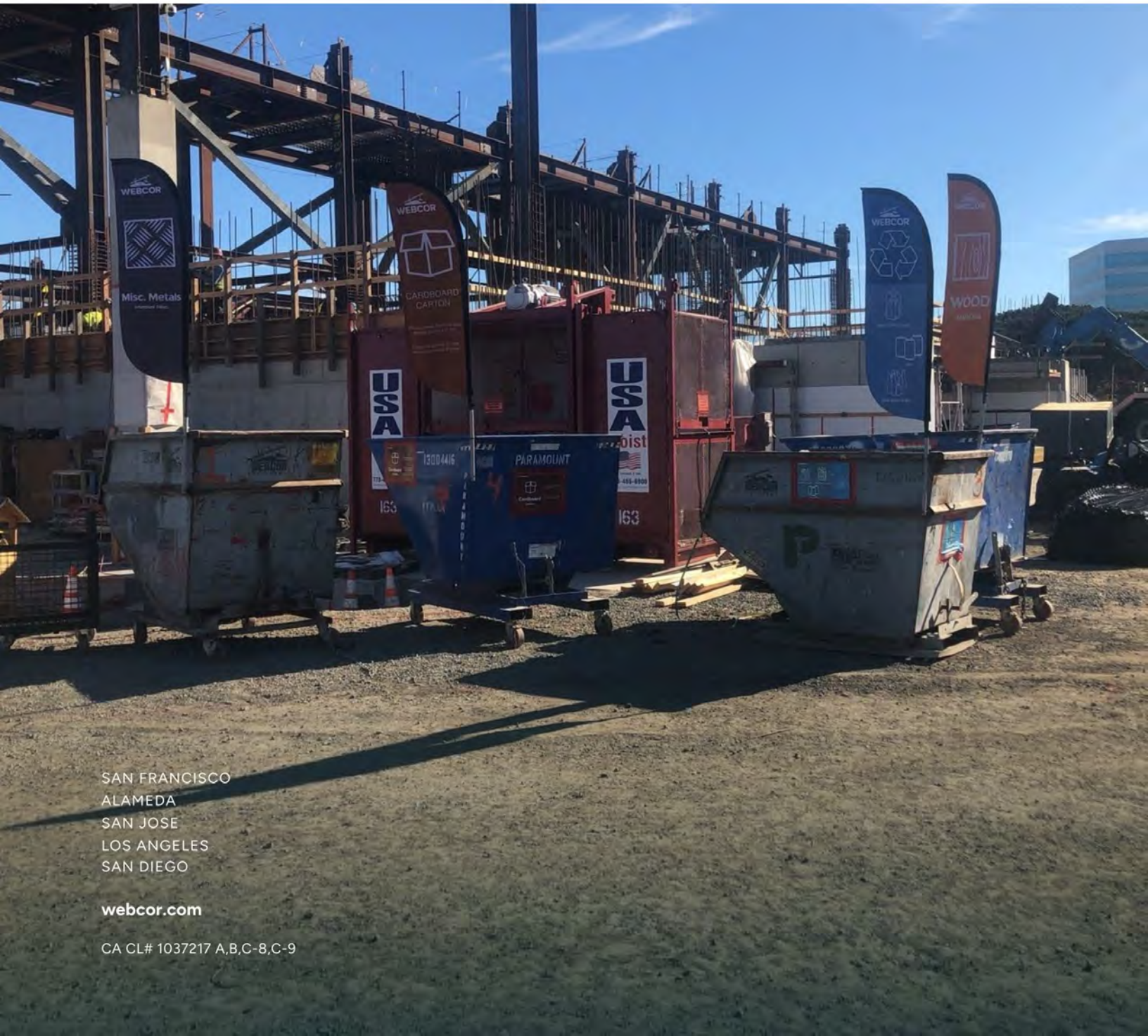
WHITEPAPER

WEBCOR

BUILDING CIRCULARITY:

How Zero Waste Construction Keeps Materials in Use, Cuts Costs, and Lowers Carbon on the Jobsite



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WASTE AND CIRCULARITY

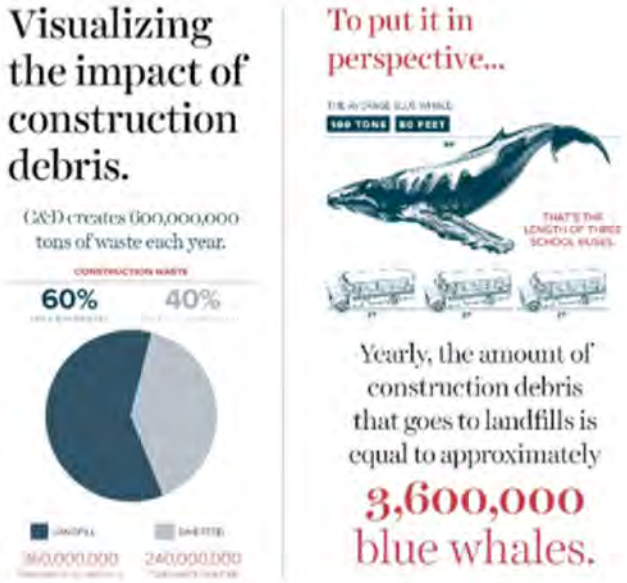
Buying secondhand clothes, composting, and bringing reusable bags to the grocery store are examples of how we incorporate circularity in our daily lives without even realizing it. Simply stated, circularity happens when you keep material in use—through repair, reuse, composting, recycling, etc.—instead of letting it sit in a landfill.

Our current approach is to extract materials from the earth, make products, and then put them in the trash, where they just stay in a landfill for decades. This linear, take-make-waste approach relies on finite resources that produce waste.

Landfill space is limited, but we're generating more waste. C&D materials account for between 21.7 to 25.5% of the disposed waste stream in California. (StopWaste, n.d.)

Waste and recycling present a huge, untapped potential to reduce greenhouse gas emissions, conserve resources, promote social equity, and build community. Reducing, reusing, and recycling creates ten times more jobs than disposal (TRUE, 2015). The "circular economy" is the system where materials are kept in circulation, i.e. materials never become waste, and nature is regenerated (Ellen McArthur Foundation, n.d.).

As organizations seek to advance circularity, TRUE Zero Waste Certification provides a trusted, comprehensive framework for implementation. Backed by the credibility and technical expertise of USGBC, it equips project teams with a clear, proven pathway to reduce waste, maximize resource recovery, and support circular economy principles.





The linear "take-make-waste" model. Image source: (Nikam, 2019)



The circular economy keeps materials in circulation. Image Source: (Recycle Track Systems, 2025)

TRUE ZERO WASTE: WHAT IT IS AND WHAT IT AIMS TO DO

***T**otal **R**esource **U**se and **E**fficiency* (TRUE) is focused on minimizing waste and optimizing efficient use of materials as a resource. Managed by the United States Green Building Council (USGBC), this Zero Waste certification enables facilities to define, pursue, and achieve zero waste goals, cut their carbon footprint, and support public health.

Initially, TRUE was meant to support existing operational buildings. However, in recent years, TRUE has expanded to active construction projects.

TRUE improves and expands LEED's C&D waste management approach. TRUE's ethos closely aligns with the zero-waste hierarchy as published by the Zero Waste International Alliance (ZWIA). Under ZWIA, redesigning and reducing resource use sit at the top, followed by reuse, compost, recycle etc. (Zero Waste International Alliance, 2025)



Image Source: (Zero Waste International Alliance, 2025)

THE WORLD'S FIRST TRUE ZERO WASTE FOR CONSTRUCTION–CERTIFIED PROJECTS — BOTH DELIVERED BY WEBCOR:

1. **Genesis Marina** involved the construction of new commercial offices and lab spaces. Nestled between the 101 freeway and the San Francisco Bay in the City of Brisbane, the project boasts 560,000 square feet of space, along with incredible amenities. The project site, which was used as a landfill through the 1960s, is supported by 1,500+ piles running 200 feet deep. The McAteer-Petris Act was passed in 1965 to establish Bay conservation, preventing future dumping into the Bay. Genesis Marina is the world's first construction project to achieve TRUE Zero Waste for construction certification.

2. **Contra Costa County's Administration Development and Renovation (ADR) project**, located in Martinez, California, is a new administration building for Contra Costa County. The project included demolition of an existing county administration building and an adjacent old jail, and construction of a new building with offices, a law library, and other spaces for the county. ADR is the world's first public project to achieve TRUE Zero Waste for construction certification.

PREDESIGN KICKING OFF THE ZERO WASTE PROCESS

The zero-waste process starts at predesign. Every project needs a champion to drive this process forward and maintain momentum when the project picks up. Initial conversations about this with the owner are crucial to finding a driver or purpose.

- For Contra Costa County's ADR, the driver was to achieve zero waste certification in public projects and show market leadership.
- For Genesis Marina, the driver was to be the first project in the world to achieve TRUE Zero Waste certification.

A zero-waste policy outlining a comprehensive, strategic approach to managing resources on the project is a good starting point to bring all parties together and agree on a shared vision and approach to zero waste construction. This will serve as a "north star" for the project, guiding decisions along the way.

The very next question will most likely be around cost. **Project team time is the most important cost.**

- Extra hours for superintendents and labor on-site to enforce and correct source separation are crucial.
- A zero-waste champion who will coordinate with the jobsite team, consultant, haulers, and others involved in the project. This does not need to be a separate person but can be carved out in the overall project duties.
- Hours for a zero-waste consultant and/or a zero-waste manager / specialist are also needed. This role can be folded in with other green building roles within the project team structure or be standalone. The exact configuration would depend on the size & complexity of the project and the experience & expertise of the team members.

The second largest expense is waste hauling. If the project is pursuing another certification (like LEED), this cost would lie in the difference between the price of achieving the diversion goal associated with that first certification and that of achieving TRUE's 90 percent diversion rate.

- For example, if a project is pursuing LEED v4 and already has a 75 percent diversion goal, the added cost would be for the extra 15 percent diversion, as well as TRUE-specific waste requirements like load-specific diversion rates, reporting contamination rates, photos of each haul, and close coordination with the project team including site visits, meetings, and other support.

Since nothing like this had been done before, Genesis Marina and ADR partnered with All About Waste, a zero-waste consultant, to consult on TRUE certification. At Genesis Marina, the waste hauling partner was primarily Premier Recycling, and at the ADR project, it was mainly Republic Services. Both projects retained other waste hauler services for smaller, specialized waste streams and municipal waste from jobsite offices.

FACTORS TO CONSIDER

Given the current state of the construction industry, not every project will have an easy path to zero waste. Identifying the relevant factors to consider early – along with a plan of action – is important.

Size of project site. The size of a project site will determine how many materials can be source-separated, as the process requires multiple roll-off containers. On a tight site, mixed C&D will have to be separated off-site and measured separately, which may add cost.

Waste franchise agreements are another challenge. Under waste franchise agreements, the city has exclusive waste hauling contracts with specific haulers. The Genesis Marina project had to get an exception on the waste franchise agreement from the City of Brisbane to use their waste hauler of choice—Premier Recycling, a hauler that could provide source-separated load-specific breakdown.

The demolition of an existing building can be a blessing or a curse. Identifying what is being demolished and finding the highest and best use for all the demolished materials is crucial. Lower waste diversion from demolition can significantly hurt a project's chances of achieving high cumulative diversion rates.

Soft demolition of items like loose furniture; fixed items like cabinets, countertops, carpet, lighting, and plumbing fixtures; doors; and internal glazing needs to be done, depending on the condition and availability of materials. Many soft demo / reuse organizations offer free assessments that can help gauge what is salvageable and reusable. Pricing of soft demolition / deconstruction, as well as including this information in demolition contracts and exhibits, is important to keeping track of these details.

Many resources and online marketplaces like Rheaply and Reseat offer used / lightly used products that need a new home.

CASE STUDY **MATERIALS REUSE**

The Contra Costa project identified three materials – granite, wood panels and marble – for reuse from the existing structures in the new building. The project involved the demolition of an existing 7-story office building and an old jail building replaced by a new 3-story building.

The project team and architect conducted a pre-demolition tour to identify items for reuse. Three materials were selected for salvage and reuse in the new building: granite from the old jail walls, perforated wood panels from the county chambers, and marble from the building. Granite was cut and reused in walls and pavers in landscape, wood panels were used in the lobby walls as wainscotting, and marble was cut and reused as a wall cladding at the lobby of each floor. In addition, some permanent law library furniture and other loose furniture were reused in the new and other county buildings to lower waste generation. This process included close coordination with the architect, ASTM testing of materials, storage and cutting to install in the new design etc, among other things.

DESIGN

The Contra Costa County ADR project incorporated zero-waste requirements in specifications, exhibits and contracts as part of its buyout. Having upfront conversations with subcontractors and even manufacturers about zero-waste strategies in designing, packaging, and construction can uncover hidden opportunities.

A project-specific waste management plan was crafted and incorporated as part of the contract documents. The developers of such a plan should think ahead and incorporate all the various scenarios, project lifecycles, and materials that might be generated at each stage. Project teams are encouraged to continually revise and update the plan per evolving project conditions.

The Genesis Marina and ADR project teams asked vendors and manufacturers to address packaging waste by reducing packaging or replacing non-recyclable packaging like plastic with recyclable packaging such as wood, cardboard, and metal, or by taking back packaging items like pallets.
Zero-waste operations must be designed into the project, not treated as an operational afterthought. Operational-phase strategy should account for the building's end-use and include measures that simplify waste separation, improve speed, and reduce contamination.

Designing for zero waste during construction will take different forms at different phases. Over-ordering is one of the leading causes of construction waste. Prefabrication also reduces on-site construction waste by ensuring minimal field cutting. Incorporating reusable components like reusable formwork and reusable floor protection can also reduce resource use on a project.

CASE STUDY

RESOURCE REDUCTION

16,200

POUNDS OF MATERIAL USE AVOIDED BY PREFABRICATING SPRINKLER PIPING OFFSITE

The sprinkler systems at the Genesis Marina project were prefabricated offsite and then installed onsite. The sprinkler piping systems are made of cast iron and consist of mains and branches, which need to be joined.

When installed onsite, cast iron-threaded joints are used. Fabricating them offsite allows these joints to be welded, eliminating the need for these joint components. Hence, prefabrication reduces the demand for additional materials / components and contributes to resource reduction. Per calculations from the sprinkler subcontractor, prefabrication saved about 9,000 threaded joints. Calculating an average of 1.8 pounds per connection (from threaded joints), we calculated about 16,200 pounds of material use reduced (9,000 connections × 1.8 pounds per connection = 16,200 pounds of material saved).

PRECONSTRUCTION

As preconstruction progresses, setting up a trailer / jobsite office, with a clear waste management strategy, is an important step. Addressing jobsite office waste via internal tools (e.g. a zero-waste policy, an internal marketplace to promote reuse, etc.) and external tools like Rheaply ensure more materials stay out of landfills.

For waste generated during construction, it's important to review waste contracts before signing a hauler. Upon review of multiple waste quotes, we realized that the cost of co-mingled containers is typically higher than that of source-separated containers. More source-separation on-site saves money on larger projects. Structuring subcontractor contracts to incentivize better source-separation and less waste generation will also help achieve waste diversion goals.

Other waste reduction steps taken by the Genesis Marina and ADR teams included printing double-sided, using QR codes and electronic documents in lieu of paper forms, and zero-waste purchasing of food for jobsite offices. For example both projects bought snacks in bulk and added them to dispensers for consumption, used paper and paper products with post-consumer recycled content, etc.



BUILDING CIRCULARITY:

How Zero Waste Construction Keeps Materials in Use, Cuts Costs, and Lowers Carbon on the Jobsite

In addition to recycling, compost, and trash, both projects also offered a variety of waste stream collections (universal waste, candy wrappers, etc.) that were recycled via TerraCycle. The "Environmentally Preferred Purchasing Policy" introduced as part of the TRUE precertification process helped identify better products for purchase at the trailer.

Finally, Webcor office trailers typically include a small kitchenette with ceramic plates, coffee mugs, cups, bowls, silverware, a refrigerator, microwaves, a water dispenser, and dishwashers to make it easy for employees to bring home-cooked lunches—a slam-dunk strategy for lowering waste and encouraging healthy eating habits.

CASE STUDY **FURNITURE REUSE**

At the Genesis Marina jobsite trailer, all furniture – including chairs, desks, cabinets, conference tables, whiteboards, kitchen countertops, and even appliances like the dishwasher and microwave – came from another jobsite through the Webcor Marketplace, an internal online marketplace projects use to trade furniture.

Reusing these items instead of buying new saved over $90,000. At the end of the project, most of these items went to another Webcor project, and remaining items went to other uses via Rheaply, resulting in another ~$22,000 saved in disposal costs. Such actions reduce costs and carbon on both ends and deliver more value.

$90,000+

SAVED BY FURNISHING THE TRAILER THROUGH WEBCOR MARKETPLACE

~$22,000

IN DISPOSAL COSTS AVOIDED AT PROJECT CLOSE-OUT

CONSTRUCTION

Training, Education and Behavior Change: Zero-waste education was a part of buyout and training at every stage. Throughout buyout, the project team would explain our zero-waste goals to subcontractors and reiterate them at their on-site day-one training, then regularly at morning huddles.

All systems were set up digitally to avoid the use of paper, reducing generated waste. The Genesis Marina team also created a semi-enclosed space made of the average number of empty plastic water bottles used by a job site in one week, highlighting the issue of plastic waste on jobsites.

Signage was crucial to maximizing waste diversion. Flag signs, boards, and diversion guidelines were all part of the training and guidance given to the project team.

- The project posted a map of waste bins in the elevator / hoist to make sure people knew where to dispose of their materials.
- Flag signs are especially useful on large sites, as they make it easy to spot bin locations from a distance. The Genesis Marina project had a separate color for every type of waste, making it even easier to source-separate.



Day-one training reiterates the project's zero-waste goals. Image Credit: Webcor Builders



A semi-enclosed space built from one week's worth of a jobsite's empty plastic water bottles. Image Credit: Webcor Builders



The waste-bin map posted in the elevator / hoist. Image Credit: Webcor Builders





Left: the project portal moved forms, orientation, and reporting fully digital, avoiding paper. Above: the site's running diversion board keeps the whole crew aware of progress. Image Credit: Webcor Builders

How Zero Waste Construction Keeps Materials in Use, Cuts Costs, and Lowers Carbon on the Jobsite

Source-separation is the most important part of a zero-waste plan. It also requires the most innovative thinking.

At Genesis Marina, the project team erected waste chutes with signs for different waste streams and separate bins under each chute. They also created bins that grouped 3-4 waste streams, then strategically placed them at entry points and other places where it would be easier to source-separate. At one point, Genesis Marina was separating eight waste streams, including metal, wood, concrete, drywall, cardboard, PVC, and mixed debris, as well as pallets to send back for reuse.



A dedicated wood debris box. Source-separated loads cost less to divert than mixed C&D. Image Credit: Webcor Builders







Chutes, grouped multi-stream bins, and bilingual, color-coded signs made it easy to source-separate at the point of generation. Image Credit: Webcor Builders



At Genesis Marina, **diversion reports** from Premier Recycling, along with pictures of loads, were instrumental to understanding what was going in the mixed bins and could be separated. These, coupled with monthly meetings and support from Premier, ensured that we were always on top of what was getting tossed and could quickly devise an intervention accordingly.

		Weight Of Diverted Material (tons)							
Haul Tons		Metal	Concrete	Inert	Plastic	Drywall	Cardboard	Wood	Non-Recyclable
6.09		0.00	0.00	0.00	0.00	0.00	0.00	5.48	0.61
5.02		0.00	0.00	0.00	0.00	0.00	0.00	4.52	0.50
2.35		0.00	0.00	0.00	0.00	0.00	0.00	0.82	1.53
5.69		0.00	0.00	0.00	0.00	0.00	0.00	5.69	0.00
6.02		0.00	0.00	0.00	0.00	0.00	0.00	6.02	0.00
2.83		0.00	0.00	0.00	0.00	0.00	0.00	2.83	0.00
5.33		0.00	0.00	0.00	0.00	0.00	0.00	4.26	1.07
3.47		0.00	0.00	0.00	0.00	0.00	0.00	3.30	0.17
2.60		0.00	0.00	0.00	0.00	0.00	0.00	2.60	0.00
2.73		0.14	0.00	0.00	0.00	0.00	0.00	0.82	1.77
1.63		0.00	0.00	0.00	0.00	0.00	1.63	0.00	0.00
6.36		0.00	0.00	1.27	0.00	0.00	0.00	4.13	0.95
5.39		0.16	0.00	0.00	0.00	0.00	0.00	4.85	0.38

Load-specific diversion reports from the hauler showed exactly what was landing in the mixed bins. Image credit: Premier Recycle



Photos of each haul, like this cardboard load, accompanied the reports. Image credit: Premier Recycle

How Zero Waste Construction Keeps Materials in Use, Cuts Costs, and Lowers Carbon on the Jobsite

Pallets/formwork reuse and temporary materials: Despite being a very low-hanging fruit, reuse of temporary construction materials is often overlooked.

At Genesis Marina, we realized we were tossing the pallets received from subcontractors, while Webcor Equipment was buying pallets to deliver materials and equipment. Instead of tossing out the pallets, we started collecting and sending them back in empty trucks after materials delivery.

Reusing the pallets saved the project team 25,500-plus pounds of pallets and $1,700.

The Genesis Marina team identified and implemented various small interventions to reduce waste, including replacing pallet wrap with metal banding, replacing straw waddles with burlap bio-waddles, replacing Styrofoam with cardboard, replacing plastic buckets with bulk packaging or metal containers, and replacing plastic water bottles with reusable bottles or canned water.



The ADR lobby table, built from field gloves and spare wood. Image Credit: Webcor Builders

Webcor Equipment, which buys, manages, and supplies temporary materials to project teams, plays a huge role in reducing waste. Webcor Equipment buys and manages a large inventory of machines and tools that are also repaired on-site. To encourage responsible use, Webcor Equipment also credits project teams for returning temporary equipment (called consumables) in reusable condition, which ensures the items can be used for a long time.

At the ADR project, the team collected gloves used by the field personnel and spare wood on the project to craft a table that has a permanent home in the new building lobby. This table serves as a nice link to the history of the project and as an educational tool on how sustainability can be incorporated in construction.



BUILDING CIRCULARITY:

How Zero Waste Construction Keeps Materials in Use, Cuts Costs, and Lowers Carbon on the Jobsite

Above: the Pro Deck horizontal formwork system at the Contra Costa ADR jobsite. Image credit: Webcor Concrete Group

CASE STUDY **REUSABLE FORMWORK**

21,000
SQ FT OF PRO DECK RENTED FROM THE WEBCOR EQUIPMENT YARD

54,900
POUNDS OF PLYWOOD WASTE DIVERTED FROM LANDFILL / RECYCLING

$23,500
SAVED VERSUS BUYING NEW PLYWOOD

At the Contra Costa ADR jobsite, the project used about 21,000 square feet of Pro Deck – a reusable horizontal formwork system that is handset and panelized. This system, rented from the Webcor Equipment yard, was sent back after use and will be used on the next project that needs it.

In comparison, if plywood had been used instead of Pro Deck, the project would have needed to purchase 29,276 square feet of new plywood from a lumber yard because plywood doesn't last as long as Pro Deck panels.

Also, cuts made on the first level might not fit on the second level. Therefore, to account for waste, 15 percent is added to the total floor square footage for each additional floor. 29,276 square feet of plywood equates to 915 sheets of plywood. Each sheet weighs approx. 60 pounds, which adds up to about 54,900 pounds of waste diverted from landfills/recycling.

When comparing the costs of renting Pro Deck and buying new plywood, the project also saved about $23,500 by using the reusable formwork system.

TAKE-AWAYS

WASTE GENERATED

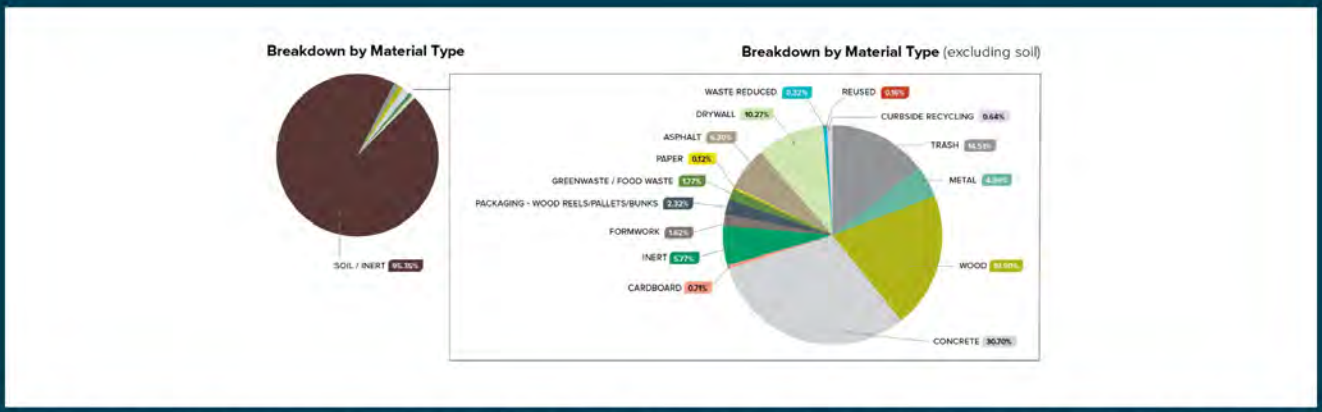
Genesis Marina and ADR diverted 98.4 percent and 95.51 percent of project waste, respectively, becoming the world's first TRUE Gold for construction-certified project and TRUE Gold for construction-certified public project. To put it in perspective, both projects cumulatively diverted over 900 blue whales' worth of waste from landfills.

The composition of the waste offers intriguing insights into where we can make the greatest impacts. Due to high amounts of civil work, 95 percent of the waste generated at Genesis Marina was clean soil, which was reused. Of the remaining 5 percent, the top five waste categories were concrete, wood, non-recyclables, drywall, and metal.

1. **Source-separation saves cost and gives higher diversion.**
2. **Furniture, appliances and equipment has the biggest cost, carbon impact and should be prioritized for reuse.**
3. **Subcontractors are your most important ally in identifying opportunities.**

For non-soil waste streams, recycling is still the top diversion strategy, with 79 percent of waste diverted by recycling without counting alternative daily cover (ADC). Although recycling is not the highest and best use, it is still the most prevalent and cost-effective strategy for diversion. ADC is used to cover landfill working face at the end of each operating day to control for pest, litter, fires and odors, and made from a variety of different materials. TRUE requires material used as ADC to be counted as waste and not diversion.

Studying the end-markets for both projects, we realized that most of the recycling happens locally / within the state. It is expensive and environmentally damaging to haul away recyclable waste long-distance, so it stays local. Concrete and inert materials are typically used as crushed aggregate or road base in projects around the state, while drywall is used as an agricultural soil amendment in agriculture. Metal is very valuable and typically sold to the scrap market in the Bay Area, and wood was used locally to make wood chips for landscaping. The project team had to specifically request that none of the waste go to an incinerator.



Genesis Marina waste composition by material type (left: all waste, dominated by clean soil; right: excluding soil). Image Source: Webcor Builders

How Zero Waste Construction Keeps Materials in Use, Cuts Costs, and Lowers Carbon on the Jobsite

COST

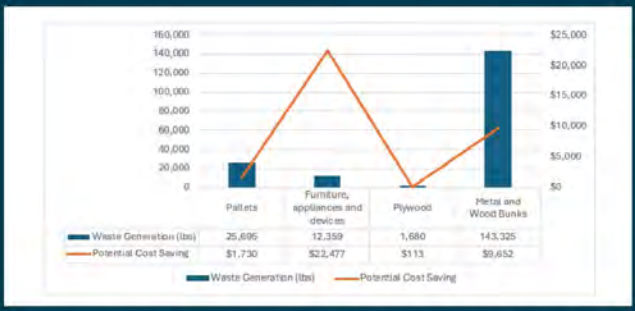
When comparing the costs of diverting different materials, an interesting equation emerges. More source-separation leads to lower costs, as the cost of source-separated bins is lower than that of mixed C&D bins. This is evident when reviewing waste contracts and reflected in the final costs of diversion. The cost of diverting source-separated materials like wood, concrete, drywall and inert pales in comparison to the cost of diverting mixed debris bins. Source-separation is a win-win-win from a cost, carbon, and diversion rate perspective.

Genesis Marina also calculated costs saved by reducing the amount of waste generated by takeback. Pallets were taken back by Webcor Equipment for reuse; furniture / appliances were reused through Webcor Marketplace, Webcor Equipment and Rheaply. Plywood was taken back by Webcor Concrete for reuse on other projects. Metal and wood bunks, used to deliver curtainwall / façade, were taken back by the subcontractor for reuse.

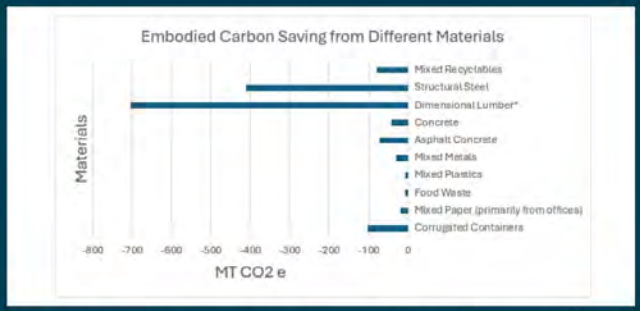
EMBODIED CARBON

The TRUE-certified project teams also used the EPA Waste Reduction Model (WARM) to calculate emissions saved by recycling / composting. At Genesis Marina, about 1391 MTCO2E carbon was avoided by diverting materials away from landfill. To put things in perspective, this is equal to taking 318 cars off the road—the equivalent of 156,000 gallons of gasoline.

Embodied carbon savings at the end of each material's life looks very different. Wood and steel diversion results represent the largest embodied carbon reductions compared to throwing them in landfills. Wood, metal, concrete, asphalt, plastic, and asphalt should be prioritized, as they have established pathways for recycling. However, recycling also produces some emissions, so resource reduction and reuse of existing materials are ideal.



Waste avoided and cost saved through takeback and reuse at Genesis Marina. Image Source: Webcor Builders



Embodied carbon saving from diverting different materials (MT CO2e). Image Source: Webcor Builders

1 **1,391**
MTCO2E AVOIDED AT GENESIS MARINA THROUGH LANDFILL DIVERSION

2 **318**
CARS TAKEN OFF THE ROAD — THE EQUIVALENT IMPACT

3 **156,000**
GALLONS OF GASOLINE — THE EQUIVALENT EMISSIONS

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