

Angelus

BLOCK CO., INC.
Since 1946

Sustainable & Resilient Design

Angelus Block Products Application to Rating Systems and Code



CarbonKind  TM
by Angelus Block

Sustainability & Resilience Rating Systems and Code

An overview of products and systems related to credits and strategies.



Concrete masonry units (CMU) produced by Angelus Block and referenced in the following credits and strategies are CarbonKind low impact products. CarbonKind CMU have demonstrated, substantial reductions in CO_{2e} compared to Carbon Leadership Forum's 2021 Material Baselines and 2023 Material Baselines Appendices. Learn more at AngelusBlock.com.

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| California Building Standards Commission 2022 California Green Building Standards Code, July 1, 2024 Supplement | CalGreen |
| Collaborative for High Performance Schools® CA-CHPS Criteria v2.0 | CHPS |
| Green Building Initiative™ Green Globes® for New Construction 2021 Technical Reference Manual | GGlobes |
| The Sustainable SITES Initiative SITES™ v2 for Sustainable Land Design and Development | SITES |
| U.S. Green Building Council: LEED® v4 Building Design & Construction LEED® v4.1 Building Design & Construction LEED® v4 Neighborhood Development LEED® v4.1 Communities: Plan & Design | BDCv4 BDCv4.1 NDv4 CommP&D |

Integrative Process

| Integrative Process | |
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| Intent / Goal: Support high-performance, cost-effective outcomes through early analysis of interrelationships among systems. | |
| CalGreen | |
| CHPS | II P1.0 Req.: 1 pt.; II C1.1: 1 pt. |
| GGlobes | |
| SITES | |
| BDCv4 | Integrative process: 1 pt. |
| BDCv4.1 | Integrative process: 1 pt. |
| NDv4 | |
| CommP&D | |
| Products / Systems | <ul style="list-style-type: none"> Concrete unit masonry |
| Requires pre-design modeling and analysis of energy-related systems to inform an optimized design and encourages taking advantage of efficiencies. The building envelope is among the systems to be explored. The thermal mass and heat capacity of concrete masonry has been shown to benefit energy design, and in most cases significantly contribute to reduction in HVAC requirements. The California Energy Code recognizes and accounts for concrete masonry as a heavy mass wall. In most Southern California climate zones, insulation is NOT required for concrete masonry walls 8-inches and greater in width. See Optimize Energy Performance. Further efficiencies may be gained when considering concrete masonry as a multi-function system with structural, acoustic, fire-resistant, energy, and design finish properties. See Multi-Function Assemblies. | |

| Assessment, Planning, and Design for Resilience | |
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| Intent / Goal: Design and construct buildings resistant to natural disasters with minimal damage and passive survivability. | |
| CalGreen | |
| CHPS | II C7.1: 2 to 9 pts. |
| GGlobes | |
| SITES | |
| BDCv4 | IPpc98: 1 pt.; IPpc99: 2 pts.; IPpc100: 2 pts. |
| BDCv4.1 | IPpc98: 1 pt.; IPpc99: 2 pts.; IPpc100: 2 pts. |
| NDv4 | |
| CommP&D | |
| Products / Systems | <ul style="list-style-type: none"> Concrete unit masonry |
| The resilience, passive thermal, and interior environment properties of concrete masonry are considered for Integrative Process, Optimize Energy Performance, Enhanced Durability, Acoustic Performance, and Thermal Comfort Design. Similarly, those attributes are supportive of analyses to achieve the goals for these pilot credits, while also performing as a stout, disaster-resistant structural system. | |

Location and Site

Development Density / Infill Sites

Intent / Goal: Channel development to urban areas with existing infrastructure.

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| CalGreen | A5.103.1 | <p>Concrete Masonry</p> <p>While the specific criteria for many rating systems pertain to urban density and surrounding services, the goal is explicit to existing infrastructure and at the very least implicit to infill sites. Certain product systems inherently provide value in support of this goal by their performance properties or flexibility in design and construction.</p> <p>Concrete masonry walls intrinsically provide fire and separation walls. In our region, walls are typically solid-grouted; therefore, a common 8-inch thick concrete masonry wall meets a 4-hour resistance rating just as it is. Stud-based systems must add significant layers for fire resistance.</p> <p>Unitized materials such as these are ideal for sites with limited access and working space.</p> |
| CHPS | C4.1: 2 to 3 pts. | |
| GGlobes | 2.1.1.1: 10 pts. | |
| SITES | SC 1.6: 4 pts. | |
| BDCv4 | LT Sensitive land protection Op 1: 1 pt. LT Surrounding density and diverse uses: up to 5 pts. | |
| BDCv4.1 | LT Sensitive Land Protection Op 1: 1 pt. LT Surrounding density and diverse uses: up to 5 pts. | |
| NDv4 | SLL Smart, Preferred Locations: up to 10 pts. | |
| CommP&D | High Priority Site: up to 2 pts. | |
| Products / Systems | <ul style="list-style-type: none"> •Concrete unit masonry •Proto-II™ post tension masonry site walls | |

Development Density / Infill Sites (cont.)

Intent / Goal: Channel development to urban areas with existing infrastructure.

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| CalGreen | A5.103.1 | <p>Permeable Interlocking Concrete Pavements</p> <p>New development can often strain existing municipal storm drain facilities, sometimes to critical levels. PICP, however, can significantly mitigate this impact.</p> <p>Use of PICP can also help maximize the profitability of developing constrained urban sites by combining runoff detention facilities with pavement. Both functions can occupy the same area, freeing valuable space for additional income-generating structures.</p> |
| CHPS | C2.1: 1 to 3 pts. | |
| GGlobes | 2.1.1.1: 10 pts. | |
| SITES | SC 1.6: 4 pts. | |
| BDCv4 | LT Sensitive land protection Op 1: 1 pt. LT Surrounding density and diverse uses: up to 5 pts. | |
| BDCv4.1 | LT Sensitive Land Protection Op 1: 1 pt. LT Surrounding density and diverse uses: up to 5 pts. | |
| NDv4 | SLL Smart, Preferred Locations: up to 10 pts. | |
| CommP&D | High Priority Site: up to 2 pts. | |
| Products / Systems | <ul style="list-style-type: none"> •Permeable interlocking concrete pavements | |

Brownfield Sites

Intent / Goal: Rehabilitate damaged sites where development is complicated by environmental contamination, reducing pressure on undeveloped land.

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| CALGreen | A5.103.2.1 | <p>Sites to be rehabilitated can be subject to severe settlement issues. Interlocking concrete pavements (ICP) are excellent at maintaining usability when underlying soils settle, move, or expand. Repairs can be made with original stones reinstalled, reducing cost and material consumption.</p> <p>PICP can be designed in a no-exfiltration option to capture runoff and prevent direct drainage into underlying soils, thereby lessening potential water-borne migration of site contaminants. Its detaining and filtering of runoff can mitigate stress on existing storm drain infrastructure.</p> <p>Proto-II™ Post Tensioned Masonry has designs for expansive soils, suitable for rehabilitated sites where post-development settlement is anticipated.</p> |
| CHPS | | |
| GGlobes | 2.1.2.1: 10 pts. | |
| SITES | SC Redevelop degraded sites, Case 2: 6 pts. | |
| BDCv4 | LT High priority site: up to 3 pts. | |
| BDCv4.1 | LT High Priority Site and Equitable Development, Op 1, Path 1: 1 or 2 pts. | |
| NDv4 | SLL Brownfield remediation: up to 2 pts | |
| CommP&D | High Priority Site: up to 2 pts. | |
| Products / Systems | <ul style="list-style-type: none"> •Permeable interlocking concrete pavements •Proto-II™ post tension masonry site walls | |

Location and Site

Walkable Streets

Intent / Goal: Provide appealing and comfortable pedestrian street environments in order to promote pedestrian activity. Promote public health through increased physical activity.

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| CALGreen | | ICP and PICP naturally invoke reduced speeds, demarcating zones by texture, color, and pattern. Excellent for creating woonerfs or home zones (an area, usually residential, where motorists and other users share the street without boundaries such as lanes and curbs). Woonerfs are included in equivalent provisions for walking. ICP and PICP excel at creating a sense of place and defining a focal-point, intimately detailed and purposed for foot traffic, inviting common areas and gathering places. |
| CHPS | | |
| GGlobes | | |
| SITES | | |
| BDCv4 | Innovation Catalog: Walkable project site: 1 pt. | |
| BDCv4.1 | Innovation Catalog: Walkable Project Site: 1 pt. | |
| NDv4 | NPD Walkable streets: Prereq.; up to 9 pts. | |
| CommP&D | Walkability and Bikeability: up to 4 pts. | |
| Products / Systems | <ul style="list-style-type: none"> •Interlocking concrete pavements •Permeable interlocking concrete pavements | |

Protect Habitat

Intent / Goal: Limit all site disturbance by delineating construction buffer zones.

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| CALGreen | | Green Globes: 40 ft from building; 5 ft from parking lots, roadways, sidewalks, and utility right of ways, unless intended to improve natural integrity. LEED ND: 40 ft. from building; 10 ft. from walkways, patios, parking; 15 ft. from street curbs and main utility trenches; 25 ft. from constructed areas with permeable surfaces. Concrete masonry, Proto-II™ Wall Systems, pavers, and decorative landscape walls are unitized materials that do not require large equipment for placement, nor large staging areas. Proto-II™ utilizes optimized footings that displace much less soil than conventional masonry fence and retaining walls. Segmental decorative landscape walls respect the natural contours of the site, and do not require large footings and the associated soil displacement. Pavers are immediately usable after installation and may be utilized for their own self-contained staging area as work progresses. |
| CHPS | | |
| GGlobes | 2.3.2.1: 5 pts. | |
| SITES | | |
| BDCv4 | | |
| BDCv4.1 | | |
| NDv4 | GIB Minimized site disturbance: 1 pt. | |
| CommP&D | | |
| Products / Systems | <ul style="list-style-type: none"> •Concrete unit masonry •Interlocking concrete pavements •Permeable interlocking concrete pavements •Decorative landscape walls •Proto-II™ post tension masonry | |

Heat Island Reduction

Intent / Goal: Reduce heat islands.

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| CalGreen | A5.106.11.1 | Pavements with higher SRI or SR values reflect sunlight, absorb and emit less heat than standard pavements, especially compared to asphalt. Angelus Pavers can provide a wide selection of design options with the following colors meeting the SRI of 29, and initial SR of 33%: |
| CHPS | SS C7.1: 1 to 4 pts. | |
| GGlobes | 2.3.4.2: up to 2 pts. | |
| SITES | SD-S+V Reduce urban heat island effects: 4 pts. | |
| BDCv4 | SS Heat island reduction: up to 2 pts.. | |
| BDCv4.1 | SS Heat Island Reduction: up to 2 pts. | |
| NDv4 | GIB Heat island reduction: 1 pt. | |
| CommP&D | | |
| Products / Systems | <ul style="list-style-type: none"> •Concrete unit masonry •Interlocking concrete pavements •Permeable interlocking concrete pavements | |

| | SRI | SR* | Applicable to: |
|----------------------------|-----|-----|-----------------------|
| Angelus Paver Gray | 37 | 33 | All |
| Angelus Paver Cream | 36 | 33 | All |
| Angelus Paver Red | 37 | 31 | CalGreen, CHPS, GG |
| Angelus Paver Sand (S.O.) | - | 37 | All |
| Angelus Paver Terra Cotta | 32 | - | CHPS, GG, BDCv3, NDv3 |
| Angelus Paver Adobe (S.O.) | 36 | - | CHPS, GG, BDCv3, NDv3 |
| Angelus Paver Buff (S.O.) | 35 | - | CHPS, GG, BDCv3, NDv3 |

*Initial SR %

Green Globes includes permeable surfaces such as PICP in the calculations.
Green Globes also includes opaque wall surfaces (east, west, south).
Concrete masonry without pigments is deemed to comply.

Location and Site

Stormwater Design / Rainwater Management

Intent / Goal: Reduce runoff volume and improve water quality, replicating natural hydrology of the site.

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| CalGreen | 5.106.1, 5.106.2; A5.106.2, A5.106.3 | <p>Rainwater management in LEED v4 combines quantity control and quality control which were separate in previous LEED versions. Using green infrastructure and low-impact development approaches, the goal is to replicate natural site hydrology in the design of site elements.</p> <p>PICP are well recognized as a proven strategy that manages rainwater where it falls, allowing it to infiltrate the underlying soils, and controlling any runoff beyond the capacity of the soil.</p> <p><i>Quantity control:</i> The pervious surface and base structures of PICP create typical water storage capacity 30% to 40% of the total volume of the base and sub-base. This water is allowed to infiltrate into the soil usually within 24 to 72 hours. Water that does not infiltrate can be filtered through the base before draining through perforated pipes in the sub-base.</p> <p>The ICPI manual on permeable pavement notes that the long-term conservative pavement surface infiltration rate is approximately 3 in./hour (210 l/sec/ha). This rate will easily accommodate 2-year, 24-hour rainfall intensities given sufficient base storage and soil infiltration. Permeable interlocking concrete pavements can reduce runoff to zero for the most frequent storms.</p> <p>PICP can maximize the percentage of pervious surface area by combining parking with runoff detention and by utilizing grid pavements for auxiliary parking and fire access lanes.</p> <p><i>Quality control:</i> PICP act as a buffer between developed areas and the surrounding natural environment. PICP filter out significant portions of contaminants – including oil drippings – as well as cooling the temperature of the runoff, mitigating potential damage to sensitive flora and fauna.</p> <p>Since PICP reduce runoff through infiltration, it has the ability to reduce TSS (total suspended solids) and TP (total phosphates). Several studies have demonstrated 80% reduction of TSS and at least 40% TP reduction. These studies compared reductions in pollutants from PICP to that from impervious pavements.</p> <p>The ability of PICP to reduce these pollutants is typically greater than these percentages according to references in the Interlocking Concrete Pavement Institute’s manual, Permeable Interlocking Concrete Pavements (Fifth Edition) – Selection, Design, Construction, Maintenance. The ICPI manual references studies on permeable pavements with reductions in TSS and TP as high as 95%. For more information visit www.angeluspavingstones.com.</p> |
| CHPS | SS C3.1: 1 pt. | |
| GGlobes | 2.4.1.1.1: 3pts., 2.4.1.1.2: 1 pt., 2.4.1.1.3: 1 pt., 2.1.1.1.4: 1 pt., 2.4.1.1.5: 1 pt | |
| SITES | SD-W Manage precipitation on site: Req, 3.3: 4-6 pts. | |
| BDCv4 | SS Rainwater management: up to 3 pts. | |
| BDCv4.1 | SS Rainwater Management: up to 3 pts. | |
| NDv4 | GIB Rainwater Management: up to 4 pts. | |
| CommP&D | Stormwater Management: up to 5 pts. | |
| Products / Systems | <ul style="list-style-type: none"> • Permeable interlocking concrete pavements | |

Energy

Optimize Energy Performance

Intent / Goal: To reduce the environmental and economic harms of excessive energy use by achieving a minimum level of energy efficiency for the building and its systems.

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| CalGreen | 5.201.1; A5.203.1.2 | <p>Concrete masonry can harvest site energy using passive solar designs and decrease the size of HVAC systems. It has high thermal mass and specific heat, providing very effective thermal storage. The result is a beneficial lag between peak heating and cooling loads and outside temperature peaks, thereby delaying needed heating or cooling and lowering associated energy demand.</p> <p>Interior walls act as heat-sinks to moderate indoor temperature swings, further reducing heating/cooling loads. Whole-building analysis programs capable of projecting a building's energy use and cost based on an hour-by-hour simulation can accurately model concrete masonry's thermal mass and predict associated savings.</p> <p>Concrete masonry's thermal mass is a resilient feature and a potential for thermal storage walls.</p> <p>The California Energy Code recognizes the value of heavy mass walls (with concrete masonry units (CMU) in its definition); for most metro areas in Southern California, no insulation is required.</p> <p>Please see California Energy Code References, a quick reference guide available from your Angelus Block representative or AngelusBlock.com.</p> |
| CHPS | EE P1.0; C1.1: up to 30 pts. | |
| GGlobes | 3.1.1: up to 180 pts. | |
| SITES | | |
| BDCv4 | EA Minimum energy performance: Prereq.; Optimize energy performance, Op 1: up to 18 pts. (Healthcare 20 pts., Schools 16 pts.) | |
| BDCv4.1 | EA Minimum Energy Performance: Prereq.; Optimize Energy Performance, Op 1: up to 18 pts. (Healthcare 20 pts., Schools 16 pts.) | |
| NDv4 | GIB Minimum building energy perf.: Prereq.; GIB Optimize building energy per.: up to 2 pts. | |
| CommP&D | Energy Efficiency: up to 4 pts. | |
| Products / Systems | <ul style="list-style-type: none"> •Concrete unit masonry | |

Materials and Resources

Building Life-Cycle Impact Reduction / Building Reuse

Intent / Goal: To encourage adaptive reuse and optimize the environmental performance of products and materials.

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| CalGreen | A5.105.1; A5.105.2 | <p>Concrete masonry is exceptionally durable and its life-cycle considerably longer than many other building envelope systems. This allows the opportunity to refurbish the building for other uses while maintaining the concrete masonry shell.</p> <p>At the end of its service life, concrete masonry can be completely recycled.</p> <p>NDv4 and SITES: ICP and PICP are high-strength concrete units high in durability and can be lifted and reset to accommodate revised site plans.</p> |
| CHPS | MW C4.1: 1 to 2 pts. | |
| GGlobes | 5.5.1.1: up to 20 pts. | |
| SITES | SD-MS 5.2 Maintain on-site structures and paving: 2-4 pts. | |
| BDCv4 | MR Building life-cycle impact reduction: up to 5 pts. | |
| BDCv4.1 | MR Building Life-Cycle Impact Reduction: up to 5 pts. | |
| NDv4 | GIB Recycled and Reused Infrastructure: 1 pt. GIB Building reuse: 1 pt. | |
| CommP&D | | |
| Products / Systems | <ul style="list-style-type: none"> •Concrete unit masonry •Interlocking concrete pavements •Permeable interlocking concrete pavements | |

Materials and Resources

Environmental Product Declarations

Intent / Goal: To reward project teams for selecting products with verified improved environmental life-cycle impacts.

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| CalGreen | | <p>CarbonKind™ CMU by Angelus Block significantly lowers CO₂e well below the Carbon Leadership Forum's (CLF) 2021 Material Baselines (v2) for concrete masonry units, and 2023 CLF Material Baselines Appendices. Medium Weight (MW) CMU are the predominant product type used in buildings. Medium Weight (MW) CMU are the predominant product type used in buildings.</p> <p>The average CO₂e impacts in Angelus EPDs for MW show reductions of 42% and 61% compared to 2021 CLF Typical and Baseline values, and 21% reduction in 2023 CLF MB Appendices.</p> <p>With data now available from CLF, comparisons to baselines are possible. A new LEED v4.1 Pilot Credit, Procurement of Low Carbon Construction Materials (MRpc132), provides means to account for and define reductions in the embodied carbon of materials, and ultimately the building. Angelus CarbonKind cmu significantly contribute to the intent of this pilot credit.</p> <p>All typically used structural and architectural cmu are covered in Type III EPDs, specific to manufacturing location.</p> |
| CHPS | MW C5.1: 2 pts. | |
| GGlobes | 5.2.1.1: up to 29 pts. | |
| SITES | SD-MS 5.9 Support sustainability in materials manufacturing: 1-5 pts. | |
| BDCv4 | MR BPDO – EPDs: up to 2 pts. MRpc132 Procurement of Low Carbon Construction Materials: up to 2 pts. | |
| BDCv4.1 | MR BPDO – EPDs: up to 2 pts. MRpc132 Procurement of Low Carbon Construction Materials: up to 2 pts. | |
| NDv4 | | |
| CommP&D | | |
| Products / Systems | •Concrete unit masonry | |
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Health Product Declarations

Intent / Goal: To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances.

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| CalGreen | | <p>Angelus Block was among the first producers to publish HPDs. The set of six HPDs are reported to 100 ppm and encompass all typically specified cmu products, grouped by ASTM C90 density categories.</p> <p>Angelus CMU do not contain intentionally added BM-1 substances.</p> <p>Copies are available from your Angelus Block representative or at AngelusBlock.com.</p> |
| CHPS | II C9,1: 1 to 2 pts.; EQ C7.1: 1 to 2 pts. | |
| GGlobes | | |
| SITES | | |
| BDCv4 | MR BPDO – Material ingredients: Op 1 1pt. | |
| BDCv4.1 | MR – Material Ingredients Op. 1: 1pt. | |
| NDv4 | | |
| CommP&D | | |
| Products / Systems | •Concrete unit masonry | |
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Regional Materials

Intent / Goal: To reduce impacts from transportation.

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| CalGreen | A5.405.1 | <p>CALGreen and SITES recognize a 500-mile radius. All Angelus produced items are manufactured and sourced well within 500 miles of our market area, and all are within California.</p> <p>LEED v4 eliminated Regional Materials as a standalone credit, instead incorporating it as a contribution multiplier in the BPDO credits. However, the radius has been reduced to 100 miles, and more significantly, current wording and interpretation does not allow for any partial accounting – 100% of raw material sourcing and production must occur within 100 miles of the project.</p> <p>Applicability of Angelus products will depend on much more than the obvious project and supplying plant location. Other factors such as product density (weight) classifications and pigmenting will determine its qualification. For LEED v4, determination will be made on a project and product-specific basis.</p> <p>By far, the bulk of materials used in the manufacture of Angelus products are local to our market area and within the state, thus contributing to local economies.</p> |
| CHPS | | |
| GGlobes | | |
| SITES | SD-MS 5.6 Use regional materials: 3-5 pts. SD-HH+W 6.11 Support local economy: 3 pts. | |
| BDCv4 | Project and product specific | |
| BDCv4.1 | Project and product specific | |
| NDv4 | | |
| CommP&D | | |
| Products / Systems | <ul style="list-style-type: none"> •Concrete unit masonry •Interlocking concrete pavements •Permeable interlocking concrete pavements •Decorative landscape walls •Proto-III™ post tension masonry site walls | |
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Materials and Resources

Recycled Content

Intent / Goal: To avoid the environmental consequences of extracting and processing virgin materials by using recycled and reclaimed materials.

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| CalGreen | A5.405.4 (except structural frame) | <p>Unit-level: Angelus Block offers CMU, pavers, and landscape units with postconsumer / preconsumer recycled content blends (crushed reclaimed and waste product as aggregate replacement). Many stock items contain recycled material. The result is a corresponding reduction in consumption of virgin aggregates.</p> <p>System-level - concrete masonry. Masonry grout is approximately 50% or more of the volume of solid grouted concrete masonry, and has substantially greater potential for sustainability benefit than recycled content in CMU alone. Fly ash, or fly ash combined with ground granulated blast furnace slag (GGBFS), may be used as a partial Portland cement replacement, and as a practical means of introducing significant recycled content into the masonry wall without adversely affecting aesthetic control of exposed masonry units. Studies undertaken by numerous industry organizations have shown:</p> <ul style="list-style-type: none"> • Grouts with up to 30% by weight of Portland cement replaced with Class F fly ash can be treated as conventional masonry grout. • Grouts with 40% to 50% by weight of Portland cement replaced with Class F fly ash are viable; compressive strength should be tested at 42 days, and should not have a significant effect on the overall project schedule. • Grouts with 50% to 80% by weight of Portland cement replaced by fly ash (25%) and GGBFS (varying %) are also viable. • These grouts have other benefits, such as increased workability. <p>Availability and specific mix designs will vary by local grout suppliers, who should be consulted for specifications. Please contact the Concrete Masonry Association of California and Nevada (CMACN), www.cmacn.org, or your Angelus Block representative for more information.</p> |
| CHPS | MW C3.1.2: 1 to 2 pts. | |
| GGlobes | 5.4.1.1: up to 10 pts. | |
| SITES | SD-MS 5.5 Use recycled content materials: 3-4 pts. | |
| BDCv4 | MR BPDO – Sourcing of raw materials Op 2: up to 2 pts. | |
| BDCv4.1 | MR BPDO – Sourcing of Raw Materials: up to 2 pts. | |
| NDv4 | GIB Recycled and reused infrastructure: 1 pt. | |
| CommP&D | Responsible Sourcing: up to 2 pts. | |
| Products / Systems | <ul style="list-style-type: none"> • Concrete unit masonry • Interlocking concrete pavements • Permeable interlocking concrete pavements • Decorative landscape walls • Proto-II™ post tension masonry site walls | |

Construction Waste Management

Intent / Goal: To reduce construction and demolition waste disposed of in landfills by recovering, reusing, and recycling materials. Prevent the generation of waste materials.

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| CalGreen | 4.408.1, 5.408.1; A5.408.3.1 | <p>Concrete masonry units, pavers, and segmental retaining units are completely recyclable when crushed and used as aggregates for base material or in other concrete products. These credits are attainable for either demolished installations, or the waste and scraps from new construction.</p> <p>Undamaged, unused new product delivered to the job site may be diverted to and used in other projects.</p> <p>CMU and paver products are stored and shipped on reusable pallets that may be returned to the manufacturer. At approximately 45 - 50 lbs. each and potentially hundreds involved on a typical project, that's thousands of pounds to include in diversion calculations.</p> <p>LEED 4.1 gives point preference to waste prevention above waste diversion. Unitized materials inherently prevent excessive material use.</p> |
| CHPS | MW P2.0 Req.; MW C2.1: 2 to 4 pts. | |
| GGlobes | 5.6.1.3: up to 10 pts., 5.6.1.4: up to 6 pts. | |
| SITES | C Divert construction and demolition materials from disposal: 3-4 pts. | |
| BDCv4 | MR Construction and demolition waste management: Prereq.; up to 2 pts. | |
| BDCv4.1 | MR Construction and Demolition Waste Management: Prereq.; up to 2 pts. | |
| NDv4 | GIB Solid Waste Management: 1 pt. | |
| CommP&D | Construction and Demolition Waste Management: Required. | |
| Products / Systems | <ul style="list-style-type: none"> • Concrete unit masonry • Interlocking concrete pavements • Permeable interlocking concrete pavements • Decorative landscape walls • Proto-II™ post tension masonry | |

Materials and Resources

Enhanced Durability

Intent / Goal: Choose materials proven to be characterized by durability.

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| CalGreen | A5.406 | <p>Proven longevity with minimal deterioration, reduced maintenance, and recyclability at end of service life: concrete masonry, interlocking concrete pavements, permeable interlocking concrete pavements, decorative landscape walls, and Proto-II™ certainly apply to all of the criteria.</p> <p>Concrete is prized as an extremely durable material, and in the form of concrete masonry units, pavers, and landscape units provides long-lasting structures and pavements requiring little to no maintenance, with less impact than poured concrete.</p> <p>While concrete masonry walls are not “flexible” in the sense of reconfiguring to a new layout, they are one of the most resilient and disaster-resistant structural systems possible. Their performance would be the reason a building could be refitted or repurposed beyond original intent or post-disaster.</p> <p>ICP and PICP are not only inherently durable, but they can be removed and reinstalled to revised site plans.</p> |
| CHPS | | |
| GGlobes | | |
| SITES | | |
| BDCv4 | | |
| BDCv4.1 | | |
| NDv4 | | |
| CommP&D | | |
| Products / Systems | <ul style="list-style-type: none"> • Concrete unit masonry • Interlocking concrete pavements • Permeable interlocking concrete pavements • Decorative landscape walls • Proto-II™ post tension masonry | |

Integrative Analysis of Building Materials

Intent / Goal: Encourage the use of materials for which life cycle information is available.

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|--------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CalGreen | | <p>Concrete masonry supports many of the pilot credit's life cycle, human health, and environmental impact concerns. Please see our library of EPDs and HPDs at www.AngelusBlock.com.</p> <p>Life cycle: Concrete masonry is valued for its very long service life, minimal construction waste (zero waste is possible), minimal maintenance and high recyclability. It is a multi-functioning system that combines structure, design, fire resistance, and noise control. Concrete masonry uses less cementitious materials than poured concrete, and absorbs atmospheric CO₂ during its lifespan.</p> <p>Human health: It is completely inert in its installed state, has zero VOCs (without surface treatments), and if subjected to fire, does not outgas toxic chemicals.</p> <p>Occupant safety: Concrete masonry is a preferred system for resilience, with a long history of extremely high survivability in seismic and wind events. And not just for occupant evacuation, but sheltering in place.</p> |
| CHPS | | |
| GGlobes | | |
| SITES | | |
| BDCv4 | MRpc103: 1 pt. | |
| BDCv4.1 | MRpc103: 1 pt. | |
| NDv4 | | |
| CommP&D | | |
| Products / Systems | <ul style="list-style-type: none"> • Concrete unit masonry | |

Indoor Environmental Quality

Acoustic Performance

Intent / Goal: Provide building occupants with an indoor environment conducive to learning and healing.

| CalGreen | 5.507.4; A5.507.5 | <p>Concrete masonry walls can be used to isolate noise, block sound transmission and absorb noise. They are successfully used as party walls, hotel separation walls, and highway sound walls.</p> <p>Sound Transmission Class (STC) measures the sound-blocking capability of an assembly.</p> <table border="1"> <thead> <tr> <th colspan="2">Typical STC ratings of solid grouted Medium Weight CMU</th> </tr> <tr> <th>Thickness</th> <th>STC</th> </tr> </thead> <tbody> <tr> <td>6-inch</td> <td>50</td> </tr> <tr> <td>8-inch</td> <td>55</td> </tr> <tr> <td>10-inch</td> <td>60</td> </tr> <tr> <td>12-inch</td> <td>63</td> </tr> </tbody> </table> | Typical STC ratings of solid grouted Medium Weight CMU | | Thickness | STC | 6-inch | 50 | 8-inch | 55 | 10-inch | 60 | 12-inch | 63 |
|--------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--|-----------|-----|--------|----|--------|----|---------|----|---------|----|
| Typical STC ratings of solid grouted Medium Weight CMU | | | | | | | | | | | | | | |
| Thickness | STC | | | | | | | | | | | | | |
| 6-inch | 50 | | | | | | | | | | | | | |
| 8-inch | 55 | | | | | | | | | | | | | |
| 10-inch | 60 | | | | | | | | | | | | | |
| 12-inch | 63 | | | | | | | | | | | | | |
| CHPS | EQ P15.0: 5 pts.; C15.1: 1 to 5 pts. | | | | | | | | | | | | | |
| GGlobes | 6.5.1.2: up to 2 pts. | | | | | | | | | | | | | |
| SITES | | | | | | | | | | | | | | |
| BDCv4 | IEQ Acoustic performance.: Prereq, (Schools) 1 pt. (2 pts. Healthcare) | | | | | | | | | | | | | |
| BDCv4.1 | IEQ Acoustic Performance.: Prereq, (Schools) 1 pt. (2 pts. Healthcare) | | | | | | | | | | | | | |
| NDv4 | | | | | | | | | | | | | | |
| CommP&D | | | | | | | | | | | | | | |
| Products / Systems | •Concrete unit masonry | | | | | | | | | | | | | |

Low-Emitting Materials

Intent / Goal: To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

| | | |
|--------------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CalGreen | | <p>Under LEED v4 Emission and Content Requirements, and Green Globes VOC for wall systems, concrete and concrete masonry are specifically listed among products that are inherently nonemitting, and therefore are considered fully compliant without testing, if it does not include integral organic-based surface coatings or sealers.</p> |
| CHPS | | |
| GGlobes | 6.2.1.3.4: 1 pt., | |
| SITES | | |
| BDCv4 | IEQ Low-emitting materials: up to 3 pts. | |
| BDCv4.1 | IEQ Low-Emitting Materials: up to 3 pts. | |
| NDv4 | | |
| CommP&D | | |
| Products / Systems | •Concrete unit masonry | |

Thermal Comfort Design

Intent / Goal: To promote occupants' productivity, comfort, and well-being by providing quality thermal comfort.

| | | |
|--------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CalGreen | | <p>With thermal mass and high specific heat, concrete masonry walls remain warm or cool long after heat or air-conditioning has shut off. This can effectively: reduce heating and cooling loads; improve occupant comfort by moderating indoor temperature swings; and shift peak heating and cooling loads to off-peak hours.</p> <p>The high heat capacity of concrete masonry can play a role in designing Thermal Storage Walls to contribute to passive thermal in emergencies.</p> |
| CHPS | EQ P10.0: 2 pts. | |
| GGlobes | 6.4.2.1: 9 pts. | |
| SITES | | |
| BDCv4 | IEQ Thermal comfort Op 1: 1 pt. | |
| BDCv4.1 | IEQ Thermal Comfort Design: 1 pt. | |
| NDv4 | | |
| CommP&D | | |
| Products / Systems | •Concrete unit masonry | |

Innovation in Design

Intent / Goal: To encourage projects to achieve exceptional or innovative performance.

| | |
|--------------------|--------------------------------------------|
| CalGreen | |
| CHPS | II C9.1: 1 to 2 pts. |
| GGlobes | |
| SITES | C 10.1 Innovation or exemplary performance |
| BDCv4 | IN Innovation: up to 5 pts. |
| BDCv4.1 | IN Innovation: up to 5 pts. |
| NDv4 | IN Innovation: up to 5 pts. |
| CommP&D | Innovation: up to 6 pts. |
| Products / Systems | •Varies with strategy |

Many of the strategies discussed have the potential to earn additional LEED Exemplary Performance points where certain criteria are exceeded. Applicability of the credit may be specific to certain LEED rating systems or to particular options or paths within a given credit. Credits with Exemplary Performance options include:

| Exemplary Performance: | BDCv4 | NDV4 | CHPS |
|-------------------------------------|--------------|-------------|-------------|
| Sites | | | |
| High-Priority Site | X | | |
| Protect or Restore Habitat | X | | |
| Rainwater Management | X | X | |
| Heat-Island Reduction | X | X | |
| Energy & Atmosphere | | | |
| Optimize Energy Performance | X | X | X |
| Materials & Resources | | | |
| Building and Material Reuse | X | X | |
| Environmental Product Declarations | X | | |
| Recycled Content | X | X | |
| Health Product Declaration | X | | X |
| Construction Waste Management | X | | X |
| Indoor Environmental Quality | | | |
| Low-Emitting Materials | X | | |

Opportunities to achieve additional points under LEED Innovation in Design IDc1 exist with Pilot Credits and the Innovation Catalog. Refer to USGBC for applicability and details of each:

| Possible Innovation in Design Credits for LEED v4 and v4.1 | Pilot Credits | Innovation Catalog |
|-------------------------------------------------------------------|----------------------|---------------------------|
| Enhanced acoustical performance – exterior noise control (EQpc57) | X | |
| Assessment and Planning for Resilience (IPpc98) | X | |
| Design for Enhanced Resilience (IPpc99) | X | |
| Integrative Analysis of Building Materials (MRpc103) | X | |
| Procurement of Low Carbon Construction Materials (MRpc132) | X | |
| Innovation: Walkable Project Site | | X |



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