



# On the Slopes

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**Two ski resort condominium projects in Utah rely on structural steel to meet the unique challenges of mountain construction.**



**WHEN YOU THINK OF SKI RESORT ARCHITECTURE, DOES STRUCTURAL STEEL FRAMING COMING TO MIND?** Probably not. But with the upcoming completion of two steel-framed condominium projects in Utah's Deer Valley ski resort, maybe it should. Grand Lodge and Silver Strike Lodge are located in the Rocky Mountains south of Park City—a beautiful but challenging location for construction.

Accounting for high design snow loads, working with small staging areas, delivering materials to sites with steep mountain slopes and difficult site access, overcoming shortages of local construction labor and local construction materials, and working within aggressive construction schedules that would not conflict with the ski season were all major considerations. Add to these the challenges of selecting a framing system with a structural grid that would work well with the architectural design and construction of the buildings; a demanding design schedule accounting for different design requirements due to mixed-use categories of different areas of the buildings; working around special sound detailing requirements; and incorporating the required area separations, and the design team for the two projects had quite a feat ahead of them.

Faced with these challenges, structural steel was selected as the main framing system for both Grand Lodge and Silver Strike Lodge because of its ability to address all of them.

## Grand Lodge

Grand Lodge is a six-story building consisting of parking at the low-





**Above:** Rendering of the Grand Lodge. The lower level is parking with five levels of condominiums above.

**Opposite:** The building exterior features traditional lodge-style finishes.

**Below:** Residential levels of the Grand Lodge use conventional composite floor slabs.

est level and five stories of condominiums above. Located at the base of the Northside Express chair lift at Deer Valley, it is scheduled to be completed in October.

Grand Lodge was constructed with steel, concrete, and wood. The structural steel framing consists of composite wide flange floor beams, composite floor slab (metal deck with concrete topping), steel wide flange columns, and hollow structural steel columns. The main lateral force resisting system consists of special steel moment frames and special concrete shear walls, and the exterior walls at the base of the building are pre-cast concrete.

The building is situated on a hillside such that the third floor walks out at the base of a ski slope on one side of the building. The centerline of the west end of the building is at a 45° angle to the rest of the building, and this geometry made it very difficult to establish a structural grid that







The multi-gabled roof of the Silver Strike Lodge is framed with open web steel joists and wide-flange beams.

worked well with the architectural layout of the living units and the parking layout in the garage below. In addition, the building owner requested that the design team maximize ceiling heights in specific areas of each of the living units while keeping sound transmission between living units at a minimum.

The design team was originally asked

to design the building with a concrete or steel system up to a “platform” level with wood framing at the top four stories. As the design of the building progressed, however, the main framing system was modified to be structural steel with the exception of the loft areas and the roof framing, which remained wood framing. Structural steel offered the best overall solution to the many



Larger than Grand Lodge, Silver Strike Lodge has two floors of parking topped with six floors of condominiums.

challenges of a faster construction schedule, reduced size and number of transfer beams, and reduced overall building weight, when compared to a concrete system. Also, structural steel did not require a large staging area and could be lifted from the truck directly to the building with the on-site tower crane.

### Silver Strike

Just down the road from Grand Lodge—at the base of Deer Valley’s Silver Strike Express chair lift—is Silver Strike Lodge, an eight-story building consisting of two parking levels and six stories of condominium space. It is scheduled to open in June 2008.

Silver Strike Lodge, like Grand Lodge, is constructed with steel and concrete. The structural steel framing consists of open web steel joists, wide flange beams, composite floor slabs, steel wide flange columns, and hollow structural steel columns, while the exterior walls at the base of the building and the second floor of the parking garage are pre-cast concrete. The main lateral force resisting system consists of special steel moment frames, special steel concentrically braced frames, and special concrete shear walls.

One of the most unique aspects of Silver Strike Lodge is its roof framing. The roof is sloped and has multiple dormers similar to what is typically seen with wood framing. However, the roof framing was designed with open web steel joists and wide flange beams. Using open web steel joists with this type of sloped roof required special detailing work for items such as joist bearing seats at hips and valleys, roof overhangs, bent plate blocking, and work points for joist seat depth. Open web steel joists made it possible to support the 150 psf balanced snow load on the roof using the same column grid that was used for the rest of the building below. This provided high vaulted ceilings and reduced the number of transfer beams that would have been required with a wood roof framing system. The open webs of the steel joists allowed flexibility in the routing of mechanical and electrical equipment in the roof framing of individual living units.

Silver Strike Lodge is also situated on a hillside such that the second and third floors have portions that walk out at the base of a ski slope on one side of the building. The challenges faced by the design team for the Silver Strike project were essentially the same as the challenges for the Grand Lodge project, with the exception of the 45° turn in

the building. One major difference between the two was the involvement of the entire design and construction team from very early on in the development of the Silver Strike project. This allowed all team members to have input on the structural framing system, which provided better coordination of the overall project prior to and during construction in the following areas:

**Structural grid.** Having a consistent structural grid throughout the building eliminated costly (and time-consuming to erect) transfer beams and structural discontinuities.

**Framing system.** Having the structural steel framing system selected early in the design of the building made it possible to have items such as holes through webs of wide flange beams provided in the original building design.

**Foundation system.** Temporary shoring walls were required to minimize the impact on the adjacent ski slope. Coordination of the foundation system with the shoring wall contractor at the beginning of the project was essential to the overall construction schedule.

**Submittal and construction schedules.** Good communication and coordination between all members of the design and construction team was required to meet the submittal and construction deadlines.

This coordination process led to the selection of a structural steel framing system that utilized open web steel joists and was well coordinated to reduce conflicts between the architectural, mechanical, and structural design. MSC

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#### **Developer**

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#### **Structural Engineer**

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#### **Architect**

JSA Architects, Salt Lake City

#### **Contractor**

Jacobsen Construction, Salt Lake City

#### **Steel Joist Supplier**

CMC Joist, Fallon, Nev.

#### **Steel Erector**

C&L Erectors, Pleasant Grove, Utah

#### **Steel Fabricator**

B&L Steel, Lindon, Utah (AISC member)

#### **Structural Design Software**

RAM Structural System



The Grand Lodge (shown) differs from the Silver Strike Lodge in that its gabled roof is framed in wood.