Structural Feasibility of Salvaged Lumber from Portland Residential Building Deconstruction for CLT Manufacturing

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Background
Portland, Oregon was the first U.S. city to implement a deconstruction ordinance in 2016. While reclaimed wood from deconstructed dwellings have high demand, market for small-sized salvaged lumber is near saturation. Our research goal is to investigate the feasibility of using salvaged lumber for the manufacturing of Cross-Laminated Timber (CLT), which could provide a new market for this material.

Portland, Oregon was the first U.S. city to implement a deconstruction ordinance in 2016. While salvaged lumber from Portland deconstruction stores carbon for longer than in landfills, reduces waste and extends the life of wood waste markets, as well as research provides opportunity to expand wood waste markets, as well as Portland’s deconstruction ordinance and downstream markets.

3,600 linear feet of 2×4 salvaged lumber boards were sourced from three deconstruction contractors in Portland, OR. Boards arrived having variable dimensions and quality. Before being able to be used for CLT manufacturing, attempts were made to measure the dynamic stiffness of each board using a Metriguard Model 340 E-Computer. Of the 534 boards, grading was successful on only 316 due to grading apparatus length requirements.

Findings
• Locating and removing all metal from salvaged boards is challenging and time consuming, but necessary for reprocessing
• Material loss from reprocessing salvaged boards was excessive and unavoidable

Procedure
1) Detect and remove all metal from boards
2) Process material (sizing)
3) Pre-assemble panels and label
4) Apply adhesive and load press

Manufacturing Details:
• Press size: 4ft x 8ft
• Panel size: 46±1in x 91±1in, 3-ply
• Adhesive type: PUR
• Adhesive spread rate: 180±10g/in²
• Open time: 70 min
• Assembly time: <25 min
• Pressing force: 110±10psi
• Pressing time: 3.5 hrs

Research Relevance
• Research characterizes salvaged lumber coming from Portland deconstruction practices
• Salvaged lumber from Portland residential building deconstruction is stiff enough for use in E3 grade CLT panels
• Research provides opportunity to expand wood waste markets, as well as Portland’s deconstruction ordinance
• Use of salvaged material in mass timber reduces waste and extends the life of landfills
• Reapplication of salvaged materials stores carbon for longer

Sample Making & Testing

Objectives
1) Source and re-grade salvaged material for CLT manufacturing
2) Manufacture salvaged CLT panels in accordance with PRG320
3) Prepare samples, test and compare results

Procedure
1) Remove panel and mark cutting diagram
2) Cut samples from panels
3) Structural Testing (**IN PROGRESS**)

Testing Details:
• Flat-wise long-span bending
• ASTM D198
• Center-point loading
• Flat-wise short-span bending
• ASTM D198
• Block shear
• AITC T107
• Cyclic delamination
• AITC T110

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