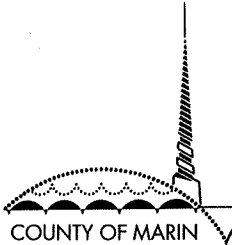


COMMUNITY DEVELOPMENT AGENCY
PLANNING DIVISION



COUNTY OF MARIN

November 19, 2019

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SUBJECT: Proposed ordinance to add a new subchapter to Marin County Code Title 19 (Building Code) and adopt standards for low embodied emissions in concrete.

Dear Supervisors,

RECOMMENDATION:

Initiate an amendment to the Building Code by taking the following actions:

1. Conduct public hearing
2. Consider adopting proposed ordinance with an effective date of January 1, 2020

SUMMARY: On November 5, 2019, your Board conducted a first reading of the attached ordinance and scheduled a public hearing for November 19, 2019 at 10:30AM.

The County of Marin has long been a leader in local green building policies, most recently demonstrated in the October 2019 adoption of the updated green building ordinance. To date, these programs have focused on reducing operational energy use through increased energy efficiency requirements and emphasis on low-emission fuel sources. These policies are critical to achieving local greenhouse gas reduction targets. However, standards to date have focused little on reducing the *embodied carbon* emissions generated by the processes associated with the production of a building, including material extraction, transportation and manufacturing.

For older, less energy efficient buildings, the lifetime carbon emissions from electricity, gas, and other operational energy use exceeds the embodied carbon emissions generated during construction. This paradigm is shifting, as new construction and upgraded buildings grow closer to zero net operating energy emissions through increased energy efficiency and renewable power. With low annual energy use, embodied carbon emissions from construction represent most of the lifetime emissions of a building. Because the emissions from material extraction, transportation, manufacturing, and building construction are already emitted by the time the building is occupied, there is little potential to mitigate those impacts later in the building's life, as is possible with energy efficiency retrofits for operational emissions. The importance of addressing embodied carbon emissions is heightened by the pressing need to reduce emissions in the near term to avoid the most catastrophic impacts of climate change.

Concrete is the most widely used construction material in the world and is responsible for an estimated six to ten percent of global carbon dioxide emissions from human activity. Most of these emissions come from Portland cement, the "glue" that binds aggregate like sand and gravel into concrete, creating artificial rock. The emissions

associated with concrete can be reduced by minimizing cement use to the extent possible while still achieving necessary strength, or by using cement alternatives, called “supplementary cementitious materials,” or *SCMs*. *SCMs* can include but are not limited to fly ash, slag, and glass pozzolans. The proposed ordinance introduces innovative yet practical measures to begin addressing embodied emissions in concrete through modifications to the Building Code.

Based on conversations with local ready-mix suppliers, staff understands these cement alternatives to be locally available and have cost parity with cement. In cases where the amount of cement can be minimized without the need for supplements, there may be cost savings. For projects that need strength quickly, accelerators can be used to speed curing time without substantial increases in emissions, but these additions may add cost. As with all the County’s green building policies, hardship and infeasibility exemptions are written into the code for circumstances where applicants cannot comply or where it is cost-prohibitive to do so, and specific allowances are made in the ordinance for projects that need high early strength.

The Countywide Plan includes multiple recommendations for implementing programs around low-carbon materials in construction, including Program EN-3.d *Encourage Fly Ash in Concrete* which directs the County to “consider regulations requiring new building projects that use a substantial amount of concrete to incorporate at least 25% fly ash to offset some of the energy use and greenhouse gas emissions associated with the manufacturing of cement”. To advance this program, staff sought to develop policies that were current, locally responsive, and regionally replicable. In 2018, the County partnered with StopWaste, the Embodied Carbon Network, Arup, and Bruce King of the Ecological Builders Network and was awarded funding the Bay Area Air Quality Management District’s Climate Protection Grant Program. These funds supported the development of this proposed ordinance through technical consultants and coordination and convening of stakeholders. The funds have also supported County staff time for the policy adoption process, technical assistance for pilot projects, and outreach and dissemination to promote replication.

The standards were developed with substantial review and feedback by the regional stakeholder group convened through the grant. Seven meetings with a group of expert stakeholders, who represented diverse perspectives across academia, the building trades, the concrete industry, and local government staff provided framing for the standards and review of technical recommendations. The proposed standards were developed by the project’s technical consultant but were largely influenced and shaped through rigorous analysis and debate over the course of a year of project development. Local stakeholders including ready-mix concrete suppliers, local structural engineers, and building officials from multiple Marin County jurisdictions were engaged throughout the process participated in a meeting about the proposed standards and local barriers in mid-2019. This feedback was used to inform development of the ordinance.

The proposed standards modify the Building Code to establish a sliding scale of requirements for the maximum amount of cement used for different strength concrete mixes. The standards also include an alternate pathway for compliance using limits on embodied emissions within concrete mixes, which provides flexibility for *SCMs* and innovations in cement alternatives. These standards are innovative by setting limits on the high emissions potential in conventional, Portland cement based concrete mixes, something that has not previously been done in a local building code. As demonstrated in national and regional surveys (detailed in Attachment 4), the recommended limits

do not change the allowable mix designs but sets a ceiling on potential emissions and provides opportunities for increased education around the impacts of and alternatives to cement use.

The proposed standards apply to projects that include new poured concrete. Enforcement of the standards via the building code may not capture projects that pour concrete but do not require a building permit, which can include patios, walkways, and driveways. Ongoing education of the public, building industry, and ready-mix suppliers will be important to promote the use of low-carbon concretes regardless of local permit requirements. The proposed standards would also apply to public projects developed by the County of Marin. Sustainability team staff will work closely with capital projects staff to apply the appropriate requirements and to gather data about opportunities and barriers that arise during the implementation of the proposed standards. Lessons learned during implementation will be used to improve program administration and be shared with other jurisdictions that are interested in adopting similar policies.

The proposed ordinance is an important step towards more holistically addressing emissions from building activity in Marin County. The importance of considering the climate impacts of the entire building process highlights the need to educate the building community and the general public about the life cycle of climate impacts of construction. In addition to these proposed standards, the stakeholder group developed a draft pathway to zero emission concrete by 2050. Achieving this would require ratcheting down concrete emissions on an aggressive schedule that both anticipates and prompts advancements in cements and carbon-storing technologies, and depends upon zero carbon technologies that do not presently exist. Staff recommends monitoring the implementation of the proposed standards, if adopted, in Marin County as well as regionally, as is the goal of the Air District grant. Implementation of these novel proposed policies will aid staff in developing recommendations for the 2022 code cycle that continue to lead on innovative climate solutions while supporting fair and achievable growth within the building community.

FISCAL/STAFFING IMPACT: This action does not impact the General Fund.

REVIEWED BY:

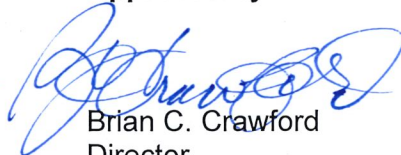
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SIGNATURE:

Approved by:



Alice Zanmiller
Planner



Brian C. Crawford
Director



William Kelley
Deputy Director

Attachments:

1. Ordinance Adopting Amendments to Marin County Code Title 19 (Building Code)
2. Sample Residential Specification
3. Sample Nonresidential Specification
4. Study of Limits for Cement and Embodied Carbon of Concrete
5. Low Carbon Concrete Compliance Form (Cement)
6. Low Carbon Concrete Compliance Form (Embodied Carbon)