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Idaho 2018 Commercial New Construction Code Compliance Evaluation

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1. Executive Summary

This study seeks to understand the extent to which newly constructed commercial buildings in Idaho comply with the adopted 2018 International Energy Conservation Code (IECC). The 2018 IECC was formally adopted in Idaho as of January 1, 2021. All buildings permitted after that date are required to comply with the 2018 IECC via a prescriptive pathway, a performance approach, or by meeting ASHRAE Standard 90.1-2016. This study focuses on compliance with the prescriptive pathway of the 2018 IECC.

The objectives of the study are to catalog the building systems in sampled new construction sites, assess compliance of major building systems with the 2018 IECC, and assess the replicability and efficiency of the methodologies used to collect and analyze data.

1.1 Sampling

The study team used the Dodge Data & Analytics database of new construction projects to develop the population from which to draw a random sample of projects stratified by building size, building type, and geography. The original sample consisted of 100 small (≤20,000 ft^2), medium (20,001-99,999 ft^2), and large (≥100,000 ft^2) buildings falling into the five categories – Office, Mercantile, Multifamily, Education, and Other. For these 100 sites, the study team collected data from online portals and requests for information from local building departments.

The review of site maps and collected building drawings revealed that many of the buildings included in the original sample were either permitted prior to 2021 or unbuilt. In some cases, buildings were found to replace those removed from the sample either from the original list in the Dodge database or from new construction information obtained on local building planning websites. The final sample, which included replacement sites, additional sites from local building planning websites, and sites with multiple buildings was 105 total buildings.

1.2 Data collection and code compliance analysis

Data on building systems was collected and verified through three paths:

1. COMcheck[1] reports: Compliance and information on specific building systems was gathered from the COMcheck reports for sampled sites. Building documentation includes individual COMcheck reports for the building envelope, mechanical systems, interior lighting, and exterior lighting. This method was limited due to the availability of the COMcheck reports for some sites. The study received at least one COMcheck report for the majority of sampled sites, but only 40% had all four COMcheck reports included in building documentation.
2. Building drawings: A more detailed assessment of code compliance was conducted using architectural, mechanical, electrical, and plumbing (A-MEP) drawings for sites with available documentation. The study team was able to conduct these detailed assessments on a subset of 25 of the sampled sites.
3. Site visits: The study team targeted those sites with complete building documentation for site visits to verify installed equipment. Of the 25 sites with complete documentation, 11 received site visits.

The study team created an Excel-based tool to log key compliance metrics for each of the four major building systems: envelope, HVAC, service water heating, and lighting. Information was collected from the available COMcheck reports

[1] COMcheck captures user inputs to determine if a new construction building meets energy code requirements. The COMcheck reports are typically required by building departments for issuance of building permits, and therefore represent one of the best sources for code compliance information.

and building drawings and then catalogued in the data collection tool. The “as-built” values gained from the site visits were used in place of COMcheck and documentation values where possible in the final compliance analysis.

The study team determined code compliance on a per-measure basis using a binary method with weighting by measure quantity where applicable. The binary component strictly compares a measure’s as-found condition to the applicable code requirement. The weighting component takes into account the percentage of each system that is compliant.

In addition to energy code compliance, the study team sought to examine the energy performance of sampled sites using monthly energy bills and/or more granular meter data. This effort required permission from building site contacts to obtain energy consumption data from the local utility. The study team did not find any contacts willing to provide access to utility data and were unable to complete a consumption analysis for any sampled sites.

1.3 Findings and Recommendations

1.3.1 Building Systems

The study team found that fossil fuel heating is prevalent in overall building systems (76% of floor area), and particularly common in warehouses (98% of floor area). Although the sample may not be representative of the overall new construction population in Idaho, the finding suggests that designers are still selecting fossil fuels for heating.

1.3.2 Compliance Analysis

The majority of assessed building systems were in compliance with energy code requirements. The results are discussed in greater detail later in the report. Major take-aways include:

1. For the HVAC equipment and the lighting systems, the team found efficiency and power density requirements, respectively, far exceeded the code. This is not surprising, as the federal standards for HVAC equipment and the transformation of the LED market have caused available equipment to exceed the standards set in the 2018 IECC.
2. While envelope systems were marked as compliant in COMcheck reports, the study team found envelope compliance difficult to assess as individual envelope components—roofs, walls, fenestration, and floors—often did not meet prescriptive requirements. It is possible that the building envelopes were code compliant through the performance method, but the specific method used was not indicated in the documentation. Detailed calculations of overall envelope performance are needed to demonstrate compliance, and these are not included on COMcheck reports.
3. HVAC controls and lighting controls were both difficult to assess, mainly due to the lack of information in the documentation that was collected for the study. Given the overall high compliance level associated with building envelopes and equipment (lighting and mechanical), a better understanding of post-occupancy controls could provide some real insight into how well buildings are optimized around energy use.

The results of the compliance study of these building systems are available in Table ES1.

Table ES1. Compliance Summary of Key Building Systems (n=25)

System	Subsystem	Pass	Fail	Could Not Assess	Not Applicable
Envelope	Roof U-Value	64%	32%	4%	0%
	Wall U-Value	67%	29%	4%	0%
	Slab F-Value	56%	40%	4%	0%
	Window to Wall Ratio	64%	32%	4%	0%
	Window U-Value	84%	12%	4%	0%
	Window SHGC	83%	5%	12%	0%
Water Heating	SWH Efficiency	44%	4%	28%	24%
Mechanical	Air-Conditioner Efficiency	56%	0%	24%	20%
	Heat Pump Heating Efficiency	40%	0%	0%	60%
	Heat Pump Cooling Efficiency	44%	0%	0%	56%
	Gas Furnace Efficiency	68%	0%	4%	28%
	Boiler Efficiency	4%	0%	0%	96%
Lighting	Interior Lighting	80%	0%	20%	0%
	Exterior Lighting	88%	0%	12%	0%

The recommendations that the study team has from these findings are as follows:

- **Consider developing templates for COMcheck submission.** The COMcheck reports reviewed for this study explicitly addressed only a fraction of the requirements in 2018 IECC pertaining to envelope, mechanical systems, and lighting systems. More complex requirements pertaining to envelope components and mechanical and lighting controls were left unaddressed. In addition, the format of COMcheck reports varied from project to project. Some of the reports included more information than others, and the reports themselves were typically embedded in the building drawings. These issues could be addressed by coordinating with building officials at the state and local levels to develop consistent templates for COMcheck submission. The templates would help ensure that the most impactful code requirements on energy consumption are not overlooked by designers.
- **Consider options for supporting building departments in more robust energy code reviews.** Past studies have cited the challenges that code officials face in reviewing energy code compliance. Building departments often lack the capacity necessary to perform thorough reviews. A variety of solutions have been proposed in previous industry studies on the topic, to address this problem, including policies for utilities to provide technical assistance in return for the ability to claim savings from increased code adoption.[2][3] NEEA may wish to work with its stakeholders to explore solutions that can improve code adoption throughout the Northwest.

[2] Riggins, M. (2025, August 7). Adopting New Building Energy Codes Isn't Enough – Effective Implementation Drives Impact. ACEEE. https://www.aceee.org/blog-post/2025/08/adopting-new-building-energy-codes-isnt-enough-effective-implementation-drives
[3] Cohen, J., Cherney, S., Ehrich, K., Barajas, J., Smidt, A., Westcott, J., & Siler-Evans, K. (2025). Understanding building code adoption and enforcement challenges: insights from authorities having jurisdiction. *Sustainable and Resilient Infrastructure*, 1–22. https://doi.org/10.1080/23789689.2025.2552527

1.3.3 Study Replicability and Standardization

The study team has the following recommendations to help improve the effectiveness and efficiency of future studies:

- Recommendation 1: Where the same energy code is applied across different states, define the specific code measures and metrics for evaluation. For the purposes of this study, the study team created a prioritized list of code measures to track across sampled sites. While these mostly align with the studies completed in other Northwest states (Montana, Oregon, and Washington), a prescriptive list facilitates the use of the same data collection tools across the region and streamlines the evaluation process.
- Recommendation 2: Standardize compliance evaluation methodologies. The complexity of building systems is reflected in the complexity of determining compliance with energy codes. It is possible to approach compliance using a binary method that compares individual building components against specific metrics. It is also possible to use a weighted approach that evaluates entire building systems against code requirements (that is, each wall must meet insulation requirements vs. the percentage of total wall area that meets insulation requirements). Standardizing methods to apply to each building system in the evaluation would increase the efficiency of data collection and compliance evaluation.
- Recommendation 3: Select specific communities within each state (when possible) from which to obtain the sampled sites. If these communities are representative of the state, it is likely that a sample pulled from these communities will be more closely representative of the new construction landscape than Dodge database information. This recommendation involves a trade-off between getting a representative sample of new construction buildings and efficiently collecting building data. The level of available documentation and ease of obtaining this data vary significantly between municipalities. Focusing on municipalities with well-organized and accessible building plans would significantly reduce the evaluation period.
- Recommendation 4: The study team found few discrepancies between building plans and as-built conditions. Given the high cost of onsite visits, NEEA should consider whether and how to incorporate onsite verifications in future studies. A more targeted approach toward onsite verifications may be warranted, in which the focus of onsite inspections is to review more complex measures that were not documented in COMcheck reports and that typical building inspectors lack the capacity to review. For example, instead of verifying HVAC nameplate information, researchers would arrange to view a building's building automation system (BAS) to collect data on HVAC controls measures such as demand control ventilation or temperature setbacks. These types of site visits could often be done remotely using standard virtual meeting software (for example, Teams or Zoom) to reduce cost. Such approaches may require buy-in in from controls vendors to gain their assistance, which could necessitate specific outreach to this sector combined with incentives.

2. Introduction

2.1 Study Scope

The scope of the Idaho Commercial Construction Evaluation Study is to assess the implementation of the 2018 IECC in Idaho's new construction buildings. This assessment uses a combination of document reviews and site visits to understand the methods used to comply with the state-amended 2018 IECC code and determine the degree of compliance success.

2.2 Study Goals and Objectives

The study aims to assess the path(s) by which and degree to which code compliance is achieved according to the state-amended 2018 International Energy Conservation Code (IECC) in newly constructed buildings. The results of the study will inform the NEEA Codes team as to the efficacy of the code and compliance efforts and provide other regional code stakeholders guidance in targeting their energy efficiency work in the commercial new construction sector.

The study objectives are:

- Evaluation of system and building compliance with the current Idaho commercial new construction code (specifically the 2018 IECC with Idaho amendments) and the path(s) to compliance taken by builders. This includes the following:
  - Building Systems: A catalog of the major current design and engineering practices by major building type; with a focus on primary building systems, including envelope, mechanical and HVAC systems, lighting, and service water heating, as well as the primary fuel type(s) used in each building.
  - Compliance: Assessment of compliance of new commercial buildings in Idaho constructed under the 2018 IECC; the primary analysis of compliance focused on each of the individual major building systems— envelope, mechanical systems, lighting, and service water heating.
- Assess the degree to which the methodology selected for use in this study (a) generates reliable information regarding decisions made by builders in seeking compliance with current commercial building codes, and (b) is likely to be replicable over time and across states.

3. Methodology

3.1 Population Definition

Dodge Data & Analytics[4], a software and analytics firm that provides detailed information on construction projects across the globe, is a commonly accepted and used source of building construction information. Dodge Data & Analytics, referred to hereafter as Dodge, provides access to historical and current construction projects through their Global Network service. The primary advantage of Dodge data that makes it ideal for this evaluation is the granularity of data collected for each project, including but not limited to information on the building type (for example, office, education, retail), construction scope (for example, alteration, new construction), building floor area, number of buildings, project valuation, and project dates, notably, publish date, bid date, target start date, and target completion date. The granularity of project information in conjunction with the volume of projects within the database makes Dodge data a primary source of population data.

The study team performed a data cleaning process to remove projects that are outside the scope of this study. This includes projects that are exempt from the 2018 IECC, residential construction under three stories, stand-alone parking garages, and construction activities that are not considered new construction, for example, alterations and additions. Refer to Table 1 for the full list of filters applied prior to exporting projects from Dodge.

Table 1. List of filters applied to Dodge data prior to exporting

Dodge Filter	Inclusion	Exclusion
Publish Range	1/1/2020 through 3/13/2024	Projects published outside the inclusion date range
Action Stage	Pre-Design, Design, Bidding/Negotiating, Construction, Operation, and Delayed	Abandoned
Project Type Categories	Commercial Buildings, Residential (+4 Stories), and Unclassified	Manufacturing, Parking Garage, Building Gas/Chemical Plant, Refinery, Housing, Engineering, and Utilities
Construction Type	New Projects	Additions, Alterations, and Interiors

Prior to cleaning, Dodge contained approximately 3,100 Idaho projects occurring between January 1, 2020 and March 13, 2024, which represents the study team's date of extraction from Dodge. The final population of projects is 2,615. However, this is larger than the total projects available for sampling (1,474) due to missing floor area in 44% of the population of projects, which prevented assigning those projects to a sampling stratum.

3.1.1 Dodge Validation

While Dodge data are a commonly accepted source for population-level information on construction trends, it is important to validate their representativeness for a given community. The study team identified two sources for validation: the 2019 Commercial Building Stock Assessment performed by NEEA and the 2018 Commercial Building Energy Consumption Survey (CBECS) conducted by the U.S. Energy Information Administration (US EIA).

Each dataset utilizes a different definition for building types, contains varying levels of detail on building location, and has other inconsistencies that limit the validation. At each step, the study team identified the "least common

[4] The study team extracted construction data from the Global Network service offered by Dodge Data & Analytics at https://www.construction.com/

denominator" between the datasets and normalized each dataset to that term, as best as possible. The team discusses normalization and limitations in the Idaho Commercial Code Compliance Evaluation Sampling Plan memorandum delivered to NEEA in May of 2024 and is included in Appendix A.[5]

The study team concluded that the differences between the datasets were sufficiently minor to move forward with the assumption that the Dodge dataset is adequately representative of the population of commercial new construction in Idaho under the IECC 2018 building code. However, the study team determined that continued monitoring of trends was warranted, and reassessment of the sampling design would occur if trends did not meet expectations.

3.2 Sample Design

The study team, coordinating with NEEA, framed the study around three building characteristics of interest: 1) building location in incorporated and unincorporated jurisdictions, 2) building floor area, and 3) building type. To satisfy sampling requirements of a 90 percent confidence level with a 10 percent margin of error (90/10), the study team developed a sample size of 100 commercial new construction projects distributed across the three strata, as summarized in Table 2. A detailed discussion on the development of the sample design is available in the May 2024 memorandum.[6]

Table 2. Summary of Population and Sample

Stratum	Building Type	Population in Dodge		Targeted Sample Size		Achieved Sample Size	
		Incorporated	Unincorporated	Incorporated	Unincorporated	Incorporated	Unincorporated
≤20,000 ft²	Office	339	2	20	2	4	0
	Mercantile	276	3	16	3	0	0
	MF	90	0	5	0	2	0
	Education	30	1	2	1	0	0
	Other	144	3	9	3	7	0
20,001-99,999 ft²	Office	162	0	10	0	0	0
	Mercantile	30	0	2	0	0	0
	MF	37	0	2	0	3	0
	Education	29	0	2	0	2	0
	Other	120	2	7	2	3	0
≥100,000 ft²	Office	91	0	5	0	0	0
	Mercantile	17	0	1	0	0	0
	MF	49	0	3	0	1	0
	Education	2	1	0	1	0	0
	Other	45	1	3	1	3	0
Total:		*1,461*	*13*	*87*	*13*	*25*	*0*

The study team assigned randomly generated numbers to each of the 1,474 available projects for sampling and selected 100 projects. For these 100 sites, the study team collected data from online portals and requests for information from local building departments, which is discussed in detail in the following section.

[5] Opinion Dynamics memorandum to the Northwest Energy Efficiency Alliance, "Idaho Commercial Code Compliance Evaluation Sampling Plan." May 7, 2024.
[6] Opinion Dynamics memorandum to the Northwest Energy Efficiency Alliance, "Idaho Commercial Code Compliance Evaluation Sampling Plan." May 7, 2024.

The review of collected materials revealed that many of the buildings included in the original sample were either outside of the date range, were unbuilt, or had other issues preventing their use in the sample. In some cases, new buildings were found to replace those that were removed from the sample. Ultimately, due to data availability constraints, a complete analysis of building drawings was conducted on a subset of 25 buildings, representing the achieved sample, summarized in Table 2. The study team was unable to identify a viable site for the unincorporated and mercantile strata from the collected materials, that is, one where information was available and construction met the study design.

3.3 Data Collection

3.3.1 Requests for Information

The study team first began by determining both the timeframe for newly constructed buildings and the types of documents that were needed in order to conduct the study. The 2018 IECC went into effect in Idaho on January 1, 2021, and the study targeted buildings permitted after June 1, 2021 to allow a grace period for compliance. The study relied on existing compliance documentation, such as COMcheck reports and other forms of compliance information. COMcheck reports are created for each building as a necessary step to obtain building permits. The study team found the COMcheck reports embedded in the building documentation for most sampled sites which facilitated their usage for compliance assessment. Building plans were used in conjunction with the existing compliance information; specifically, architectural, mechanical, electrical, and plumbing (A-MEP) plans were needed to get a full picture of the building systems.

To help decrease the burden on public offices for information requests, the study team began by gathering available public plans from local city and town websites. When public plans were limited or not available from these websites, the study team called and emailed city and town building offices to manually request COMcheck reports and any building plans and permitting documents they could make available, specifically architectural, mechanical, electrical, and plumbing (A-MEP) plans. Requests typically required the submission of a Public Records Request form. Depending on the availability of the requested documentation, the study team received a link containing building data. Large requests, for cities such as Boise, called for payment to cover the time required of employees to gather the building documentation. The documents received then had to be sorted by site and type in preparation for analysis.

3.3.2 Data Collection Tool

To aggregate all of the information gained from the data collection, Opinion Dynamics created an Excel-based tool to log key compliance metrics for each of the four major building systems: envelope, HVAC, water heating, and lighting. The tool was designed to clearly show the required metric by the 2018 IECC, the condition of that building metric from plan reviews, and any insights regarding the metric generated through onsite verification. The tool is also used to record building systems like primary heating/cooling systems, primary water heating systems, and primary lighting types.

3.3.3 Plan Reviews and Site Visits

Once all the information was assembled from the various sources, the study team conducted desk reviews on the existing documentation. The desk reviews were aimed at cataloguing building characteristics, design, and engineering practices for major building systems and types.

The study team reviewed the permit and building plan documentation collected for each building in order to catalogue the building's systems, identify key building characteristics, determine if the building was built in the correct timeframe, and assess compliance with the 2018 IECC. The main documents the team reviewed were applicable architectural, mechanical, electrical, and plumbing plans and compliance certification forms.

The team focused on those measures that are new or significantly different in IECC 2018 from previous versions, or that have been found to have compliance issues in recent commercial code studies. Based on these criteria, the team identified 12 measures for the building envelope, 23 measures for the building HVAC systems, one for the building service hot water systems, 13 measures for the building lighting systems, and two miscellaneous measures regarding optional onsite renewables and additional efficiency packages included in the building design.

The team reviewed buildings that had viable documentation and used the desk reviews to refine the sample and determine which buildings were developed in the correct timeframe. Buildings that had complete desk reviews were used as the pool for targeted site visits. These site visits verified the plan takeoff conditions recorded from the plan review. The verified values taken from the site visits were used in place of the values from the desk review for the final compliance assessment.

3.4 Code Compliance Assessment

The study team used the data collected from building COMcheck documents and drawings and organized them in the data collection tool to determine compliance with the 2018 IECC. The COMcheck documents provide an overarching look at building envelope, mechanical systems, interior lighting, and exterior lighting compliance. The team pulled additional information needed to assess elements of code compliance not addressed in COMcheck reports from building drawings. When possible, building systems were verified through site visits.

The study team approached the assessment of code compliance using a binary method with weighting by measure quantity where applicable. The binary component is a strict comparison of a measure's as-found condition to the applicable code requirement. For example, if the code requirement for the thermal conductivity of a roof is a U-value of 0.032, and the roof's as-built condition is 0.033, it would be classified as non-compliant. The weighting component takes into account the relative impact of each feature. For example, if a building has four air-conditioners of equal capacity, and one is found to be non-compliant, then this measure would be scored as 75% compliant. For envelope and lighting measures, area was used for weighting, with the exception of slab-on-grade insulation, which uses perimeter length. For HVAC measures, capacity (Btu's per hour) was used for weighting. For interior and exterior lighting, compliance with power density requirements was assessed at the building level, which implicitly takes into weighting by area or length, depending on the specific requirement.

3.5 Energy Performance Analysis

The original study scope included an energy performance analysis that was intended to look at the energy use intensity of the sampled building against benchmark buildings of similar use and characteristics. However, the study team was unable to secure sufficient billing data from participating sites to derive meaningful and statistically significant results. As a result, the team, through consultation with NEEA, chose to drop the energy performance analysis from the study.

4. Whole Building Findings

4.1 Building Characteristics

The study team reviewed permitting files for 25 commercial new construction projects consisting of office, multifamily, education, and other building types, summarized in Table 3. A total of 1,137,807 ft^2 of floor area was included in the sample with the Other: All building types, accounting for 64% of the total sample followed by multifamily (26%), education (8%) and office (3%). While the Other: All building type is inclusive of any building type outside of the three other categories, it was predominantly comprised of warehouse facilities. Other: warehouse (n=6) accounted for 91% of the Other: All building type floor area and 58% of total floor area sampled. Further, warehouses were more than twice the average size of sampled buildings at 110,394 ft^2. The study team did not sample warehouses discretely, but due to their outsized influence on the results, in particular when weighted by floor area, the team presents specific findings here and in the following sections.

Table 3. Building types and floor area.

Building Type	Sample	Total Floor Area (SF)	Average Floor Area (SF)
Office	4	28,817	7,204
Multifamily	6	291,701	48,617
Education	2	91,171	45,586
Other: All	13	726,118	55,855
Other: Warehouse	6	662,366	110.394
Total: All	25	1,137,807	45,512

Overall, natural gas serves 76% of the total sampled floor area for space heating, while electricity serves 38% of water heating. Natural gas is the primary fuel source for space heating in the office, education, and other: all building types. Electricity is the primary water heating fuel in the office, multifamily, and other: all building types. These numbers are driven largely by warehouses. When removing warehouses, electricity becomes the primary space heating fuel at 55% and increases its share of water heating at 53% of the total floor area. Table 4 presents the distribution of fuels by end-use, which are weighted by floor area.

Table 4. Fuel use by end-use, weighted by floor area served.

Building Type	Space Heating Fuel			Hot Water Heating Fuel				Cooling Presence
	Electricity	Natural Gas	Propane	Electricity	Natural Gas	Propane	Unknown	
Office	41%	50%	9%	91%	0%	9%	0%	100%
Multifamily	86%	14%	0%	65%	34%	0%	1%	100%
Education	0%	100%	0%	0%	100%	0%	0%	100%
Other: All	2%	98%	0%	29%	3%	0%	67%	33%
Other: Warehouse	2%	98%	0%	26%	0%	0%	74%[7]	26%
Total: All	24%	76%	0%	38%	19%	0%	43%	57%
Total: Without Warehouse	55%	44%	1%	53%	45%	1%	1%	100%

[7] Service Water Heating was not on the majority of COMcheck reports for warehouses included in the sample. It is possible that service hot water systems were added during construction. For this reason, the study team designated the Hot Water Heating Fuel as Unknown for these cases.

4.2 Building Compliance

The initial review of site documentation included a confirmation of building type and size, and a review of the provided COMcheck reports. For each site, the included COMcheck reports indicated compliance with 2018 IECC. The team also noted when sampled sites were missing COMcheck reports but did not use that as an indication of noncompliance. A portion of the results of this initial review is provided in Table 5 below. The table has been truncated for the report, but the full table is provided in Appendix C.

Table 5. Site-level Initial Review Findings

Unique ID	Building Size	Building Type	Envelope COMcheck	Mechanical COMcheck	Interior Ltg COMcheck	Ext Ltg COMcheck
ID001	Medium	Education	Yes	Yes	Yes	Not Available
ID002	Small	Other	Yes	Yes	Yes	Yes
ID003	Small	MF	Yes	Yes	Not Available	Yes
ID004	Medium	Other	Yes	Yes	Yes	Yes
ID005	Large	Other	Yes	Yes	Not Available	Yes
ID006	Small	Other	Yes	Yes	Yes	Yes
ID007	Medium	MF	Yes	Yes	Yes	Yes
ID008	Small	Mercantile	Yes	Yes	Yes	Yes
ID009	Small	Other	Not Available	Not Available	Not Available	Not Available
ID010	Medium	MF	Not Available	Not Available	Not Available	Not Available
ID011	Medium	Other	Yes	Yes	Yes	Yes
ID012	Large	Other	Yes	Yes	Yes	Yes
ID013_1	Small	MF	Yes	Not Available	Not Available	Not Available
ID013_2	Small	MF	Yes	Not Available	Not Available	Not Available

Table 6 summarizes the presence of COMcheck reports for each of the 105 sampled sites. 79 of the 105 sampled sites included at least one COMcheck report.

Table 6. Summary Initial Review Findings

Review Category	Number	Percentage
Envelope COMcheck	71	68%
Mechanical COMcheck	59	56%
Interior Ltg COMcheck	54	51%
Exterior Ltg COMcheck	55	52%
All COMchecks Complete	42	40%

For sites with Envelope, Interior Lighting, or Exterior Lighting COMcheck reports, the report provides an estimate of the "Percent Better Than Code" achieved by the building system. A summary of this information is provided in Table 7.

Table 7. Building System Percent Better Than Code

Building System	Average	High	Low
Envelope COMcheck	6%	30%	0%
Interior Ltg COMcheck	40%	97%	1%
Exterior Ltg COMcheck	61%	99%	2%

The 2018 IECC also requires an additional efficiency package for all sites complying through the Prescriptive Pathway. The team did not find any indication that any of the sampled sites were complying through the Performance Pathway, which does not require an additional efficiency package. The inclusion of the additional efficiency packages and the lack of any additional information that would be required to comply with the Performance Pathway, leads to the conclusion that all sampled sites sought compliance through the Prescriptive Pathway. Table 8 summarizes the additional efficiency packages indicated in the building COMcheck reports. It should be noted that some sites indicated more than one additional efficiency package.

Table 8. Additional Efficiency Packages

Additional Efficiency Package	Number of Sites
Reduced Lighting Power Density	50
More Efficient HVAC Equip.	7
Dedicated Outdoor Air System	4
Enhanced Envelope Performance	4
Enhanced Lighting Controls	3
Reduced Air Infiltration	3
Reduced Energy Use in Service Water Heating	2
Unknown	14

The information collected in the COMcheck reports clearly shows that reducing building lighting power density is the simplest method to comply with this component of the 2018 IECC. LED fixtures have rapidly become the ubiquitous choice for lighting, and market transformation has outstripped the efficiency requirements of the energy code. The team expects that this will change after the next code update cycle.

5. Envelope Findings

5.1 Envelope Characteristics

The study team collected key envelope characteristics from COMcheck reports and building plans, including thermal conductance through roofs, walls, and floors, plus window-to-wall ratio (WWR), window conductance, and window solar heat gain coefficient (SHGC). Summary data is presented in Table 9. For each feature-type, an average code requirement is provided for reference. Note that actual code requirements vary by climate zone (the state of Idaho includes ASHRAE climate zones 5 and 6), building type (residential-occupancy buildings or non-residential buildings), and other factors.

By square footage, the predominant roof type in the study sample was Insulation Entirely Above Deck. The average U-value of this roof type was 0.031. Attics were the next most significant roof type and had a lower average U-value of 0.026, owing to the more stringent insulation requirement for this roof type.

Mass and wood-framed walls comprised the vast majority of wall square footage in the study sample. Mass walls have a much less stringent insulation requirement, so the average conductance of this wall type (0.079) was significantly higher than wood-framed walls (0.058). The average window-to-wall ratio (WWR) was 14%, significantly below the maximum of 30% allowed under IECC 2018, driven in large part by the large proportion of warehouses within the study sample, which had an average WWR of 7%. The large size of the warehouses included in the sample has a large impact on values weighted by Floor Area or Perimeter. To address this issue, this report provides tables that include all sampled sites as well as a table that excludes warehouses.

Every building reviewed with data on floor conductivity had an unheated slab-on-grade; for most buildings, this was the only external floor assembly.

Table 9. Summary of Envelope Characteristics (Full Sample)

Feature	Type	# of Sites	Total Area or Perimeter[8]	Average Area or Perimeter[9]	Average Code Requirement	Average Factor, As Found
Roof	Insulation Entirely Above Deck	11	693,364	63,033	U-value ≤ 0.032	0.031
	Metal Building	4	47,415	11,854	U-value ≤ 0.033	0.033
	Attic	11	141,490	12,863	U-value ≤ 0.023	0.026
Wall	Mass	12	251,217	20,935	U-value ≤ 0.080	0.079
	Metal Building	2	19,702	9,851	U-value ≤ 0.052	0.055
	Metal-Framed	2	12,054	6,027	U-value ≤ 0.064	0.079
	Wood-Framed	14	200,217	14,301	U-value ≤ 0.058	0.058
Floor	Unheated Slab-on-Grade	24	18,467	769	F-value ≤ 0.533	0.599
WWR	All	24	483,190	20,133	WWR ≤ 30%	14%
Window	All	24	64,200	2,675	U-value ≤ 0.405	0.310
		22	63,373	2,881	SHGC ≤ 0.533	0.318

[8] All figures are in square feet except Unheated Slab-on-Grade which is the perimeter length in feet.
[9] Ibid.

Table 10. Summary of Envelope Characteristics (Warehouses Excluded)

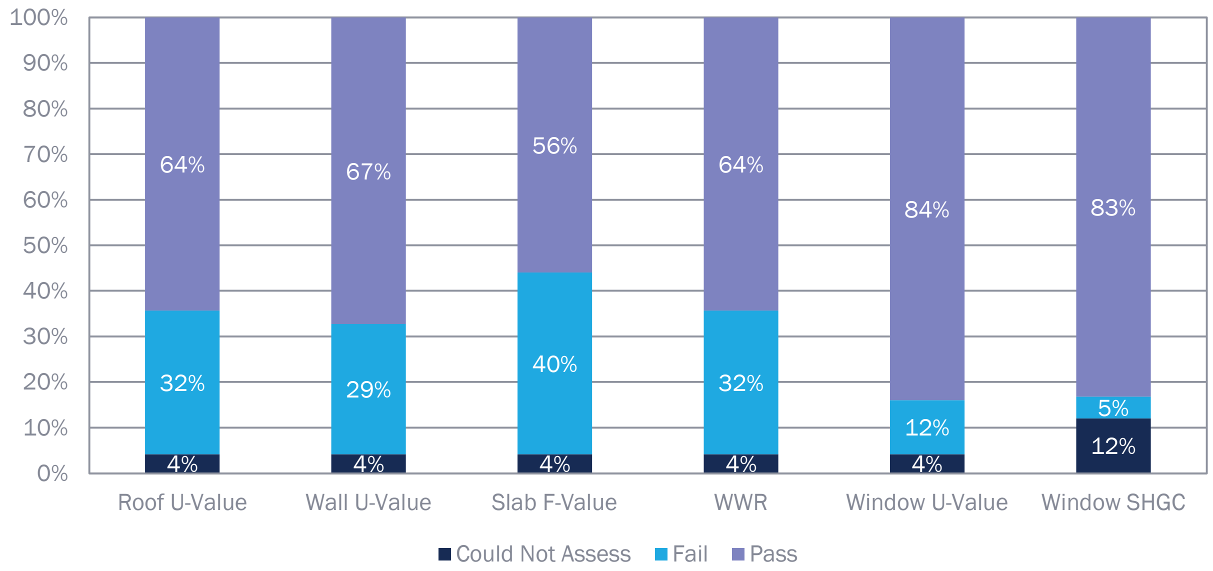
Feature	Type	# of Sites	Total Area or Perimeter[10]	Average Area or Perimeter[11]	Average Code Requirement	Average Factor, As Found
Roof	Insulation Entirely Above Deck	8	76,781	9,598	U-value ≤ 0.032	0.027
	Metal Building	1	1,695	1,695	U-value ≤ 0.033	0.032
	Attic	11	141,490	12,863	U-value ≤ 0.023	0.026
Wall	Mass	7	40,523	5,789	U-value ≤ 0.08	0.074
	Metal Building	0	0	0	U-value ≤ 0.052	0.000
	Metal-Framed	2	12,054	6,027	U-value ≤ 0.064	0.079
	Wood-Framed	13	192,111	14,778	U-value ≤ 0.058	0.058
Floor	Unheated Slab-on-Grade	18	11,055	614	F-value ≤ 0.533	0.564
WWR	All	18	244,688	13,594	WWR ≤ 30%	21%
Window	All	18	52,255	2,903	U-value ≤ 0.405	0.291
		16	51,428	3,214	SHGC ≤ 0.533	0.315

5.2 Envelope Compliance

For each site, the team compared the as-found condition to the prescriptive code requirement for roof, wall, and floor conductance, WWR, window U-value, and window SHGC to determine compliance. The results are presented in Figure 1. Note that a relatively high percentage of "fails" was found for roofs, walls, floors, and WWR. However, all the envelope plans the team reviewed included a signed COMcheck report stipulating that the proposed envelope systems were designed to meet IECC requirements, even though it was common for individual structures to "fail" on a prescriptive basis. Though not explicitly documented, it is likely that many designers leveraged IECC 2018 section C402.1.5. This section provides a "component performance alternative" to strict adherence to prescriptive requirements on an individual component level, putting forth a methodology for assessing the overall envelope performance that effectively allows for individual components to "fail" as long as the impact is offset by other components exceeding their individual requirements. The building permit data and plans collected for this study did not provide enough information to assess compliance under the component performance alternative.

[10] All figures are in square feet except Unheated Slab-on-Grade which is the perimeter length in feet.
[11] Ibid.

Figure 1: Envelope Compliance Results



6. Lighting Findings

6.1 Lighting Characteristics

The study team reviewed each building's compliance with the lighting codes for both interior and exterior lighting systems and controls. Interior lighting compliance in the 2018 IECC was based on the lighting power density (LPD) (W/ft^2) for a given building type[12]. Exterior lighting compliance in the 2018 IECC was based on the lighting power allowance per exterior lighting space (building grounds, building entrances and exits, sales canopies, etc.)[13] and the lighting zone that the building was constructed in (national parks, residential areas, high-activity commercial areas, etc.)[14]. In Table 11 below, the IECC 2018 values for the different building types are shown. For the interior lighting measures, the "Code LPD" is taken from the 2018 IECC, and the "Average As-Built LPD" is based on the total wattage installed divided by the total square footage of the building. For the total exterior lighting power allowance, the "Code LP Allowance" is the average value for all buildings in that building type. The "Average As-Built LP Allowance" is based on the sum of the lighting power allowance for each of the exterior spaces.

The study team found that all building types and sizes reviewed for internal and external lighting power allowances, were, on average, more efficient than required by code. On average, the internal as-built LPD is 58% lower (more efficient) than the code requirement, and the exterior as-built lighting power analysis is 48% lower (more efficient) than code. A contributing factor to this was the finding that one of the most frequently chosen "additional efficiency packages" was reduced lighting power density. Below in Table 11 the building characteristics for lighting are shown. All of the buildings that were reviewed were incorporated and are organized by size and building type.

Table 11. Lighting System Characteristics

Size	Building Type	Sample Size	Interior		Exterior	
			Code LPD	Average As-Built LPD	Average Code LP Allowance	Average As-Built LP Allowance
Small	Office	4	0.790	0.573	1,815	1,243
	Multifamily	2	0.680	Could not assess	6,492	4,397
	Other	7	0.680	0.367	3,145	910
Medium	Education	2	0.810	0.455	3,718	1,501
	Multifamily	3	0.703	0.150	2,875	2,041
	Other	3	0.690	0.209	6,894	3,398
Large	Multifamily	1	0.680	Could not assess	Could not assess	Could not assess
	Other	3	0.480	0.086	20,182	7,844

Verifying the inclusion of lighting controls, such as occupancy sensors, daylighting controls, and exterior lighting controls for buildings, was only possible when detailed lighting plans were included in the documentation. The COMcheck and other compliance documents do not include lighting controls as part of the included measures in the document. In the sample, the lack of documentation for lighting controls made these measures difficult to verify and assess. Through site visits, lighting controls were assessed with greater success for only some occupancy sensors and exterior lighting

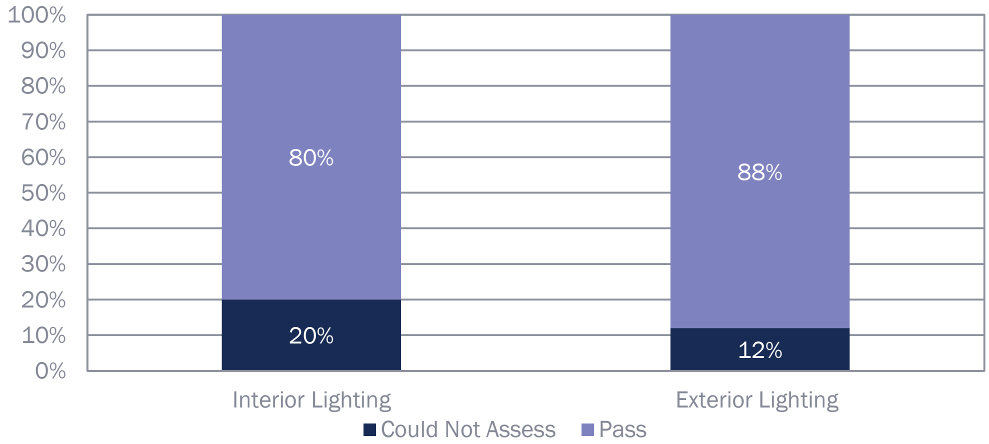
[12] IECC 2018 C405.3.2 Table (1) Interior Lighting Power Allowances: Building Area Method
[13] IECC 2018 C405.4.2 Table (2) Lighting Power Allowances for Building Exteriors
[14] IECC 2018 C405.4.2 Table (1) Exterior Lighting Zones

controls. Therefore, only the compliance with lighting power allowances for interior and exterior spaces is presented in the following section, as lighting controls were not as successfully assessed.

6.2 Lighting Compliance

As a whole, all of the buildings that had COMchecks and detailed information were compliant with the 2018 IECC. The team conducted a binary pass/fail compliance assessment of each building with the results shown below in Figure 2. Of the 25 buildings in the sample, five did not have an interior lighting COMcheck, and three did not have an exterior lighting COMcheck from which to pull the information for the binary analysis, so could not be assessed. The weighted compliance method for the lighting measures yields the same results, because all areas in the building are grouped under either interior or exterior lighting, as opposed to analyzing the lighting in different sections throughout the building.

Figure 2: Lighting Compliance Results



7. Mechanical Findings

7.1 Mechanical Characteristics

The study team collected data on HVAC equipment and service water heaters from COMcheck reports and building plans.

In general, the team found that while heating and cooling efficiency ratings were readily available, information on control sequences was rare, despite the large number of code requirements in IECC pertaining to the control of HVAC equipment. The team did observe general language in A-MEP documents calling out the need for controls to meet IECC requirements, but the A-MEP notes did not go into detail on the specific codes or control strategies intended to meet those codes. It is possible that code-compliant control strategies are implemented at a later date, such as when a building owner secures a tenant in a nonowner-occupied building or during the period between construction completion and commissioning. This could explain why the study team did not have clearer evidence of code compliant control strategies since A-MEP drawings are drafted prior to construction and may not be revised only to update control strategies.

A summary of HVAC characteristics for the reviewed projects is presented in Table 12 . By cooling capacity, air-conditioners and heat pumps were roughly equal, though the average cooling efficiency of heat pumps was significantly higher than that of air-conditioners (17.6 SEER versus 14.1 SEER). For heating equipment, gas furnaces comprised the vast majority of capacity, with a total capacity over five times greater than heat pumps. The average as-found efficiency of gas furnaces exceeded the minimum requirement, though it did not reach the condensing range (above 0.90). Only one site had boilers, and no sites reviewed had chillers.

Table 12. HVAC System Characteristics

Equipment	# of Sites	Total Capacity (MBH)	Average Capacity per Site (MBH)	Code Efficiency Requirement	Average As-Found Efficiency	Units
Air-Conditioners	11	3,830	348	11-14, depending on capacity	14.13	SEER/IEER[15]
Chillers	0	-	-	-	-	-
Gas Furnaces	17	13,372	787	0.80	0.88	AFUE
Gas Boilers	1	387	387	0.80	0.95	E_t
Heat Pumps-heating	10	2,388	239	8-11.3, depending on capacity	11.30	HSPF[16]
Heat Pumps-cooling	10	3,964	396	11-14, depending on capacity	17.61	SEER/IEER

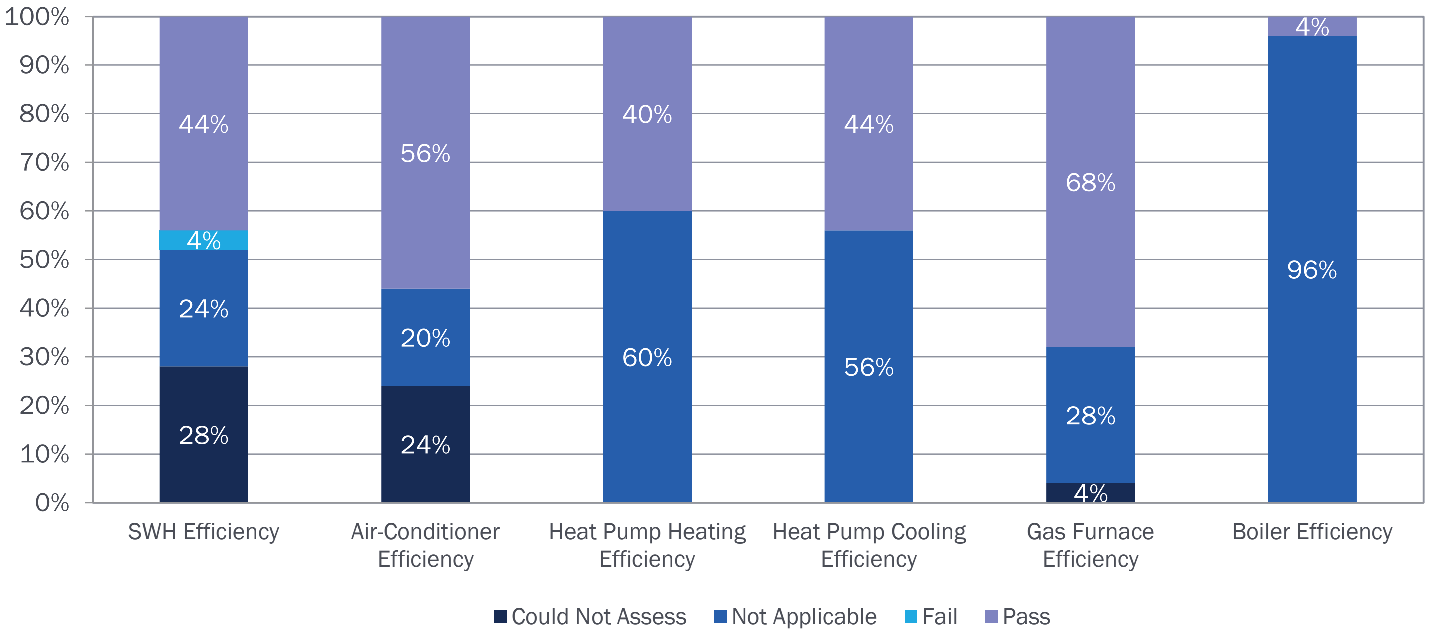
[15] Air-conditioners and heat pumps under 65,000 Btu/h are rated by seasonal energy efficiency ratio (SEER) for annual cooling efficiency, while larger units are rated by integrated energy efficiency ratio (IEER). For the purpose of this table, the two metrics can be considered equivalent.

[16] Heat pumps under 65,000 Btu/h are rated by heating system performance factor (HSPF) for annual heating efficiency, while larger units are rated by coefficient of performance (COP). For simplicity, the team converted COP to HSPF for both the code requirement and as-found efficiencies for larger units using the formula HSPF = 3.412 * COP.

7.2 Mechanical Compliance

For each site, the team compared the as-found efficiencies of service water heater (SWH) and HVAC equipment to the prescriptive requirements where efficiencies were available from building plans or COMcheck reports. Where equipment was installed, it met or exceeded minimum efficiency requirements in all cases, with the exception of one building's water heaters. This result is not surprising since HVAC equipment is also subject to federal efficiency standards, which in recent years have risen for air-conditioners and heat pumps and now exceed IECC 2018 requirements in many categories. Figure 3 illustrates the compliance levels for specific mechanical equipment at sampled sites.

Figure 3. Mechanical Compliance Results



8. Findings and Recommendations

8.1 Building Systems

- **Fossil fuel heating is prevalent.** Within the buildings reviewed, gas furnaces comprised the vast majority (85%) of total heating capacity, totaling 13,327 MBH compared to 2,388 MBH from heat pumps. While the sample may not be representative of the overall new construction population in Idaho, this finding suggests that designers are still selecting fossil fuels for heating.

8.2 Compliance

Findings: Major findings related to compliance with IECC 2018 include the following.

- **Envelope compliance was difficult to assess.** While the team's findings showed that individual envelope systems – roofs, walls, fenestration, and floors – often did not meet prescriptive requirements at the component level, insufficient information was available to assess overall envelope performance. The COMcheck reports reviewed do not include the calculations necessary to verify compliance through the component performance alternative pathway for envelopes.
- **Compliance with equipment efficiency requirements was high.** For the buildings with sufficient data to assess mechanical system compliance, compliance with efficiency requirements was high. This is not surprising considering that federal efficiency standards align with or exceed the requirements in IECC 2018 in many equipment categories.
- **HVAC controls compliance was difficult to assess.** While data on equipment efficiencies could be readily assessed from COMcheck reports and mechanical plans, the opposite was true for controls-related measures. A few examples of control measures found in IECC 2018 that could not be assessed through this study include economizer controls, demand-control ventilation, and variable speed fans and pumps. Given that most buildings in the commercial sector experience large variations in heating and cooling load and occupancy throughout the year, these measures can have a significant impact on energy use.

  Despite the importance of HVAC controls, none of the drawing packages collected for this study included control sequences. Moreover, none of the COMcheck reports reviewed explicitly assessed control measures; these requirements were sometimes listed on the reports but left blank. As a result, the team was unable to assess compliance with these measures.
- **Commissioning reports were not available in building documentation from the permit offices or upon request from building contacts during site visits.** Based on the study team's data requests from local building departments, no building commissioning reports or documentation indicated that building commissioning was completed. Building commissioning is essential for buildings to function as designed and is required by IECC 2018. It is possible that commissioning was completed, but documentation stored in an unknown location. It is also possible that commissioning was not completed in such a way to meet IECC 2018 requirements.
- **Compliance with lighting power density requirements was high.** Actual lighting power densities in the sample of buildings reviewed were an average of 58% below (more efficient than) code. This result is not surprising given the market transformation of LEDs in the years since IECC 2018 was released.
- **Lighting control compliance was difficult to assess.** Like HVAC controls, the study team encountered difficulty assessing the lighting controls in the buildings. IECC 2018 includes a large number of requirements related to

occupancy sensing, daylight harvesting, and scheduled control. The COMcheck reports did not specifically address these requirements, nor did the building plans in the projects reviewed.

Recommendation:

- **Consider developing templates for COMcheck submission.** The COMcheck reports reviewed for this study explicitly addressed only a fraction of the requirements in IECC 2018 pertaining to envelope, mechanical systems, and lighting systems. More complex requirements pertaining to envelope components and mechanical and lighting controls were left unaddressed. In addition, the information contained in individual COMcheck reports varied from project to project. These issues could be addressed by coordinating with building officials at the state and local level to develop consistent templates for COMcheck submission. The templates would help ensure that the most impactful code requirements on energy consumption are reviewed.
- **Investigate the availability and repository of building commissioning documents.** It is unclear if the study team was unable to locate building commissioning documents, or if they did not exist for sampled sites. Some additional research into the location of these documents, perhaps with building owners or with local building departments, could provide insight into the state of building commissioning.
- **Consider options for supporting building departments in more robust energy code reviews.** Past studies have cited the challenges that code officials face in reviewing energy code compliance. Building departments often lack the capacity necessary to perform thorough reviews. A variety of solutions have been proposed to address this problem, including policies for utilities to provide technical assistance in return for the ability to claim savings from increased code adoption. NEEA may wish to work with its stakeholders to explore solutions such as this example that can improve code adoption throughout its footprint.

8.3 Study Replicability and Standardization

Findings: Major findings related to data collection include the following.

Evaluating energy code compliance in new construction buildings is a notoriously hard task. One of the objectives of this study was to think about methods and strategies that would make future studies more effective and efficient. To this end, the study team provides the following recommendations:

- **Recommendation 1:** Where the same energy code is applied across different states, define the specific code measures and metrics for evaluation. For the purposes of this study, the study team created a prioritized list of code measures to track across sampled sites. While these mostly align with the studies completed in other Northwest states, a preemptive list facilitates the use of the same data collection tools across the region and streamlines the evaluation process.
- **Recommendation 2:** Standardize compliance evaluation methodologies. The complexity of building systems is reflected in the complexity of determining compliance with energy codes. It is possible to approach compliance using a binary method that compares individual building components against specific metrics. It is also possible to use a weighted approach that evaluates entire building systems against code requirements. (that is, Each wall must meet insulation requirements vs. the percentage of total wall area that meets insulation requirements.) Standardizing which methods to apply to each building system in the evaluation would increase the efficiency of data collection and compliance evaluation.
- **Recommendation 3:** Select specific communities within each state (when possible) from which to obtain the sampled sites. This recommendation involves a trade-off between getting a representative sample of new construction buildings and efficiently collecting building data. The level of available documentation and ease of obtaining this data vary significantly between municipalities. Focusing on municipalities with well-organized and accessible building plans would significantly reduce the evaluation period.

- Recommendation 4: The study team found few discrepancies between building plans and as-built conditions. Given the high cost of onsite visits, NEEA should consider whether and how to incorporate onsite verifications in future studies. A more targeted approach toward onsite verifications may be warranted, in which the focus of onsites is to review more complex measures that were not documented in COMcheck reports and that typical building inspectors lack the capacity to review. For example, instead of verifying HVAC nameplate information, researchers would arrange to view a building's BAS to collect data on HVAC controls measures such as demand control ventilation or temperature setbacks. These types of site visits could often be done remotely using standard virtual meeting software (for example, Teams or Zoom) to reduce cost. Such approaches may require buy-in in from controls vendors to gain their assistance, which could necessitate specific outreach to this sector combined with incentives.

Appendix A. Idaho Commercial Code Compliance Evaluation Sampling Plan Memorandum

Executive Summary

This memorandum outlines Opinion Dynamics' Evaluation Team's sampling strategy in support of the Idaho Commercial New Construction Code Evaluation Study (Idaho Code Study). The sampling strategy presented in this memo includes a discussion of data sources, data quality, sampling considerations, and the statistical methods used in development of the final sample design.

This evaluation focuses on buildings constructed under the 2018 International Energy Conservation Code (2018 IECC). To identify them, the evaluation team leveraged Dodge construction data to develop the population of permitted projects in Idaho, from which the sampling frame is developed. Dodge provides a high granularity of project detail and is a leading resource for construction bidding, making it an ideal resource for understanding the types and volume of construction happening in Idaho. The study team validated Dodge's statewide representativeness through comparison with regional data resources, notably the 2018 Commercial Building Energy Consumption Survey (CBECS) and 2019 Commercial Building Stock Assessment.[1,2] This validation process confirmed the representativeness of the Dodge data.

The sampling design approach incorporates the industry standard 90 percent confidence level with a 10 percent margin of error (90/10) at a total sample size of 100 buildings. The sample design considers the following three building characteristics: community (that is, incorporated versus unincorporated), type (that is, office, mercantile, multifamily, education, and all others), and floor area (that is, ≤ 20.,000 ft^2, 20,001 – < 100,000ft2, ≥100,000 ft^2). The study team developed weights using Dodge project counts for the three building characteristics to allocate sample sizes. The final sample design is provided at the end of this memo.

Introduction

This memo outlines in detail the sampling strategy implemented by the evaluation team in fulfillment of Task 2 for the Idaho Code Study. The focus of this document is the methodological development of the sampling strategy for buildings constructed under the IECC 2018 code.

Evaluation Objectives

The primary purpose of the Idaho Code Study is to assess the implementation of the 2018 IECC in Idaho's new construction buildings. This assessment looks at the methods used to comply with the state-amended 2018 IECC code, as well as determining the degree of compliance success and the associated building performance. The overarching research objectives are to:

- **Objective 1**: Evaluate system and building compliance with the current Idaho commercial new construction code (specifically 2018 IECC with Idaho amendments), analyze building energy performance for a subset of buildings, and identify the path(s) to compliance taken by builders; Idaho code allows for ASHRAE 90.1-2016 as an alternative pathway.

[1] U.S. EIA. 2018 Commercial Building Energy Consumption Survey retrieved at https://www.eia.gov/consumption/commercial/
[2] NEEA (2020). "Commercial Building Stock Assessment 4 (2019) Final Report" data retrieved at https://neea.org/data/commercial-building-stock-assessments

- **Objective 2**: Assess the degree to which the methodology selected for use in this study (a) generates reliable information regarding decisions made by builders in seeking compliance with current commercial building code, and (b) is likely to be replicable over time and across states.

To achieve these objectives, Opinion Dynamics developed a population of commercial new construction activity from Dodge with a Publish Date starting January 1, 2020, one year prior to when the IECC 2018 code became effective.. This date was selected for several reasons, including: (1) the Dodge database only includes a target start date field, which is populated for 60% of projects; (2) the Dodge database does not include a field with a definitive start date for a project; (3) it is expected that lead-times for project starts can run up to and beyond 1 year from publication in Dodge. The study team will remove projects through a validation step that do not meet the qualifications for the study; that is, the project does not meet all the criteria of the sampling plan and stratification for which it was selected.

The remainder of this memo will describe in detail the evaluation team's approach to Task 2, including a discussion on data sources, sample strata, and the sample design.

Data Sources & Validation

The evaluation team leveraged multiple data sources to develop and validate the population of buildings constructed since January 1, 2020. The primary data sources are categorized as Population Data, that is, data used to develop a statewide population of building construction with project-specific information, and Validation Data, that is, data used to validate that the population data is representative of Idaho construction trends. The following sections discuss the data sources in terms of data quality and the statewide representativeness of the population data. The data sources are summarized in Table 1.

Table 1. Summary of data sources and their advantages and disadvantages

Data Source	Data	Use	Advantages	Disadvantages
Dodge Data & Analytics	Project-level construction data	Population	▪ Project-level data ▪ Contact information ▪ Project address ▪ High granularity of project characteristics	▪ Incomplete data fields, for example, building floor area ▪ Overlapping data, for example, multiple building types per project
2019 Commercial Building Stock Assessment	Surveyed Buildings	Validation	▪ Most recent data available (2019 survey) ▪ Building stock data for Idaho/Montana region	▪ Existing building stock, not current construction trends ▪ Statistical estimate
U.S. Energy Information Administration	2018 Commercial Building Energy Consumption Survey	Validation	▪ High granularity of building types and characteristics ▪ Aligned with Dodge building type taxonomy	▪ Regional data including hot construction markets of Pheonix and Denver ▪ Existing building stock, not current construction trends ▪ Statistical estimate

Population Data

Dodge Data & Analytics[3], a software and analytics firm that provides detailed information on construction projects across the globe, is a commonly accepted and used source of building construction information. Dodge Data &

[3] The evaluation team extracted construction data from the Global Network service offered by Dodge Data & Analytics at https://www.construction.com/

Analytics, referred to hereafter as Dodge, provides access to historical and current construction projects through their Global Network service. The primary advantage of Dodge data that makes it ideal for this evaluation is the granularity of data collected for each project, including but not limited to information on the building type (for example, office, education, retail), construction scope (for example, alteration, new construction), building floor area, number of buildings, project valuation, and project dates, notably, publish date, bid date, target start date, and target completion date. The granularity of project information in conjunction with the volume of projects within the database makes Dodge data a primary source of population data. However, Dodge data has disadvantages that were considered by the evaluation team.

The evaluation team observed two challenges with Dodge data: overlapping and incomplete data. Overlapping data includes the assignment of multiple building types without identifying one building type as the primary use. The evaluation team also observed fields with incomplete data, such as the target start date and building floor area. While these challenges do not inhibit the use of Dodge data in developing the sample, they do increase uncertainty and ambiguity in developing a sampling plan.

To address these challenges, the evaluation team performed a data cleaning process to remove projects that are exempt from 2018 IECC code, such as projects having begun construction prior to January 1, 2021, and projects that are outside the scope of this study, such as residential construction under 3 stories, stand-alone parking garages, building alterations, and building additions. Refer to Table 2 for the full list of filters applied prior to exporting projects from Dodge.

Table 2. List of filters applied to Dodge data prior to exporting

Dodge Filter	Inclusion	Exclusion
Publish Range	1/1/2020 through 3/13/2024	Projects published outside the inclusion date range
Action Stage	Pre-Design, Design, Bidding/Negotiating, Construction, Operation, and Delayed	Abandoned
Project Type Categories	Commercial Buildings, Residential (+4 Stories), and Unclassified	Manufacturing, Parking Garage, Building Gas/Chemical Plant, Refinery, Housing, Engineering, and Utilities
Construction Type	New Projects	Additions, Alterations, and Interiors

Prior to cleaning, Dodge contained approximately 3,100 Idaho projects occurring between January 1, 2020 and March 13, 2024, the date of extraction. The final count of projects representing the population of construction activity, following cleaning steps discussed above, is 2,615.

Validation Data

Dodge data is a commonly accepted source for population-level information on construction trends, but it is important in developing a sampling plan to understand its representativeness for a given community. Validating Dodge's representativeness is a difficult task as there are no equivalent alternative resources that provide as detailed a snapshot of Idaho's construction trends over time as Dodge. The evaluation team identified two sources for validation, the 2019 Commercial Building Stock Assessment performed by NEEA and the 2018 Commercial Building Energy Consumption Survey (CBECS) conducted by the U.S. Energy Information Administration (US EIA) as the validation sources.

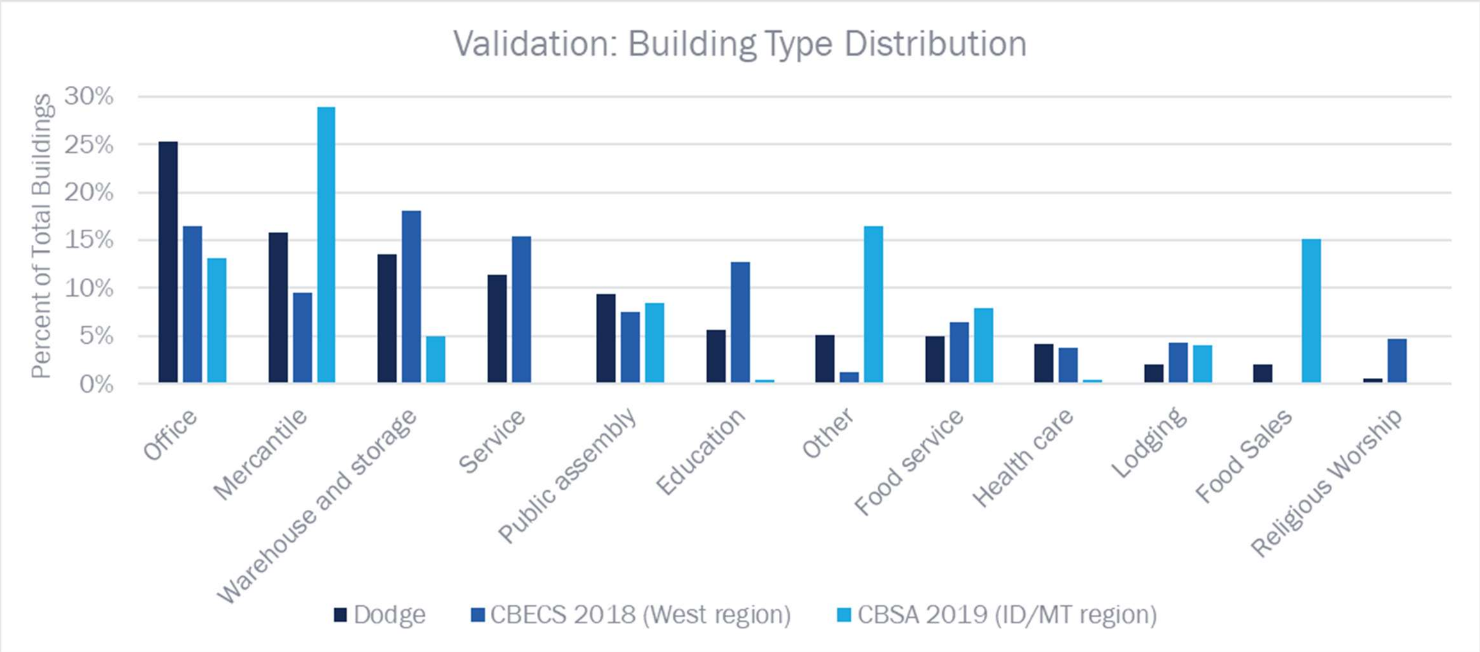
These three datasets utilize different definitions for building types, contain varying levels of detail on building location, and have other inconsistencies that limit the validation of Dodge. At each step of the validation, the evaluation team identified the “least common denominator” between the datasets and normalized each dataset to that term, as best as possible. The following validation sections discuss normalization and limitations.

Building Type Distribution

A primary means of validating Dodge data is to compare the types of buildings constructed against the historical construction trends. It is expected that trends have changed, but the distribution of building types is relatively consistent over time as communities typically promote housing, workplaces, and shopping over other building types.

Figure 1 illustrates the distribution of the building types in Dodge (by project count, more than one building type may apply), CBECS (by building count), and the CBSA (by building count) as percentages of the total buildings within each database.

Figure 1. Distribution of commercial building types in the population and validation datasets. Data is sorted by largest to smallest share in Dodge.



In compiling the distribution of building types, the evaluation team made two observations. First, the CBSA and CBECS data did not include information on multi-family housing. The team reviewed the US EIA Residential Energy Consumption Survey (RECS) as a possible alternative to CBECS, but residential apartments are in terms of apartments and not buildings like Dodge and CBSA. Second, each dataset is from a different population, with the CBECS data covering the West region—AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, and WY—and the CBSA covering ID and MT. This inconsistency is rigid to the datasets, meaning no pathway around was possible. As a result, validation based on building types focused on the commercial sector and assumed building trends are similar enough across the west region to draw conclusions on the representativeness of Dodge.

Comparison of the two validation datasets with the Dodge population shows relative consistency and a few notable differences.

The Dodge data is most comparable to the CBECS data. The top six building types in Dodge and CBECS are the same, starting with office (#2 in CBECS), mercantile (#5), warehouse and storage (#1), Service (#3), Public Assembly (#6), and Education (#4). Combined, these six building types account for 80% of Dodge and 81% of CBECS buildings.

The CBSA data tells a slightly different story. While three of the top six buildings in Dodge and CBECS are also in the CBSA data: mercantile (#1), office (#4), and public assembly (#5), the remaining top six in the CBSA are different: other (#2), food sales (#3), and food service (#6). Further, the top six building types in the CBSA account for 90% of the building types, in contrast to 80%.

While the CBSA data is more regionally specific and current, the differences between the CBSA, Dodge, and CBECS data are explainable by the building taxonomies applied and the statistical expansion of the CBSA results. The study team attempted to align the building type taxonomies in the three datasets. While satisfactory matching was present between the Dodge and CBECS data, the study team observed difficulties in aligning the CBSA data with CBECS building types. Inconsistencies between the detailed building type and the primary building type in the CBSA data, attributable to the study design and multiple buildings located at any one site, partially prevented developing a crosswalk with the CBECS building type taxonomy. Further, the team ultimately chose not to reclassify the CBSA building types because this would have consequences on the study's sample weights, preventing the expansion of results to the population.

Project Location

In addition to building type, the study team compared the percentage of buildings located in an urban versus rural setting as another check on the representativeness of Dodge. While the sampling plan includes a stratum for incorporated and unincorporated jurisdictions, only the Dodge data provides the site city for the project; the CBSA data provides an urban/rural flag, and the CBECS data does not include that level of detail. Therefore, to create a comparison, the study team assigned urban and rural flags to the Dodge data based on site city and US Census data.[4] Not surprisingly, the Dodge data shows the overwhelming majority of commercial new construction occurring in urban centers, illustrated in Table 3. This is in stark contrast to the CBSA data, which shows a relatively even distribution of buildings across urban and rural regions. It is difficult to pinpoint a reason for the difference. It may be due to the study team's application of sampling weights from the CBSA study, or the study design itself, where the CBSA focused on both new construction and existing building stock, while the Dodge data focuses on new construction only. It is also unclear how it affects this study, as it is expected that the majority of new construction is located in urban settings.

Table 3. Distribution of buildings across urban and rural settings.

Population Setting	Dodge	CBSA
Urban	93%	56%
Rural	7%	44%

The evaluation team notes the differences between the datasets but does not find strong enough evidence to suggest the Dodge data is not representative of the population of commercial new construction in Idaho under the IECC 2018 building code. The study team will continue to monitor trends as they progress through the sampling and reassess the Dodge data representativeness if observations do not meet expectations.

Sample Design

The evaluation team, coordinating with NEEA, framed the study around three building characteristics of interest: 1) building location in incorporated and unincorporated jurisdictions, 2) building floor area, and 3) building type.

[4] Opinion Dynamics used the U.S. Census Rural-Urban Commuting Area Codes data which assigns an urban and rural code to each zip code in Idaho. Data was retrieved at https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx

To satisfy sampling requirements of a 90 percent confidence level with a 10 percent margin of error (90/10), the evaluation team selected a sample size of 100 commercial new construction projects. The evaluation team will randomly select projects from the Dodge population data following the sample frame presented in Table 4.

Table 4. Dodge population sample design

Location Strata	Floor Area Strata	Building Type Strata
Incorporated Unincorporated	≤ 20,000 ft^2 20,001 ft^2 to 99,999 ft^2 ≥ 100,000 ft^2	Office Mercantile MF Education Other

The remainder of this section discusses the stratifications and weighting used in the sample design before presenting the final sample frame.

Building Location

Dodge data contains an address for each of the 2,615 projects in the population. The evaluation team compiled a list of unincorporated cities through a web search and cross-referenced that list against a list of incorporated cities found the *Association of Idaho Cities* website.[5] Using the Dodge-listed city, The study team assigned each project to the corresponding incorporation status. A total of 2,575 projects (98% of all) are within incorporated cities, while the remaining 2% (40 projects) are in unincorporated cities. At the request of NEEA, the evaluation team will oversample from the population of projects within unincorporated cities to illuminate differences in compliance with incorporated cities. Given the low number of projects in unincorporated regions, the study team will sample a census of the unincorporated projects with the remaining sample coming from incorporated regions.

Floor Area

Dodge data contains floor area information for 1,474 projects (56% of all) ranging in area from 240 ft^2 to over 1,000,000 ft^2. The evaluation team will stratify sampled projects into three bins: buildings with floor areas under 20,000 ft^2, between 20,000 and 100,000 ft^2, and over 100,000 ft^2. Through past experiences, the team learned that floor area information in Dodge exhibits a degree of uncertainty that requires verifying at the time of data collection.

To illustrate this, the team compared the distribution of projects with listed floor areas in Dodge with information from the CBSA and CBECS West Region and found a significant distinction between those datasets, summarized in Table 5.

Table 5. Distribution of projects across floor area strata.

Floor Area Strata	Population	Dodge Distribution of Projects	CBSA Distribution of Buildings	CBECS Distribution of Buildings
≤20,000 ft^2	888	61%	97%	88%[a]
20,001-99,999 ft^2	380	26%	2%	10%[b]
≥100,000 ft^2	198	14%	1%	2%

[a] includes buildings up to 25,000 ft^2

[b] includes buildings between 25,001 and 99,999 ft^2

[5] Association of Idaho Cities. "Idaho's 199 Incorporated Cities" retrieved on November 29, 2023 at https://idahocities.org/page/Cities

The CBSA and CBECS distribution of buildings aligns with common understanding in that >90% of commercial buildings in the U.S. are under 50,000ft^2. Moreover, the CBSA data lists the largest building at 670,000 ft^2 and the next largest at 290,000 ft^2. In contrast, the Dodge data list 53 projects over 290,000 ft^2 floor area.

It is not unexpected that Dodge data does not reflect CBECS or the CBSA, as projects contain multiple buildings. However, the evaluation team is sampling buildings, and not projects. Therefore, as the study team samples and verifies building floor areas, sampled project's stratum will be reassessed and reassigned as needed.

Building Type

Dodge data contains building type classifications for each of the 2,615 projects. However, each project may contain more than one building type. To avoid double counting projects with more than one building type, the study team ranked each building type within a project based on the total floor area estimated in the US EIA data and adopted the highest-ranking building type as the primary type for each project in Dodge.[6] This ensured that each project was associated with one building type and only counted once. The results of the ranking are presented in Table 6.

Table 6. Ranking of building types.

Building Type	US EIA Floor Area (million ft^2)	Rank
Residential (+4 Stories)	1,790	1
Office	1,358	2
Mercantile	1,125	3
Warehouse and storage	1,049	4
Education	895	5
Lodging	827	6
Public assembly	570	7
Service	462	8
Health care	404	9
Food service	210	10
Religious Worship	0	T-11
Other	0	T-11
Food Sales	0	T-11

The study team also wanted to prioritize which buildings are discretely sampled and which buildings fall within the "Other" building type sampling stratum. Leveraging the rankings in Table 6, the team elected to include Residential (+4 Stories), Office, Mercantile, and Education as discrete strata, and aggregate all other buildings types into the Other category. This mostly aligns to the rankings, with the exception of Warehouse and Storage buildings. This building type was not selected as a discrete sample stratum because of their relatively low energy use intensity compared with the other building types. Warehouse and storage buildings still represent a relatively large portion (8%) of new construction in Idaho since January 1, 2020, and will likely be well represented in the Other stratum.

[6] For commercial buildings, the study team used floor area for the Mountain region from the *2018 CBECS Table B5. Census region and division, floorspace*. For multi-family buildings over four stories, the team used floor area for the Mountain region from the *2020 RECS Table HC10.7. Total square footage of apartment units*.

Sample Weighting

When combined, the three sampling strata—location, floor area, and building type—result in 1,474 projects (Floor area is the limiting field) containing the necessary information in Dodge to develop sample weights. The study team is unable to sample from the full population of 2,615 projects due to limited floor area information inhibiting assignment of all projects to a stratum. The 1,474 projects with complete data form the foundation for weighting and the subset of the population from which the team will sample; however, the team will extrapolate results to the full population of 2,615 projects. This assumes the subset of projects with complete data are no different than the subset of projects with incomplete data, which the study team confirmed through a comparison of the subset of projects with floor area against the subset of projects with unknown floor area, see Table 7.

Table 7. Comparison of projects in Dodge with and without floor areas listed

Location	Building Type	Population of Dodge Projects with:				Difference
		Known Floor Area	Distribution	Unknown Floor Area	Distribution	
Incorporated	Office	592	40.5%	351	31.5%	-9.0%
	Mercantile	323	22.1%	186	16.7%	-5.4%
	MF	176	12.0%	130	11.7%	-0.4%
	Education	61	4.2%	144	12.9%	8.8%
	Other	309	21.1%	303	27.2%	6.0%
Unincorporated	Office	2	15.4%	2	7.4%	-8.0%
	Mercantile	3	23.1%	6	22.2%	-0.9%
	MF	-	0.0%	4	14.8%	14.8%
	Education	2	15.4%	2	7.4%	-8.0%
	Other	6	46.2%	13	48.1%	2.0%

To create sampling weights, the evaluation team counted the total number of projects in each stratum, for example, Incorporated – ≤20,000 ft^2 – Office, and divided by the total number of projects available (1,474). This resulted in an under-sampling of Unincorporated communities. To satisfy study objectives of examining differences in compliance rates between incorporated and unincorporated communities, the study team reallocated sampling to increase sample sizes in the unincorporated strata. Table 8 summarizes the final weighting scheme employed for sampling.

Table 8. Sample weights for each stratification.

Location	Floor Area	Building Type	Population with Floor Area in Dodge	Calculated Weights	Final Weights
Incorporated	≤20,000 ft^2	Office	339	23.0%	20%
		Mercantile	276	18.7%	16%
		MF	90	6.1%	5%
		Education	30	2.0%	2%
		Other	144	9.8%	9%
	Subtotal		*879*	*59.6%*	*52%*
	20,001-99,999 ft^2	Office	162	11.0%	10%
		Mercantile	30	2.0%	2%
		MF	37	2.5%	2%
		Education	29	2.0%	2%
		Other	120	8.1%	7%
	Subtotal		*378*	*25.6%*	*23%*
	≥100,000 ft^2	Office	91	6.2%	5%
		Mercantile	17	1.2%	1%
		MF	49	3.3%	3%
		Education	2	0.1%	0%
		Other	45	3.1%	3%
	Subtotal		*204*	*13.8%*	*12%*
Subtotal Incorporated			*1,461*	*99.1%*	*87%*
Unincorporated	≤20,000 ft^2	Office	2	0.1%	2%
		Mercantile	3	0.2%	3%
		MF	0	0.0%	0%
		Education	1	0.1%	1%
		Other	3	0.2%	3%
	Subtotal		*9*	*0.6%*	*9%*
	20,001-99,999 ft^2	Office	0	0.0%	0%
		Mercantile	0	0.0%	0%
		MF	0	0.0%	0%
		Education	0	0.0%	0%
		Other	2	0.1%	2%
	Subtotal		*2*	*0.1%*	*2%*
	≥100,000 ft^2	Office	0	0.0%	0%
		Mercantile	0	0.0%	0%
		MF	0	0.0%	0%
		Education	1	0.1%	1%
		Other	1	0.1%	1%
	Subtotal		*2*	*0.1%*	*2%*
Subtotal Unincorporated			*13*	*0.9%*	*13%*
		Total:	*1,474*	*100%*	*100%*

Totals and subtotals may not add to the reported value due to rounding.

The study team applied the final weights to the total sample size of 100 to develop sample sizes within each stratification. The results are presented in Table 9.

Table 9. The Final Sampling Strata with Sample Sizes

Stratum	Building Type	Sample Size	
		Incorporated	Unincorporated
≤20,000 ft²	Office	20	2
	Mercantile	16	3
	MF	5	0
	Education	2	1
	Other	9	3
20,001-99,999 ft²	Office	10	0
	Mercantile	2	0
	MF	2	0
	Education	2	0
	Other	7	2
≥100,000 ft²	Office	5	0
	Mercantile	1	0
	MF	3	0
	Education	0	1
	Other	3	1
	Total:	*87*	*13*

Sampling Approach

The study team will randomly generate and assign numbers to each of the 1,474 projects in Dodge from which the sample is drawn, starting with the highest number and working through to the lowest number. Each project will be assigned to one stratum. For the Unincorporated stratum, the team will sample a census of projects.

During recruitment and verification, the study team will reassess the validity of a project with respect to its stratum. If it is determined that a project is misclassified for the stratum, the team will make note of the misclassification and remove the project from the sample. This is to maintain the final weighting and randomness of the sample.

Appendix B.Sample site location, size, strata, evaluation status

Unique ID	City	Electric Utility	Gas Utility	Incorporation Status	Building Size	Building Strata	Detailed Compliance Evaluation	Site Visit Completed
ID001	Blackfoot	Idaho Power	Intermountain	Incorporated	Medium	Education	Yes	Yes
ID002	Caldwell	Idaho Power	Intermountain	Incorporated	Small	Other	Yes	
ID003	Caldwell	Idaho Power	Intermountain	Incorporated	Small	MF	Yes	Yes
ID004	Eagle	Idaho Power	Intermountain	Incorporated	Medium	Other	Yes	
ID005	Eagle	Idaho Power	Intermountain	Incorporated	Large	Other	Yes	Yes
ID006	Boise	Idaho Power	Intermountain	Incorporated	Small	Other	Yes	Yes
ID007	Boise	Idaho Power	Intermountain	Incorporated	Medium	MF	Yes	
ID008	Boise	Idaho Power	Intermountain	Incorporated	Small	Mercantile	Yes	
ID009	Boise	Idaho Power	Intermountain	Incorporated	Small	Other		
ID010	Boise	Idaho Power	Intermountain	Incorporated	Medium	MF		
ID011	Caldwell	Idaho Power	Intermountain	Incorporated	Medium	Other	Yes	
ID012	Caldwell	Idaho Power	Intermountain	Incorporated	Large	Other	Yes	
ID013_1	Caldwell	Idaho Power	Intermountain	Incorporated	Small	MF		
ID013_2	Caldwell	Idaho Power	Intermountain	Incorporated	Small	MF		
ID013_3	Caldwell	Idaho Power	Intermountain	Incorporated	Small	Office	Yes	Yes
ID013_4	Caldwell	Idaho Power	Intermountain	Incorporated	Small	MF		
ID014	Driggs	Fall River Coop	None	Incorporated	Small	Office	Yes	Yes
ID015	Driggs	Fall River Coop	None	Incorporated	Medium	MF	Yes	Yes
ID016	Eagle	Idaho Power	Intermountain	Incorporated	Small	MF		
ID017_1	Eagle	Idaho Power	Intermountain	Incorporated	Medium	Other		
ID017_3	Eagle	Idaho Power	Intermountain	Incorporated	Small	Office		
ID018	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Medium	Mercantile		
ID019_1	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Medium	MF		
ID019_2	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Medium	MF		
ID020	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Small	Other		
ID021	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Small	Office		
ID022_1	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Medium	MF		
ID022_2	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Medium	MF		
ID022_3	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Large	MF	Yes	Yes

Unique ID	City	Electric Utility	Gas Utility	Incorporation Status	Building Size	Building Strata	Detailed Compliance Evaluation	Site Visit Completed
ID022_4	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Medium	Other	Yes	Yes
ID023_1	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Small	Office		
ID023_2	Idaho Falls	Idaho Falls Electric	Intermountain	Incorporated	Small	Other		
ID024	Ketchum	Idaho Power	Intermountain	Incorporated	Small	Office	Yes	
ID025	Kuna	Idaho Power	Intermountain	Incorporated	Small	Other	Yes	
ID026	Kuna	Idaho Power	Intermountain	Incorporated	Medium	Other		
ID027	Kuna	Idaho Power	Intermountain	Incorporated	Small	Other		
ID028	Lewiston	AVISTA/Clearwater Power	AVISTA	Incorporated	Small	Other		
ID029	Meridian	Idaho Power	Intermountain	Incorporated	Small	Office		
ID030	Meridian	Idaho Power	Intermountain	Incorporated	Medium	Office		
ID031	Middleton	Idaho Power	Intermountain	Incorporated	Small	Education		
ID032	Middleton	Idaho Power	Intermountain	Incorporated	Small	Other		
ID033	Middleton	Idaho Power	Intermountain	Incorporated	Small	Other		
ID034	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Office		
ID035	Nampa	Idaho Power	Intermountain	Incorporated	Small	Office		
ID036	Nampa	Idaho Power	Intermountain	Incorporated	Small	Other		
ID037	Nampa	Idaho Power	Intermountain	Incorporated	Small	Other		
ID038	Nampa	Idaho Power	Intermountain	Incorporated	Large	Other		
ID039	Nampa	Idaho Power	Intermountain	Incorporated	Small	Mercantile		
ID040	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		
ID041	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		
ID042	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Office		
ID043	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		
ID044	Nampa	Idaho Power	Intermountain	Incorporated	Small	Office		
ID045	Nampa	Idaho Power	Intermountain	Incorporated	Large	MF		
ID046	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		
ID047	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Office		
ID048	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Other		
ID049	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		
ID050	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		
ID051	Nampa	Idaho Power	Intermountain	Incorporated	Large	Office	Yes	
ID052	Nampa	Idaho Power	Intermountain	Incorporated	Small	Office		
ID053	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Education		
ID054	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		

Unique ID	City	Electric Utility	Gas Utility	Incorporation Status	Building Size	Building Strata	Detailed Compliance Evaluation	Site Visit Completed
ID055	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Other		
ID056	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		
ID057	Nampa	Idaho Power	Intermountain	Incorporated	Small	Office		
ID058	Nampa	Idaho Power	Intermountain	Incorporated	Medium	MF		
ID059	Post Falls	Kootenai Elec/AVISTA	AVISTA	Incorporated	Medium	Other		
ID060	Tamarack	Idaho Power	None	Unincorporated	Small	Mercantile		
ID061	Tamarack	Idaho Power	None	Unincorporated	Small	Other		
ID062_1	Tamarack	Idaho Power	None	Unincorporated	Medium	Other		
ID062_2	Tamarack	Idaho Power	None	Unincorporated	Medium	Other		
ID063	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Education	Yes	Yes
ID064	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Education		
ID065	Nampa	Idaho Power	Intermountain	Incorporated	Small	Other		
ID066	Nampa	Idaho Power	Intermountain	Incorporated	Medium	Other		
ID067	Nampa	Idaho Power	Intermountain	Incorporated	Large	Other	Yes	
ID068	Nampa	Idaho Power	Intermountain	Incorporated	Small	MF		
ID069	Boise	Idaho Power	Intermountain	Incorporated	Small	Office		
ID070	Boise	Idaho Power	Intermountain	Incorporated	Small	Other	Yes	
ID071	Boise	Idaho Power	Intermountain	Incorporated	Small	Office	Yes	
ID072	Boise	Idaho Power	Intermountain	Incorporated	Small	Office	Yes	
ID073	Boise	Idaho Power	Intermountain	Incorporated	Small	Office		
ID074	Boise	Idaho Power	Intermountain	Incorporated	Small	Other		
ID075	Boise	Idaho Power	Intermountain	Incorporated	Small	Other		
ID076	Boise	Idaho Power	Intermountain	Incorporated	Small	Mercantile	Yes	
ID077	Boise	Idaho Power	Intermountain	Incorporated	Small	Education	Yes	Yes
ID078	Boise	Idaho Power	Intermountain	Incorporated	Small	MF		
ID079	Boise	Idaho Power	Intermountain	Incorporated	Small	Other		
ID080	Boise	Idaho Power	Intermountain	Incorporated	Medium	Office		
ID081	Boise	Idaho Power	Intermountain	Incorporated	Medium	Other		
ID082	Boise	Idaho Power	Intermountain	Incorporated	Medium	Other		
ID083	Boise	Idaho Power	Intermountain	Incorporated	Medium	Other		
ID084	Boise	Idaho Power	Intermountain	Incorporated	Medium	Mercantile		
ID085	Boise	Idaho Power	Intermountain	Incorporated	Medium	MF		
ID086	Boise	Idaho Power	Intermountain	Incorporated	Medium	MF		
ID087	Boise	Idaho Power	Intermountain	Incorporated	Medium	MF		

Unique ID	City	Electric Utility	Gas Utility	Incorporation Status	Building Size	Building Strata	Detailed Compliance Evaluation	Site Visit Completed
ID088	Boise	Idaho Power	Intermountain	Incorporated	Large	Other		
ID089	Boise	Idaho Power	Intermountain	Incorporated	Small	Other		
ID090	Boise	Idaho Power	Intermountain	Incorporated	Small	Other		
ID091	Boise	Idaho Power	Intermountain	Incorporated	Small	Other		
ID092	Boise	Idaho Power	Intermountain	Incorporated	Large	MF		
ID093	Boise	Idaho Power	Intermountain	Incorporated	Large	MF		
ID094	Boise	Idaho Power	Intermountain	Incorporated	Large	MF		
ID095	Boise	Idaho Power	Intermountain	Incorporated	Large	MF		

Appendix C. Site-level Initial Review Findings

Unique ID	Building Size	Building Strata	Envelope COMcheck	Mechanical COMcheck	Interior Ltg COMcheck	Ext Ltg COMcheck
ID001	Medium	Education	Yes	Yes	Yes	Not Available
ID002	Small	Other	Yes	Yes	Yes	Yes
ID003	Small	MF	Yes	Yes	Not Available	Yes
ID004	Medium	Other	Yes	Yes	Yes	Yes
ID005	Large	Other	Yes	Yes	Not Available	Yes
ID006	Small	Other	Yes	Yes	Yes	Yes
ID007	Medium	MF	Yes	Yes	Yes	Yes
ID008	Small	Mercantile	Yes	Yes	Yes	Yes
ID009	Small	Other	Not Available	Not Available	Not Available	Not Available
ID010	Medium	MF	Not Available	Not Available	Not Available	Not Available
ID011	Medium	Other	Yes	Yes	Yes	Yes
ID012	Large	Other	Yes	Yes	Yes	Yes
ID013_1	Small	MF	Yes	Not Available	Not Available	Not Available
ID013_2	Small	MF	Yes	Not Available	Not Available	Not Available
ID013_3	Small	Office	Yes	Not Available	Not Available	Not Available
ID013_4	Small	MF	Yes	Not Available	Not Available	Not Available
ID014	Small	Office	Yes	Yes	Yes	Yes
ID015	Medium	MF	Yes	Yes	Yes	Yes
ID016	Small	MF	Yes	Yes	Yes	Yes
ID017_1	Medium	Other	Yes	Yes	Yes	Yes
ID017_3	Small	Office	Yes	Yes	Yes	Yes
ID018	Medium	Mercantile	Yes	Not Available	Not Available	Not Available
ID019_1	Medium	MF	Yes	Not Available	Not Available	Not Available
ID019_2	Medium	MF	Yes	Not Available	Not Available	Not Available
ID020	Small	Other	Yes	Yes	Yes	Yes
ID021	Small	Office	Not Available	Yes	Not Available	Not Available

ID022_1	Medium	MF	Yes	Not Available	Not Available	Not Available
ID022_2	Medium	MF	Yes	Not Available	Not Available	Not Available
ID022_3	Large	MF	Yes	Yes	Not Available	Not Available
ID022_4	Medium	Other	Yes	Yes	Not Available	Not Available
ID023_1	Small	Office	Yes	Not Available	Not Available	Not Available
ID023_2	Small	Other	Yes	Not Available	Not Available	Not Available
ID024	Small	Office	Yes	Not Available	Yes	Yes
ID025	Small	Other	Not Available	Yes	Yes	Yes
ID026	Medium	Other	Yes	Not Available	Yes	Yes
ID027	Small	Other	Not Available	Yes	Yes	Not Available
ID028	Small	Other	Yes	Yes	Yes	Yes
ID029	Small	Office	Not Available	Not Available	Not Available	Not Available
ID030	Medium	Office	Not Available	Not Available	Not Available	Not Available
ID031	Small	Education	Not Available	Yes	Yes	Yes
ID032	Small	Other	Not Available	Not Available	Not Available	Not Available
ID033	Small	Other	Not Available	Not Available	Not Available	Not Available
ID034	Medium	Other	Not Available	Yes	Yes	Not Available
ID035	Small	Office	Not Available	Yes	Yes	Yes
ID036	Small	Other	Not Available	Not Available	Not Available	Not Available
ID037	Small	Other	Not Available	Not Available	Not Available	Not Available
ID038	Large	Other	Yes	Not Available	Yes	Yes
ID039	Small	Mercantile	Not Available	Not Available	Not Available	Not Available
ID040	Small	MF	Yes	Not Available	Not Available	Not Available
ID041	Small	MF	Not Available	Not Available	Not Available	Not Available
ID042	Medium	Office	Not Available	Not Available	Not Available	Not Available
ID043	Small	MF	Not Available	Not Available	Not Available	Not Available
ID044	Small	Office	Not Available	Not Available	Not Available	Not Available
ID045	Large	MF	Yes	Yes	Not Available	Yes
ID046	Small	MF	Not Available	Not Available	Not Available	Not Available
ID047	Medium	Office	Not Available	Not Available	Not Available	Not Available
ID048	Medium	Other	Not Available	Not Available	Not Available	Not Available
ID049	Small	MF	Not Available	Not Available	Not Available	Not Available
ID050	Small	MF	Not Available	Not Available	Not Available	Not Available
ID051	Large	Other	Yes	Yes	Yes	Yes
ID052	Small	Office	Yes	Yes	Not Available	Not Available
ID053	Medium	Education	Not Available	Not Available	Not Available	Not Available
ID054	Small	MF	Not Available	Not Available	Not Available	Not Available
ID055	Medium	Other	Not Available	Not Available	Not Available	Not Available
ID056	Small	MF	Yes	Not Available	Not Available	Not Available
ID057	Small	Office	Not Available	Not Available	Not Available	Not Available
ID058	Medium	MF	Not Available	Not Available	Not Available	Not Available
ID059	Medium	Other	Yes	Yes	Yes	Yes
ID060	Small	Mercantile	Not Available	Not Available	Not Available	Not Available
ID061	Small	Other	Not Available	Yes	Yes	Yes

ID062_1	Medium	Other	Yes	Not Available	Not Available	Not Available
ID062_2	Medium	Other	Yes	Not Available	Not Available	Not Available
ID063	Medium	Education	Yes	Yes	Yes	Yes
ID064	Medium	Education	Yes	Yes	Yes	Yes
ID065	Small	Other	Not Available	Yes	Yes	Yes
ID066	Medium	Other	Yes	Not Available	Not Available	Not Available
ID067	Large	Other	Yes	Yes	Yes	Yes
ID068	Small	MF	Yes	Yes	Not Available	Yes
ID069	Small	Office	Yes	Yes	Yes	Yes
ID070	Small	Other	Yes	Yes	Yes	Yes
ID071	Small	Office	Yes	Yes	Yes	Yes
ID072	Small	Office	Yes	Yes	Yes	Yes
ID073	Small	Office	Yes	Yes	Yes	Yes
ID074	Small	Other	Yes	Yes	Yes	Yes
ID075	Small	Other	Yes	Yes	Yes	Yes
ID076	Small	Mercantile	Yes	Yes	Yes	Yes
ID077	Small	Education	Yes	Yes	Yes	Yes
ID078	Small	MF	Yes	Yes	Yes	Not Available
ID079	Small	Other	Yes	Yes	Yes	Yes
ID080	Medium	Other	Yes	Yes	Yes	Yes
ID081	Medium	Other	Yes	Yes	Yes	Yes
ID082	Medium	Other	Yes	Yes	Yes	Yes
ID083	Medium	Other	Yes	Yes	Yes	Yes
ID084	Medium	Mercantile	Not Available	Not Available	Not Available	Not Available
ID085	Medium	MF	Yes	Not Available	Not Available	Yes
ID086	Medium	MF	Yes	Yes	Yes	Yes
ID087	Medium	MF	Yes	Yes	Yes	Yes
ID088	Large	Other	Yes	Yes	Yes	Yes
ID089	Small	Other	Yes	Yes	Yes	Yes
ID090	Small	Other	Yes	Yes	Yes	Yes
ID091	Small	Other	Yes	Yes	Yes	Yes
ID092	Large	MF	Not Available	Not Available	Not Available	Not Available
ID093	Large	MF	Yes	Yes	Yes	Yes
ID094	Large	MF	Yes	Yes	Yes	Yes
ID095	Large	MF	Yes	Yes	Yes	Yes

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