ARXX™ ICF
Redefining building.

ARXX Technical Bulletin 5.06.02.13

ARXX ICFs Contribution to LEED Credits

LEED NC 2009 • LEED Core and Shell • LEED for Schools

A number of core issues form the basis of "green building". These include energy efficiency, air and water quality and the responsible use of materials and resources. In recent years, the inclusion of a wider set of planning, social and economic considerations has been incorporated into green building. The greater picture of sustainability involves not only material choices and construction practices but also the social sustainability of our communities.

Leadership in Energy and Environmental Design (LEED) was developed by the United States Green Building Council (USGBC) in 2000, as a comprehensive rating system to quantify green buildings. The Canada Green Building Council (CaGBC) followed this lead, and their first version of LEED was released in 2004. LEED has grown to become the most prominent rating system for sustainable buildings in North America.

Based on "LEED Technical Review - ARXX ICF", by Morrison Hershfield, Jan 2010

ARXX ICF Contribution to Green Building

ARXX Insulating Concrete Forms (ICF) have many benefits that can contribute LEED credits to projects, making ICFs an ideal choice for green building:

- Air tightness: independent third party studies[1] have demonstrated that ICF buildings typically achieve superior air tightness characteristics compared to conventional wall constructions. A 60% reduction in air infiltration associated with ICF wall construction can lower a building's peak heat and cooling loads by 57% and 16% respectively.
- Thermal mass performance: thermal mass is the ability of a material to retain heat and slowly release it back into the environment. The concrete's thermal mass evens out temperature fluctuations and provides a thermal buffer between indoor and outdoor conditions. This thermal mass effect in an ICF wall reduces building heating and cooling loads, particularly where large daily fluctuations in exterior temperature occur.
- Standard EPS foam based ARXX forms (ARXX Edge, ARXX Prime) are by weight between 40% and 50% recycled material. The polypropylene webs or connectors are recycled from post industrial plastic. ARXX Steel forms with galvanized steel webs are by weight 25% recycled content.
- ARXX ICFs are manufactured in eleven locations in North America, thereby reducing the environmental effects associated with long distance transportation.
- ARXX ICFs allow for the use of higher percentages (50% or more) of supplementary cementing materials (SCMs). The common issues related to

[1] A CMHC study on a seven storey residential apartment building under construction concluded that theaverage air leakage index was 1.25 L/s/m2 @75 Pa. (28.5 ft3/min/ft2 @1.57 psf) In comparison, another CMHC study of 11 multi-unit residential buildings across Canada found overall indices in the range of 0.9- 10.3 L/s/m2 @ 75 Pa (21 - 235 ft3/min/ft2 @1.57 psf), with an average of 3.19 L/s/m2 @ 75 Pa (73 ft3/min/ft2 @1.57 psf).
Other references suggest that typical buildings have a normalized air leakage index in the range of 2- 20 L/s/m2@ 75 Pa (46 - 460 ft3/min/ft2 @1.57 psf). These results suggest that buildings constructed with ICF are relatively airtight, owing largely to the continuity of the concrete and the ICF assembly.

SCMs, such as aesthetic quality and cure time, are inherently reduced when ARXX ICFs are used.

- ARXX ICFs are a modular system, which allow cut material to be used in other areas, eliminating construction waste. All materials in an ICF are recyclable prior to installation providing the potential for near zero construction waste.
- EPS and concrete (the main components of an ARXX ICF walls) are mold, mildew and rot resistant unlike building materials such as wood and cellulose based alternatives.
- ARXX ICFs do not emit VOCs or off-gas.
- ARXX ICFs provide sound attenuation rates at or over the minimum requirement levels of STC 50.

There are also several other indirect advantages of incorporating an ARXX ICF wall system that contribute towards achieving LEED credits:

- An ARXX ICF exterior wall eliminates a number of associated products that are required on a conventional wall (i.e. air barrier membrane, vapor barrier membrane, sealants and tapes), to provide an energy efficient comparable wall.
- The structural capacity of the reinforced concrete wall within an ARXX ICF may eliminate steel columns and miscellaneous steel for lintels and cross ties.

ARXX ICF Contribution to LEED Credits

In the analytical review process for LEED credits, ARXX ICFs as a high performance building product for exterior and interior walls can be classified into three categories for the application of credits:

- Contributor – directly and significantly contribute toward the credits within the specifics of the category. Using ARXX ICFs will either singularly achieve or be a primary contributor towards achieving a LEED credit.
- Enabler – enable the application of design and operational credits by using the functional advantages of ARXX ICFs or are a contributor to achieving a credit. ARXX ICFs will be one of several factors that could result in achieving a LEED credit.
- Indirectly Enhance – by utilizing the structural capabilities or the other natural characteristics of an ARXX ICF installation and design, may indirectly enhance or make feasible some aspect of the project design to apply for more credits. An example of this category is the excess structural capacity of ICF walls which enable a green roof to be more easily utilized.

A detailed review of ARXX contribution to achieving specific LEED credits is provided in the following summary table*.

** The "ARXX ICF Contribution to LEED Credits" summary is focused on the USGBC LEED NC 2009 but can be applied to LEED Core and Shell and LEED for Schools and similar LEED systems in North America.*

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ARXX ICFs Contribution to LEED Credits

ARXX ICF Contribution to LEED Credits - Summary:

LEED Section	LEED Credit	LEED Points	Relevant Benefits of ARXX ICFs
Sustainable Sites	SSc5.1 Site Development: Protect or Restore Habitat	1	Enabler - on a greenfield site this credit can be achieved by limiting site disturbance around the building perimeter (plus roads, trenches and some other constructed features). ARXX ICF wall systems are typically braced from the interior. Accordingly, they allow minimal excavation area, enabling reduced site disturbance around the building perimeter.
	SSc7.2 Heat Island Effect Roof	1	Indirectly Enhanced - ARXX wall systems are capable of withstanding higher structural loads and could support the added load of a green roof. A green roof can reduce heat island effect and bring more natural spaces into an urban location.
Energy and Atmosphere	EAp2 Minimum Energy Performance	Prereq. 2	Contributor - the credits for energy performance relate to energy use of the whole building. The use of ARXX wall systems can directly contribute to energy reduction.
	EAc1 Optimize Energy Performance	Up to 19	Contributor - the credits for energy performance relate to energy use of the whole building. The use of ARXX wall systems can directly contribute to energy reduction by providing superior air tightness, insulating value and thermal mass benefits.
Materials and Resources	MRc2 Construction Waste Management	Up to 2	Enabler - the credits for ensuring debris from construction is recycled or redirected back to the manufacturing process. The nature of ARXX wall systems is such that very little waste is produced during construction, and what is produced can typically be fully recycled. ARXX can be a zero waste system.
	MRc 4 Recycled Content	Up to 2	Enabler - ARXX ICFs contain between 25% to 50% recycled content material. Rebar typically has greater than 90% recycled content. Additional benefits are achieved by the use of concrete products that substitute part of the Portland Cement content with supplementary cementing materials (SCMs) such as fly ash, slag and silica fume.
	MRc5 - Regional Materials	Up to 2	Contributor - 80% of a material must be locally manufactured (within 500 mile radius) to qualify under this credit; ARXX currently has 11 manufacturing facilities throughout North America - concrete itself is locally manufactured.
	MRc8 Durable Building (Canada only)	1	Enabler.
Indoor Environment Quality	EQc3.2 Construction IAQ Management Plan:Before occupancy	1	Enabler - ARXX ICFs do not deteriorate indoor air quality. They are insignificant contributors to VOCs, particulates, formaldehyde, carbon monoxide and 4-PC. Accordingly, they can help lead to a pass of the air testing required for this credit.
	IEQp3, IEQc9 Acoustical Performance (LEED for Schools)	1	Contributor - ARXX ICFs have superior acoustic properties, providing sound attenuation rates at or over the minimum requirement levels of STC 50.
	IEQc10 Mold Prevention (LEED for Schools)	1	Enabler - ARXX ICFs are mold, mildew and rot resistant unlike building materials such as wood and cellulose based alternatives. ARXX ICFs can therefore contribute to the required IAQ management plan related to mold.

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ARXX ICFs Contribution to LEED Credits

LEED Section	LEED Credit	LEED Points	Relevant Benefits of ARXX ICFs
Innovation and Design	IDc1 Innovation in Design	Up to 5	Contributor to the LEED reward points for exemplary performance when projects achieve an additional level of performance on other LEED credits. The use of ARXX ICFs can contribute or enable many LEED credits in this category. Primary examples of how ARXX ICFs can contribute include: ■ Acoustic performance: innovative strategy to provide acoustical privacy. ■ Air leakage: not readily measured in most energy simulation tools. Benefits include energy use reduction. Reduced risk of mold, and improved occupant comfort. ■ Thermal mass: not readily measured in most energy simulation tools. Can also contribute to occupant comfort. ■ Security and durability: high mass concrete will provide superior resistance to excessive loads possible during extreme weather events or explosions. ■ Recycled content: contribute to achieving exemplary performance. ■ Regional materials: contribute to achieving exemplary performance. ■ Waste reduction: contribute to achieving exemplary performance.
Regional Priority	Regional Priority	Up to 4	Regional priority credits are identified by the USGBC from the existing set of LEED credits noted above. They represent additional credits that are deemed more important for the specific region in which the project is located. As they are drawn from the current set of LEED credits, ARXX ICFs can contribute to regional priority credits.

The Bottom Line

Based on the data shown on the LEED Credit Summary table, building with ARXX ICFs can enable, indirectly enhance or contribute up to **38** LEED points for your project. The actual LEED point contribution will be project specific and should be determined by a LEED Accredited Professional for each project seeking LEED accreditation.

Visit the **ARXX Project Gallery** at www.arxx.com or call us at **1.800.293.3210** for examples of the ARXX projects certified for all levels of achievement: LEED Certified, LEED Silver, LEED Gold and LEED Platinum.