

## Supplementary Material: S1. Product summary sheets

### Containerboard

<p><b>Product Overview</b></p> <p>In Canada, containerboard (a heavy grade of paper) is made from both recycled (old cardboard containers) and virgin wood fibre (e.g. mechanical pulp, kraft pulp). Approximately half of the containerboard produced in Canada is made uniquely of recycled wood fiber, while the other half is produced using a mix of recycled and virgin wood fibre.</p> <p>While containerboard is mostly constituted of fibre, additives are also added at the paper machine:</p> <ul style="list-style-type: none"><li>• Fibre: 97.5%</li><li>• Coatings (e.g., starch, clay): 1.8%</li><li>• Additives (e.g., alum, starch): 0.6%</li><li>• Dies and other chemicals: 0.1%</li></ul> <p>To produce containerboard, wood fibres are either separated from wood chips through a mechanical or chemical process, or recovered from old containerboard through “repulping”. The mixture of pulp and water coming from the pulping process is spread across a forming fabric at the front end of the machine used for paper production. Water is removed from the pulp through the press section and dryers, prior to containerboard being wound into large rolls.</p>	<p><b>Assembly Overview: Corrugated Cardboard Box</b></p> <p>Corrugated cardboard is made of two main components: the liner and the medium. Both are constituted of containerboard. Linerboard is flat and is located on the outer surfaces for single wall cardboard. The liner adheres to the medium which is formed into arches (or flutes) and is glued between the linerboard facings.</p> <p>The typical composition for a cardboard box is:</p> <ul style="list-style-type: none"><li>• Containerboard: 97%</li><li>• Glue: 2.5%</li><li>• Ink: 0.5%</li></ul> <p>The sheet of containerboard that will become the medium is fed through a machine called a “corrugator”, in which hot steam is sprayed on the paper to allow it to be pressed. Afterwards, the machine glues the liners to the medium and cuts the sides. A bending machine then folds the boxes, and glue is applied prior to the box sections being secured together.</p>
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### Chemi-Thermomechanical Pulp (CTMP)

<p><b>Product Overview</b></p> <p>In Canada, chemi-thermomechanical pulp (CTMP) is made from both softwood and hardwood species. It can be used to manufacture many paper products including coated cardboard, printing and writing paper and paper towels or napkins.</p> <p>CTMP is typically sold as “market pulp”, purchased by other facilities to manufacture paper products. CTMP is composed of the main constituent of wood (lignin, hemicellulose and cellulose) and no extra additives are added.</p> <p>CTMP pulping is similar to mechanical pulping, where wood chips are ground up and separated into individual wood fibres. However, this is preceded by steam treatment and impregnation with chemicals to facilitate mechanical fibre separation. Water is separated from the pulp through a pressing process and then dried before being compressed into bales for shipping.</p>	<p><b>Assembly Overview: Moulded Pulp Food Container</b></p> <p>Moulded food containers are manufactured by pressing wood-based pulps, namely CTMP, into a three-dimensional shapes using a moulding machine. CTMP is a preferred wood-pulp material to northern bleached softwood kraft (NBSK) pulp for food containers, because it is more rigid and allows for lighter products.</p> <p>A coating, which can be derived from plants, is applied to the food containers to prevent water, grease and oil from foods leaking through the container. While the amount of this coating applied to food containers is small, its exact contribution to the overall mass of the product is not available.</p> <p>Moulded food containers are recyclable (assuming no major food contamination) and are expected to show similar compostability properties as other paper products.</p>
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## Softwood Lumber

<p><b>Product Overview</b></p> <p>In North America, softwood lumber is primarily used for the construction and renovation of residential single-family homes (55%) and manufacturing of furniture or other products (34%). Canada accounts for roughly half of the softwood lumber produced in North America. Softwood lumber is available in a wide range of nominal dimensions, the most common being 2 inches by 4 inches (2x4) and 2 inches by 6 inches (2x6).</p> <p>The average density of softwood lumber is 460 kg/m<sup>3</sup> and the main species harvested in Canada are :</p> <ul style="list-style-type: none"><li>• Fir (29%)</li><li>• Pine (22%)</li><li>• Spruce (19%)</li><li>• Other (29%)</li></ul> <p>Lumber manufacturing comprises of three main processes: sawing, kiln-drying and planing. Logs are converted to rough green lumber and co-products at sawmills. Green lumber is then dried, reducing its moisture content from 50% to 15% to improve its use in construction and manufacturing. The dry lumber is then planed giving it a smooth surface and creating uniform sized pieces of lumber.</p>	<p><b>Assembly Overview: Wood Stud Wall</b></p> <p>Single-family and low-rise multifamily homes typically uses light-frame wood construction. Light-frame construction is made up of dimensional lumber and engineered wood that is regularly spaced and fastened together with nails to create floor, wall, stair and roof assemblies.</p> <p>The typical assembly for a load bearing interior wood stud wall is:</p> <ul style="list-style-type: none"><li>• Gypsum panel (75%)</li><li>• Softwood lumber (24%)</li><li>• Nails, screws, nuts and bolts (1%)</li></ul> <p>In a common wood stud wall, 2x4 pieces of lumber are joined to the top and sole plates, with stud spacing of 16 inches (centre-to-centre). Gypsum panels are screwed on top of the wall assembly. Piping, electric cables and electrical boxes are also part of wall assemblies.</p>
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## Particleboard

<p><b>Product Overview</b></p> <p>Particleboard is used to manufacture countertops, door cores, floor underlayment, furniture and multiple other products. Particleboard is mainly manufactured from wood residues that are by-products of lumber milling.</p> <p>The average density of particleboard is approximately 700 kg/m<sup>3</sup> and the typical product composition is :</p> <ul style="list-style-type: none"><li>• Wood residues (92.5%)</li><li>• Urea formaldehyde resin (5.4%)</li><li>• Melamine urea formaldehyde resin (0.9%)</li><li>• Other synthetic resins and wax (1.2%)</li></ul> <p>Particleboard is manufactured in three or five layers. The surfaces, or face layers, are made from finer material than the materials that make up the inside of the particleboard. Raw material is classified by size, dried, and blended with resin or wax. The blended material is then formed into a mat, hot pressed, and finally sent to finishing operations (including laminate or veneer application).</p>	<p><b>Assembly Overview: Cabinet</b></p> <p>Cabinets, including the doors and drawers, can be made of particleboard whose surface is laminated.</p> <p>Cabinets are typically composed of:</p> <ul style="list-style-type: none"><li>• Particleboard (93%)</li><li>• Solid wood (4%)</li><li>• Melamine impregnated paper (3%)</li><li>• Steel hinges (1%)</li><li>• ABS and PVC plastics (1%)</li><li>• Glue (1%)</li></ul> <p>Particleboard panels are cut to size prior to melamine-based paper being hot pressed on the upper and lower sides of the board surfaces. Shelves and doors, including the required accessories (plastic plugs, hinges) are then mounted.</p> <p>Lastly finished cabinets are packaged in cardboard and LDPE film before it is loaded into a truck for delivery to the customer. Cabinets typically require minimal installation (screwed in to wall).</p>
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