

## Executive Summary

This case study examines how a high school residential construction program switched from framing with conventional methods to Optimum Value Engineering (OVE) practices. It underscores the barriers to successful implementation of OVE techniques and presents realistic lumber savings.

Based on the case study, OVE techniques that were practical to implement (when visibly marked on the construction plans) and had noticeable material savings, thermal benefits, and positively affected the quality of framing included:

- right-sized headers
- three-stud insulated corners
- ladder-blocking for intersecting walls
- header hangers
- 24" o.c. floor joist framing

OVE techniques that were found to be problematic, either from a technical or logistical standpoint, or had minimal energy or lumber saving benefits (considering that exterior foam sheathing was employed on the home) included:

- single top plates
- in-line framing
- 24" o.c. wall framing
- two-stud corners
- single member framing around window and door openings
- single member headers

OVE techniques resulted in wall framing lumber savings of 14 percent and floor framing material savings of 8 percent compared to conventional, IRC 2006-based practices. Design changes that could have achieved additional material savings, such as alternate wall bracing methods, are also presented in this report.

The case study highlights the advantages of and barriers to widespread adoption of OVE practices. More conscientious attention to framing details such as right-sized headers, three-stud insulated corners, and ladder blocking at wall intersections, reduces unnecessary material use and increases the available space for cavity insulation. However, changes to conventional framing practices requires increased effort at the design stage and oversight during construction, with efforts diminishing as framing crews become more familiar with the new practices. For successful implementation, OVE details must be clearly depicted on architectural plans and easily referenced on the jobsite. On a first-time home, these added "soft costs" associated with the implementation of even the most basic OVE practices are likely to offset any savings accrued from reduced lumber use. Furthermore, the energy efficiency gains associated with using continuous exterior insulating sheathing overshadow the efficiency gains from employing OVE framing techniques.

Barriers to other OVE techniques are both technical and practical in nature. Currently, sections of the 2006 IRC (and other residential building codes) pertaining to braced wall panels are sufficiently confusing to discourage use of alternatives to continuous structural sheathing. Single top plates preclude the use of standard pre-cut studs and usually necessitate added on-site labor to cut studs and drywall to length. Wall, joist, and rafter framing to 24" o.c. requires in-line framing unless extra top plate material or blocking is used, and considerable on-site

management is needed to ensure it is implemented properly. Furthermore, some interior and exterior finish materials may not be approved for a fastening schedule greater than 16" o.c. Finally, reduced framing around window and door openings presents practical difficulty in adequately nailing siding and trim.

In the unique scenario of the case study project, most of the barriers to OVE implementation were not insurmountable. However, in a fast-paced construction environment, the relatively small lumber savings or efficiency gains may not be worth the additional design and management costs, or the risk of construction delays, rework, or callbacks.