1 Project Story

This dual project brief is based on the desire for better material- and time-efficiency on residential construction sites; specifically, sites where large groups of houses in a neighbourhood or subdivision are constructed at the same time. Current practice is to gather lumber materials at each house site as needed, cut each piece of lumber to the correct length according to the construction plans, lay the loose pieces out at the correct spacing on the ground, then nail them together before standing the wall up into place. This requires time and organization of materials at each individual house site and can cause difficulties keeping wall panels square during nailing or finding a flat surface to assemble walls on. It also leads to material waste because lumber is shipped to site in standard lengths that require custom cutting, and scraps may not be useable.

The parts of the roof structure are commonly assembled in roof truss factories and shipped to site for installation, but the rest of the house is still built using site-framing. Wall panel plants do exist that can pre-fabricate sections of wall to be delivered on site; however, these facilities are less common and therefore usually too far away to be worth utilizing for local builders. Videos linked below show current site-framing methods for wall construction and provide an example of the type of equipment that is used to make wall framing more efficient in framing plants.

Our homebuilder client desires a solution that can make framing on site more efficient and improve quality (squareness, assured stud spacing, etc.) of walls but avoid the environmental impact of shipping panels long distances from plants. This brief encompasses several potential project areas, for example; (1) innovation of a site-based framing plant or other solution for improving the time-efficiency of wall construction or (2) development of materials kits (think Ikea-style) or material storage/sorting solutions that would reduce material wasted from custom-cutting of lumber at individual house sites. The proposed solution must address *at least* one of the time-, material- or cost-efficiency concerns of our industry client and prioritize environmentally-friendly ideas.

2 Extra Context

- Homebuilding industry includes several stakeholders with different objectives. The primary stakeholders this project concerns are the construction company owners, who prioritize efficiency, cost-savings, and may wish to reduce their environmental impact, and the framers/carpenters, who may already have a preferred way of doing things based on their training. Proposed solutions will need to have clear benefits for both parties (easier to use/quicker) to convince them to want to change their current methods.
- It should also be kept in mind that most construction companies have established relationships with their local lumber suppliers, so desirable solutions should avoid

disrupting local businesses by continuing to utilize standard length/size of sawn lumber (2 by 4, 2 by 6, etc.) that can be sourced from nearby.

- The following videos provide further explanation of the terminology of wall construction, current practice, and an introduction to the factory-based framing plants:
    - Introduction to on-site wall framing process: https://www.youtube.com/watch?v=KGJaA5u9Yj8&ab_channel=ThisOldHouse
    - CAD-based explanation of wall parts and design considerations: https://www.youtube.com/watch?v=G3YxoLL9zHI&ab_channel=Buildsum
    - Video showcasing in-factory framing equipment: https://www.youtube.com/watch?v=mWQv31ETkyU&ab_channel=PanelsPlus
    - Comprehensive homebuilding guide for more detailed information: https://www.youtube.com/playlist?list=PLv8J8XldbK3_l5e8jGe5CCuFuvVGtkgYO

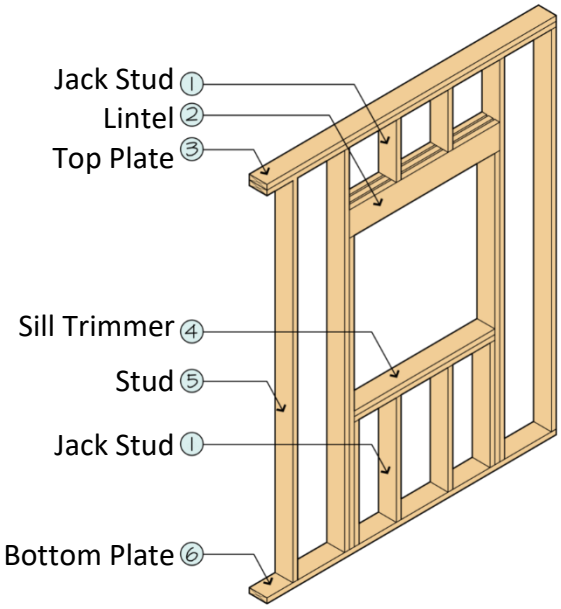

Figure 1: Common wall-framing terminology

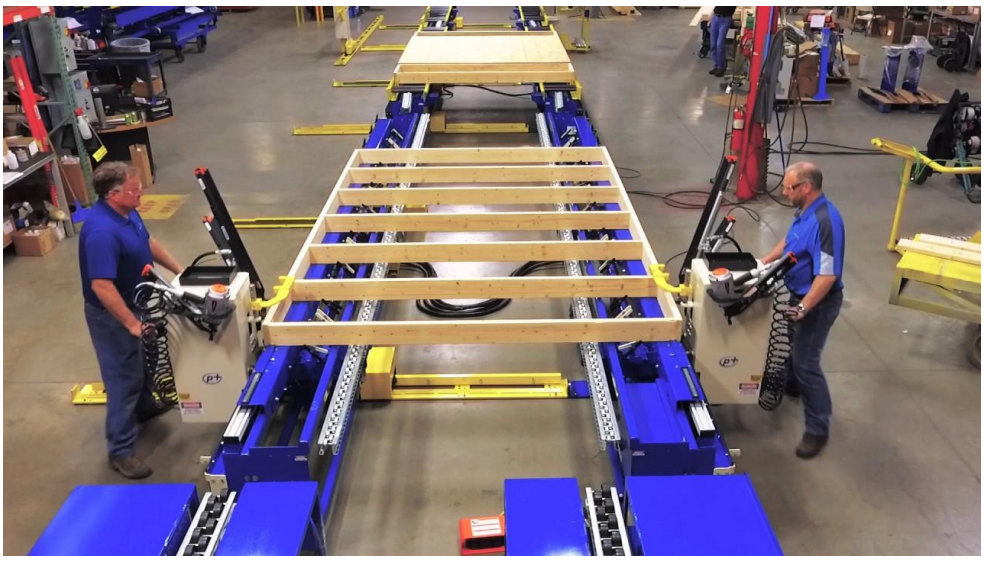

Figure 2: In-plant wall panel framing table