

IGEM Grant Report

Progress (due January 1) Annual (due July 31) Final (due August 31)

IGEM Grant # 26-005 Principal Investigator Mustafa Mashal

Name/Full Title of Project: A Sustainable AI-Powered Low-Carbon Emission Concrete (SCALE Concrete): Leveraging Agricultural Byproducts and Wastewater for Circular Economy Solutions

Submission Date 12/23/2026 Primary Institution Idaho State University

*Instructions: Complete each section of this report directly on this template. Completed reports must be limited to **1 page for Progress Reports and 2 pages for Annual or Final Reports in 12 pt Arial or similar font**, excluding the expenditure report. Simple and concise answers will be appreciated, and even bullet lists of information will be sufficient. Reports that do not follow these requirements will be returned for revision. Submit reports by the appropriate due date to HERC@edu.idaho.gov.*

Section 1: Provide a short one paragraph summary describing the project and its goals
The project evaluates Idaho’s sugar beet–derived precipitated calcium carbonate as a partial cement replacement in concrete. ISU is testing performance impacts across key properties. The goal is to develop practical mix guidelines that reduce cement use and reuse a local industrial byproduct.

Section 2: Summary of project accomplishments for the reporting period and plans for the upcoming reporting period.

The team tested concrete mixes with 0–50% PCC in 5% increments, evaluating strength, flexure, and shrinkage, while investigating wastewater as a viable PCC source with testing planned for early 2026. Industry engagement is ongoing, with ITD, Oldcastle Infrastructure, Knife River Prestress, Kloepfer, and others collaborating on potential use of PCC and small pilot projects.

Section 3: High-level summary of budget expenditures for the period just completed. If budget is underspent at time of report, explain why and plans for expending funds.

Year 1 funding totals \$173,761. As of November 5th 2025: \$83,567 spent or encumbered (48%) and \$90,583 remaining (52%). All funding for Year 1 is expected to be utilized by July 1st 2026.

Section 4: Demonstration of economic development/impact, including the following as applicable: patents, copyrights, plant variety protection certificates received or pending; technology licenses signed, start-up businesses created, & industry involvement; private sector engagement; jobs created; external funding; any other pertinent information.

A non provisional patent is pending (#63/638,006), a full-time staff member has been hired by ISU for this project, six industry partners have been engaged, NDAs have been signed with some industry partners, and a proposal for external funding has been submitted to the Federal Highway Administration.

Section 5: Number of faculty and student participants as a result of funding, and brief description of student efforts.

The project involves 9 faculty/staff and 10 students, with students performing most hands-on experimental work under faculty oversight. They handle concrete mixing, testing, shrinkage monitoring, data entry, and analysis using AI/ML to identify trends and optimal PCC replacement levels.

Section 6: Updated details and/or progress on the long-term sustainability plan for the project and description of future plans for project continuation or expansion.

The project is advancing toward pilot-scale PCC use in Idaho with spring 2026 demonstrations alongside ISU, local producers, and ITD. Future plans include documenting field performance, expanding waste byproduct use, leveraging AI/ML for optimization, and securing funding for additional pilots and long-term implementation.

Section 7: Expenditure Report – Attach an expenditure report as a separate document showing expenses toward the original budget submitted for this project. The expenditure report does not count toward the page limit. A written summary of budget expenditures should be provided in section 2 of this report.



Summary by Hierarchy - Current Year

(Data as of 11-05-2025 05:07:07 AM)

Idaho State University

Period Nov-2025 | By Acct | Budget Annual Adjusted Budget | Chart = 9 | Fund = 110000 ISU General Clearing | Orgn = 630054 IGEM SCALE Concrete | Acct = Mgt Fin Rpt | Prog = 04ORO Organized Research on Campus

Acct	Title	Annual Adjusted Budget	Nov-2025 YTD Actual	Encumbrances	Budget Available	Budget Fav/Unfav
Operating Expenses						
B11	Contracted Wages (Closed)	17,045	11,852	35,294	-30,102	176.6%U
B12	Irregular Wages (Closed)	100,172	14,562	0	85,610	85.5%F
B13	Fringe Benefits (Closed)	17,700	4,064	11,524	2,111	11.9%F
	Subtotal	134,917	30,479	46,819	57,619	42.7%F
	Total Expenses	134,917	30,479	46,819	57,619	42.7%F
Operating Expenses						
B21	Services (Closed)	0	1,416	0	-1,416	U
B22	Supplies (Closed)	19,661	2,088	0	17,573	89.4%F
B23	Insurance, Utilities, Rent (Closed)	0	450	0	-450	U
B24	Scholarships & Fellowships (Closed)	12,100	0	0	12,100	100%F
B25	Capital (Closed)	0	1,340	0	-1,340	U
B27	Travel (Closed)	3,000	586	0	2,414	80.5%F
B31	Administrative Recovery	4,083	389	0	3,694	90.5%F
	Subtotal	38,844	6,269	0	32,575	83.9%F
	Total Expenses	38,844	6,269	0	32,575	83.9%F
	Total All Expenses	173,761	36,748	46,819	90,194	51.9%F
	Total Revenues Less Expenses and Transfers	-173,761	-36,748	-46,819	90,194	51.9%F

Budget Available after excluding Admin Recovery charge: \$90,583