County of Santa Cruz

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DEPARTMENT OF PUBLIC WORKS

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THOMAS L. BOLICH
DIRECTOR OF PUBLIC WORKS

AGENDA: SEPTEMBER 26, 2000
September **15, 2000**

SANTA CRUZ COUNTY BOARD OF SUPERVISORS
701 Ocean Street
Santa Cruz, California 95060

SUBJECT: CONSTRUCTION AND DEMOLITION WASTE RECOVERY PROGRAM
BUENA VISTA LANDFILL

Members of the Board:

On June 13, 2000, your Board directed Public Works to return on September 26, 2000, with a report on development of construction and demolition (C&D) waste recovery operations at the Buena Vista Landfill. At that time we informed your Board that the results of our Waste Characterization Study last year indicated the majority of recoverable waste still entering the Buena Vista Landfill is in the form of C&D material. The Waste Characterization Study also quantified the unincorporated county diversion level at approximately 45 percent, as compared to the statewide average of33 percent. While the county's diversion level is ahead of most jurisdictions in the state, we are still short of the overall goal of 50 percent mandated under AB 939. Development of a comprehensive C&D waste recovery program was determined to be the most effective way to achieve the final AB 939 objective.

Development of a comprehensive C&D waste recovery program can be undertaken with many different approaches and combinations of programs. We have been primarily focusing our efforts on development of operational programs, ordinance changes, and collection services. However, other program components such as focused public education and information, improved markets for diverted materials, and additional rate incentives will be included in the overall C&D waste recovery program as we move farther along in development.

C&D Operations

The Buena Vista Landfill currently accepts several C&D type materials for diversion such as clean lumber, concrete, asphalt, scrap metal, sheetrock and carpet. Most of these items are accepted at reduced rates as an incentive for the customer to source separate their waste. These incentive programs have been in place for many years and have proven effective for those individuals/companies that either wish to reduce their costs or have a strong commitment to resource conservation. However, there are still many who choose not to take advantage of these

incentive programs and continue to be willing to pay our higher disposal fees in order to dispose of mixed loads of highly recoverable materials, including those listed above. It is this existing and substantial stream of mixed C&D waste that we are seeking to divert from landfilling.

Earlier this year county staff was asked by the City of Santa Cruz to participate in a selection process for a C&D recovery contractor. During the selection interviews, county staff was allowed to present questions to the contractors regarding possible expansion of their operations to include the Buena Vista Landfill The responses to County inquiries were positive; however, the City only received four proposals and they eventually rejected all proposals as too costly or not consistent with its objectives. Based upon the outcome of the City's selection process, they are now considering a City owned and operated C&D recovery program at their Dimeo Lane Landfill.

Public Works is continuing to move forward with issuance of a Request for Proposal (RFP) for C&D waste recovery services, despite the poor response to the City of Santa Cruz' RFP. We feel there may still be opportunities that have not been fully considered, and with our significantly larger wastestream, the Buena Vista Landfill may be more attractive to potential processors. Waste Management of Santa Cruz County (WMSCC) has also shown an interest in cooperatively developing a C&D waste recovery operation with the County. Public Works is scheduled to meet with WMSCC officials later this month to explore the potential for a cooperative venture.

Funding for both capital improvements and staffing for a C&D waste recovery operation at the Buena Vista Landfill have been included in this year's Solid Waste and Recycling Program budget. If the RFP or discussions with WMSCC do not yield any acceptable or innovative proposals, Public Works is prepared to move forward with acquisition of equipment and recommendations for staffing a County-operated C&D waste recovery operation at the Buena Vista Landfill. We anticipate making a final recommendation to your Board regarding the most appropriate operational structure for C&D waste recovery by January 2001.

C&D Ordinance

Attachment A is a summary of the different types of ordinances and policies that are now being utilized by other jurisdictions to facilitate C&D waste recovery at the job site. Following are three types of ordinances that may be utilized to further C&D waste recovery:

1. Addition of a building/development/demolition permit requirement for waste recovery planning

2. Imposition of landfill disposal bans on specific recoverable materials such as scrap metal, clean lumber, and/or concrete

3. Franchising or permitting of debris box carriers over 10 cubic yards in capacity with the requirement to make source separated C&D waste collection and other recycling services available to all customers.

All three types of these ordinances or policies are being used singly or in combination by other jurisdictions throughout the country to facilitate diversion of C&D waste streams. For your Board's general information, we have also included a recent article (Attachment B) outlining the many types of C&D waste recovery programs currently employed across California.

Imposition of planning permit conditions requiring some form of waste reduction or management is one of the most recent and proactive approaches being taken by several California jurisdictions. Applicants for new construction, remodeling, or demolition are required to submit a waste recovery plan. As a condition of permit issuance, the applicant must demonstrate compliance with their waste recovery plan objectives. Some of the programs are voluntary and others have some form of refundable deposit based upon project size or waste generation calculations. Items 1 through 5 of Attachment "A" summarizes the various permit programs currently being utilized.

Public Works' preliminary recommendation is to utilize a diversion based deposit system. Each applicant would estimate the volume of waste generated from the project, submit a C&D waste recovery plan with a minimum 50 percent recovery goal and submit a deposit based upon the number of tons expected to be diverted. Public Works would be responsible for review and approval of the C&D waste recovery plan, job site field visits as appropriate, final review and confirmation of diversion levels, and reimbursement of deposits upon project conclusion. Applicants meeting their approved C&D waste recovery plan objectives would receive full deposit reimbursement, and those not meeting the plan objectives would receive a prorated reimbursement with the balance going to support mixed C&D waste recovery operations at the Buena Vista Landfill Public Works will also be seeking input from the construction and development community as we move forward with this process in order to propose and draft ordinance changes that will meet our waste diversion objectives and minimize impacts to permit applicants.

In addition to the above permit conditions, the County may further enhance the program by placing voluntary or mandatory landfill bans on certain higher value, easily recovered materials such as clean lumber, concrete, asphalt, and scrap metal. There are already similar state-imposed landfill bans on tires and large appliances. To support such bans, the landfill and transfer station could provide additional staffed tipping areas for self-haul customers with mixed loads to enable and ensure material separation as the vehicles are unloaded. This additional service could be provided in conjunction with a mixed C&D waste recovery operation.

C&D Waste Collection

The final piece of this program is development of an appropriate collection infrastructure to assist the homeowner or contractor in meeting the C&D waste recovery objective in their permit. Public Works has been developing a format for permitting/franchising debris box service providers operating in the unincorporated county, as provided for under section 7.020.011 of the County Code. Staff has contacted the current debris box haulers in the area and is scheduling meetings to receive their input prior to making any formal recommendations to your Board. As a condition of these franchises, the County may impose terms and conditions requiring each operator to provide recycling, and specifically C&D waste recovery services, for its customers. Creating the supporting collection infrastructure for source separated C&D wastes should be done concurrently with any ordinance changes conditioning C&D waste recovery plans for building or demolition permits.

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As we have summarized above, there would be several components to implementing a comprehensive C&D waste recovery program. Public Works is continuing to define and develop an appropriate mix of program components to meet this next and most important waste diversion objective. This program is currently the highest priority for the County's Solid Waste and Recycling Program for several reasons. This plan will assure our meeting the 50 percent waste diversion mandate of AB 939, further extend the life of the Buena Vista Landfill, and prevent the loss of many recoverable natural resources that would otherwise be lost forever if land tilled.

It is therefore recommended that the Board of Supervisors take the following action:

1. Accept and file this report on the Construction and Demolition Waste Recovery Program.

2. Direct Public Works to return on or before January 23, 2001, with a status report and recommendations on construction and demolition material recovery operations at the Buena Vista Landfill.

3. Direct Public Works, in consultation with the Planning Department, to begin development of a draft construction and demolition waste recovery ordinance as outlined in this report.

Yours truly,

THOMAS L. BOLICH
Director of Public Works

RPM:mg

Attachments

RECOMMENDED FOR APPROVAL:

County Administrative Officer

copy to: Planning Department
Public Works (Fred Magaard)

ATTACHMENT A

PRELIMINARY REPORT ON ORDINANCE OPTIONS: DIVERSION OF CONSTRUCTION AND DEMOLITION WASTE

A. PERMIT-RELATED OPTIONS

1. VOLUNTARY SEPARATION

This approach would involve adoption of an ordinance with a policy statement to encourage and promote separation of construction and demolition (C&D) materials prior to their delivery to the county landfill or transfer station. It would apply to all types (defined) and quantities of such materials regardless of the delivery vehicle size. The policy would become part of the County's Landfill Disposal Policy, copies of which are distributed at the landfill and transfer station.

A variation on this approach would involve establishing a building permit requirement for submittal of a waste reduction plan as part of the permit application process. This plan would be reviewed by Solid Waste staff and recommendations made for specific waste reduction actions. The plan submittal requirement would be keyed to a threshold for estimated waste generation or based on square footage of the project. However, implementation of the plan would be on a voluntary basis and no compliance activities would be undertaken by the County.

2. DEPOSIT SYSTEM A

This approach has been enacted by ordinance in the City of Dublin in Alameda County. The ordinance requires compliance as a condition of the permit approval for applicable projects, The ordinance applies to all building or demolition projects with value equal to/over $100,000, including new construction and remodels. It applies to both private and public sponsored projects.

The applicant must prepare and submit a Waste Management Plan (1 page) and a Waste Reduction and Recycling Form (WRRF, 1 page). The WRRF identifies types and quantities of waste materials generated by the project and must demonstrate diversion of at least 50% of these materials. Before the permit is issued, the WRRF is reviewed and must be approved by staff and the applicant must submit a performance security deposit/bond with the amount based on the project square footage.

Within 30 days of the issuance of the occupancy permit, the applicant must submit their final diversion documentation. This would include receipts from buyers/users of the diverted materials indicating weights received. Once staff has determined that the 50% diversion requirement has been met, the security deposit/bond is released. There are provisions for exemptions due to special circumstances, coupled with an appeals process. Securities which are forfeited are dedicated to city waste diversion programs. Enforcement for non-compliance with the ordinance is through an infraction or civil action, including injunctive relief.

3. DEPOSIT SYSTEM B

The Alameda County Waste Management Authority offers a model ordinance similar to that adopted in Dublin. The differences are options for applicability of the ordinance: 1) applies to building or demolition projects with value equal to/over $50,000 or 2) applies to such projects over 1000 square feet in size.

4. DEPOSIT SYSTEM C

This approach has been enacted by ordinance in the City of Atherton in San Mateo County. The ordinance applies to all new construction, remodel, landscaping and demolition projects, including roofing. Compliance with the ordinance is a condition of permit approval. For new construction, remodels or re-roofing the diversion requirement is 50%. Any building proposed for demolition must first be made available for deconstruction or salvage. Diversion requirements for demolition projects are 50% of the total tonnage generated, if concrete or asphalt waste is involved. If concrete or asphalt is not involved in the demolition, the diversion requirement is only 15%.

The applicant must submit a Recycling and Waste Reduction Form with an estimate of the types and amount of waste generated. City staff will conduct a site visit to confirm amounts estimated. The applicant must post a deposit at a rate of $50 per ton to be recycled, with a $5000 minimum deposit. If less than 50% is actually recycled, $50 of the deposit is forfeited for every ton not recycled. Collected monies are dedicated to city diversion programs. Non-compliance with the ordinance is resolved through a misdemeanor.

The City of San Jose is developing an ordinance with a similar deposit approach.

5. FLAT FEE

This approach involves a flat fee that would apply to all new and remodel building and demolition projects, including roofing. The fee would be based on project square footage and the amount would be calculated to reflect typical disposal quantities & waste types. The fee would be collected through the normal permit process and the revenue used to offset cost of the county's landfill-based C& D separation/recovery program.

B. OTHER OPTIONS

6. MATERIAL SPECIFIC LANDFILL BAN

This approach involves an ordinance-based prohibition on the disposal of individually specified materials. These materials would not be accepted at landfill or transfer station for disposal. Under this approach it would be incumbent on the hauler to separate and deliver the identified materials to the appropriate recovery location, whether at the landfill or transfer station or to another collection site. This approach requires widespread and continual distribution of information on the prohibited materials and corresponding diversion options. A small quantity exemption should be included.

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7. NON-EXCLUSIVE FRANCHISE FOR DEBRIS BOX HAULERS

This ordinance option would be applicable to all debris box (roll-off) carriers 10 cubic yards and greater. Such carriers would be required to enter into a franchise agreement with the county in order to operate within the unincorporated county or to use county disposal facilities. A condition of franchise would be to provide collection service for source separated materials.

Crucial to each of the seven options described above is the development and provision of detailed information on recycling and other waste diversion opportunities for project sponsors. Such information includes formulas for calculating weights of waste materials, diversion sources such as recycling or composting outlets, contractor lists for assistance in diversion activities on site (such as building deconstruction, salvage, and hauler lists for assistance in removal of diverted materials from the jobsite).

This information is provided to the applicant when the waste reduction/recycling form is issued during the permit application process. The applicant would use the information and resource contacts to develop his or her own waste reduction strategy.

Attachment B

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Trend Setters: Recovering C&D

Several local governments in California have found ways to better manage their C&D waste.

By Kelly McArthur Ingalls

The key to lessening landfill dependency isn't simply recovering materials, but being able to sell what you recover. As a result, municipalities have targeted a recoverable portion of the waste stream with good end-markets: construction and demolition (C&D) debris. Not only is C&D highly recyclable, it also represents between 15 percent and 30 percent of all waste headed to landfills.

There currently are a variety of C&D recovery programs. Some local governments require C&D diversion or contractors to recycle these materials. Others create guidelines for developers and contractors, provide technical assistance, and conduct education and outreach programs instead of creating regulations. Each program, however, should be tailored to the needs of the community.

Frequent trend setters in the waste industry, communities in California have instituted several C&D recovery policies and practices. For example:

City of Los Angeles

Since the early 1990s, the city of Los Angeles (L.A.) has conducted a hybrid voluntary-mandatory program to promote C&D recycling. Using a three-pronged approach, the city has focused on buildings that it controls directly; city-influenced developments, such as projects subject to Environmental Impact Reports (EIRs); and private sector projects.

For example, Los Angeles' Public Works Department spends more than $100 million per year on building developments. The city's Harbor, Airport, Water and Power Departments have comparable annual capital budgets.

To maximize and track C&D recycling, the Public Works Department requires contractors to submit a Solid Resources Management Plan after winning a bid and prior to construction. Additionally, contractors must submit a summary of diversion and disposal with each application for progress payment.

L.A.'s Community Redevelopment Agency targeted larger developments. For example, the agency required the Staples Center Arena developers to submit a C&D recycling plan and tonnage summaries during demolition and construction phases.

Additionally, the city has conducted extensive public education programs, as well as outreach programs about C&D for the building industry. L.A. has provided direct technical assistance to contractors, distributed booklets on C&D recycling as well as construction product recycling guides, sponsored a series of presentations and workshops, and closely interacted with industry associations such as the Construction Specifications Institute.

The city's outreach program has received many awards. However, because the program is voluntary, the city has had a limited opportunity to measure its effectiveness, particularly with private sector projects.

City of Santa Monica

Santa Monica's Green Building Development Guidelines address transportation. energy efficiency, water conservation, materials selection, construction waste management and other environmental design aspects. Some of the programs described in the guidelines, including a 50 percent C&D waste recycling requirement, Hazardous materials management, stormwater runoff reduction and submission of a solid waste management plan currently are being drafted as city ordinances.

The guidelines also incorporate voluntary construction practices, such as using pre-engineered materials to reduce onsite waste.

Town of Atherton

Located in the San Francisco Bay area of Northern California, the town of Atherton primarily is residential Consequently, C&D activities center on home improvements and new residential construction

Atherton has imposed ordinances for C&D recycling and diversion, which requires that every demolition project be available for deconstruction. salvage and recovery prior to demolition Owners and contractors must recycle 50 percent of demolition debris including concrete and asphalt; 15 percent of debris other than concrete and asphalt; 50 percent of roofing shingles; and 50 percent of new construction materials.

Additionally, contractors are required to submit a Recycling and Waste Reduction Form to the town's Building Department when applying for a building or demolition permit. The form estimates recyclable and disposable materials quantities that the project will produce, and the contractor is required to post a cash deposit of $50 for each ton of recyclable material, equaling no less than $5,000.

The contractor must demonstrate that he recycled the estimated tonnage to receive a deposit refund. If he does not meet his estimated goal, the town keeps a portion of his deposit.

The Town of Hillsborough

Also located in the San Francisco Bay area, the town of Hillsborough requires contractors to submit a Waste Reduction Plan to its Director of Public Works to obtain a building or demolition permit. If the plan is satisfactory. the town will issue a Waste Reduction Permit that mirrors the Waste Reduction Plan

Sacramento, Capitol Area East End Complex

During the next three years, the state of California will construct a $293 million complex of fire office buildings, with approximately 2 million square feet of space.

During project construction, the state will institute a green building program governed by various representatives from the Department of General Services, the California Integrated Waste Management Board, the California Energy Commission, the Department of Health Services, the Air Resources Board and the Department of Water Resources.

When the state requested proposals for a project developer, regulators included green standards that address water conservation, C&D recovery, waste management, reuse of recycled materials, alternative energy sources, indoor air quality and recharging stations for electric vehicles. The demolition contractor also is required to recycle 75 percent of the C&D debris gentrated during the demolition of existing buildings.

These requirements already have been incorporated into subcontractor specifications for the project's demolition phase. Also, new construction project specifications must meet the recycling specification in the project's General Requirements.

Additionally, for all of the-new buildings, a list of recycled-content construction products has been developed that includes recycled pla site amenities, carpeting, tile si and other materials.

How to Manage a C&D Recovery Plan

Here are a few elements that are essential to developing and managing a good C&D recovery plan.

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1. Ordinances and Policy Statements. Support from the city council, the district government and other decision-makers is crucial to the success of any C&D program. Ordinances, resolutions and motions provide a foundation and define the program's goals. With clear instructions from high-level decision-makers, department managers and lower-level staff will be able to implement policies without confusion.

2. Best Management Practices. A list of standards, performance guidelines and procedures — best management practices (BMPs) — must be established to ensure that the program is implemented efficiently These discreet procedures might include site pre-assessments, techniques for identifying recoverable materials and other practical aspects of management. Some municipalities choose to combine the BMPs for C&D recovery with other related BMPs. In these cases, the, combined BMPs list might include everything from stormwater runoff procedures to site safety and site security measures.

3. Timelines. Even with high-level support, public policies can end up stagnating without a clear description of how and when procedures will be implemented. In creating a timeline, regulators should identify financial and staff resources, set project milestones and develop a schedule for project completion. The timeline alsb should include processes that monitor success and identify areas needing improvement.

4. Reporting and Documentation. C&D diversion programs rely heavily on contractors to report and document results. To avoid confusion, reporting should be quantifiable rather than qualitative. Results should be reported in tons, cubic yards or other standard measuring units.

Detailed program descriptions can bc a valuable tool for understanding diversion procedures. However, descriptive information alone is inadequate for measuring a program's effectiveness. Narrative reports, however, often tend to be too general.

— *Kelly McArthur Ingalls*

Why Recycle C&D Waste?

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Diversion of C&D materials (excluding C&D materials contaminated with hazardous substances) is a key strategy for reaching landfill waste diversion goals. This is because :

- C&D can be a significant portion of the waste stream, ranging from 15 percent to 30 percent:
- C&D materials are heavy and high in volume;
- C&D materials are highly recyclable;
- There are well-established C&D processing technologies, improved equipment and new systems continue to come online;
- There are good end-uses and markets for most types of C&D materials;
- C&D materials can be source-separated, transported, and processed cost-effectively;
- C&rD recycling centers provide good business and job creation opportunities; and
- Costs for processing C&D materials often are much lower than the cost of landfilling them.

— *Kelly McArthur Ingalls*

City of Hawthorne

The city of Hawthorne, Calif., awarded an exclusive franchise for C&D debris to its existing hauler in July 1999 to meet state-ordered year 2000 mandates. Contractors that self-haul C&D using their own equipment and labor forces arc excluded from the franchise requirement.

By focusing on C&D diversion along with other diversion efforts, such as multifamily recycling, the city anticipated that it could increase its recycling rate.

The city of Alhambra, Calif., also requires C&D recycling as part of its new franchise agreements, which will go into effect after July 2000.

Programs in the Works

The city of San Jose, Calif., has proposed a program to require contractors to post a deposit for the estimated recyclable materials in their C&D work. When the program is adopted, the city will retain &posited amounts for any non-recycled materials and use those funds to operate its C&D diversion program.

The Alameda County Waste Management Authority has developed a draft model ordinance to encourage developers and contractors to recycle C&D materials. It will require contractors with projects exceeding a given square footage to divert a minimum of 50 percent of their construction waste materials from the landfill, and to submit a waste management plan for projects.

Applicants will be required to submit proof that materials have been recycled or reused. This model ordi-

Tips for Franchising

Municipalities should be aware of several important factors when franchising C&D debris:

- The franchisee should be familiar with and have a background in recycling the materials.
- The franchisee should submit a detailed plan of how it will divert the various types of debris.
- Municipalities should consider excluding self-haul by contractors who employ their own trucks and use their own staff for hauling C&D debris. The definition of self-haul should be clear so that contractors are not allowed to sub-contract their hauling services to trucking companies and haulers other than the franchisee.
- The franchisee must demonstrate that it has the capacity to handle C&D contracts ranging from small jobs to heavy projects. In the event of very large demolition projects, the franchisee should clearly demonstrate how it will subcontract trucking services to recycle large volumes of debris. Proper notice should be given to contractors, an education program should be put in place to inform contractors that they are to use the franchisee. and under what conditions franchisees might be excluded by self haul.

— *Kelly McArthur Ingalls*

nce will be standardized so that all of the cities in Alameda County will be able to modify it and adopt a specific ordinance for their own use.

C&D Presents Opportunities

Municipalities have an opportunity to achieve high diversion rates by reusing and recycling C&D. Public education. technical assistance and industry outreach may make sense in some areas. However, voluntary, incentive-based programs are more difficult to document and may have less influence on the outcome and effectiveness of a C&D recycling program.

On the other hand, mandator!- approaches such as advance deposits and submittal of recycling plans with permit applications have their own set of issues. For example, if contractors are required to estimate recyclable quantities of C&D materials on a project as a basis for refundable deposits, the municipalities must be able to verify the accuracy of those estimates.

And when contractors submit tonnage C&D recycling data. staff will be required to evaluate data. resolve discrepancies and record information.

Consider this before implementing a mandatory program based on recyclable quantities:

- What happens if a contractor submits a C&D waste diversion plan with its application for a building permit and a municipality rejects it?
- Will the building permit or certificate of occupancy be denied?

Types of Regulatory Programs

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hlunicipalities that want to enforce construction and demolition (C&D) recycling should implement one or more of the following:

1. Local Ordinances. Establishing local ordinances that require contractors to reuse and recycle a certain percentage of C&D waste can be an effective diversion strategy. To ensure these ordinances' success, municipalities may designate recycling as a condition that contractors must meet before obtaining a C&D permit or a certificate of occupancy.

2. Local Conditions of Approval. Some municipalities have established conditions of approval, which list the C&D recovery guidelines contractors must follow to receive building approval. These conditions arc included during the land development review. They apply to entitlements and subdivisions, and include infrastructure improvements and other special requircmcnts.

3. Environmental impact Report (EIR) Measures. When development projects require an EIR, regulators look at solid waste impacts to determine hou much C&D debris the new project will gcncrate, and how the project will affect local landfills. Some municipalities have written solid waste mitigation measures in the EIR, requiring the dcvclopcrs and contractors to recycle C&D debris. In these cases, however, local planning agencies can override the measures if the value of the development outweighs the environmental concerns.

Municipalities committed to requiring C&D recovery should indicate that mitigation measures are not subject to overriding considerations.

4. Construction Specifications. For individual projects that rely on contractors and subcontractors to recycle C&D debris, municipalities can write construction specifications in a standard three-part format. The first part is a set of general recycling guidelines; the second is the contractor's C&D diversion plan, which must be submitted prior to construction; and the third is a C&D diversion and disposal report that is submitted during construction, along with progress payment requests.

C&D recycling specifications should be included in the General Requirements section.of construction contract documents.

— *Kelly McArthur Ingalls*

As a municipality adopts regula-ions, these questions must bc eval-uated clearly so that contractor requi-ements are effective, equitable and practical for all parties involved. WA

Kelly McArthur Ingalls is the principal of KMI Associates in Glendale, Calif. This article was based on the presentation delivered at WasteExpo 2000 in May. For further information on these programs, e-mail Ingalls at kmibldg @earthlink.net

The availability of C&D recycling facilities varies. Consequently, C&D policies and practices must take into consideration local resources. Following is a description of processing technologies available in the United States.

1. Salvage for On- and Off-Site Use. Materials such as historic fabric and architectural items from historic buildings can be recovered prior to demolition, stored, reconditioned and incorporated into new structures. Light fixtures, wood partition walls and decorative masonry units are materials whose value and aesthetic appeal warrant the time and expense required to reuse them.

Non-historic items in good condition, including electrical conduits and carpet pieces, also have been reused in buildings such as the Southern California Gas Company's Energy Resource Center in Downey, Calif.

2. Dismantling Prior to Demolition. By dismantling a building prior to mechanical demolition, municipalities can recover a wealth of materials such as old-growth timbers, red brick and windows for reuse and recycling. These materials can be transported to other building projects or sold.

For example, the hletropolitan Waste Authority in Portland, Ore., conducted a salvage operation prior to the selective demolition of an old Sears, Roebuck and Co. store. By allowing a local lumber company to recover the Sears store's hardwood flooring, the authority not only diverted the flooring from the landfill, but it also provided a business opportunity for the lumber company.

The barriers to dismantling are labor rates, time limitations and liability concerns. Deconstruction can take weeks or months, depending on the size and scope of the project, and many insurance companies will not cover deconstruction workers not employed by the contractor.

3. On-Site Crushing and Grinding. Mechanical processing equipment for C&D materials rapidly is becoming more sophisticated and cost-effective. Processing materials such as concrete can be crushed for use onsite or transported offsite for reuse. Wood and green waste materials also can be ground onsite, saving landfill tipping fees and transportation costs.

When materials are reused onsite, the costs of buying and shipping new materials are eliminated. Also, avoiding trips to the landfill reduces harmful emissions. For example, the Playa Vista development in the Marina Del Rey area of Los Angeles processed more than 60,000 tons of concrete and asphalt for reuse as base material at the site, thereby avoiding more than 3,000 trips to the landfill.

4. Source Separation for Off-Site Processing. Building projects are completed in phases, starting with site construction, continuing with roof installation and ending with interior finish work. Materials generated during new construction, therefore, may yield homogenous loads of debris such as lumber during framing and drywall during sheetrock installation.

Similarly, demolition produces mixed debris during bulldozing operations, and concrete, asphalt and green materials during site clearance. Consequently, C&D debris can be source-separated cost-effectively during the different construction, deconstruction and demolition phases.

For instance, when using high capacity equipment, contractors can extract recyclable materials from mixed debris and place these materials in source-separated, roll-off containers or trucks for offsite processing.

Depending on the location, recycling facilities for source-separated materials such as concrete. asphalt, soils, red clay brick, ferrous and non-ferrous metals, cable and wire, drywall, lumber, green materials. cardboard and mixed debris may exist. Reclamation opportunities also are expanding for carpeting, celling tiles and asphalt roofing shingles.

5. Mixed C&D Debris Loads for Off-Site Processing. Due to space constraints. the lack of similar loads and the lack of source-separated facilities, many contractors find that generating mixed C&D debns loads is the most cost-effective option.

Mixed C&D processing facilities are becoming more prevalent across the United States. In man) cases, these facilities have a simple setup: C&D debris is dumped on the sorting floor and removed with loaders. grapplmg equipment, by hand or on conveying systems with picking stations. In addition to this basic. operation, such facilities may have grinders or a crushing plant for processing large volumes of concrete, asphalt, and wood and green waste materials.

Some facilities have more advanced, automated setups, which use loaders with grapplers and pulverizing heads, as well as high-capacity mechanical equipment including screeners, horizontal grinders or tub grinders, conveyor systems, vibrating floors and flotation tanks.

These automated systems still may employ picking stations with manual sorting. While basic processing setups may only achieve a C&D recovery rate of 50 percent or less, automated setups may achieve recovery rates as high as 90 percent.

To justify the expense of building and operating an automated system, however, facilities require a steady stream of C&D materials to generate tipping fee revenues.

— *Kelly McArthur Ingalls*