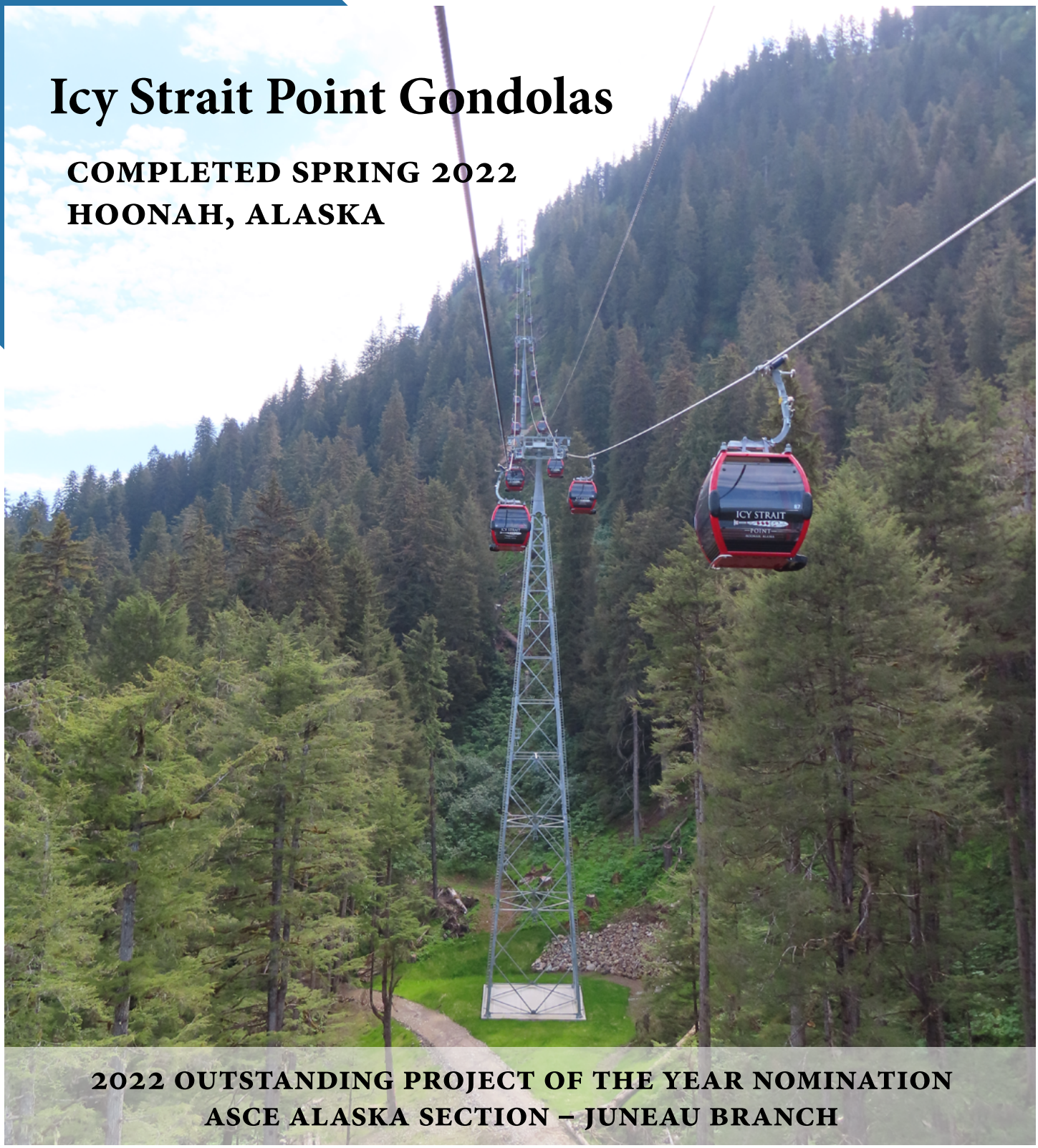
Icy Strait Point Gondolas

COMPLETED SPRING 2022
HOONAH, ALASKA



2022 OUTSTANDING PROJECT OF THE YEAR NOMINATION
ASCE ALASKA SECTION – JUNEAU BRANCH

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Nominated by:
PND Engineers, Inc. – Juneau Office

PND
ENGINEERS, INC.

Owner:
Icy Strait Point

ICY STRAIT
—POINT—
HOONAH ALASKA

Photo: Peter Landsman, Lift Blog

PND Engineers, Inc.

PROJECT DESCRIPTION

Icy Strait Point (ISP), located in Hoonah, Alaska, is a bustling tourist destination that sees thousands of visitors each year. ISP is owned and operated by Huna Totem Corporation and is a popular port of call for numerous cruise lines. However, ISP's mountainous terrain and dirt roads made transportation throughout the area and to the top of Hoonah Mountain challenging. In 2019, PND Engineers, Inc. (PND) joined a design-build team to design two gondola systems and support infrastructure for ISP.

PND performed structural and geotechnical engineering for the improvements, which included installation of the TRANSPORTER Gondola, SKYGLIDER Mountaintop Gondola, gondola storage buildings, Wilderness Landing Tour Sales building, and Wilderness Landing Gift Shop and Restroom. Our team also performed investigations and developed design for the Wilderness Landing Bridge.

TRANSPORTER Gondola system in action. Photo: ISP

These infrastructure improvements will contribute directly to ISP's reputation as a world-class, accessible destination, ensuring it remains competitive and continues to support the residents of Hoonah, many of whom are employed at ISP.

Transporter Gondola

The TRANSPORTER Gondola traverses approximately 1/2 mile between two cruise ship berthing facilities, giving visitors easy access to the Wilderness Landing and Adventure Landing and all their associated amenities. Wilderness Landing is where both gondolas are based and where passengers can jump onto the SKYGLIDER. Visitors can purchase excursions and activities at Wilderness Landing's tour sales building, peruse the gift shop, or use the restrooms. Once in Adventure Landing, visitors can walk to the docks, restaurants, shops, and cannery museum in ISP's Historic Cannery District.

Map of the ISP project site

Both gondola cars are Americans with Disabilities Act (ADA) accessible and can transport up to eight passengers per ride with the capacity to move 2,800 passengers per hour.

Skyglider Mountaintop Gondola

Once visitors make it to Wilderness Landing, they can ride the SKYGLIDER 0.85 miles from sea level to the top of Hoonah Mountain, gaining 1,600 feet in elevation on the ride. This route traverses steep terrain and reaches the top of the mountain in 6 minutes, replacing the 30-minute vehicle shuttle along a winding dirt road that visitors were previously required to use. An efficient transportation route to the top of Hoonah Mountain is a necessity, as it hosts some of ISP's most well-known attractions, including the world's longest ZipRider®, according to ZipHoldings, LLC.

Wilderness Landing Gift Shop and Restrooms

Wilderness Landing Buildings

PND provided foundation and structural design of the 1,400-square-foot Wilderness Landing Tour Sales building. The building will streamline ticketing operations, allowing visitors to find activities, purchase excursions, and check out local vendors in one place after departing the TRANSPORTER Gondola. PND also provided foundation and structural design for the Wilderness Landing Gift Shop and Restroom. The 3,200-square-foot structure provides additional retail space for shops and restrooms to accommodate increased traffic from the opening of the second cruise ship dock. For both buildings, PND implemented conventional reinforced shallow concrete foundations and a light-frame timber construction with wood shear walls to resist heavy snow loads and lateral loads from high-wind and seismic events. Our team additionally designed two storage buildings at Wilderness Landing where all the gondolas can be easily unloaded and stored during windy days or the winter season.

INNOVATION

Designing and installing the SKYGLIDER system on the Hoonah Mountain hillside required navigating complex mountain topography that included steep terrain, weak overburden, complex rock features, large trees, and consideration for avalanche and mass wasting hazards. PND's geotechnical engineers teamed with landslide and rockfall specialists from subconsultant Landslide Technology to investigate the proposed gondola route and tower locations. The site's terrain required the team to use rope access to ascend and descend the steep slopes.

After recommending tower location adjustments based on the initial reconnaissance, the team planned and implemented a complicated field drilling investigation. The field program involved a helicopter-portable drill rig used to investigate each tower group location on the hillside in winter weather conditions. The project civil contractor prepared each site for the investigation using hand tools and small excavators to construct rock and earthen benches for both the drill and crew to work on.

Reconnaissance crew at work

The field investigation involved performing oriented rock coring to collect continuous samples of bedrock at each location. Each borehole was then logged with a downhole televiewer, which produces a 360-degree, unwrapped image of the borehole walls. The imaging allowed the engineers to obtain a clear picture of critical features in each borehole that are not always apparent from recovered rock cores.

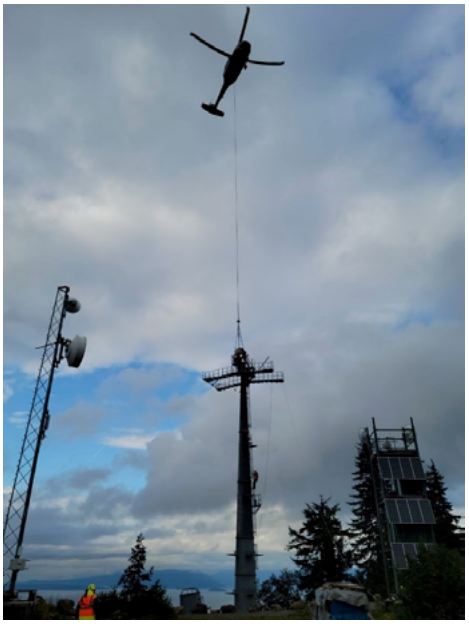
PND Principal Engineer Sean Sjostedt, P.E., using a static line during the geotechnical investigation

After the design team assessed the site topography, subsurface conditions, and tower loads provided by the gondola designer and manufacturer, Doppelmayr Group, the team recommended employing micropile-supported concrete foundations for towers situated on the slopes of Hoonah Mountain. This method provided several key schedule and cost advantages over conventional spread footings for the project, such as:

- Significant tower loads, overturning, and slewing moments would have resulted in large footings, requiring substantial excavation into the hillside and filling beyond the slope.
- Vertical and horizontal micropiles enabled load transfer from the foundation to competent rock 10 to 15 feet beyond the existing ground surface, bridging weak colluvium overburden and weathered bedrock.
- Smaller foundations used less concrete, much of which was delivered via helicopter.

Dental concrete was required at one location with a near-vertical rock face on the downhill side of the tower foundation footprint. The concrete was tied to the bedrock hillside using dowel bars and provided a working surface for construction crews and a bearing surface for the tower foundation.

Following the design phase, PND and Landslide Technology worked with the contractor throughout construction, which also required rappelling to tower locations and flying construction materials in with a helicopter and sling.



Helicopter transport of tower component during construction

BENEFIT TO COMMUNITY

The installation of the two gondola systems has significantly streamlined visitor access and transportation for ISP. The TRANSPORTER Gondola takes visitors between the two berthing facilities efficiently, while the SKYGLIDER greatly reduces the time it takes to reach the top of Hoonah Mountain and avoids traveling through ISP and Hoonah. The quick transport between the two cruise ship berths means passengers have easy access to either Wilderness Landing and the SKYGLIDER, as well as the new shops and facilities located there, or Adventure Landing and all of its amenities. Previously, visitors who wanted to reach the top of Hoonah Mountain hopped on a shuttle service that first took passengers through Hoonah before ascending an old logging road filled with switchbacks up the mountain. The quick SKYGLIDER transport gives visitors more time to explore the amenities at the top of the mountain and to access one of the largest attractions, the ZipRider®.

TRANSPORTER Gondola storage building

The new Wilderness Landing Tour Sales and Wilderness Landing Gift Shop and Restroom buildings allow visitors to take advantage of potential excursion and activity purchases, as well as shopping. With the gondolas' capacity to move 2,800 passengers per hour and the SKYGLIDER's travel time of 6 minutes to get to the mountaintop, ISP can maximize gondola ticket sales and generate additional income from the increased time visitors have to explore tours and local businesses, contributing to increased revenue for Hoonah.

ISP now boasts a positive reputation as a tourist destination that is easy to maneuver and is accessible to everyone. ISP is critical to the local community, which makes up the majority of the destination's staff and benefits directly from its success.

Most of the design and construction work for this project was performed during the timeframe the COVID-19 pandemic shut down the cruise traffic that feeds ISP. However, the tourism traffic ISP lost was partially offset by the project, as some locals were employed by the contractors, and the design and construction crew supported the economy by using local lodging and dining at restaurants in the area.

PROJECT MANAGEMENT

The project was delivered using the design-build procurement process, which involved multiple contractors and design professionals.

Due to the limited summer work window, potential for inclement weather, and intensive logistical planning required to transport building materials and project personnel, it was critical that all team project leaders effectively communicated and met delivery deadlines. Ensuring that design was completed on schedule allowed the contractors enough time to procure supplies and develop a practical construction schedule.

Constant communication between the project owner, designers, and construction team was crucial, as the contractor provided input throughout design to ensure it could be realistically constructed within weather windows and with the equipment available onsite. This coordination and communication allowed the project to meet all key milestones on time.

Construction of tower foundation being performed on steep terrain using benches

PND Key Engineering Personnel

Sean Sjostedt, P.E., M. ASCE
Principal Engineer – Lead Geotechnical Engineer

Brian Nielsen, P.E., S.E., M. ASCE
Principal Engineer – Lead SKYGLIDER Mountaintop Gondola Foundation Engineer

Mark Sams, P.E., S.E, M. ASCE
Principal Engineer – Lead TRANSPORTER Gondola Foundation Engineer

Chris Gianotti, P.E., S.E.
Senior Engineer – Lead Building Structural Engineer

Matt Holm, P.E., M. ASCE
Senior Engineer – Structural Engineering Support

Project Team

Geotechnical Subconsultant: Landslide Technology

Tower Designer: Doppelmayr Group

Architect: Jensen Yorba Wall, Inc.

Survey and Civil Design: DOWL

General Contractor: Alaska Commercial Contractors

Civil Subcontractor: Admiralty Construction

Drilling Subcontractor: Condon Johnson

Drilling Exploration: HazTech Drilling

VALUE ENGINEERING

With the project delivered through the design-build method, there was ample opportunity for the project team to implement value engineering processes and use resources effectively to deliver the highest-quality project.

Early on, the engineering team found that the most cost-effective way to resolve the overturning forces for the TRANSPORTER Gondola foundations was to excavate the unsuitable overburden and soft surficial bedrock to the extents necessary for a conventional shallow spread footing. This process eliminated the need for a drill and allowed the contractor to use an excavator that was already onsite for rock removal. The designers were able to increase the allowable bearing pressure used for foundation design, since the rock increased in competence with depth, resulting in smaller foundations and less concrete. A total of nine reinforced concrete foundations were installed for the TRANSPORTER Gondola.

Tower 6. Photo: Peter Landsman, Lift Blog

The different geotechnical conditions encountered at each SKYGLIDER tower location required a flexible design approach to ensure a cost-effective and safe solution was developed for each tower foundation. The geotechnical team relayed information from the investigation to the tower and structural designers as soon as it became available, so preliminary designs could be developed and coordinated with the contractor to determine an optimal solution for each tower. This process led to the use of three different types of foundations: five conventional spread footings for relatively small towers on flat terrain, one concrete column on spread footing for a large tower at the base of Hoonah Mountain, and seven reinforced concrete foundations using micropiles for towers on the hillside.

The completed project design components were provided to the contractor in pieces to allow the contractor to begin construction before the entire design was complete. This allowed construction to begin early and proceed continuously, further reducing project cost and schedule delays.

Thank you for reviewing our application. For more information, please contact Sean Sjostedt, P.E., Principal Engineer, PND Engineers, Inc., at 907.586.2093 or ssjostedt@pndengineers.com.

Photo: Peter Landsman, Lift Blog

Award Package Produced by Stephanie Hernandez McGavin, PND Marketing Coordinator