

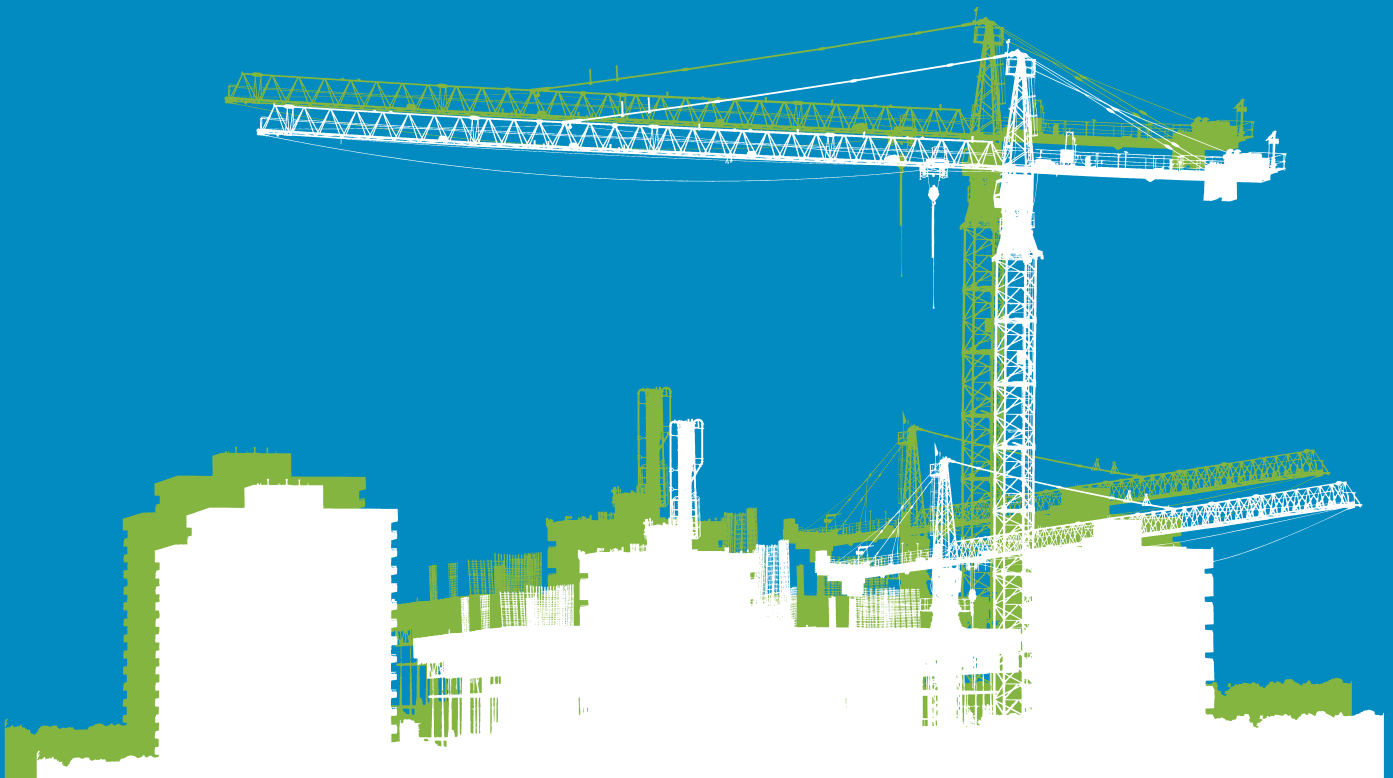


RECYCLE COLORADO

2023

COLORADO CONSTRUCTION, DEMOLITION & DECONSTRUCTION

POLICY TOOLKIT



Background

The Construction, Demolition & Deconstruction Policy Toolkit was developed by members of Recycle Colorado’s C&D Council, a group of industry stakeholders including public, private, and nonprofit sector entities working to support construction, demolition and deconstruction (C&D) materials recovery in Colorado.

The toolkit can assist local government staff and policymakers in developing diversion programs for the built environment which significantly contributes to climate and zero waste planning efforts. The toolkit provides a step-by-step process to develop policies to manage C&D materials - from research through policy development, program implementation and ongoing management.

The C&D Council adapted and credits the CalRecycle [“Developing a C&D Ordinance”](#) guide for informing this toolkit. We expanded to include content, learnings and various approaches from Colorado communities with existing waste diversion programs. Our vision is that C&D material waste reduction, recycling and reuse be promoted as a standard best practice across the state which will create new infrastructure opportunities and end market investments.

Thank you to our project contributors:

- Ryan Call, EcoCycle
- Winn Cowman, Yampa Valley Sustainability Council
- Tessa Dieter, City of Fort Collins
- Mellik Gorton, Colorado Department of Public Health & Environment
- Allie Flynn, High Country Conservation Center
- Emily Freeman, City of Boulder
- Amelia Kovacs, Walking Mountains Science Center
- Caitlin Haselbalg Long, City of Lakewood
- Anna Perks, Perks Deconstruction,
- Michael Port, Pitkin County Solid Waste Center
- Kathryn Slaughter, VertSites LLC
- Jonathan Wachtel, City of Lakewood
- Emily Wilson, GreenSheen



About Recycle Colorado



Recycle Colorado is a 501(c)(3) statewide nonprofit advancing circular economies and improving recycling across the state of Colorado.

Its members share a vision to transform Colorado into a national leader in waste reduction, recovery, and diversion, with the goal to ensure more than 50-percent of Colorado's current waste stream is diverted to reuse/remanufacturing or compost by advancing infrastructure, end markets and policies in waste reduction, recovery and diversion.

Visit their website for more information (www.recyclecolorado.org).

Our membership includes:

- 55% Private businesses
- 25% Local governments
- 13% Non-Profit entities

Table of Contents

Background	1
About Recycle Colorado	2
Table of Contents	3
Introduction	4
Why C&D?	5
Step 1: Know Your Waste Stream	6
Assessing Waste Composition	6
Local Construction Trends - Project Types	8
Non-Permitted Projects	8
Step 2: Know Your Infrastructure	10
Step 3: Policy Framework	12
Policy Goals	12
Regulated Project Types	12
Ordinance Incentive Structures	12
Deposit-Refund	13
Material Recycling Requirements	14
Other Incentive Types	15
Non-Enforceable Diversion Policy	15
Step 4: Ordinance Planning and Implementation	16
Initial Planning Process	16
Ordinance Implementation	20
Encouraging and Enforcing Compliance	20
Material Tracking Systems	21
Methods to Encourage C&D Diversion	22
C&D Waste Management Plan	22
Education and Outreach Activities	22
Staff Training	22
Educational Outreach	23

Table of Contents

Specifications	24
CalRecycle Specifications	24
King County in Washington State	25
Triangle J Council of Governments in North Carolina	25
Step 5: Other Policy Considerations	25
Green Building and Sustainable Materials Management	25
Green Building	25
Green Building Resources	26
Green Building Certification Bodies	26
Sustainable Materials Management	26
Environmental Hazards and Environmental Justice	28
Environmental Hazards - Asbestos, Lead Paint, Mold	28
Impact Mitigation, Environmental Justice and Variances	29
Conclusion	30
Appendix	31
A. Definitions	31
B. Model Ordinances	32
Deconstruction Ordinances	32
C. Other Resources	33
EPA Data	33
Colorado C&D Research	33
Colorado Waste Diversion Grants	33
National Associations	33
D. Existing C&D and Deconstruction Policies in Colorado	34

Introduction



Photo source: [Unsplash](#)

Construction and demolition (“C&D”) materials make up approximately 25% of the total solid waste generated in the State of Colorado.¹ Common C&D materials include concrete, asphalt, lumber, metal, gypsum wallboard, roofing products and others that are generated from residential, commercial, institutional, industrial and infrastructure projects. Unlike peer states considered to be environmental leaders, Colorado does not have state-level policies encouraging C&D recovery. However, municipalities from the Front Range to our mountain communities are beginning to tackle this issue at the local level, and state grant programs have prioritized projects focused on C&D materials.

Policies targeting C&D materials recovery can take a variety of forms but they can be broadly categorized as general **C&D ordinances (requiring recycling for multiple types of construction and demolition projects)** and **deconstruction ordinances (requiring the careful disassembly of structures instead of traditional demolition practices)**. Ordinances are formal, publicly adopted laws that give a jurisdiction enforcement authority for the diversion activities required in the ordinance.

As with any recycling policy development, **it is important to understand the local context including available recycling infrastructure, end markets and the characteristics of the C&D materials being generated in the jurisdiction.** This toolkit draws from the first-hand experience of several Colorado communities that enacted C&D diversion and deconstruction ordinances. The following sections provide a step-by-step guide for evaluating local C&D waste generation through the policy development process and include other links and resources related to C&D materials.

¹ Colorado Integrated Solid Waste & Materials Management Plan, 2016.

Why C&D?



Communities focus on keeping C&D materials out of landfills to reap multiple benefits, often as part of broader climate action and sustainability goals.

EPA's free, downloadable [Waste Reduction Model \(WARM\)](#) calculates the greenhouse gas savings of sixty different types of recyclable materials, including C&D materials. This tool can help municipalities measure and achieve its climate targets.



Economic Benefits

- Selective deconstruction is cost competitive with demolition.
 - It is oftentimes cleaner and easier to remove a cabinet for reuse than to break it into small pieces with a sledgehammer and landfill it.



Summit County Resource Allocation Park: pallet and concrete sorting pads. VertSites 2023.

- Full structure deconstruction has a greater upfront cost than traditional mechanical demolition. Using building material appraisers and donations of the building materials to nonprofit reuse organizations, property owners can offset the initial cost through tax deductions. In some cases, it may make the most sense to cherry-pick the higher-value items via selective deconstruction and then bulldoze the building.
- Materials from projects can be sold by the building owner.
- Contractors can save money on landfill roll-offs.
- According to the EPA's [2020 Recycling Economic Information Report](#), 1.17 jobs are supported for every 1,000 tons of materials recycled.



Environmental Benefits

- Less material disposed of through landfilling and incineration.
- Maintain embodied energy - Building materials are energy intensive to produce. For example, cement production is one of the largest industrial sources of CO2 emissions in the world, and recycling reduces the need for virgin material.
- Avoid production of new materials and associated greenhouse gasses and resource consumption.
- According to Boulder County's "[Deconstruction and Recycling](#)" publication the average 2,500 square foot home contains 41 mature trees and recycling this lumber saves the energy equivalent to 256 gallons of gasoline.



Social Benefits

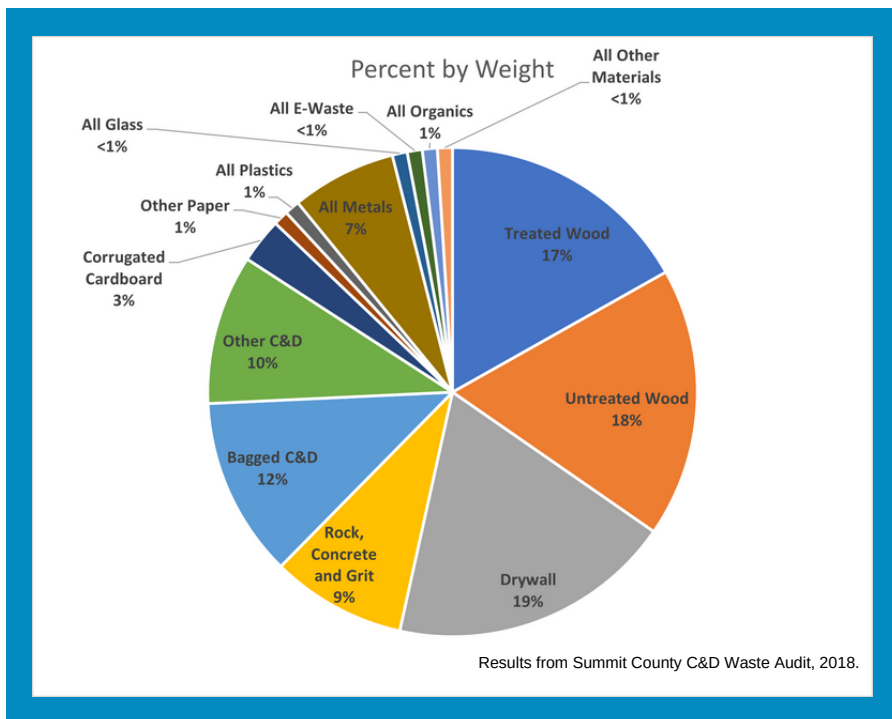
- Historic preservation - Deconstructing historic buildings retains the cultural value of the materials used to build them.
- Workforce development and green sustainable jobs (taking things apart is a great way to learn how to build).
- A larger supply of affordable building materials for resale.

Step 1: Know Your Waste Stream

Assessing Waste Composition

The first step in developing a policy targeting C&D debris is to identify the types and quantities of projects in the area that generate C&D material, and how that material is currently being managed. The answers will bring focus and allow the policy to target projects generating the most and most easily divertible building materials.

Follow these steps to assess the current waste stream:



1 Review Existing Data

Review the most recent waste composition study for the local landfill, transfer station or other waste management facilities. If unavailable, consider funding² a waste composition study. Ideally, execute the study during peak construction season, which may vary by region.

² Two state grant programs, the [Front Range Waste Diversion](#) enterprise fund (FRWD) and [Recycling Resource Economic Opportunity](#) program (RREO) offer funding for C&D waste diversion projects.

2 Identify C&D materials able to be recycled or recovered with current operating systems

Acquire data for materials that are being diverted to other processors for recycling or recovery, and if those markets will be available indefinitely. For example, in Summit County, Peak Materials (a local, private business) accepts concrete, asphalt, dirt, and other aggregates for environmental reclamation projects, as well as for repurposing and selling to the public. However, the backfilling operation is expected to be complete by 2028-2029, so the Summit County Resource Allocation Park must be prepared to accept more concrete, asphalt, and other aggregates at that time.



Multi-family home construction project in Frisco, CO. VertSites 2023.

Additional Resources

EPA. Estimating 2003 Building Related Construction and Demolition Materials Amounts.

EPA. 1998 Characterization of Building-Related C&D Debris in the United States.

3 Work with local contractors and materials processors/recyclers to:

1. Identify materials already being recycled or recovered. Note where each material type is being recycled or recovered, if not at the local landfill or MRF.
2. Identify which materials have the highest diversion potential.
3. To gather this information, consider distributing a survey to contractors and offering an incentive for the completion of the survey.
 - a. High Country Conservation Center worked with the Summit County Builders Association to gather data from local contractors in 2022, which helped influence their 5-Year C&D Plan.

Local Construction Trends - Project Types

It is also beneficial to understand local construction trends to determine the main sources of C&D waste. Working with the local Community Development and/or Building Department can help answer the following questions:

1. What types of projects (and what percentage of each) are occurring in the area:
 - 1) large commercial/industrial buildings, 2) new residential construction (including multifamily complexes), or 3) remodels/alterations?
2. What kinds of projects (e.g., based on square footage (s.f.), dollar value, or types of waste material generated) are most frequently permitted in the jurisdiction?
3. Is the waste generated from these projects typically diverted, or is it being disposed of in a landfill?

Knowing the predominant types of construction projects will help determine which to target in a policy and the adequacy of existing infrastructure for handling the C&D debris generated from those projects. For example, it is assumed that the vast majority of debris is generated from demolitions, while the remainder comes from new construction and renovations, yet it is often easier to divert demolition debris if it consists of large amounts of asphalt or concrete.

Non-Permitted Projects

In some jurisdictions, most C&D waste is related to small residential projects that may not require a permit. If that is the case, while individual projects may be small, the cumulative impact on the jurisdiction's total annual disposal rate may be significant. This is a reason to still consider an effort to encourage or require the diversion of this material.

For other jurisdictions, small projects like home remodels produce less significant tonnage when compared to larger building removal projects, but these projects are still included in the jurisdiction's overall policy.

Other jurisdictions have opted to not target small generators in the C&D diversion ordinances, but instead encourage them to divert C&D waste material by:

- Providing a list of C&D recyclers in the area
- Providing educational materials on C&D diversion
- Requesting the project divert at least 50-percent of C&D materials
- Offering free pickup of these materials

Non-Permitted Projects Cont.

Landfill vs. Recycling Tipping Fees

Disposal pricing is another mechanism to encourage C&D diversion. **Prices can be structured at waste management facilities to discount source-separated recyclable or reusable materials compared to landfill trash rates.** This is often possible in communities with publicly owned and operated facilities that have co-located landfill and waste diversion programs and more control over pricing. This can be an effective incentive for all C&D waste generators, not just those covered by an ordinance or other policy. Pricing is a challenge for any waste diversion in the state as Colorado has landfill tipping fees lower than the US average.³

Eagle County Solid Waste and Recycling, Glenwood Springs's South Canyon Landfill, and the Pitkin County Waste Center all use this strategy.



Pitkin County Landfill: Pallet sorting pad. VertSites 2023.

³ <https://www.statista.com/statistics/692063/cost-to-landfill-municipal-solid-waste-by-us-region/>

Step 2: Know Your Infrastructure

Central to the success of any C&D policy is having adequate recycling facilities and knowing if the facilities and markets have the capacity to handle the amount and types of materials the policy intends to target.

Colorado has readily available end markets for concrete, asphalt, scrap metal, cardboard, glass, paint and untreated wood. Thus diversion of these materials is readily accessible. Reusable materials like appliances, cabinets, windows, and doors are typically diverted through nonprofit organizations, but more end markets are needed.

Conversely, Colorado currently lacks adequate C&D recycling facilities and access to end markets for materials like drywall, asphalt shingles and engineered wood products, that are typically diverted in other states



Photo source: Unsplash

Once the jurisdiction's C&D recycling facilities are identified, consider "certifying" which of the facilities are known to divert at least the minimum percentage or type of C&D materials that are required for separation. Some jurisdictions in other states have developed a process for certifying recycling facilities that handle C&D material. No municipality in Colorado certifies C&D recycling facilities, but this requirement could be part of a more comprehensive future policy.

Step 2: Know Your Infrastructure Cont.

In other states, during the certification process, a jurisdiction verifies the diversion rate at a particular facility. If the facility meets certain criteria, like meeting the diversion rate or rates required in the jurisdiction's ordinance, the facility will be added to the jurisdiction's "certified facilities" list.

A certified facilities list can facilitate compliance with the ordinance by allowing contractors to simply verify they took C&D materials to one or more of those facilities instead of having to produce individual weight tickets from the various facilities used. Such a list should be included in the educational material for contractors about how to comply with the ordinance.

Boulder County provides a C&D Recycling Resources [list](#) of facilities that can process C&D materials. The City of Fort Collins also offers a similar [list](#). The Pitkin County landfill diverts C&D materials and provides a list of accepted items on its [website](#); (See Education & Outreach for more information).



Photo source: Canva

C&D Material Recovery Facilities (MRFs)

In other states with more advanced C&D recovery ecosystems, C&D MRFs are common. These facilities accept single-stream materials and separate them into recyclable fractions, usually through a partially manual and automated process, **with the ability to recover over 50% of incoming material**. For example, California's 65% C&D diversion goal must be met by C&D MRFs to ensure local governments stay in compliance.

Single-stream disposal can remove barriers to job site recycling by making it more convenient and reducing the number of hauls required to get material off-site. However, **source separation improves diversion potential and reduces contamination**, resulting in higher quality materials. Source-separating does require additional logistics and space that complicates a job site diversion program, so a potential opportunity for market development in this space is devising new ways to optimize source-separation

Step 3: Policy Framework

Policy Goals

Policies for C&D materials recovery are often a part of communities' broader climate, sustainability and waste diversion strategies that promote triple bottom line benefits (outlined in section "Why C&D?"). All of the ordinances in Colorado set minimum waste diversion goals for projects and include a list of C&D materials that are required for separation from trash. Policies begin to differ in the types of projects they target and the enforcement mechanisms utilized.

Regulated Project Types

Policies for C&D materials recovery can take a variety of forms but they can be broadly categorized as general C&D ordinances that have requirements for new construction, remodel/renovation, and demolition or deconstruction ordinances that specifically target demolition.

Demolition is usually the largest source of C&D materials, so deconstruction ordinances are a popular option for improving C&D management. Deconstruction, in contrast to traditional demolition, is the process of dismantling a structure to maximize the recovery of reusable material. It also has the potential to create stable jobs with low training thresholds, close the consumption loop of building materials, foster community connections, and contribute to more sustainable construction practices.

While demolition is usually the largest source of waste, a jurisdiction can also choose a more general C&D ordinance that regulates new construction and remodels as well since there is still diversion potential from these project types. This decision will be shaped by knowing the local waste stream and construction trends.

Ordinance Incentive Structures

Incentives like refundable deposits, fines and/or tying compliance to a final certificate of occupancy are linked to the specific waste diversion requirements projects must meet under an ordinance.

Ordinance Incentive Structures Cont.

Deposit-Refund

A deposit-refund system is a policy tool where projects are required to submit a deposit based on factors like square footage or estimated waste in order to obtain a permit. The deposit is potentially fully refundable if the waste diversion requirements are met. An advantage of a deposit-refund system is tying waste diversion requirements to the building permit process. This lends legitimacy to the requirements and helps ensure data reporting.

The **City of Boulder** requires projects to create a sustainable deconstruction plan prior to applying for a demolition permit and submit a refundable deconstruction deposit of \$1 per square foot of the structure, with a \$1,500 minimum. Projects must divert a minimum of three building material types and 75% of the materials generated from deconstruction projects, by weight, from the landfill, including concrete and asphalt. Upon project completion, permittees submit weight tickets and a diversion report to demonstrate the requirements were met. If 75% or more and three materials types were diverted, the project will receive a full deposit refund. If a lower percentage or less than three materials were diverted, a portion of the deposit will be returned.

Pitkin County has a deposit-refund system requiring a minimum 35% diversion rate on all projects and separation of select materials. Projects pay a deposit of \$1000 per ton of estimated trash which allows projects to reduce the deposit amount if they aim for a higher diversion goal. Projects track their materials in Green Halo and must submit their data to apply for a refund and be eligible for a final building inspection.



Pitkin County Landfill: asphalt & concrete sorting pads. VertSites 2023.

Ordinance Incentive Structures Cont.

The City of Lakewood established Sustainable Development Standards in its Zoning Ordinance to address C&D waste. Projects in Lakewood are required to pay a deposit of \$1/square foot for new construction over 2,500 square feet. and all demolitions with a specific list of materials that are required to be recycled or repurposed.

Material Recycling Requirements

Another approach is requiring the separation of commonly recyclable materials with evidence submitted through receipts/weight tickets at the end of a project. Jurisdictions may impose fines if a project is found to be out of compliance.

Fort Collins requires the separation of select materials depending on the project type. Remodels and additions over 2,500 square feet, and all new construction, must recycle the following materials:

- Asphalt, concrete, and masonry
- Metal
- Wood
- Cardboard

All demolition projects, excluding non-structural demolitions under 1,000 square feet must recycle:

- Asphalt, concrete masonry
- Metal
- When possible, all remaining materials such as doors, windows, cabinets, fixtures, and wood

The City of Lakewood established Sustainable Development Standards in its Zoning Ordinance to address C&D waste. Projects in Lakewood are required to pay a deposit of \$1/square foot for new construction over 2,500 square feet. and all demolitions with a specific list of materials that are required to be recycled or repurposed.

- Concrete
- Asphalt
- Untreated wood
- Metal
- Cardboard

Ordinance Incentive Structures Cont.

Demolition projects (regardless of size) must recycle:

- Concrete
- Asphalt
- Metal
- Where possible, all remaining materials, such as doors, windows, cabinets, and fixtures

The City & County of Denver's Waste No More Ordinance will require all construction and demolition activities subject to city permit to separate and recycle a specific list of materials to be defined by the Rules and Regulations. All parties seeking a demolition permit must also have a recycling and reuse plan approved by the city prior to the issuance of the demolition permit. The City and County of Denver is working with a Task Force of stakeholders to further develop the timeline of implementation and enforcement details.

Other Incentive Types

Eagle County's Solid Waste and Recycling facility runs a pilot program to divert concrete, asphalt and clean lumber from the landfill. Projects are incentivized to pay cheaper tipping fees by source-separating recoverable materials from trash. These options are marketed to contractors and other waste generators disposing of material at the facility, but no specific requirements are in place in local communities.

Boulder County requires that demolition permit holders create a waste diversion plan and submit waste documentation indicating the weights of materials diverted in order to receive their certificate of occupancy.

Non-Enforceable Diversion Policy

Local leadership may choose an informal advisory document or a program that strongly encourages the diversion of C&D materials, but does not provide the same level of enforcement authority as an ordinance. Such policies or resolutions are simply expressions of opinion or preferences. In this context, the purpose of a policy would be to encourage C&D diversion without actually requiring it.

Non-Enforceable Diversion Policy Cont.

A non-enforceable diversion policy can:

- Serve as an alternative to an ordinance when a jurisdiction does not have the time and resources necessary to fully implement an ordinance.
- Be used as a stepping stone in the ordinance process. While there may be a need to establish some kind of a C&D diversion program, a jurisdiction may first want to try alternatives to an ordinance. A policy can be a useful tool if used as a first step in establishing a C&D diversion program. Once a policy is in place and a C&D diversion program is established, a jurisdiction can determine over time if an ordinance would be more effective, or if a policy is adequately achieving the diversion of C&D waste.
- Provide a jurisdiction with more flexibility than an ordinance, since ordinances require a more formal process to revise.

Step 4: Planning & Implementation

Initial Planning Process

Each community has its own unique process for drafting and adopting local ordinances. While the specific steps taken, the approval process and approving bodies (planning boards, commission, councils, etc.) may vary, the following is a summary of common steps and considerations.

1. Identify applicable policy documents and goals to be achieved: Most communities developing C&D requirements have adopted goals related to waste diversion, sustainability, or circularity included in one or more adopted plans. This could include the community's Comprehensive Plan, Sustainability or Climate Action Plan, or a more specific Zero Waste Plan. Aligning the project with one or more adopted goals from these plans will help to clearly establish the purpose and desired outcome of developing a C&D ordinance.



Photo source: Canva

Initial Planning Process Cont.

2. Assess appropriate municipal or county code sections: Depending on your community, there may be one or more existing code sections where a C&D requirement could logically fit. It is often easier to add the requirement to an existing code or ordinance section as an amendment than to adopt an entirely new section. Building Codes and Zoning Ordinances are two existing elements that may be appropriate for C&D standards. Some communities may choose to develop new stand alone sections or place C&D requirements alongside sections of the municipal code that address waste removal and management. Including C&D standards as one component of a larger update (Building Code or Zoning Ordinance) may help streamline the adoption process.

3. Evaluate risks, identify key considerations, and establish criteria for success: It can be helpful to identify any concerns or risks that might result from the adoption of C&D waste diversion requirements and to establish criteria with which to assess the costs and benefits of new standards. Naming risks and establishing criteria for success early in the process can help staff maintain a clear focus through the community engagement and adoption process. Some key considerations and evaluation criteria to consider include:

- a. Administrative burden and costs
- b. Costs to developers and residents
- c. Compliance challenges, incentives, and penalties
- d. Impact on community goals (diversion rate, emission reductions, economic outputs, etc.)
- e. Political considerations

4. Engagement strategy and stakeholder identification: Equitable and inclusive stakeholder engagement can help staff develop a human-centered and practical set of C&D standards while also helping minimize political risk, build support for new policies and identify the types of supporting resources necessary for successful implementation. Staff should consider the following when developing a community and stakeholder engagement process:

- **Engagement Strategy:** Determine what level of engagement and outreach is appropriate for the community, and how that outreach will be performed. This will vary by community (high-growth or low-growth; supportive of waste reduction or not supportive), the main types of construction and demolition occurring in the community (new single-family housing or remodels of existing non-residential buildings?), and the adopted waste goals.

Initial Planning Process Cont.

- Some questions to ask may include: Who will the new policies primarily impact? What might those impacts be? What can we do to minimize negative impacts?
- **Stakeholder Identification:** Strategic engagement with both external and internal stakeholders can help staff develop a practical and effective ordinance while also supporting organizational buy-in and successful implementation after adoption.
 - Key external stakeholders typically include contractors, architects, developers, local housing authorities, and community based organizations. Consider the goal of engaging these stakeholders and what level of participation they need to have. Ways to interact with these groups may include one-on-one interviews, focus groups, technical working groups, open houses, or informational presentations.
 - Regular engagement with internal stakeholders is key to creating a program that can be implemented after adoption. Any other city staff who are involved in development review, plan review and permitting and/or construction should be included to ensure that the new regulations fit or align with other existing processes. Consider what the C&D review process will entail, where it fits within the greater development review process, and how compliance will be determined.

Key external stakeholders typically include contractors, architects, developers, local housing authorities, and community based organizations.



Photo source: Unsplash

Initial Planning Process Cont.

Case Study: City of Lakewood, CO

Lakewood established both an external task force and internal working group during the development of their most recent C&D diversion requirements.

Lakewood's external task force included representatives from Lakewood Advisory Commission (citizen advisory body to City Council), the local housing authority, local citizen organizations, environmental groups, technical experts, and other interested residents. Meetings were held monthly to review proposed policy framework and language until the initial ordinance draft was ready, then held as needed throughout the adoption process. An interactive project page and suite of community outreach channels were used to inform the wider community of the process of the task force.

Lakewood's internal working group was made up of internal staff from Sustainability, Long Range Planning, Current Planning, Building, Engineering, Finance, Legal, Municipal Facilities, and Information Technology to help guide the policy goals, ordinance language, process for implementation, and integration with existing permitting software.



Photo source: Unsplash

5. Draft Code Assessments: Once a draft code has been developed, it can be useful to assess likely outcomes based on the evaluation criteria established earlier in the process. Cost assessments for a variety of applicable project types and scales along with modeling the implementation process can be particularly useful in finalizing code language and for the public review and adoption process.

6. Public review and adoption: Typically the final step in the process, each community has its own standards and requirements for public notification, review and adoption.

Ordinance Implementation

During the implementation phase, ongoing education for staff implementing the ordinance as well as contractors should be provided. **The ordinance's effectiveness (e.g., any increase in diversion of C&D material or decrease in the amount being landfilled) and to enforce compliance with the ordinance should be monitored.**

The amount of staff time to implement the ordinance depends on the requirements, for example, if it:

- **Requires a waste management plan (WMP)**, develop a template for contractors to use. Training to complete the plan and tracking may be necessary. Consider providing training/recordings and examples of a completed WMP on the city's website. The City of Boulder conducted a [webinar](#) that touched on the WMP process.
- **Has a diversion requirement**, train staff on what are reasonable estimates for anticipated diversion/disposal per project and/or material type.
- **Has penalties and/or fines** (other than forfeiture of deposit), develop procedures for implementing the penalty/fines, and train staff accordingly.
- **Requires a deposit**, staff must handle the deposits (taking in and returning) and evaluate compliance with the requirements that allow deposits to be returned, and handle any related disputes or appeals.
- **Require onsite source separation and diversion**, staff must monitor onsite compliance.

Encouraging and Enforcing Compliance

Below are ways for a jurisdiction to encourage or enforce compliance with their ordinance:

- Develop suggested best practices tailored to local C&D material streams
- Provide technical assistance and education for contractors
- Provide education/training for staff and workforce training
- Require security (or performance) deposits
- Require proof of compliance through weight tickets and receipts from diversion facilities
- Implement fines for violations
- Tie issuance of project permits to meeting ordinance requirements; for example, submission of a complete waste management plan

Encouraging and Enforcing Compliance Cont.

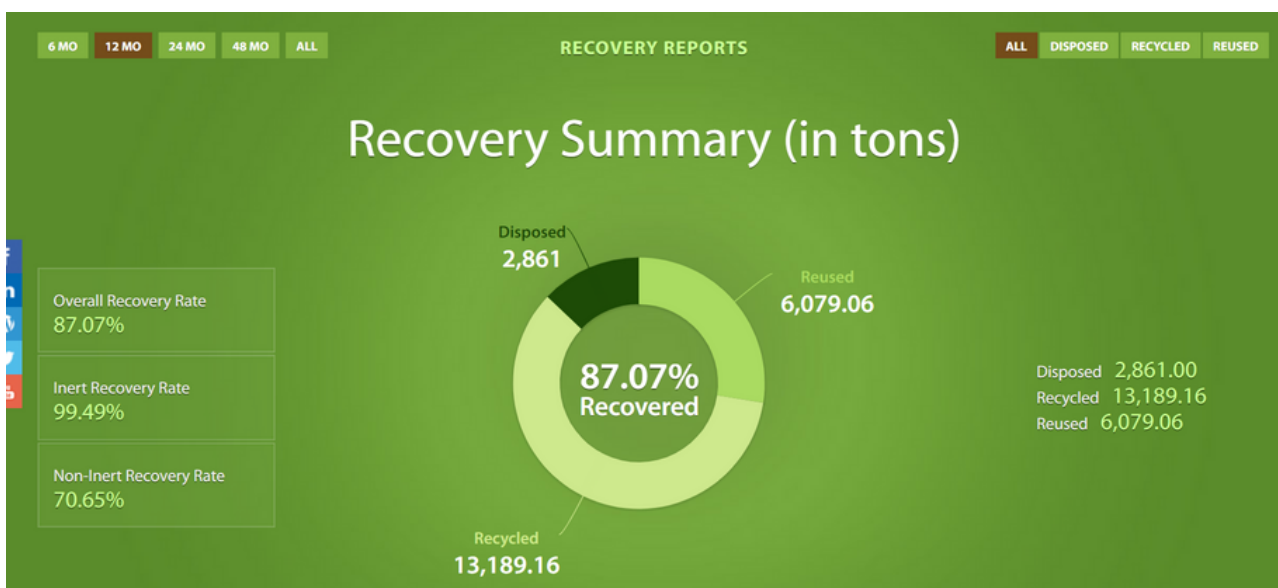
- Decreasing permit fees for reuse/recycling
- Conduct field inspections of onsite practices
- Tie final approval of projects to comply with the C&D ordinance; for example, a jurisdiction may choose to only release the certificate of occupancy when the project applicant is found to be in compliance with the ordinance

Material Tracking Systems

C&D material tracking platforms such as Green Halo Systems, Green Badger and Excel-based systems are a common element used to collect performance data and enforce compliance, since “you can’t manage what you can’t measure.”

Automated systems simplify administrative burden and reporting. However, being unable to acquire an automated system should not be a roadblock to a C&D ordinance or policy, as an Excel file that tracks material types, diversion and total project weight can be sufficient. Pitkin County uses the Green Halo platform to administer its program, while the City of Boulder uses an Excel-based system.

Consider requiring the reporting of building materials reused, recycled and landfilled prior to closing out the demolition permit or approving the certificate of occupancy on the new building.



Screenshot from Pitkin County's Green Halo C&D Material Tracking System.

Methods to Encourage C&D Diversion

C&D Waste Management Plan

Most policies include a requirement that a waste management plan (WMP) be completed and submitted prior to the beginning of a project. A WMP typically estimates how much C&D materials will be generated and describes how the materials will be managed. This requires an applicant to estimate how much C&D material will be generated and to consider how, where, and how much will get diverted. The WMP assists projects in overseeing waste diversion and also provides useful data for program administrators. **Resource:** [Fort Collins CWMP Example](#)

Education and Outreach Activities

A phase-in period before implementing an ordinance provides time to educate staff on how to implement the ordinance and inform contractors about the ordinance requirements. This facilitates greater compliance and smoother implementation. Handouts on available diversion facilities and cost comparisons of recycling facilities versus disposal and others are also helpful resources.

Staff Training

Depending on how a policy is written and intended to be enforced, there may be staff from multiple departments involved in administering a program, including:

- Building Inspectors
- Plans Reviewers/Permit Technicians
- Environmental and Sustainability Staff
- Code Enforcement

The education and training needed depends on what is included in the policy. For example:

- If requiring a deposit:
 - Develop a procedure for handling deposits
 - Decide what form of payment will be acceptable (e.g., cash, check, credit card, certificate of deposit, surety bond, etc.)
 - Establish procedures for handling any appeals should a non-returned deposit be contested
 - Establish procedures for returning deposits

Methods to Encourage C&D Diversion Cont.

- If requiring a particular diversion rate, but also allow for a reduced rate based on the feasibility of attaining that rate:
 - Establish criteria and train application reviewers on how to evaluate such applications.
 - For example, train staff to recognize which projects are likely to result in non-divertible hazardous materials, like lead-based painted wood.
- If requiring estimates of anticipated materials to be generated, disposed of, or diverted, be included in a waste management plan (WMP) as a condition of a permit:
 - Train reviewers on how to evaluate the estimates.
 - Estimates can vary from jurisdiction to jurisdiction, depending on size and project type.
 - Consult with local construction companies for accurate estimations of C&D waste generated by project type/size.
- If establishing thresholds for determining which projects would fall under the ordinance:
 - Train the staff person responsible for reviewing the project proposals to be able to evaluate the accuracy of a project's estimated cost and or/square footage, and the anticipated amount of C&D materials associated with a project of that size, whether it is a deconstruction, new construction, or renovation project.

Educational Outreach

A simple method to help divert C&D materials is to provide contractors with educational material and information about alternative facilities that take C&D waste. This could include providing a brochure listing the C&D diversion facilities in the region, with hours, location, cost, and material types accepted. See [Boulder County's C&D Recycling Resources flier](#) and [Eco-Cycle's A-Z Recycling Guide for Boulder County](#) as examples. Both municipalities and local recycling organizations can distribute this information.

Providing information on reuse opportunities, such as materials exchange programs, can result in tons of material being diverted from the landfill while also saving the contractors money. Below are links to exchange programs and other information on C&D materials that could be included on a website or in a brochure with general information regarding C&D waste diversion:

- Fort Collins: [Construction Debris - Recycling](#). This webpage includes an educational video, resource sheet, management plan, and FAQ. The Construction Site Recycle Brochure and Introduction Letter for Subcontractors are also available in Spanish.

Methods to Encourage C&D Diversion Cont.

- Boulder: [Sustainable Deconstruction Requirements | City of Boulder](#). This webpage includes a resource guide and an FAQ.
- Pitkin County: [Construction & Demolition Debris — Pitkin County Landfill](#) This webpage includes the ordinance language, a step-by-step plan, “Green Halo” C&D tracking software information, images, and pricing.

Effective education should include highlighting state grant programs, such as the [Front Range Waste Diversion \(FRWD\)](#) enterprise fund and the [Recycling Resources Economic Opportunity \(RREO\)](#) program to show companies the possibility of new C&D projects. The grant programs have funded:

- [FRWD C&D RFA - March 2021](#)
 - [List of awarded projects.](#)
 - Case study: [Western Disposal’s semi-automated C&D waste sorting system \(Boulder\)](#)
 - Case study: [Perks Deconstructions’s sorting warehouse \(Denver\)](#)
- [RREO Project Summaries](#)

Specifications

Generally, specifications are part of the contract between the contractor and the owner and are the major communication tool to convey the requirements and expectations of a construction or demolition project. C&D waste diversion requirements and procedures can be included in project specifications. Because specifications are a major communication tool for developers to convey the requirements of a construction or demolition project, specifications that contractors are required to follow could also include the conditions and requirements for diverting C&D materials. If the conditions are not met, the contractor could be held accountable.

Local governments may lead by example by incorporating these specifications into construction and capital improvement projects.

Sample specifications are available from several resources, some of which are listed below.

CalRecycle Specifications

- [Model C&D Diversion Specifications](#)

Methods to Encourage C&D Diversion Cont.

- [CalRecycle's Green Project Specifications](#). At the bottom of the Green Project Specifications webpage is a list of sample specifications.
- [CalRecycle's Green Building Guidelines](#). This site provides a list of external websites with green building guidelines.

King County in Washington State

In Washington State, [King County's Construction Recycling website](#) includes information on:

- [Preventing Jobsite Waste](#)
- [Design Specifications and Waste Management Plans](#)
- [Commingled vs. Source-Separated Materials](#)
- [Cost-Effectiveness of Jobsite Recycling](#)

Triangle J Council of Governments in North Carolina

The Triangle J Council of Governments in North Carolina website has a free, downloadable document regarding building specifications for reference: [WasteSpec: Model Specifications for Construction Waste Reduction, Reuse, and Recycling](#).

Step 5: Other Policy Considerations

Green Building and Sustainable Materials Management

C&D policies may be integrated into a community's broader green building regulations or codes, or looked at from a life cycle perspective through the concept of sustainable materials management to take a systems approach to the built environment.

Green Building

"Green building... is generally accepted as the planning, design, construction, and operations of buildings with several central, foremost considerations: energy use, water use, indoor environmental quality, material selection and the building's effects on its site."⁴ Policies may be able to achieve synergies if C&D is part of a broader green buildings strategy. One Colorado example is [Lakewood's Sustainable Development Standards](#) which takes a whole systems approach to development.

⁴ <https://www.usgbc.org/articles/what-green-building>

Green Building Cont.

Some green building strategies that relate to C&D materials management include:

- Specifying materials with a percentage of recycled content or easily recyclable materials.
- Prefabricated building elements that reduce waste on the job site (e.g., flooring or framing systems that are pre-cut at a manufacturing facility, modular building systems).
- Purchasing optimization during construction to avoid surplus materials.
- Adaptive reuse - reusing existing shell and structure during renovation.

Green Building Resources

- [Alameda County Waste Management Authority \(ACWMA\)](#) offers green building information including resources for C&D reuse and recycling.
- [CalRecycle's Green Building and Construction web page](#) contains information on issues such as the economic benefits of building green, occupant safety in green buildings, programs and partnerships, and case studies.
- [International Green Construction Code \(IgCC\)](#) - From the International Code Council, the IgCC provides the design and construction industry with the single, most effective way to deliver sustainable, resilient, high-performance buildings.

Green Building Certification Bodies

Below are a few of the prominent certification bodies. Others are not intentionally excluded.

- [U.S. Green Building Council](#)
- [Green Globes](#)
- [Living Building Challenge](#)
- [National Green Building Standard \(NGBS\)](#)

Sustainable Materials Management

To maximize sustainability benefits, C&D and deconstruction ordinances may also consider ways to promote sustainable materials management, which “takes a systematic approach to using and reusing materials more productively over their entire life cycles.”⁵ By understanding the environmental footprint of materials from raw material extraction, manufacturing, distribution, usage and end of life management, we can promote improvements to those life cycle steps.

⁵ epa.gov/smm/sustainable-materials-management-basics

Sustainable Materials Management Cont.

Below are a few related organizations and fields of research, others are not intentionally excluded:

- Carbon Leadership Forum (CLF) - Researches and promotes measurement and reduction of embodied carbon in building materials.
- Design for Deconstruction - Designing buildings to aid in deconstruction at end of life.
- Material Passport/Buildings as Materials Banks (BAMB) - Tracking building material inputs to a structure to understand the total environmental footprint and aid in future reuse or recycling of building elements.



EPA Sustainable Materials Management Diagram

Environmental Hazards & Environmental Justice

Environmental Hazards - Asbestos, Lead Paint, Mold

Buildings of any age may have asbestos containing materials (ACM). If the amount of ACM to be disturbed exceeds certain trigger levels, then a certified abatement contractor must remove the material. The Colorado Department of Public Health and Environment (CDPHE) has information and guidelines for the safe handling of ACM. It is recommended that deconstruction/demolition contractors have level four asbestos awareness training so that crew members can accurately identify any ACM material that they might accidentally expose during the deconstruction process.

Any paint applied earlier than 1978 could contain lead. One can test the paint to confirm the presence of lead or assume that there is lead and conduct work incorporating the EPA-recommended safety practices.



Typical Chemical Hazards Present On A Construction Site hseblog.com

Environmental Hazards - Asbestos, Lead Paint, Mold Cont.

Some studies have shown that deconstruction reduces the spread of lead dust that would otherwise get airborne and spread around the neighborhood by traditional bulldozing.

Mold can also be found in structures that have been flooded, have leaks, or other moisture issues. It is important to properly evaluate a site before deconstructing it. It is also necessary to always wear PPE and to have a safety plan in place.



5 Common Environmental Hazards in the Workplace safetymanagement.eku.edu/blog.

Impact Mitigation, Environmental Justice and Variances

Demolition is a public health problem. Mechanical demolition activities generate dust and particulate matter, which can travel 400 feet from the source and is connected to elevated blood lead levels in children and asthma. Deconstruction, if done according to best practices, has the potential to reduce the dust caused by mechanical demolition. [Read more about deconstruction and lead dust.](#)

Through careful disassembly, deconstruction also allows for the identification and abatement of asbestos-containing materials that may have been missed in an initial demolition survey. Identifying and properly abating asbestos is critical since inhaling asbestos fibers can cause mesothelioma, a deadly cancer in the protective linings of organs. [Read more about the health effects of asbestos & Learn where asbestos is commonly found in old homes.](#)

Conclusion



Photo source: [Unsplash](#)

This toolkit presents construction, demolition and deconstruction (C&D) materials as an important factor in Colorado's total waste stream and highlights the Colorado communities beginning to take action on this topic. While the toolkit is not exhaustive, we hope the resources presented will help Colorado communities begin the process to better understand their local C&D materials recovery system and the great potential we have to improve that system to maximize resource efficiency, create jobs, and meet their climate and sustainability goals.

Thank you again to **Recycle Colorado**, the C&D Council and other project contributors who provided significant time, effort and knowledge to develop the Colorado Construction, Demolition and Deconstruction Policy Toolkit.



Appendix

A. Definitions

The following terms largely lack official definitions, so they are defined based on their usage in this document.

Waste diversion - Any strategy that keeps materials out of the landfill including waste reduction, reuse, recycling, composting, energy recovery, and others.

Recycling/reuse infrastructure - Refers to the whole system required to convert waste materials from their generation point to a secondary use including collection, processing and end market elements. Materials cannot be reused or recycled if one of the three elements is missing.

Collection - For handling C&D, material is typically collected by roll-off dumpster vendors or can be self-hauled by construction companies or homeowners to materials management facilities.

Processing - Mechanical or manual processes that convert a recyclable or reusable material into a secondary product. Examples include crushing stone to create gravel and denailing and re-milling lumber in preparation for reuse.

End markets - End users and/or purchasers of recycled or reusable materials after processing and redistribution.

C&D Ordinance - An ordinance that requires a variety of construction, remodel, and demolition projects to implement recycling and reuse programs on the job site.

Deconstruction Ordinance - An ordinance that specifically targets demolitions to require the process of deconstruction instead of traditional demolition.

Deconstruction - The process of dismantling a structure to maximize the recovery of reusable material.

Appendix

B. Model Ordinances

General C&D Ordinance

[CalRecycle Model Construction and Demolition Diversion Ordinance](#)

Deconstruction Ordinances

The [Minnesota Pollution Control Agency](#) works to improve our environment through partnerships, technology transfer, technical assistance, education, research, and matching grants. The website illustrates an example of a [resolution establishing a model deconstruction policy](#).

Palo Alto, California - [Deconstruction & Construction Materials Management Ordinance](#)

Portland, Oregon - [Deconstruction Ordinance](#)

Portland established the first notable deconstruction ordinances, which requires all single-family and duplex homes built before 1940 to be deconstructed by a certified deconstruction contractor that is trained to safely and effectively disassemble the house and salvage valuable materials for reuse.

Appendix

C. Other Resources

Colorado C&D Research

[CDPHE C&D Stakeholder Survey](#)

- Scroll down the page to “Construction and demolition waste survey report”

[Recycle Colorado C&D End Market Development Report](#)

Colorado Waste Diversion Grants

Front Range Waste Diversion (FRWD) - <https://www.coloradofrwd.org/>

Recycling Resources Economic Opportunity (RREO) - <https://cdphe.colorado.gov/sustainability-programs/recycling-grants-support/recycling-resources-economic-opportunity>

EPA Data

[Construction and Demolition Debris: Material-Specific Data](#)

[Estimating 2003 Building-Related Construction and Demolition Materials Amounts](#)

National Associations

[Build Reuse](#) - Advocate for deconstruction and building materials reuse.

[Build Reuse Community Guidebook](#)

[Construction & Demolition Recycling Association \(CDRA\)](#) - C&D recycling industry trade group

Appendix

D. Existing C&D and Deconstruction Policies in Colorado

	City of Boulder	Fort Collins	Lakewood	Pitkin County
Policy Type	Deconstruction Ordinance	Building Code Requirement for diversion of specific materials during demolition and construction projects	Two complimentary regulations: 1) Building Code Requirement for diversion of specific materials during demolition and construction projects, and 2) Zoning Ordinance Supplemental Standards in Article 13 including a Deposit/Refund system.	County Code Title 6: Health and Safety. Ordinance enforced through a partnership between Community Development and Solid Waste Dept.
Compliance Requirements	75% by weight diversion; minimum of three building material types; submit weight tickets and tracking form for verification (alternative documentation and weight estimates for items without weight tickets)	Recycle Asphalt, Concrete, and Masonry, Metal, Wood, Cardboard	All concrete, asphalt, metal, untreated wood, and where possible, all remaining materials, such as doors, windows, cabinets, and fixtures.	25% minimum waste diversion rate (35% as of 2023) and separation of required recoverable materials
Enforcement Mechanism	Deconstruction deposit/refund program	Building code standard, violation punishable by fine and/or misdemeanor charges	Deposit/Refund program	Deposit/refund program

Appendix

D. Existing C&D and Deconstruction Policies in Colorado Cont.

	City of Boulder	Fort Collins	Lakewood	Pitkin County
Applicable Projects	All full structure removals (no sq. ft. minimum/maximum)	All new construction, remodels/additions over 2,500 sq. ft., all demolitions (excluding nonstructural <1,000 sq. ft.)	All new construction, remodels/additions over 2,500 sq. ft., all demolitions	All construction, demolition and remodel (no sq. ft. minimum/maximum)
# Projects / Year	90	375	xx	150
Deposit/Fee Amounts	\$1/sq.ft. with a minimum of \$1500	\$500 first offense \$1000 second offense \$3000 third offense	\$1,000 per sq. ft up to \$100,000	A deposit of \$1000 per ton of estimated trash is due prior to permit issuance
Education & Outreach Activities	Deconstruction working group; annual contractor ordinance outreach session	Educational material distribution, educational visits to job sites	Resources provided to contractors with information on facilities and haulers	Quarterly webinars, job site visits, workshops and trainings
Administrative Costs	1.5 FTE	1 FTE to manage program, 5 hours weekly administrative staff support, 1 vehicle, minimal administrative costs such as education material printing, web page updating, field staff PPE	0.5 FTE to manage the program with significant support from other staff.	1 FTE to manage the program. Minimal admin. time to coordinate with Community Development.
Performance	72.28% overall diversion July 2020-April 2023	Not available	Not available	85.33% diversion rate March 2021-present (Green Halo data)

Appendix

D. Existing C&D and Deconstruction Policies in Colorado Cont.

	City of Boulder	Fort Collins	Lakewood	Pitkin County
Contact Info	CDWastePermits@bouldercolorado.gov	environmentalcompliance@fcgov.com	sustainability@lakewood.org	Website