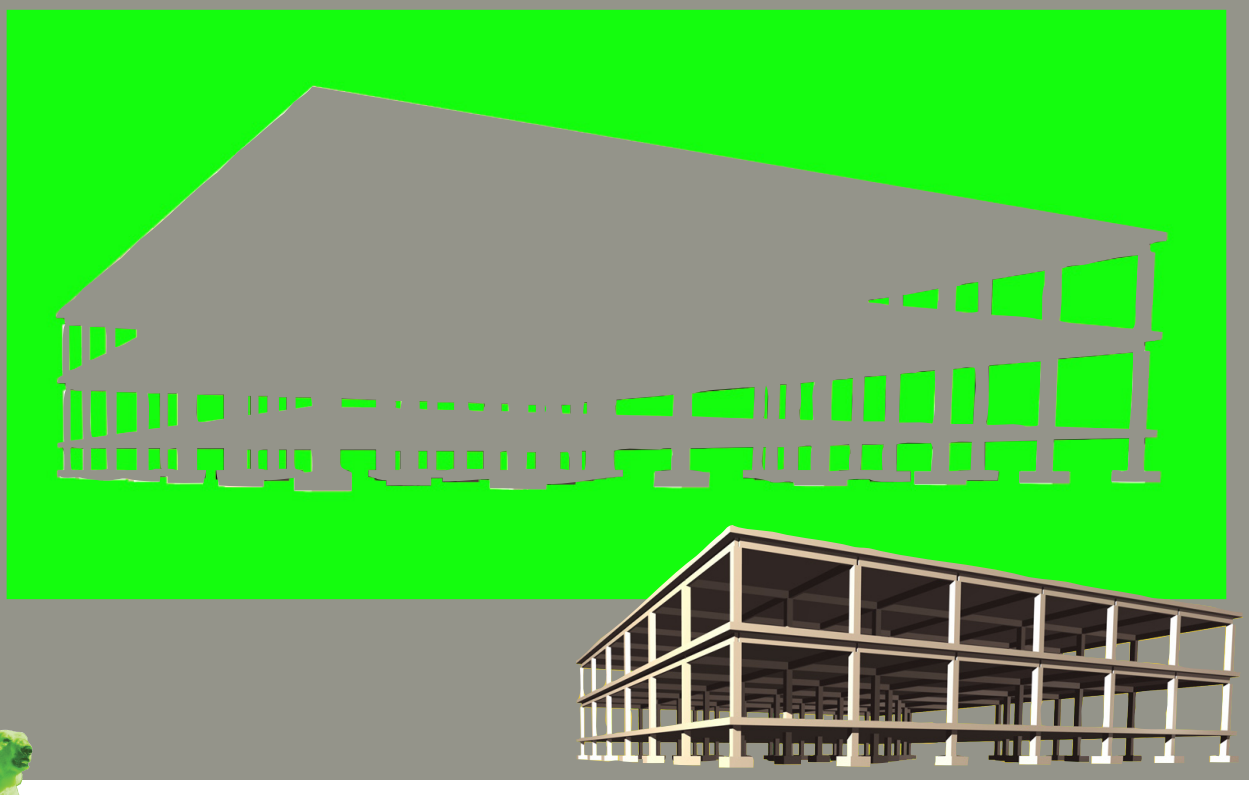

ekkomaxx™
CARBON NEUTRAL CEMENT SYSTEM

USGBC LEED Rating System Applicability Analysis of ekkomaxx™ Cement and Concrete

Independent Analysis Performed By:

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CERATECH .....Responsible Cement

U.S. GREEN BUILDING COUNCIL MEMBER

COOLEY CONSULTING

TECHNICAL REPORT

CERATECH CEMENT PRODUCTS

LEED CREDITS ANALYSIS

Contents

EXECUTIVE SUMMARY

This report reflects an analysis of potential LEED credit categories that could be supported by product selection from CERATECH Inc. It has been prepared by Steven E. Baker, CMQ/OE, LEED AP O+M, James Stawniczy, AIA, LEED AP and Laura Cooley, IE, ISO 14001 Lead Auditor at the request of CERATECH, Inc.

This report has been created by using the LEED Reference Guide for Green Building Design and Construction, 2009 Edition to analyze CERATECH product information provided in the ekkomaxx™. Carbon Neutral Cement System Performance Data Guide-17, (Rev. Date April 28, 2011), 3rd party content analysis & performance reports as well as supporting product brochures, case studies and Material Safety Data Sheets.

The analysis has shown that CERATECH's products can potentially contribute to sixteen (16) out of the seventy-one (71) elements of the LEED Green Building Guide for Design and Construction. Stakeholders cannot infer that these credits can be obtained simply by using CERATECH's products as LEED requirements involve much more than product selection. Stakeholders interested in Green Building will value CERATECH's commitment to supplying products and information that support their efforts to be responsible stewards of resources who are sensitive to their impacts on our communities and environments.

The greatest opportunity for LEED points can be found as an Innovative Design credit.

BACKGROUND

Representatives from CERATECH requested an independent review of their construction cement system to profile how concrete made with their cement can be used in the LEED certification process, and how they can be used by design teams with projects seeking LEED certification.

LEED is an internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

LEED is a voluntary, consensus-based national rating system for developing high performance, sustainable buildings. USGBC's members, representing every sector of the building industry, have developed and continue to refine LEED. LEED's objectives include:

- Define "green" and provide a third party standard of measurement
- Provide design guidelines to promote a whole-building, integrated design process
- Recognize leaders and stimulate green competition
- Establish market value with recognizable national "brand"
- Raise consumer awareness
- Transform the marketplace

Developed by the U.S. Green Building Council (USGBC), LEED provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. LEED rating systems

- Evaluate environmental performance from a whole building perspective
- Were designed to be comprehensive in scope, but simple in operation
- Are based on existing proven technology - "Strikes a balance between established practices and emerging concepts"
- Are market driven
- Are consensus-based developed
- Are performance-based

LEED is flexible enough to apply to all building types – commercial as well as residential. It works throughout the building lifecycle – design and construction, operations and maintenance, tenant fit-out and significant retrofit. LEED for Neighborhood Development extends the benefits of LEED beyond the building footprint into the neighborhood it serves.

A preliminary report was prepared and presented to the CERATECH team that profiled all of the potential LEED credits that CERATECH could focus on with regards to marketing themselves as a company providing a sustainable cement /concrete solution.

The following **LEED 2009** categories were identified as potential opportunities for credits:

1. **MR CREDIT 2: CONSTRUCTION WASTE MANAGEMENT**

   This credit focuses on diverting waste from landfills by finding multiple alternatives for end uses of the waste, namely recycling, reuse on site, donation for reuse on another site, or resale. All of these diversion methods count towards credit compliance—50% construction waste diverted for one point, 75% for two points.

2. **MR CREDIT 3: MATERIALS REUSE**

   If salvaged materials are appropriate for a project, this credit can be achieved through the significant use of salvaged materials. It is most feasible for small projects that target sources of salvaged materials early in the design process. Because salvaged materials are often opportunistically procured—they are difficult to specify, find suppliers and/or purchase in bulk; the contractor or owner usually has to procure and stockpile salvaged items when they become available. That has to happen early enough that they can be included in the design, which is often long before they are needed on the job site.

3. **MR CREDIT 4: RECYCLED CONTENT**

   a. LEED requires the base materials budget to be consistent across all MR credits. The LEED Online credit forms help provide consistency across MR credits by applying the same data to multiple credits. Materials used to earn this credit cannot also be counted for MRc3: Materials Reuse, nor for MRc7: Certified Wood

4. **MR CREDIT 6: RAPIDLY RENEWABLE MATERIALS**

   a. Rapidly renewable materials must have a harvest cycle of 10 years or fewer. This includes materials like bamboo, agri-fibers, and others. Materials for this credit can come from either plants or animals—but they have to be harvested without harming the animal. Wool is okay; leather isn't.

   b. This credit can be very easy to achieve—it only requires that a small percentage of the materials budget be spent on rapidly renewable materials.

5. ID CREDIT 1: INNOVATIVE DESIGN

Innovation in Design allows for the use of an innovative approach to something not already covered in the LEED rating system. This approach must represent an innovative design approach to a problem, must be comprehensive in scope, and must have a quantifiable environmental benefit. Approaches to using this path should be as if a new LEED "ID credit" was being created from scratch. The approach must: demonstrate the benefit, take a comprehensive approach, be a concept applicable to other projects. The strategy to leverage this credit's applicability to the use of CERATECH products would need to be considered early to maximize opportunities to leverage the products flexible and environmentally friendly benefits.

METHODOLOGY

1. Obtain the official LEED 2009 Credit worksheets from the USGBC and review all aspects of the credit, analyzing CERATECH (ekkomaxx™) cement technology for applicability.

2. Analyze each credit and explore how CERATECH's cement technology (ekkomaxx™) could assist in the attainment of LEED credits.

3. Present a list of credits to which CERATECH's cement technology (ekkomaxx™) could potentially contribute. The analysis has shown that CERATECH's products can potentially contribute to sixteen (16) out of the seventy-one (71) elements of the LEED Green Building guide for Design and Construction.

4. Create a final report discussing the five (5) credits CERATECH selected for emphasis. (See Engagement Objectives in this document.)

ENGAGEMENT OBJECTIVES

The following objectives were established:

OBJECTIVE #1: Evaluate application of LEED 2009 MR CREDIT 2, "CONSTRUCTION WASTE MANAGEMENT"

OBJECTIVE #2: Evaluate application of LEED 2009 MR CREDIT 3, "MATERIALS REUSE"

OBJECTIVE #3: Evaluate application of LEED 2009 MR CREDIT 4, "RECYCLED CONTENT"

OBJECTIVE #4: Evaluate application of LEED 2009 MR CREDIT 6, "RAPIDLY RENEWABLE MATERIALS"

OBJECTIVE #5: Explore how the selection of CERATECH's cement technology (ekkomaxx™) over traditional portland cement could lead to a LEED credit in INNOVATIVE DESIGN

ENGAGEMENT RESULTS

Engagement results are provided following the Recommendations section of this document.

CONCLUSIONS

CERATECH's cement technology (ekkomaxx™) has been designed to eliminate the many hazardous and negative environmental aspects inherent to traditional portland cement. Design teams that replace portland cement with CERATECH's cement technology (ekkomaxx™) will potentially find that their pursuit of multiple LEED credits can be supported. The magnitude of the impact of cement system product selection is a function of both the amount of product used and the project's overall LEED Credit strategy.

RECOMMENDATIONS

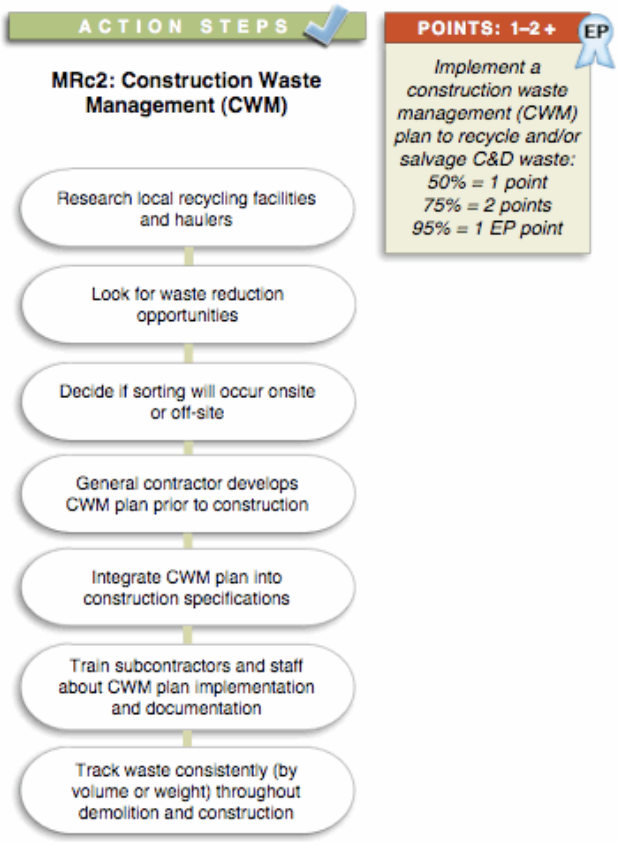
CERATECH, Inc. should be prepared to offer project-specific support for customers pursuing LEED certification so that design teams can best leverage the unique, environmentally friendly, properties of their product line. ISO14001:2004: Environmental Management Systems offers an internationally recognized framework for assessing significant environmental aspects and impacts of products, production and installation. The main objective for using this standard is to continually improve environmental performance; thereby, continuously reducing a company's carbon footprint. Leveraging this globally recognized, international standard could help potential customers rapidly recognize CERATECH's superior environmental performance as an innovative, environmentally responsible business.

OBJECTIVE #1: NC 2009 MRCR2: CONSTRUCTION WASTE MANAGEMENT

CREDIT SUMMARY:

This credit focuses on diverting construction waste from landfills by finding multiple alternatives for end uses of the waste, namely recycling, reuse on site, donation for reuse on another site, or resale. All of these diversion methods count towards credit compliance—50% construction waste diverted for one point, 75% for two points.

When structures made of concrete are demolished or renovated, concrete recycling is an increasingly common method of utilizing the rubble. Concrete was once routinely trucked to landfills for disposal, but recycling has a number of benefits that have made it a more attractive option in this age of greater environmental awareness, more environmental laws, and the desire to keep construction costs down.



There are two different approaches to recycling construction and demolition (C&D) waste: separating materials at the source (onsite), or commingling them and sending them to an off-site waste sorting facility. Either approach can work well. Your choice will depend on whether there is room for sorting onsite, whether the contractor is willing to take that on, and if there are good sorting facilities nearby.

Concrete aggregate collected from demolition sites is put through a crushing machine. Crushing facilities accept only uncontaminated concrete, which must be free of trash, wood, paper and other such materials. Metals such as rebar are accepted, since they can be removed with magnets and other sorting devices and melted down for recycling elsewhere. The remaining aggregate chunks are sorted by size. Larger chunks may go through the crusher again. After crushing has taken place, other particulates are filtered out through a variety of methods including hand-picking and water flotation.

Crushing at the actual construction site using portable crushers reduces construction costs and the pollution generated when compared with transporting material to and from a quarry. Large road-portable plants can crush concrete and asphalt rubble at up to 600 tons per hour or more. These systems normally consist of a rubble crusher, side discharge conveyor, screening plant, and a return conveyor from the screen to the crusher inlet for reprocessing oversize materials. Compact, self-contained mini-crushers are also available that can handle up to 150 tons per hour and fit into tighter areas. With the advent of crusher attachments - those connected to various construction equipment, such as excavators - the trend towards recycling on-site with smaller volumes of material is growing rapidly.

CERATECH CONTRIBUTION TO LEED CREDITS:

CERATECH products are nontoxic, recyclable and made from recycled industrial waste streams as well as no-harm agriculturally-based products. In contrast to the negative environmental impacts associated with the use of portland concrete in construction, the CERATECH ekkomax™ concrete system is comprised of nearly 100% recycled & renewable products that reduce or even eliminate the overall carbon footprint of typical concrete usage. In addition, enhanced mechanical performance characteristics of CERATECHs cement allow for structures that require less material overall: less concrete, less rebar—less environmental impact.

Table 1 below compares the amount and type of materials required to produce a ton of cement

Materials Usage

	CERATECH Green Cement Technology
One Ton of CERATECH Cement	1900 lbs. (coal ash), 80 lbs. (renewable), 20 lbs.(virgin minerals)
One Ton of Portland Cement	3500 lbs. (virgin minerals)

Data from CERATECH Bulk Cement Performance Data – Environmental Impact Comparisons, April 28, 2011

In cases where demolition of existing concrete is not applicable, simply selecting CERATECH products (unlike portland cement) can "divert" material from landfills. Where existing concrete does need to be removed, it can be crushed and used as a sub-base or as a coarse aggregate for the new ekkomaxx™ cement concrete. (The ekkomaxx™ cement technology can readily utilize reclaimed concrete that may have deteriorated due to ASR or alkali silica reactions. CERATECHs cement chemistry is not susceptible to this type of reaction from certain types of aggregates.) Calculations for this credit, in the latter case, would need to consider the total construction waste and the amount of removed concrete crushed and reused.

ANALYSIS:

Depending on the amount of portland cement concrete reclaimed and or displaced, and the size of the project, this strategy could generate 1-2 points.

CERATECH collaborates with General Contractors to develop Construction Waste Management[1] (CWM) plans prior to construction. This plan is then integrated into the construction specifications[2] to maximize opportunities for managing construction waste by incorporating into new concrete.

Subcontractors and employees of the General Contractor would need to be trained about CWM plan implementation and documentation requirements.

Reclaimed waste would need to be tracked consistently by weight or volume throughout demolition and construction. This can be documented using Construction Waste Management tracking sheets.[3]

[1] Cooley Consulting can generate custom Construction Waste Management plans that can be used by Ceratech to provide to Construction Managers, General Contractors and design teams.

[2] Example specifications based on Masterspec can be provided by Cooley Consulting.

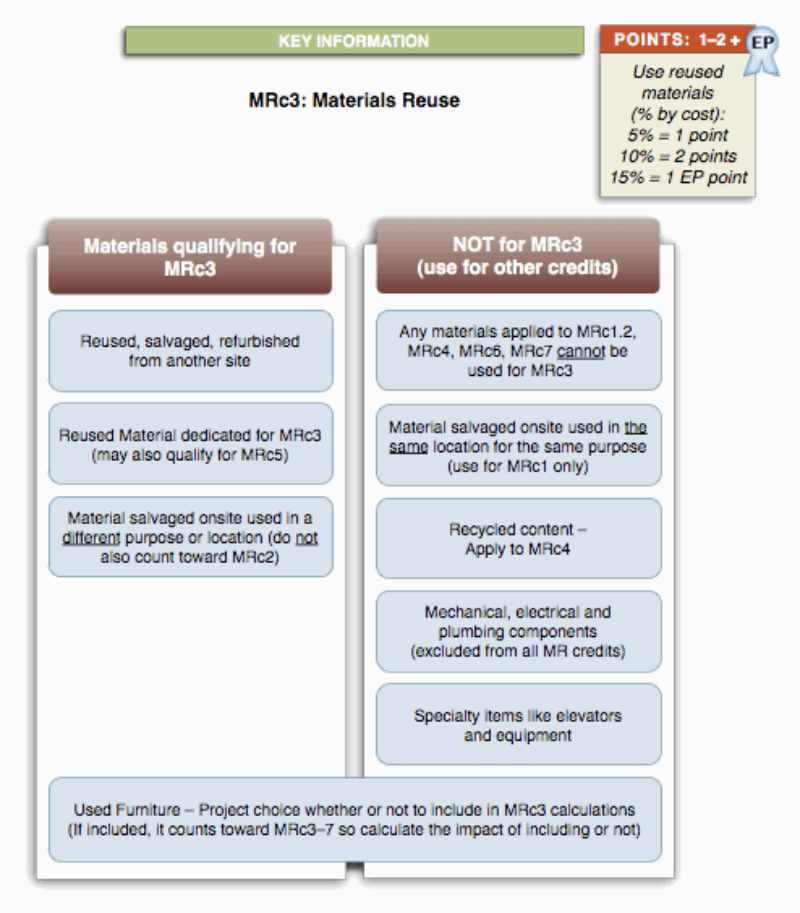
[3] Cooley Consulting can provide all tracking sheets and related documents needed for this activity

OBJECTIVE #2: NC 2009 MRCR3: *MATERIALS REUSE*

CREDIT SUMMARY:

Environmental impacts associated with extracting and processing virgin resources can be significantly reduced by reusing building materials and products. In addition, reusing materials reduces disposal into landfills or incinerators.

This credit works for projects where salvaged materials are appropriate. Typically, to achieve this credit, a lot of salvaged materials have to be used to reach the threshold. It is most feasible for small projects that target sources of salvaged materials early in the design process. Salvaged materials are not the easily specified and availability is often not reliable—contractors/owners usually need to procure and stockpile salvaged items as they become available. This has to happen early enough the salvaged materials can be included in the design, which is often long before they are needed on the job site. In order for material to qualify for this credit, the reuse has to be in a different capacity than originally intended for the material.



"Re-Used vs. Recycled"

It's not unusual to have some confusion about the difference between "reused" and "recycled"—often the terms are (incorrectly) used interchangeably—but there is a distinct difference, especially for the purposes of LEED.

Recycled refers to anything that contains recycled materials as a result of the manufacturing process—carpet that contains recycled material, for example, could be made from post-consumer recycled plastic bottles.

Reused material is something that has been reused or repurposed from another location or a different role—like antique doors salvaged from an old church, raised floor pedestals saved from one office project and sold to another, or office partitions relocated from a previous office to a new one.

"Credit Piggybacking"

In most cases, materials that have multiple environmental attributes can be applied to as many of the MR credits as they relate to. That is still true in most cases, but for this credit, there are limitations. Materials that apply to this credit cannot be applied toward:

- MRcr1: Building Reuse
- MRc2: Construction Waste Management
- MRc4: Recycled Content
- MRc6: Rapidly Renewable Materials
- MRc7: Certified Wood

CERATECH CONTRIBUTION TO LEED CREDITS:

CERATECH's ekkomaxx ™ cement system can be used to further a design team's efforts to use salvaged materials. Design teams seeking this credit can reuse salvaged materials (glass or other materials that can be crushed and used as aggregate within concrete)

The flexibility of CERATECHs cement allows for the use of non-traditional aggregates such as crushed consumer or commercial glass. Stunning architectural components (countertops for example) can be produced by taking advantage of ekkomaxx's™ inherent and forgiving chemical properties. (See Precaster Brochure - www.ceratechinc.com/precasting)

A lack of calcium hydroxide presents no opportunity for ASR issues (Alkali Silica Reaction). CERATECH's ekkomaxx ™ cement system allows for the use of a broader spectrum of coarse and fine aggregate materials. Salvaged materials such as glass, stone, tile, etc. are not suitable for a portland cement concrete mix design due to potential ASR issues. The CERATECH ekkomaxx ™ cement system is not limited to traditional coarse aggregate materials and can incorporate many salvaged materials into the cement concrete matrix. Post-consumer materials can be reused up to 100% for its coarse and fine aggregate concrete components. This advantage over portland cement, allows design teams to explore more options for material reuse as nontraditional aggregate materials. Post-consumer reused or recycled glass can be used to create unique products that extend the life cycle of resources used to produce the original products.

ANALYSIS:

By maintaining a controlled and documented inventory of reclaimed material to be used as aggregate in new concrete batches, CERATECH can help design teams earn two points toward LEED certification, and **since this credit is eligible for an EP point (Exemplary Performance), this unique strategy could result in a total of three points earned.**

OBJECTIVE #3: NC 2009 MRCR4: *RECYCLED CONTENT*

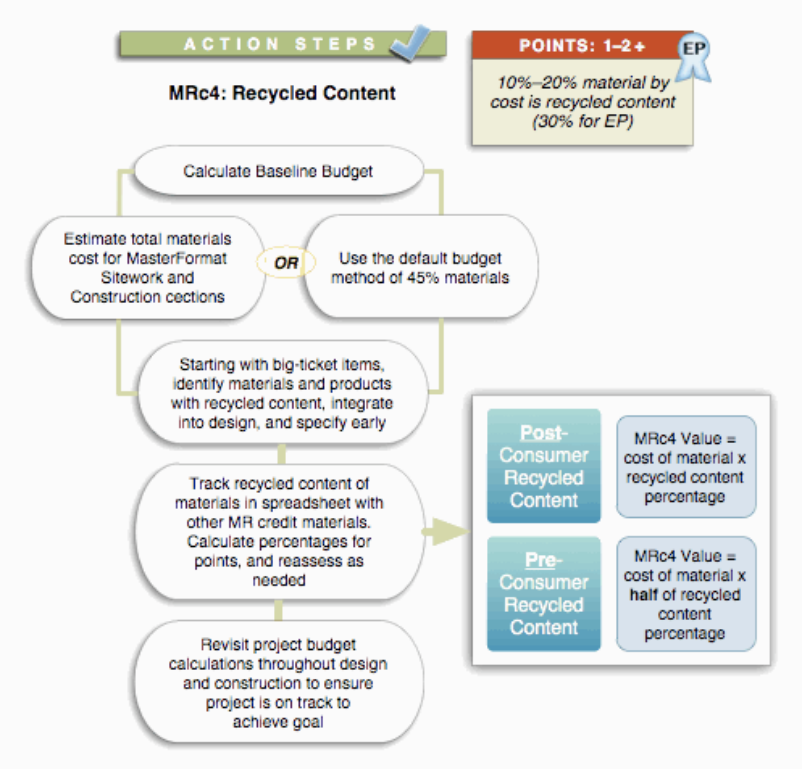
CREDIT SUMMARY:

The intent of this credit is to increase demand for building products that incorporate recycled content, thereby reducing impacts resulting from extraction and processing of virgin materials.

LEED requires the base materials budget to be consistent across all MR credits.

The LEED Online credit forms helps provide consistency across MR credits by applying the same data to multiple credits. Materials used to earn this credit cannot also be counted for MRc3: Materials Reuse, nor for MRc7: Certified Wood, but they can contribute to MRc5: Regional Materials and MRc6: Rapidly Renewable Materials.

The 10% point threshold is easy to achieve for this credit, especially if the project has a lot of concrete or steel. There is also an increasing number of products on the market that have recycled content, making the 20% threshold achievable for some projects. Concentrate on buying "big ticket" items with high recycled content levels. Depending on the building construction, projects will generally get more (due to a higher cost) out of tracking the recycled content of concrete and steel over lower cost items like tile.



Analyze the budget early in design to help determine which materials are more important to specify as having recycled content, this is dependent on project construction type.

Recycled content can be pre-consumer (also known as post-industrial), or post-consumer. These are valued differently in LEED calculations. Pre-consumer content is worth 50% of its cost value, while post-consumer is worth 100%.

Don't assume that because an item has recycled content it can be counted as the whole cost of that item towards the credit—the value contributing to the credit equals the percentage of recycled content times the value of the material.

Recycled content material is often confused with material reuse and with construction waste management, but they are different: recycled content material, covered in MRc4, has reused content as a result of the industrial process of making the product—for example; recycled-content carpet may be made of recycled plastic bottles.

CERATECH CONTRIBUTION TO LEED CREDITS:

CERATECH's ekkomaxx™ cement system uses 94% recycled content, about 5% renewable materials and only 1% virgin materials in a no manufacturing process. (The liquid activators are the only component requiring actual manufacturing/ blending) This cement is then used in the same manner as ordinary portland would cement would be to produce concrete. Portland cement production requires primarily mined virgin materials and an extremely high energy and intensive manufacturing process. CERATECH products do not require any actual production for the cement powder and uses significantly more pre-consumer recycled materials as shown in comparison to portland cement in Table 2 below.

Table 2 Recycled Pre-consumer waste percentage of cement

	Portland Cement	CERATECH ekkomaxx™ Green Cement Technology
One Ton of Cement	0 %	94 %

Data from CERATECH Bulk Cement Performance Data – Environmental Impact Comparisons, April 28, 2011

ANALYSIS:

Depending on the amount of concrete/cement used and the projects baseline materials budget, this strategy could generate a multitude of points.

For example: A typical 50,000 square foot, 3 story office building would utilize approximately 412 tons of recycled, pre-consumer waste. Multiply the cost value x 50% to determine the recycled content credit value against overall project materials cost.

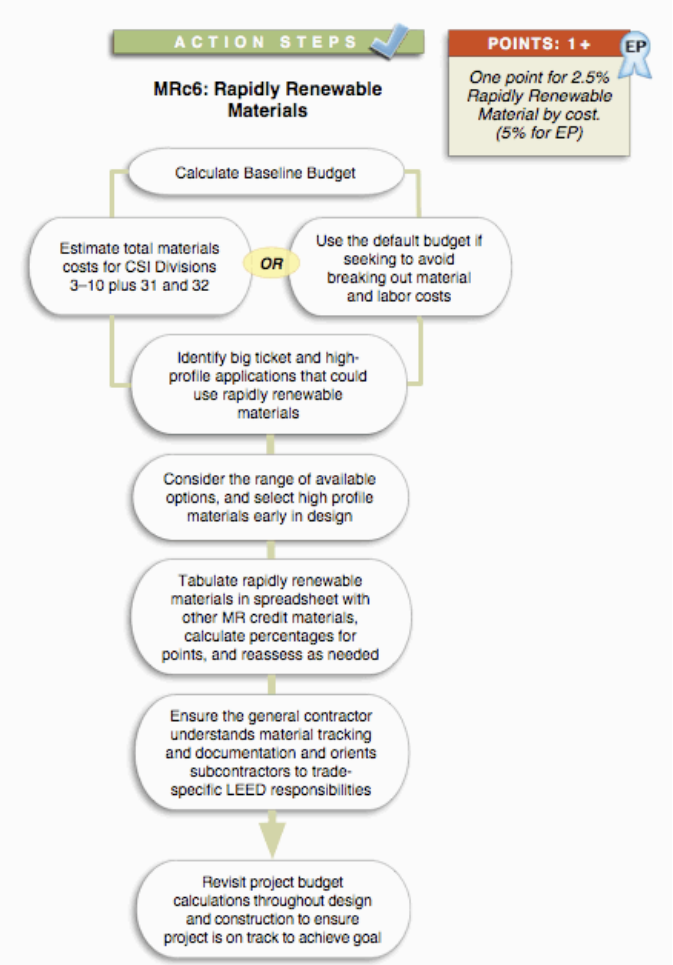
Additionally, over 412 tons of CO_2 green house gas would be displaced by avoiding the use of portland cement.

OBJECTIVE #4: NC 2009 MRCR6: *RAPIDLY RENEWABLE MATERIALS*

CREDIT SUMMARY:

Rapidly renewable materials must have a harvest cycle of 10 years or fewer. This includes materials like bamboo, agri-fibers, and others. Materials for this credit can come from either plants or animals—but they have to be harvested without harming the animal. Wool is okay; leather isn't.

Products with multiple environmental attributes—such as rapidly renewable and regionally produced—can contribute to multiple LEED credits.



CERATECH CONTRIBUTION TO LEED CREDITS:

CERATECH uses 5% renewable, no-harm, agriculture-based substances to produce its cement – **portland cement uses 0% renewable substances**[4].

ANALYSIS:

A concrete heavy project (i.e. parking garage) could realize great progress towards the attainment of this credit by using CERATECH's ekkomaxx™ cement. This could generate one point.

[4] Data from CERATECH Bulk Cement Performance Data – Environmental Impact Comparisons, April 28, 2011

OBJECTIVE #5: NC 2009 ID: *INNOVATION IN DESIGN*

CREDIT SUMMARY

Path 1 – Innovation in Design allows the use of an innovative approach to something not already covered in the LEED rating system. This approach must represent an innovative design approach to a problem, must be comprehensive in scope, and must have a quantifiable environmental benefit. Approaches to using this path should be as if a new LEED "ID credit" was being created from scratch. The approach must:

1. Demonstrate the benefit
2. Comprehensive approach
3. Concept applicable to other projects.

CERATECH CONTRIBUTION TO LEED OBJECTIVES:

Design teams that select CERATECH cement instead of portland cement can leverage its unique properties across a wide array of LEED credits. It can support many LEED strategies due to its ability to:

- Use less concrete overall (10 - 20%)
- Use less reinforcing steel (12 - 18% less)
- Ability to increase span lengths and obtain more floor space
- Displacement of one ton of CO_2 for every ton of portland cement displaced
- Divert 1900 lbs. of coal ash from landfills for every ton of ekkomaxx™ cement used
- Decrease labor and shoring requirements
- Compress construction timelines
- Build long lifecycle, chemically resistant commercial and industrial infrastructure
- Use less mix water (approximately 50% compared to portland cement concrete)

Traditional portland cement has potentially significant environmental aspects[5] for most concrete projects. Over its lifecycle the environment can be negatively impacted resulting from its:

- Water and virgin natural resource consumption.
- Intense energy (over 6 million BTUs / ton), energy emissions (CO_2), and massive production facilities requirements to produce "clinker" , the combined raw ingredients (virgin mineral) of portland cement.
- The release of one ton of CO_2 for every ton of portland cement produced via the "calcining or clinker production process" wherein the trapped CO_2 is released from the raw limestone feedstock.

CERATECH's ekkomaxx™ cement system will contribute significantly to reducing harmful environmental impacts by simply removing the environmental aspects inherent to portland cement production from the equation. It is a matter of comparing what would have been introduced if portland cement was selected versus what is no longer an environmental aspect because it simply isn't present in CERATECH's cement technology. Design teams pursuing the Innovative Design credit with groundbreaking concrete applications and designs will find their efforts supplemented by specifying CERATECH's cement. CERATECH cement / concrete performance characteristics are superior to those of portland cement concrete and can support attainment of LEED credits while pursuing the following:

SSp1 | Construction Activity Pollution Prevention

As written in LEED, the intent of this credit is to reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation. Construction activities involving cement can have more polluting impacts than just those stated in the credit's intent. Portland cement contains hazardous substances (if runoff is not contained in a responsible manner (i.e. during washout), the site and groundwater could become contaminated). Portland cement contains lime, a caustic chemical that can cause chemical burns.

Benefits of CERATECH Products:

Independent 3rd party analysis has shown that concrete made with CERATECH's cement technology "locks in or chemically binds" any heavy metals by orders of magnitude less than levels mandated by the Environmental Protection Agency (EPA) and have proven to be less than or equal to levels leached from OPC (ordinary portland concrete).

MRc1.1 | Building Reuse - Maintain Existing Walls, Floors and Roof

The objective of this credit is to extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

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[5] ISO14001: 2004 Environmental Management Systems defines Environmental **Aspect**s as: an element of an organization's activities or products or services that can interact with the environment. An Environmental **Impact** is any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.

Benefits of CERATECH Products:

CERATECH's product suite includes many options that can be used extend the life cycle of existing concrete structures; thereby, increasing opportunities to "reuse" existing structural concrete elements by repairing rather than replacing.

CERATECHs non-portland material technology was originally developed as a high performance **structural** repair material to correct structures originally constructed with portland cement concrete. Existing portland cement concrete does not readily repair or bond as well to portland cement based repair products. (See pavemend™ repair product information at www.ceratechinc.com/products)

MRc2 | Construction Waste Management

Intent: To divert construction and demolition debris from disposal in landfills and incineration facilities. Redirect recyclable resources back to the manufacturing process and reusable materials to appropriate sites. Calculations for this credit are based on the amount of waste diverted from landfill or incineration compared with the total amount of waste generated on-site.

Benefits of CERATECH Products:

CERATECH's cement does not have hazardous components that would need to be excluded from calculations.

In cases where demolition of existing concrete is not applicable, simply selecting CERATECH ekkomaxx™ cement systems can "divert" more material from landfills than portland cement concrete[6]. Data from CERATECH Bulk Cement Performance Data – Environmental Impact Comparisons, April 28, 2011 shows that one ton of CERATECH cement diverts 1900 lbs. of materials from landfills. One cubic yard concrete made from CERATECH's cement can divert between 500 and 900 lbs. of material from landfills (depending on concrete mix design) where portland concrete diverts less than 225 lbs. of similar waste stream materials. (Based on a 30% use of flyash as a SCM or supplemental cementitious material in a 700 lb. cement concrete mix design)

For project teams pursuing a Construction Waste credit and not a Materials Reuse credit, CERATECH can use demolished materials like stone, tile, glass (this glass could come from demolished materials or from sources of post-consumer products) in its coarse aggregate to create unique concrete mixes.

Where existing concrete does need to be removed, it can be crushed and used as a sub-base or aggregate material. Calculations for this credit, in the latter case, would need to consider the total construction waste and the amount of removed concrete crushed and reused. CERATECH's cement bonds chemically and mechanically to existing portland based crushed concrete and would be useful in the repair of an existing structure—it

[6] Portland cement concrete can use up to about 30% coal ash in the final concrete mix design but it does not use any in cement production. In contrast, CERATECH ekkomaxx™ cement systems can use coal ash in both its cement (up to 95%) and final concrete mix (up to 602 lbs. per 1 cubic yard of concrete). This results in a significant advantage over portland cement concrete when considering usage of post-industrial waste and landfill diversion.

potentially allows for more repair and less demolition; meaning, reduced construction waste.

MRc3 | Materials Reuse

The intent of the Materials Reuse LEED credit is to reuse building materials and products to reduce demand for virgin materials and reduce waste, thereby lessening impacts associated with extraction and processing of virgin resources.

Benefits of CERATECH Products:

CERATECH's ekkomaxx™ can be used to further a design team's efforts in reusing materials. Design teams that are seeking to reuse materials into fine finishes and architectural details can leverage ekkomax™'s superior working times, slump, strength development, de-mold and finishing times to create unique, "green" precast architectural components.

Because it lacks calcium hydroxide and has no ASR Issue (Alkali Silica Reaction), CERATECH's ekkomaxx™, allows for a broader range of coarse and fine aggregate materials, including local stone, that may not be suitable for a portland cement mix due to its ASR reactivity. Post-consumer materials can be reused to create up to 100% of its coarse aggregate for concrete production. This advantage over portland cement, allows design teams to explore more options for material reuse as nontraditional aggregate materials; such as, post-consumer reused or recycled glass to create unique products that extend the life cycle of resources used to create the original materials.

MRc4 | Recycled Content

LEED included the Recycled Content credit with the intent to increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

Benefits of CERATECH Products:

CERATECH's ekkomaxx™ cement system uses 94% recycled content, about 5% renewable materials and only 1% virgin materials in an extremely low energy process. (This cement is then used in the same manner as ordinary portland would cement would be to produce concrete). Concrete made with portland cement uses primarily mined virgin materials and an extremely high energy process to create the cement binder and can sometimes use up to a maximum 30% coal ash as a supplemental cementitious material in the overall concrete mix design. CERATECH products do not employ such high energy consuming production processes and uses significantly more pre-consumer recycled content.[7]

MRc5 | Regional Materials

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[7] *Data from CERATECH Bulk Cement Performance Data – Environmental Impact Comparisons, April 28, 2011*

The Regional Materials credit has been designed to increase demand for building materials that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

Benefits of CERATECH Products:

CERATECH products utilize coal ash or fly ash as it is commonly refereed to. Projects within range of power utilities producing this ash (500 miles of the site), could potentially realize progress towards the Regional Materials credit by selecting CERATECH's ekkomaxx™ cement instead of portland cement. Design teams can work with CERATECH to determine applicability. Project teams going for LEED will need to know the distance between the project and origination point for each required component respectively (cement, fly ash, water, slag, recycled concrete and aggregate, sand, etc.), only those components of the full concrete "assembly" that are within 500 miles count towards the credit.

Also, CERATECH's cement may enable use of local coarse aggregates (stone) and sand that might not be normally suitable for use with ordinary portland cement due to their likely contribution to ASR issues.

MRc6 | Rapidly Renewable Materials

LEED encourages the reduction of use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.

Benefits of CERATECH Products:

Data from CERATECH Bulk Cement Performance Data – Environmental Impact Comparisons, April 28, 2011 shows that CERATECH utilizes 5% renewable, no-harm, agriculture-based substances to produce its cement – in contrast, portland cement uses 0% renewable substances.

IEQc4.2 | Low-Emitting Materials --Paints and Coatings & IEQc4.3 | Low-Emitting Materials --Flooring Systems

These LEED credits can be pursued by finding solutions to reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Benefits of CERATECH Products:

CERATECH's product line includes cements that are chemical resistant (KEMROK™) and resilient under intermittent high temperatures up to 1800°F (FireRok™).

KEMROK™ and FireRok™ may help in the pursuit of this LEED credit as CERATECH's cements are inherently sulfate resistant. This precludes the necessity, in most cases, to coat concrete surfaces with expensive and noxious substances such as epoxies to protect them from chemical intrusion. CERATECH's cements are currently in wide use in the petrochemical industry for just such capabilities.

End Report