Microtel Inn & Suites

PARRY SOUND, ONTARIO

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Introduction

Canada's first Microtel Inn & Suites was opened in Parry Sound, Ontario in May 2006 by Ontarinns, Inc. of Toronto. Henry B. Lowry, president of the company, franchisee and the project's architect, designed this three-storey building using wood for all structural framing. Prefabricated wood panels designed specifically for the project were used to complete this cost effective, high quality, and energy efficient wood building quickly. The framing for the 30,000 square foot building started in early October 2005 and was finished a short six weeks later.

Microtel Inns & Suites has opened or is building nearly 300 Microtel hotels worldwide; seven of these are underway or planned for various locations in Canada, including Woodstock and London, Ontario and five more in Atlantic Canada. Mr. Lowry also designed the Woodstock hotel which uses a panelized system similar to that used in the Parry Sound hotel.

With easy access to Georgian Bay, there is a strong demand for quality and affordable accommodations in the Parry Sound area. The Microtel building is located on a high profile site off Highway 400, approximately 240 km north of Toronto. Seventy per cent of the business is generated by referrals from previous guests and repeat business, or due to the visual impact of the hotel and its location. Over the last several years, a Home Depot, Shoppers Drug-Mart and Wal-Mart have opened in Parry Sound.

The project architect acted as his own cost consultant: "A steel-framed option was considered but found to cost approximately 30 per cent higher for the materials alone."

Upon completion of the project, the architect concluded that the land, wood-framed building, all finishes, development charges and labour worked out to be approximately 20 per cent less than for a similar sized hotel built using alternative fossil fuel-intensive structural materials. The engineered and commodity wood products used in the building were approximately 12 per cent of the total building cost.

Volume of wood used in this building: over 92,000 board feet of lumber and almost 1600 sheets of plywood and OSB.

This wood building captures about 216 metric tonnes of carbon dioxide - the equivalent of driving a passenger car for more than 38 years (about 92,810 litres of gasoline).

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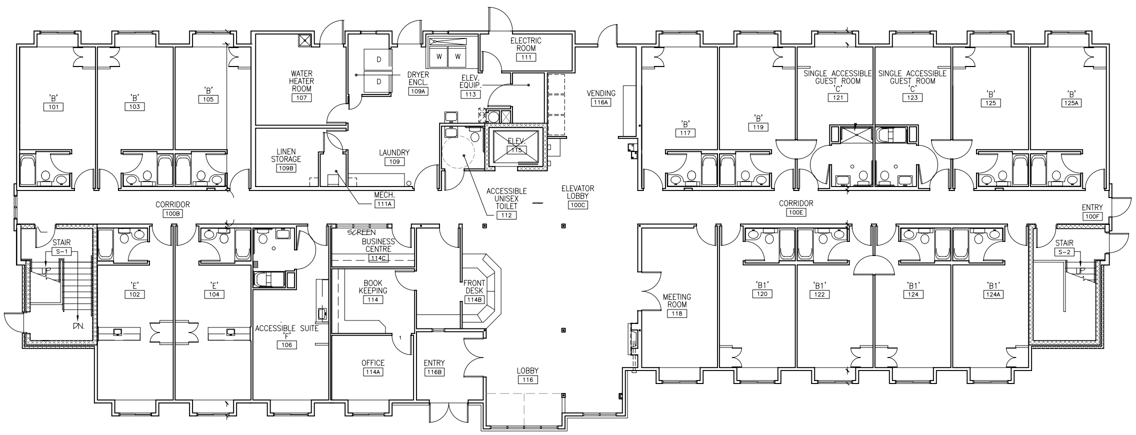
Wood products sequester more carbon dioxide than is emitted during harvesting, transportation and manufacturing, which means they actually have a negative greenhouse gas footprint.

Twelve different prefabricated wood panel configurations were used to construct this three-storey hotel.

Building Description

The hotel is a three-storey building consisting of 64 rooms in a combination of singles (24), doubles (29) and suites (11), accessed by an interior corridor. With the exception of the first floor lobby area, the three floors have the same general layout. The hotel includes several wheelchair accessible rooms, a business center and meeting room.

FIGURE 1: First Floor Plan



Part of the success of this wood-framed project is attributable to the fact that the plans are based on a 12'-0 grid pattern. The repetitive pattern helped with panel planning and manufacturing, as well as with efficient use of finishing materials (e.g., carpet is 12'-0 wide). Prefabricated wall panels are often used when the design allows for substantial repetition (e.g., standard door and window openings). Factory-built structural components offer many advantages such as the ability to build year-round, price stability, speed of construction, energy savings, onsite labour savings, reduced erection time, and specific engineering design values. Since 2000, the panel manufacturing business in North America has been growing at an average rate of approximately 9 per cent per annum. 75 per cent of the total production is used in residential construction. Automation and industrialized construction techniques provide high quality, consistent and reliable panel products.

Wood building components, including a 20" deep I-joist floor system, 2" x 6" exterior and 2" x 4" interior panelized walls, 2" x 6" and 2" x 8" framing, and light-framed wood roof trusses were used throughout this 30,000 square-foot building.


The building uses 20” deep wood I-joists.


Each panel is labeled according to the layout provided.

The governing building code at the time the Microtel plans were approved was the Ontario Building Code (OBC) 1997, the requirements of which are very similar to those found in the National Building Code of Canada (NBCC) 1995 for buildings of this type. The occupancy classification was Group C, allowing up to three storeys in height, sprinklered.

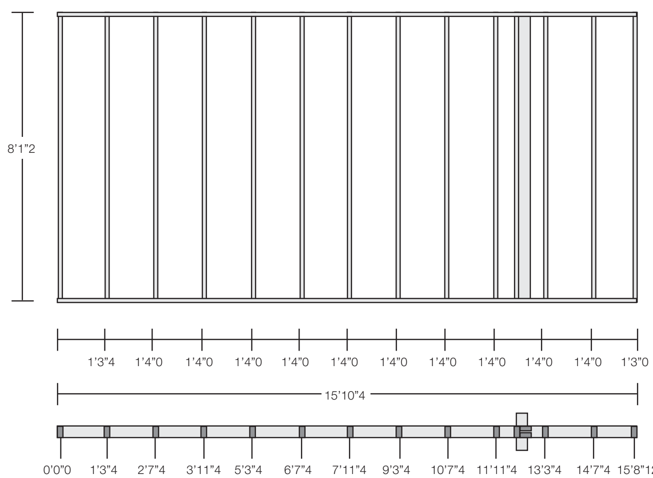
The proximity of the panel manufacturer to the site, a shortage of skilled labour in the Parry Sound area and the repetitive nature of the design led the project architect to use prefabricated panels. The material cost savings , speed of erection, energy efficiency and light environmental footprint were compelling factors in this project.

Using prefabricated panels requires an extensive amount of front-end design work. Planning is a critical part of the process, but allows for most problems to be worked out prior to the start of construction. The panel producer worked closely with the builder and architect to provide the product suitable for the building’s structural requirements. For the second wood-framed Microtel in Woodstock, the project architect was involved in pre-construction planning and design for six months.

Once the panels arrive on site, they are sequentially loaded on blocks according to the panel stacking diagram until used.

The cutting list indicates the panel size and material used. The critical studs in the panels are labeled to show the locations of point loads from roof girders, or beams – this ensures that point loads from above are placed to the center of critical studs.

FIGURE 2: Typical Wall Panel Drawing



To erect a wall panel, the bottom plate of each wall is tacked to the sub-floor then walked upright. Bracing during construction is important and outlined in the OBC 1997 and NBCC (Article 9.23.10.2, "Bracing and Lateral Support" and Appendix A).

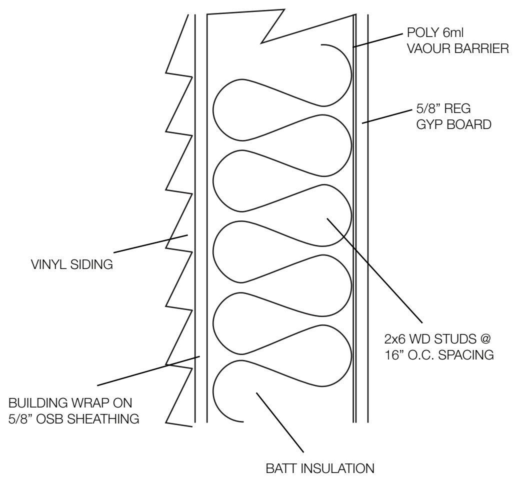
The panels are nailed together at the top, middle and bottom of the end studs, as per OBC 1997, Table 9.23.3.4 ("Nailing for Framing"). The bottom wall plate for exterior walls is nailed down into the floor system below with 3 ¼" nails at 15 ¾" o.c., also according to the OBC 1997.

The value proposition of the manufactured wood roof, wall and floor system was compelling enough for the project architect to use the system for the Woodstock Microtel, which is a larger, more complex project with 10 additional rooms, an indoor pool and fitness center.

Framing Strategy

A typical exterior wall assembly consists of horizontal vinyl siding over building wrap on 5/8" OSB on 2" x 6" wood studs at 16" o.c. with R-19 batt insulation, covered by a 6-mm poly vapor barrier and 5/8" regular or fire-rated gypsum board, as required (see Fire Protection section).

FIGURE 3: Exterior Wall Assembly



Twelve different 8-foot panelized wood wall types were designed for this building.

FIGURE 4: Building Section (2” x 6” exterior walls, 2” x 4” partition walls, 20” deep wood I-joist floor system, wood ledger board with typical hangers fastened to 8” concrete masonry unit elevator shaft)

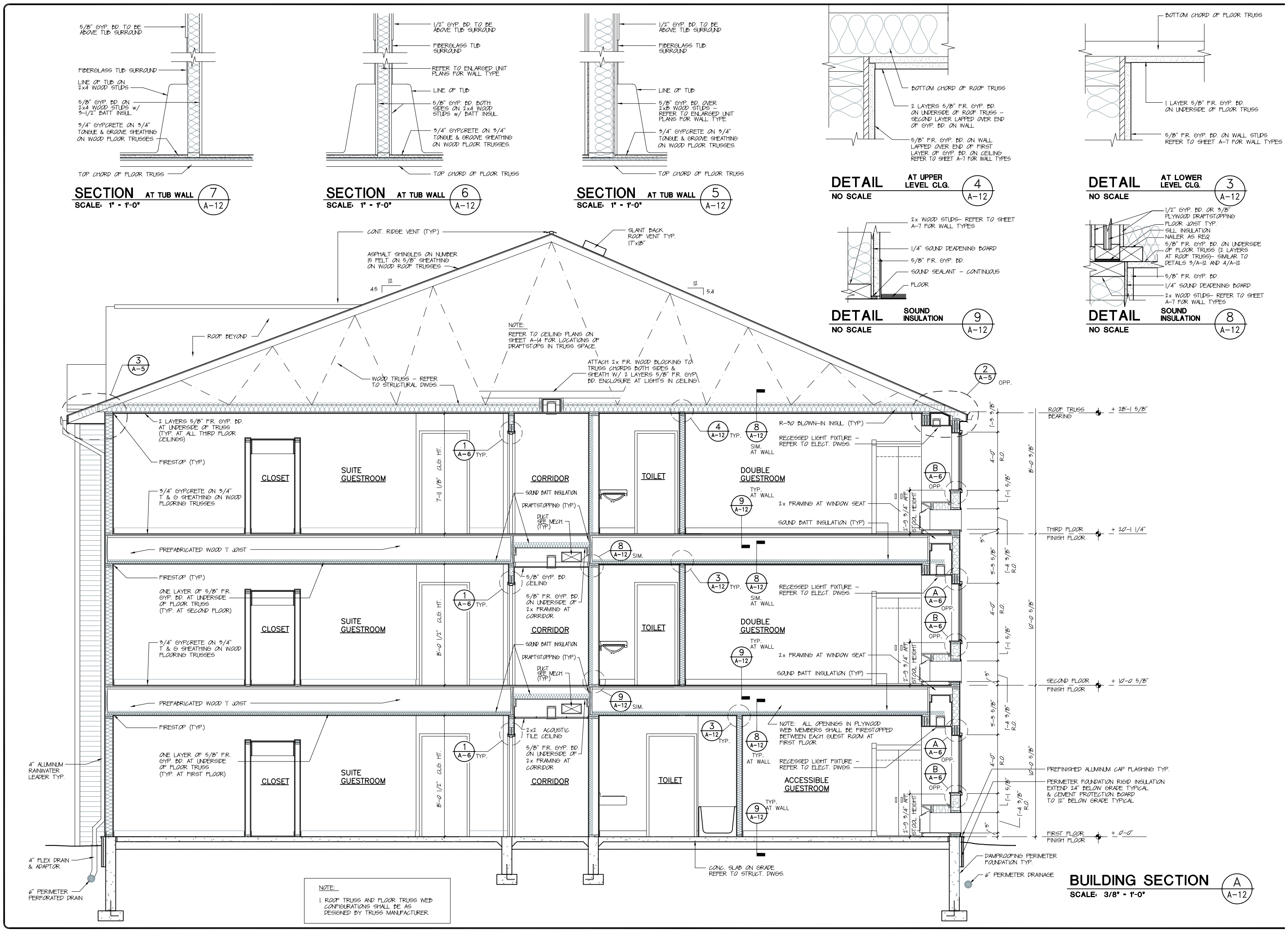
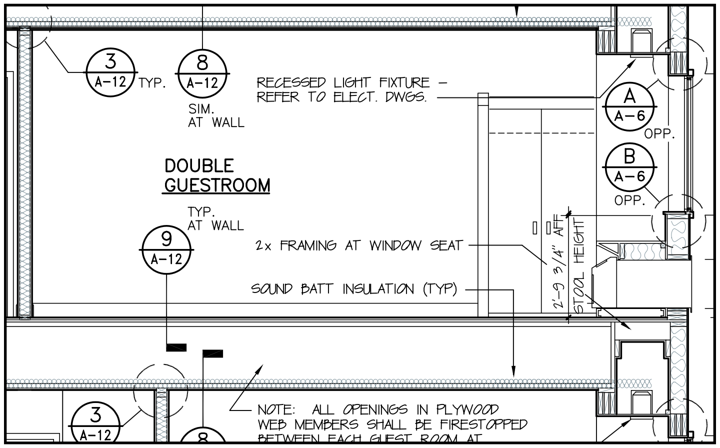


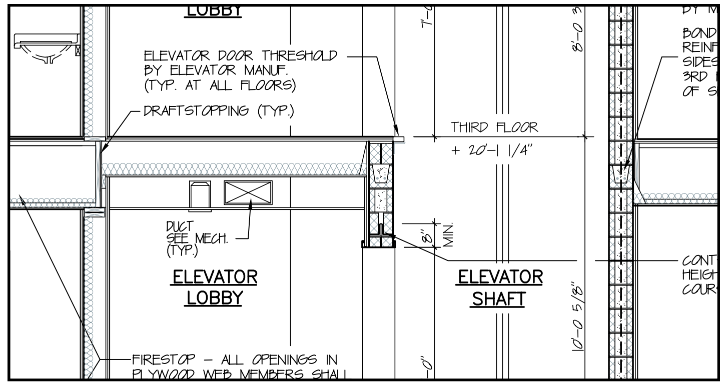
FIGURE 5: Floor System at Windows



The second and third floor assemblies are made up of ¾” of poured gypcrete floor underlayment over ¾” tongue-and-groove OSB floor sheathing, glued and nailed on the engineered structural wood I-joist floor system. This floor assembly meets the criteria for vibration, as well as for fire and acoustics, as outlined in the NBCC 1995.

The floor system was extended to the bay windows, and supported by dropped headers. This provided sufficient space for a mechanical chase, which carried the sprinkler system and recessed pocket lights. The 2” x 8” corridor floor framing allowed for the mechanical chase to contain the sprinkler system, piping and ductwork.

FIGURE 6: Corridor floor framing (forms the recessed mechanical chase)



The joist product selected was a 20” deep wood I-joist with 2” x 4” $2100F_b$-1.8E MSR top and bottom chords and performance OSB web. Engineered structural joists are light, rigid and uniform and help to reduce on-site waste and labour. Wood I-joists are available in a wide range of lengths (48’ maximum), offering greater design flexibility. 1 ¾” x 20” LVL was used as rim board in the corridor area. The LVL acted as a nailer for attaching the 2” x 6” corridor framing.

The integrated design and construction process for this wood-frame building simplified the process to ensure the load paths were completed from the roof to the concrete foundation – the panel manufacturing company was responsible for the design of the roof, walls panels and floor.

To connect the wood floor system with the elevator shaft walls, wood ledger boards were fixed to the concrete masonry unit walls (8” CMU) which surround the shaft (see Figure 6 on page 9).

The factory-built panelized wall system lead to completion of the framing in sixty days with the required quality, consistency and cost effectiveness.

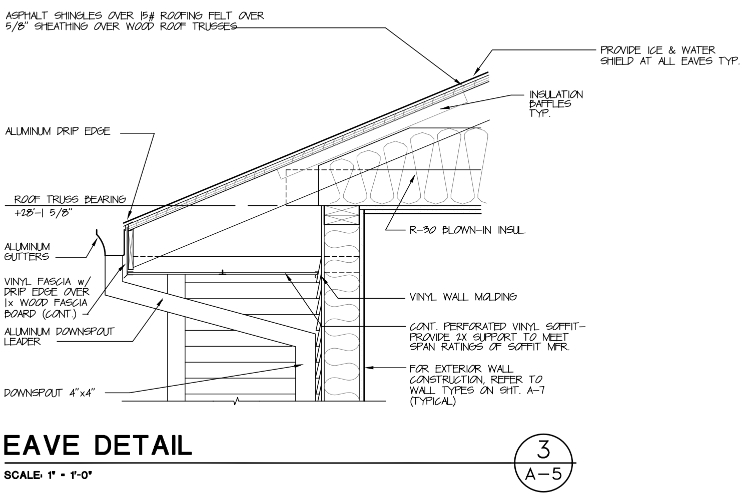
Roof

The wood truss roof was also factory built. These triangular structural frames have high strength-to-weight ratios and permit long spans without intermediate supports. They can be designed in almost any shape or size, allowing for distinctive roof shapes. Light-frame wood trusses are prefabricated by pressing galvanized steel truss plates into wood members that are pre-cut and assembled in a jig.

Wood trusses are strong, reliable, cost effective, and easy to insulate and maintain.

Prefabricated trusses are erected quickly and simply. The open web configuration of the roof trusses allows for easy installation of insulation.

FIGURE 7: Eave Detail



Fire Protection

The provincial building code specifies fire-resistance ratings for assemblies depending on the size and occupancy of the building. The OBC requires a sprinklered Group C occupancy of this height and area to have one-hour fire-resistance rated exterior and interior load bearing walls, structural frame, shaft enclosures, suite separations, floors and stairways.

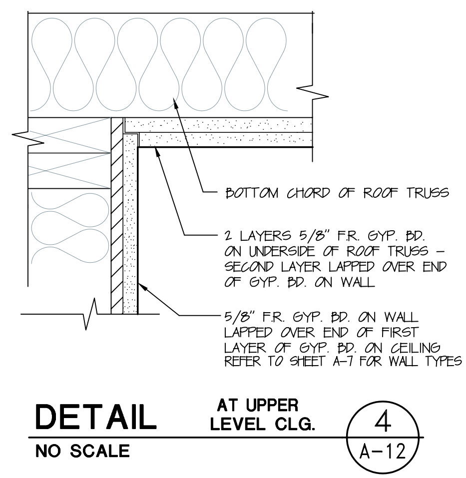
The Parry Sound Microtel uses a proprietary engineered wood floor system to conform to the one-hour fire-resistance rating requirement for floors. This required one layer of 5/8" fire-rated gypsum board to be attached to the underside of the floor I-joists.

The building code provisions in Subsection 3.2.2 of the OBC for a sprinklered Group C occupancy building of this height and area do not require the roof to have a fire-resistance rating. However, there are other fire separation requirements in the code that apply in this situation.

Subsection 3.3.4 in the OBC requires that "suites of residential occupancy", such as those in a hotel, be separated from each other and the rest of the building by a fire separation with a one-hour fire-resistance rating. As well, Article 3.6.4.2 requires that a horizontal service space, such as an attic space, that is located above a vertical fire separation must be divided at the vertical fire separation – for example, the vertical fire separation is continued up through the horizontal service space to the underside of the roof sheathing – or, the construction between the space and the space below is a fire separation with a fire-resistance rating equivalent to that required for the vertical fire separations.

In the Parry Sound hotel, the second approach was used. Two layers of 5/8" fire-rated gypsum board were attached to both the underside of the third-floor roof trusses and to the bottom chord of the rafters to meet the minimum fire separation requirements for horizontal service spaces that penetrate vertical fire separations. The second layer of gypsum board was lapped over the end of the gypsum board on the wall. As well, to maintain the fire-resistance rating provided by the gypsum board ceiling membrane, the ceiling light recesses were enclosed by wood blocking covered with two layers of 5/8" fire-rated gypsum board.

FIGURE 8: Detail (at upper level ceiling)



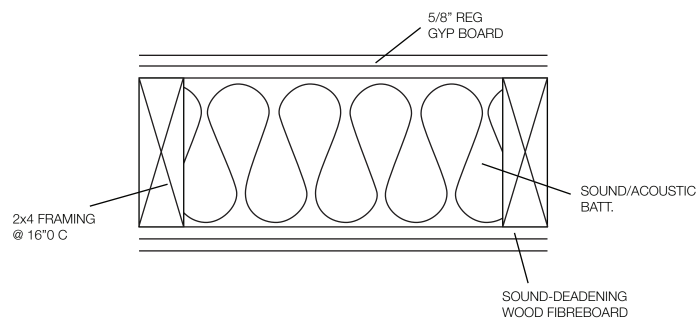
In the concealed space above the ceilings between units and at the corridor walls, ½" gypsum board was used as a firestop. As well, a firestop system using firestop sealant was applied around all penetrations of fire separations, including between all guest suites.

Special Features

Acoustic Design / Sound Control

The acoustic performance of the floor system was an important consideration in this project.

FIGURE 9: Sound Insulation



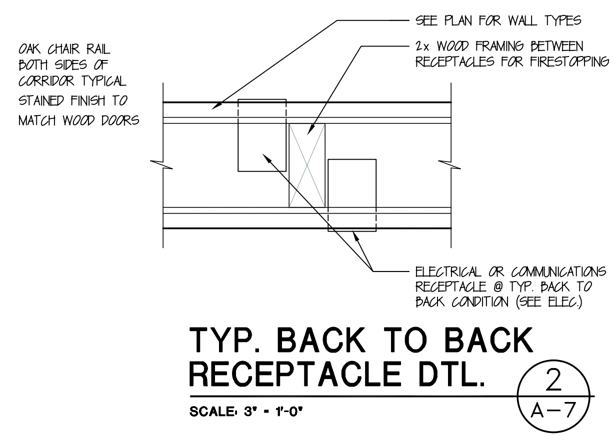
The ability of walls and floors to reduce noise is measured over the hearing range and translated into a Sound Transmission Class or STC Rating; the higher the rating the better the resistance to sound transmission. The project met a minimum STC rating of 52.

For example, to manage sound transference between the units, wall assemblies consisted of a 2" x 4" partition wall (wood studs 16" o.c.) with 3" of acoustic insulation in the wall cavities, and ½" proprietary non-structural sound-deadening wood fibreboard on both sides of the wall (12" o.c. at panel edges), covered by 5/8" fire-rated gypsum board on both sides. All panel joints were staggered. The lightweight fibreboard panels reduce the transmission of higher frequency noise and add a thermal insulation value (R-value of 1.43), while the gypsum board reduces lower frequency transmissions. This combination of products produces good sound attenuation.

Since sound leakage through openings is a major factor in reducing the STC rating of an assembly, small details such as caulking or applying dense acoustical mastic around all gaps and joints in wall and floor assemblies is important.

Also of note is the offset receptacle detail. Microtel requires that this is done in all of their hotels as part of the compliance with the brand standard, since the offset placement of electrical switches and outlets prevents the transmission of sound energy between guestrooms.

FIGURE 10: Offset Receptacle Detail



Thermal Performance

Wood is 400 times better than steel and 10 times better than concrete in resisting the flow of heat. This means more insulation is needed for steel and concrete to achieve the same thermal performance as with wood framing. Due to the thermal performance of this wood building, the thermostat-controlled gas fireplace and the waste heat from the building's mechanical and electrical equipment provide enough heat during the winter months for the common areas. The electric furnace to heat these areas has been commissioned but not turned on.

R-30 blown-in insulation was used in the truss spaces, along with insulation baffles. At the eave, a 2" air space allows for adequate air circulation.

R-19 batt insulation was used in the exterior walls and has helped to reduce the building's heating costs. Prefabricated panels provide excellent overall air tightness with few thermal bridges.

"The thermal performance of this building is exceptional. Air leakage is minimal and mostly concentrated around the penetration of the air conditioner / heater units in each room," said Mr. Lowry.

Cost / Benefit of the Wood System

The choice of wood for this project met all the building science and client requirements at the lowest cost – approximately 30 per cent less expensive for the building then the steel option. In addition, the shorter construction schedule for the wood option relative to the alternative systems, low operating cost and ease of adaptation for future modifications encouraged the project architect to use wood again. Wood structures require less energy to build and to operate, which reduces our reliance on fossil fuels. Wood can be recycled, reused and renewed.

The project created over twenty full- and part-time positions.

Conclusion

At 30 per cent less than the steel option, the Microtel Inn & Suites building is another example of how wood can be used cost effectively in non-residential building types while reducing construction lead times. The prefabricated, panelized wood-framed structure achieved an accelerated completion and opening date for the owner, in addition to reduced operating costs, projected over the service life of the building, due to its superior thermal performance.

This hotel is one of several building types that could use a similar wood structural system. Other building types viewed favourably for wood construction in Ontario include offices, retail spaces, restaurants, community facilities, university classrooms, indoor recreation, multifamily, assisted living and health care facilities (i.e., OBC occupancy Groups A through E).

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