State of Alaska **Department of Education & Early Development**
Bond Reimbursement & Grant Review Committee

Design Ratios

D E E D P o s i t i o n P a p e r

February 28, 2022

Purpose

The purpose of this paper is to review two aspects of the department's design ratios effort. The first is to provide the current status on the creation of design ratios to assist in achieving efficient and cost-effective school construction in Alaska. The second is to assess whether those design ratios will be sufficiently definable, durable, and whole-building oriented so as to be suitable for placement in Alaska Administrative Code (aka regulation).

Background & Status

The concept of using design ratios as a tool to establish cost-effective school construction in Alaska was discussed and vetted by the Bond Reimbursement & Grant Review (BRGR) Committee in April 2017. Subsequently, a subcommittee was appointed to continue investigation and development in the area of design ratios. In December of 2017, the subcommittee's work led to inclusion of 5 criteria in a report to the Legislature on the topic of measuring cost-effective school construction in the state—four of which were specific design ratios. In 2018, the 30th Alaska Legislature passed HB212 requiring that the department, with the BR&GR, develop criteria for cost-effective school construction, a portion of which was include design ratio. A fiscal note to the bill resulted in $323,000 in FY19 funding for the department to implement the bill's provisions. Subcommittee work continued in 2018 to develop a scope of work for design ratio analysis and in early 2019, an RFP was issued, and a team was selected to provide the needed analysis. A report, delivered in July of 2019, has formed the basis of subsequent work by the subcommittee in developing design ratios in support of AS 14.11.017(d):

> (d) The department shall develop and periodically update regionally based model school construction standards that describe acceptable building systems and anticipated costs **and establish school design ratios** to achieve efficient and cost-effective school construction. In developing the standards, the department shall consider the standards and criteria developed under AS 14.11.014(b).

In August 2020, the BRGR Committee reviewed and adopted a structure and format for design ratio descriptions that includes: 1) Ratio Name and Definition, 2) Calculation Clarifications, 3) the Ratio, 4) Implementation Guidance, and 5) References.

At the September 2020 meeting, the Department presented the following Openings to Exterior Wall Area (O:EW) ratio to the BRGR Committee, although the Committee did not take formal action based on DEED desire for follow-up study to pinpoint targets:

O:EW
Zone 6 – Target 15%; Range [10% - 20%]
Zone 7 – Target 14%; Range [9% - 18%]
Zone 8 – Target 10%; Range [7% - 14%]
Zone 9 – Target 8.5%; Range [6% - 11%]

In December 2020, the BRGR Committee reviewed and adopted the following Volume to Gross Square Footage (V:GSF) ratio:

> *V:GSF*
> *All Zones – Target 18.5%; Range [16% - 20%]*

In November 2021, the Department issued a small contract to provide additional detail regarding the estimated initial and operating costs relative to the above ratios, along with the V:ES ratio. The results of that finalization study were provided in mid-February. Evaluation of the report data is still underway.

Discussion

Ratios Placement in Regulation

The normal method for implementing a statute that directs the development of additional standards is to promulgate regulations in the state's administrative code. AS 14.11.017(d) clearly calls for development of additional standards. However, in order for regulations to be an effective vehicle for developed standards, those standards must be sufficiently definable so as to be clear and relatively succinct (i.e., short), and sufficiently durable so as to not required change except at reasonable intervals—maybe five years or more. In 2017, the BRGR Committee advised the Legislature on establishing cost-effective school construction and included four possible design ratios that were thought, at the time, would meet both of these effectiveness measures—definable and durable. The purpose of the fiscal note attached to HB212 was to acknowledge that in order to meet these measures, there had to be a bedrock of solid analysis accomplished. That analysis occurred in 2019 and resulted in one of the four proposed ratios being set aside. The follow-on analysis in 2021 examined some additional boundaries for the ratios which validated two of them and offered additional support for the third.

Definable: Earlier this paper mentioned the ratio descriptions format (and content for some) proposed and accepted by the BRGR. In this format, the definition is proposed as a title and two supporting sentences. The ratio(s) themselves are also relatively straightforward terms such as "target" and "ratio" followed by numeric values. The format also includes three additional areas of information: calculation clarifications, guidance (on implementation), and references. The *definition* and *ratio* elements are suited to regulation, the remaining three areas would not be included in regulation, but would be best implemented as department procedures.

Durability: The O:EW ratio establishes cost-effective design by measuring impact of windows on the energy performance of a school building. There are two primary factors which could influence the underlying basis for the ratio: the cost of energy and the thermal performance of windows relative to exterior wall assembly. While change can be expected in both of these factors, it is reasonable that it will occur incrementally over time.

The V:GSF ratio establishes cost-effective design by measuring the impact of the volume on initial cost and operating performance of a building relative to its floor area. The two factors that could influence the underlying basis for this ratio are: the cost of building enclosure and the cost of conditioning building volume. While future efficiencies might mitigate high-to-low spectrum of these factors, it's hard to imagine a gain in either enclosure construction or conditioning efficiency that would be disassociated from cost.

The V:ES ratio establishes a cost-effective design by measuring the impact of volume on the initial cost (and operating cost) of a building relative to its enclosure. The two factors that could influence the underlying basis for this ratio are again: the cost of building enclosure and the cost of conditioning building volume. The statis, or durability, of these factors seems again, almost guaranteed with gains coming at no increase in cost.

Summary

Work accomplished to date by the BRGR Committee, the Design Ratios Subcommittee, and the Department appear to support the inclusion of three design ratios in regulation when established based on fully supported and vetted analysis.

Recommendation(s)

1. Set goals for the finalization of all proposed ratios.
2. Support an appropriate period of public comment at the BRGR Committee level with adjustment to the ratio descriptions as needed.
3. Support the inclusion of these ratios in regulation.