

TONGASS NATIONAL FOREST STRUCTURES ENGINEERING

On the Tongass National Forest, the Structures Engineering Group works for the Forest Engineer in the Supervisor's Office, which has offices in Ketchikan, Petersburg, and Sitka. Engineers in the Structures Engineering Group are currently located in Ketchikan and Petersburg. The group consists of three structures engineers, one geological engineer, one hydraulic engineer, two fish pass construction technicians, and one Autocad support technician.

Structures engineers assist District engineers with project work across the Forest, from Hyder to Yakutat. We may work on a piece of a project, such as joist spacing for a warehouse floor, or an entire project, such as a bridge replacement. We do condition inspections of existing structures, mostly bridges and large culverts, but also decks, buildings, fish passes, and recreation cabins. Our work supports the facilities group (building foundations, wind and snow loads for roofs, support posts and beams), the roads group (bridges and large culverts), fish and wildlife (fish passes and wildlife viewing platforms), and recreation (cabin foundations and decks and trail bridges).

Work on a project may consist of:

- Site survey – the Forest Service has professional land surveyors to help us with this task, or we contract the work to private surveyors. For very small sites, the structures engineers may do their own low level survey with a compass, cloth tape, and clinometer.
- Use the survey data to create a topographic map in a terrain modeling software - we currently use Land Desktop.
- Do a design – a lot of our designs are from standard designs, but we need to check for different snow and wind loadings and consider a wide variety of site locations. We have projects at sea level, such as marine access points, and projects in the alpine, such as recreation cabins.
- Prepare contract documents – this includes drawings in Autocad (the Forest uses r2002), specifications in Microsoft Word, and a cost estimate in Microsoft Excel.
- Contract administration of the construction project – this involves watching the contractors work and making sure the work is being done in accordance with the plans and specifications.

BRIDGES AND CULVERTS. The Tongass National Forest is spread out over many islands and the mainland of Southeast Alaska. The Forest has built thousands of miles of roads, originally for logging activities. These roads now connect previously isolated communities and provide public access to the Forest. Since this is a rain forest, there are many rivers and streams, which means bridges and culverts along the roads. Structures engineers help maintain these culverts and bridges to assure they are safe for vehicle use and to assure passage of aquatic species through them. We do condition



Painted Creek Bridge installation

inspections on each bridge every 2 years to check the structural integrity. We replace a few bridges each year as they reach their design life.



Prince of Wales Island fish culvert replacement

The Forest is identifying culverts that are out of compliance with current aquatic organism passage requirements and making a priority list of which ones need to be fixed, replaced, or even changed to a bridge. We survey, design, and contract the construction work. Design work involves knowledge of hydrology to determine the flow rates of the streams for various precipitation events and hydraulics to design a pipe that will have a water flow rate low enough for fish to swim upstream.

MARINE ACCESS POINTS are also related to logging activities. These are the points where the road meets the salt water. During timber harvest, logs are carried by truck to the marine access point, then put in the water, either on a barge or as a “raft” floating in the water. The logs are towed to the mill for processing. Being a forest of islands, water ways are a main transportation corridor. At the marine access points, structures engineers design and maintain retaining walls that allow logging equipment to put logs in the water. These bulkheads may be made of concrete, steel, or logs.



Log bulkhead at Whale Pass

DOCKS are associated with marine access points. They provide safe moorage and transfer for people from boats and float planes. Docks are located near camps used for timber harvest, near recreation sites, such as bear viewing decks and caves, and near communities. Structures engineers help select dock locations and design the docks to provide enough length for the wingspan of a float plane, to withstand impact loads from boats, and not to go dry at low tide. Structures engineers also inspect the docks on a regular basis and make sure maintenance is done.



Camp Island Dock

FISH PASSES. Fish biologists on the Forest are always looking for ways to increase fish habitat. One way to do this is to remove barriers from streams that are blocking otherwise prime habitat for spawning and rearing anadromous fish (salmon). Structures engineers help this effort by studying the river hydraulics at the barrier (usually a waterfall) and designing a channel that will allow fish to pass over or around the barrier. The design may involve simply blasting the channel to lower the gradient or constructing a “steep pass”, which allows fish to bypass the falls through a series of steps.



Big Lake Fish Pass – steep pass

TRAIL BRIDGES. The Forest has many trails, most of which are less than 2 miles long and provide access

to a lake, river, or recreation cabin. Where a trail crosses a large river, a structures engineer assists the recreation crew with bridge design and construction. The Region has standard trail bridge designs. The structures engineer surveys the bridge site to determine the bridge length and selects the appropriate snow load to determine the stringer size. Sometimes, the crossing is too long for a standard bridge. In this case, the structures engineer works with the District recreation shop and the landscape architect to design a bridge that will fit the setting, both structurally and aesthetically. Trail bridges on the Forest are glulam, steel, and native log.



Glulam trail bridge at Man Made Hole Picnic Area Lake



McDonald Lake Recreation Cabin

BUILDINGS. Structures engineers help with the structures aspect of building construction and renovation. The buildings vary from complex visitor centers to District offices to one room recreation cabins. We help with foundation and roof designs and review plans for structural integrity.

If you would like more information about the Structures Engineering Group, contact Eleanor Oman in Ketchikan at 907-228-6338 or eoman@fs.fed.us.