹⁰.



CREDIT: SEA TO SKY REMOVAL

CASE STUDY: IMPACTS OF RECYCLING

The construction of a 2,000 sq. ft. home will **generate approximately 17,500 kg of waste**. With no diversion program in place, all of that waste, equal in weight to eight full-sized F-150's, will go to the landfill. The climate impact of that waste is **eight tonnes of greenhouse gas emissions**.

With a comprehensive recycling system in place, **you can divert up to 82% of that construction waste from landfill**. This would reduce the amount of non-divertible waste to 3,181 kg and **reduce GHG emissions by 6.4 tonnes**, equal to taking two cars off the road for an entire year!



Download the app **What Goes Where?** to search for where to dispose of items.



A list of recycling depots can be found in the **Resources** section of this guide.



9 Sea to Sky Removal, Recycling Toolkit

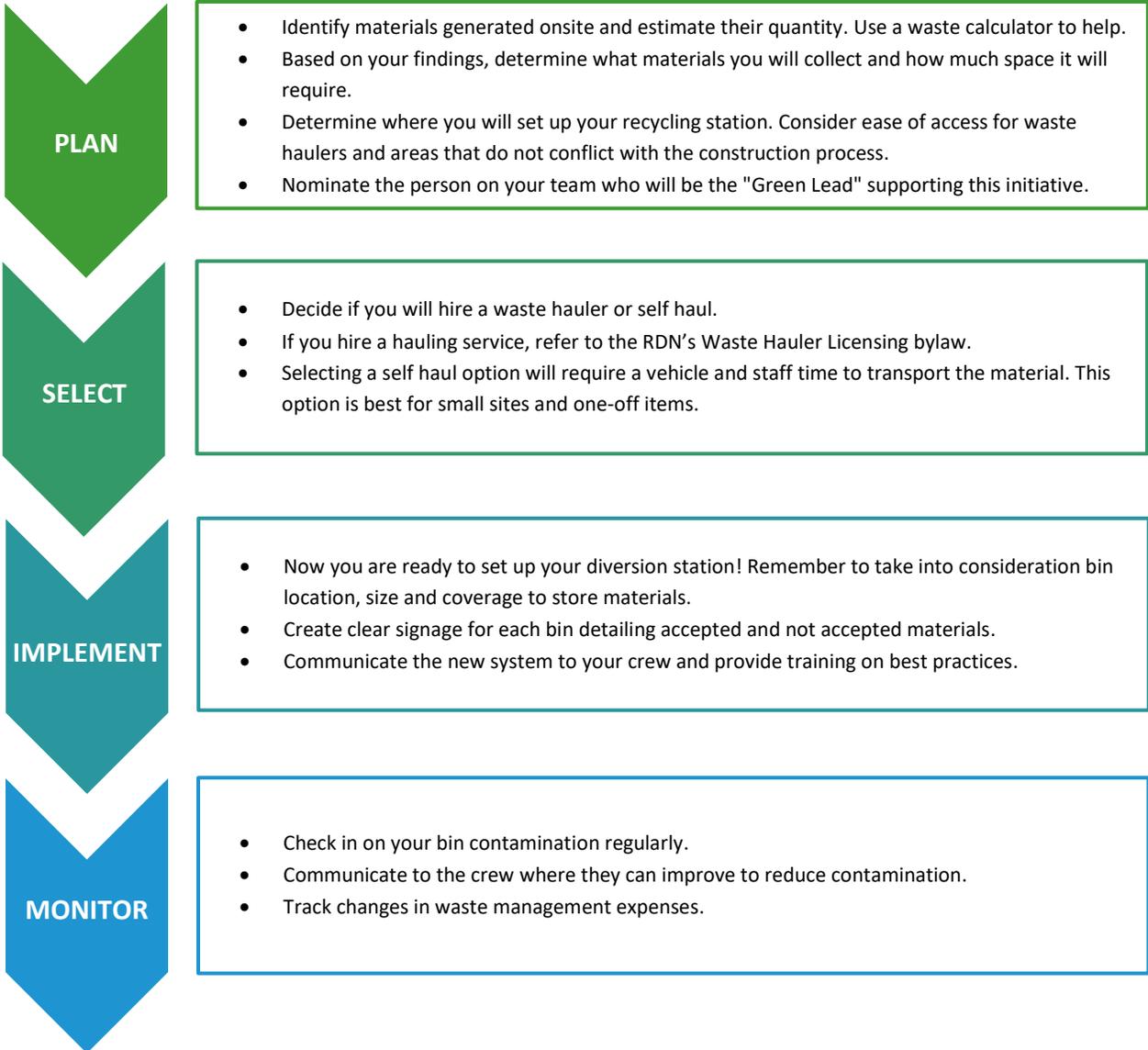
10 Alessandra DiGiacomo, Convenience improves composting and recycling rates in high-density residential builds



HOW TO SET UP A RECYCLING STATION

There are several considerations to keep in mind when setting up your recycling station that will impact the success of your program. These include the materials you will recycle, how you will haul materials from the site, where and how the station will be set up and how you will engage your crew and other sub-contractors working on the site to participate in the recycling program!

There are four key steps to set up a successful recycling station:



Add these bullet points in job descriptions to empower Green Leaders!

Use the **waste calculator** created by Light House to help in your planning stage



Scan to access



RECYCLING THE ESSENTIALS

Plastic

- ✓ Hard plastic
- ✓ Soft plastic
- ✓ Styrofoam
- ✗ Dirty or contaminated
- ✗ Tape
- ✗ PVC or ABS pipe

Cardboard

- ✓ All types of cardboard and paper
- ✗ Dirty or contaminated

Metal

- ✓ Nails, steel studs, piping
- ✓ Broken tools
- ✓ Aluminum siding
- ✓ Pop cans
- ✓ Banding
- ✓ Wires
- ✓ Rebar
- ✓ Window frames

RECYCLING OTHER ITEMS

| Material | Items and Considerations |
|--|--|
| Appliances (not suitable for reuse) | Dishwasher, laundry dryer, stove, washing machine |
| Asphalt | Asphalt roofing and pavement |
| Concrete/Stone | Concrete with rebar can be recycled at select locations, see resources below |
| Drywall | Testing and appointments may be required, see resources below |
| Insulation | Blown in, batt, rigid |
| Metal | Window frames, screens, doorknobs and handles |
| Shingles | Metal/asphalt/untreated cedar shingles can be recycled |





6. MATERIAL SELECTION

Bringing sustainability to the forefront during the design and material selection can reduce waste before it is generated, cutting it off at the source.

This is a multi-stakeholder conversation to be had with the client, general contractor, architects, engineers and interior designers involved in the project. From simple actions like paint selection to bigger undertakings like designing for disassembly, there are conscious environmental decisions that you can make regardless of where you are in your sustainability journey.

DESIGN FOR DISASSEMBLY

Considering the structure’s end-of-life during the design phase has become more common for both residential and commercial construction projects through a process called “Design for Disassembly” (DfD). DfD evaluates all building components including structural elements, finishing products and mechanical, electrical and plumbing systems. DfD also acknowledges ease of renovation and reparability of materials throughout the structure’s life, which provides significant cost benefits to the owners and operators of these buildings.

The goals of DfD strategies are to:

- 1 Streamline the deconstruction process
- 2 Reduce time and cost associated with deconstruction
- 3 Allow for maximum recovery of materials¹¹

The DfD strategies consider:

-  Material Selection
-  Fasteners and Connection Points
-  Assembly Design



Mass timber construction has been noted as a potentially advantageous material in DfD as it can “match or exceed the structural performance of concrete and steel while **reducing carbon emissions by as much as 45%**”¹².

11 Hoda Abuzied, A review of advances in design for disassembly with active disassembly applications
 12 B.C.’s Mass Timber Action Plan, 2022



A DESIGN FOR DISASSEMBLY CHECKLIST

This sample checklist was developed by Light House Sustainability Society for BC Housing Society and cited in Appendix B in the Design for Disassembly for Residential Construction report¹³.

Appendix B – Sample DfD Checklist

Project Name:

Instructions COMPLETE THE *Design Service Life for Building* FIRST. Mark the check box where the building has the criteria described, otherwise leave check box blank.

| Category | Criteria | Threshold to Meet | Threshold Achieved |
|--|---|-------------------|--------------------------|
| Design Service Life for Building | Temporary | Up to 10 years | <input type="checkbox"/> |
| | Medium Life | 25 - 49 years | <input type="checkbox"/> |
| | Long Life | 50 - 99 years | <input type="checkbox"/> |
| | Permanent | 100 years + | <input type="checkbox"/> |
| Durability, Flexibility & Adaptability | Do all elements of the structure selected have a service life equal or greater than: | 50 - 99 years | <input type="checkbox"/> |
| | Do all elements of the building envelope selected have a service life equal or greater than: | 50 - 99 years | <input type="checkbox"/> |
| | Are the interior finishes durable, maintainable and easily removable without damaging other building elements? | Yes/No | <input type="checkbox"/> |
| | Can the mechanical, electrical and plumbing systems be accessed and replaced without damaging other building elements? | Yes/No | <input type="checkbox"/> |
| | Are all building elements with a shorter service life easily replaceable? | Yes/No | <input type="checkbox"/> |
| | Is the building interior easily reconfigurable for different uses? | Yes/No | <input type="checkbox"/> |
| Material Fastenings | Have the number of fastenings been minimized? | Yes/No | <input type="checkbox"/> |
| | Are fastenings mechanical? | Yes/No | <input type="checkbox"/> |
| | Are fastenings accessible? | Yes/No | <input type="checkbox"/> |
| | Can standard tools be used to unfasten? | Yes/No | <input type="checkbox"/> |
| Closed Loop | > 50% of the building materials have recycled content? | Yes/No | <input type="checkbox"/> |
| | > 10% of the building materials are salvaged? | Yes/No | <input type="checkbox"/> |
| | >75% of building elements are reusable or recyclable? | Yes/No | <input type="checkbox"/> |



CASE STUDY: DESIGN FOR DISASSEMBLY

Nexii Building Solutions is a Vancouver-based sustainable building solutions company. Nexii is the proprietor of Nexiite fire-resistant building panels that are more thermally efficient and less carbon intensive than concrete. Nexii’s building system uses panels that are manufactured to design specs, assist in near-zero onsite construction waste and are designed for disassembly.

In 2021, Nexii completed a deconstruction case study to assess the waste and embodied carbon impacts.

Deconstruction location: Squamish, B.C.
Building size: 700 square feet
Disassembly duration: Six days
Reassembly location: Salt Spring Island, B.C.

| Material Diversion | Weight (kg) | Percentage (%) |
|--------------------|-------------|----------------|
| Reused | 34,084 | 99.83% |
| Recycled | 36 | 0.11% |
| Landfilled | 21 | 0.06% |



Community benefits included:

- 1 Reinvested money in local labor force instead of new materials
- 2 Reduced noise levels and airborne contaminants from demolition
- 3 Minimized site disturbance, including soil compaction, erosion and vegetation disturbance¹⁴

Materials sent to landfill consist of sealant that was scraped from the modular panels and other miscellaneous items that could not be recycled.

 [Read more about the Case Study here](#)



CRADLE TO CRADLE CERTIFIED® PRODUCTS PROGRAM



Cradle to Cradle Certified® Products Program is a globally recognized certification for products that are **safe**, **circular** and **responsibly made**.

Cradle to Cradle Certified® assesses materials and products across five categories of sustainability performance including material health, product circularity, clean air and climate protection, water and soil stewardship and social fairness.

Cradle to Cradle Certified® is also recognized in the USGBC WELL Building Standard and LEED Certifications. There are hundreds of certified products available for the construction industry from building exteriors to insulation, plumbing, paint and more. You can view all certified products through their product registry online at c2ccertified.org/products/registry.

Check out these Cradle to Cradle Certified® products for some inspiration!



Available at major retailers across Canada, **Graphenstone** is a range of lime-based paints and fillers. They leverage the breathability, antibacterial, antifungal and insect repellent properties of lime and designed for enhanced flexibility, hardness and thermal conductivity through the use of graphene.

Accoya® wood is a high-performance acetylated wood building material designed for outdoor use and challenging applications. Their product line includes doors, decking, siding and more.



A global leader in sustainability, **Interface®** has a wide range of carpet tile products and resilient flooring designed for commercial use. Products are designed to be disassembled at their end of life and can be returned via their ReEntry™ program to be recycled into new products.



7. RESOURCES

DIRECTORY OF SERVICES, FACILITIES & DEPOTS

| Organization | Location | Circular Services |
|------------------------------------|--|--|
| ABC Recycling | 750-C Jackson Rd, Nanaimo | Recycling - structural steel, equipment parts, non-ferrous metals, large appliances |
| Brod Demolition | Nanaimo | Reuse – deconstruction and salvage company |
| Cascades Recycling Station | 800 Maughan Rd, Nanaimo | Recycling – cardboard, paper, plastics. Offer small bin (32, 64, 96 gal) pickup service |
| Convertus Group | 981 Maughan Rd, Nanaimo | Recycling - organic waste, lawn clippings, scrap wood |
| DBL Disposal Services | 333 Tenth St, Nanaimo 911 Church Rd, Parksville | Recycling + Disposal Bins - construction materials, drywall, roofing, metal |
| Demxx Deconstruction Inc. | 1688 Alberni Hwy, Coombs | Reuse – used building materials |
| GFL | 9401 Trans-Canada Hwy, Chemainus 2250 McGarrigle Rd, Nanaimo (transfer stn) | Recycling + Hauling – gypsum, wood waste, plastics, metal |
| GRT | 769 Dalholt Rd, Nanaimo | Recycling – contaminated/excess soils, mud, dredge recycled to make construction aggregates |
| HL Demolition & Waste management | 4481 Markham St, Victoria | Reuse – structural moving, green demolition |
| Island Pallet Solutions Ltd | 190 Front St, Nanaimo | Reuse - shipping pallets |
| Milner recycling | 4299 Biggs Rd, Nanaimo 1985 Island Diesel Way, Nanaimo | Recycling + Disposal Bins – gypsum, metal, concrete, asphalt roofing, wood, organics, plastics |
| Nanaimo Regional Landfill | 1105 Cedar Rd, Nanaimo 860 Church Rd, Parksville (transfer station) | Recycling - metal, wood waste, corrugated cardboard |
| Nanaimo Regional Landfill – Gypsum | 860 Church Rd, Parksville | Disposal Guidelines - gypsum |
| Nickel Brothers | 1990 Balsam Rd, Nanaimo | Reuse – structural moving |
| Parksville Bottle Depot | 611A Alberni Hwy, Parksville | Recycling – electronics, appliances, cardboard, scrap metal |
| Regional Recycling | 2375 Hayes Rd & 839 Old Victoria Rd, Nanaimo | Recycling - scrap metal and electronics |
| ReStore | #1 – 4128 Mostar Rd, Nanaimo | Donation and Reuse – new and used building materials, cabinets, furnishings, lighting, hardware |
| Trash2Go | #5 – 4286 Departure Bay Rd, Nanaimo | Recycling + Waste Hauling – residential furniture, commercial cabinetry, flooring, roofing, electronics, appliances |
| Unbuilders | 8729 Aisne St, Vancouver | Reuse - deconstruction and salvage company |



EDUCATIONAL RESOURCES

Below are resources to learn more about the circular economy including courses, industry groups and reports.

| Educational Organization | Overview | Details |
|------------------------------------|---|--|
| BC Institute of Technology (BCIT) | Deconstruction management – Skills to manage deconstruction in a way that realizes highest social, environmental and eco benefit | Duration: Four weeks Fees apply |
| Build Reuse | Informational videos and resources about deconstruction | Free resources, available online |
| Built Green | Built Green® Program Fundamentals to help participants built sustainably built, third-party certified homes | Fees apply |
| Circular Economy Leadership Canada | Circular Built Environment event series and additional resources | Free resources available online |
| Coast Waste Management Association | Construction & Demolition Waste Working Group: Group meets every two months on specific topics related to construction and demolition waste diversion, from policy to new innovations | Free to participate. Other events, networking opportunities and educational resources available. |
| edX | Designing homes with reduced energy use and environmental impacts | Duration: 13 weeks Fees apply |
| Lighthouse | Construction waste calculator helps estimate waste generated for the construction project | Free resource |
| The Reuse People | Deconstruction Worker Certification | Duration: 14 days Fees apply |



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