Means and Methods of Residential Construction and Design in Remote Areas of Southeast Alaska

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Building in the remote locations of Southeast Alaska is currently an unexplored area of construction that has been avoided due to the complications that accompany such projects. Many property owners in the Southeast Alaska region face challenges due to a lack of common practices that would simplify the construction process, particularly those deprived of road access and utility services. These potential residents must rely on sustainable techniques and alternative modes of material transportation, creating an abundance of planning concerns. Additionally, while code restrictions are limited due to the uniqueness of these properties, certain codes regarding the Alaska Department of Natural Resources waterfront laws can reap havoc in building plans. However, custom architecture can be achieved as a result of schematic design and pertinent construction methods. By using both solar and generated power, modern filtration systems, and waste management equipment, mandatory utilities can be accounted for. Construction practices catered to remote development can also create more efficient means of building, trialed and tested by those with experience in this limited field. With the implementation of a general construction guide for remote construction in Southeast Alaska, landowners can utilize their premium estate to its maximum potential.

Key Words: Remote, Southeast Alaska, Residential, Utilities, Design

Introduction

The market for rare land and custom cabins, although limited compared to the standard residential vend, is a niche for those who enjoy being surrounded by nothing but nature. Such real estate also draws the attention of sportsmen of all types, hunters and anglers, even including outdoor tv show host Steve Rinella. Regions of Southeast Alaska provides a myriad of properties that offer the exclusivity that such owners desire. While many contractors and builders offer similar types of construction throughout the majority of Alaska, the panhandle is unique in that the land is broken up in hundreds of both small and large islands by the passageways that weave through the landscape. In addition, the geographic characteristics of Alaska make construction in general rather challenging, specifically regarding typical weather and daylight patterns throughout the year (Emerson, 2012).

Associated Complications

Complications created by the peculiarities associated with remote construction in the Southeast region of Alaska are listed below:

- Material Transportation – transporting materials, enough to build a home of any size, instantly becomes a much more intense undertaking in an area where no roads of any kind exist. Whereas typical residential locations in the state only require deliveries by truck, most remote locations would require a barge or sled to haul equipment and supplies. In more extreme cases, helicopters and cable hoists are necessary to lift heavy machinery and components into place (McQuarrie, 2019).

- Utility Acquisition – utility companies do not have the equipment to provide utility services in locations without road access, creating the need for value engineering that takes advantage of the surrounding land to compromise for the lack of such luxuries. The two most essential utilities that must be accounted for are water and electricity (Matsuura, 2019).
- Weather – Southeast Alaska frequents rainfall and/or snowfall throughout the year. The longest recorded period without precipitation in the panhandle occurred in Skagway in 1933, lasting only 35 days. When building in this region, extensive measures must be taken into consideration to be prepared for inevitable rainfall. Furthermore, the temperature during the fall and winter months drops dramatically, creating an exhaustive construction environment (Fairbanks, 2019).
- Daylight – to maximize efficiency, construction in Alaska must take place over spring and summer. On average, the Southeast Alaska region received between 16 and 18 hours of daylight, creating an optimal time to schedule construction. Problems begin to arise as fall and winter approaches, where the average amount of daylight drops as low as 6.5 hours. Projects that require longer than 4 months of construction typically must include a winter decommission that protects all progress, materials, and equipment that remain onsite. (Matsuura, 2019).
- Code Accordance – while standard building codes and laws do not pertain to remotely located properties, any property that involves building on or over water must comply with Alaska's Department of Natural Resources by means of permits (Alaska DNR, n.d.).

Literature Review

Information pertaining to this case study has been researched in correlation to the objectives the paper strives to accomplish. The goal of such literature review is to mitigate the implications associated with remote residential construction in the southeast region of Alaska, specifically coastal properties.

Background

Although remote residential construction in Southeast Alaska regions has been taking place for approximately 40 years, not enough successful projects have taken place to make this niche in the construction world appealing to the common citizen. This could potentially be the result of there being a lack of a general guide catered to construction in this area of Alaska. Many online sources supply information pertaining to remote cabin builds that occur in other areas of the state, but the unique characteristic regarding Southeast Alaska's inner water passages make these testimonials of little use. The online sources utilized in this case study offer a limited amount of knowledge that could help to create this sort of manual, mostly because coastal residential construction in Southeast Alaska is still very mysterious to today's construction world.

Goals

The primary goal of this case study is to create a preliminary construction manual that offers a number of approaches to alleviate the concerns of building on remote properties in Southeast Alaska. These methods will be suggested and supported by residents of such real estate as well as professionals who have took part in such projects. Online sources are utilized to establish general information relating to the conditions in which most residential projects would be constructed under, as well as using testimonials of similar types of construction to support methods that prove more useful than others. Contact with human sources will prove to be of much more importance since very little information can be found online regarding remote construction in this region.

Methodology

Researched performed to gather the information necessary to create a coherent case study regarding remote construction in the Southeast Alaska region was primarily qualitative. The study was conducted by requesting interviews by those who had knowledge or experience pertaining to building under conditions mentioned earlier. Questions directed towards the interviewees varied depending on their relationship to the topic. Each interview and associated questions were recorded on a custom interview template, recording mostly information directly relating to the study. Following the completion of the last interview, the responses were analyzed and organized based on their relationship to the five primary complications of such construction: material transportation, utility acquisition, code accordance, weather, and daylight. The organized information was then used to create a coherent case study that directly mitigates the troubles involved in building a home off the grid in Southeast Alaska.

While the majority of the information gathered in this study was obtained from personal interviews, the remainder of the data utilized was derived from online sources that relied on quantitative research. These sources include either applicable reports regarding weather patterns, daylight observations, and associated codes, or testimonials serving as building method experiment results. The diagrams and figures represented in this study were derived from these online sources.

Results and Discussion

The following information was formulated in coherence with data retrieved through both qualitative and quantitative research. This section is divided by separating the information pertaining to each of the five major complications associated with remote residential construction in the Southeast Alaska region.

Material Transportation

The aspect of remote construction in the Southeast Alaska region that requires the most planning with third-party members is material transportation. On a typical residential construction site, materials are delivered according to project phases to prevent unused components from being onsite for too long. Building throughout the inner waters of Southeast Alaska, however, creates issues with what would be considered a standard process of moving materials and equipment. Any time an owner pays for a barge to deliver materials to the site, it becomes very important that the most is made of each delivery. Expenses dramatically increase with every delivery made to the remote site, since every trip a barge makes can cost upwards of $20,000 (McQuarrie, 2019). This additionally requires that materials are brought in well before their designated use, so proper means of protecting the supplies from weather must take place in the form of plastic tarps and elevating them from the wet ground (Fairbanks, 2019). The most effective means of bringing building supplies to a remote property is to carefully plan and determine a near-perfect estimate so that no materials are either forgotten or not accounted for. Making a detailed quantity take-off is crucial in these type of builds since local hardware stores are not available for purchasing something that was left out of the estimate. Once the owner has gathered a list of every item needed to complete the project, they may proceed to hire a transportation service to plan and schedule deliveries (McQuarrie, 2019).

It is very important that third-party vendors and subcontractors are involved with the transportation phase of construction early on in the project. Typically, an owner will choose where materials are to be ordered from. Depending on whether materials are acquired local to the site or at a distance—such

as from Washington—can vary timing and cost exceedingly. Based on the interviews conducted, most of the residents of such properties chose to order materials, specifically lumber, local to the project location. While this decreased transportation expenses, material tend to cost much more since large vendors are not as available in the small cities of Southeast Alaska. On the contrary, one of the contractors interviewed claimed that expenses can be reduced by ordering materials from large vendors in Washington and having them shipped to the site. This aspect of remote construction creates a mass of responsibility for the owner/project lead and requires contacting multiple vendors and transporting subcontractors to determine the best fit method suited to a specific project (Mallott, 2019).

Whether materials are transported locally or from a distance does not negate the fact that barge is the most accepted mode of transportation, since the weight and space that supplies take up exceed most boat limits. The figure below depicts a barge that best represents the layout that would be most suited for a residential build in Southeast Alaska (Fairbanks, 2019).

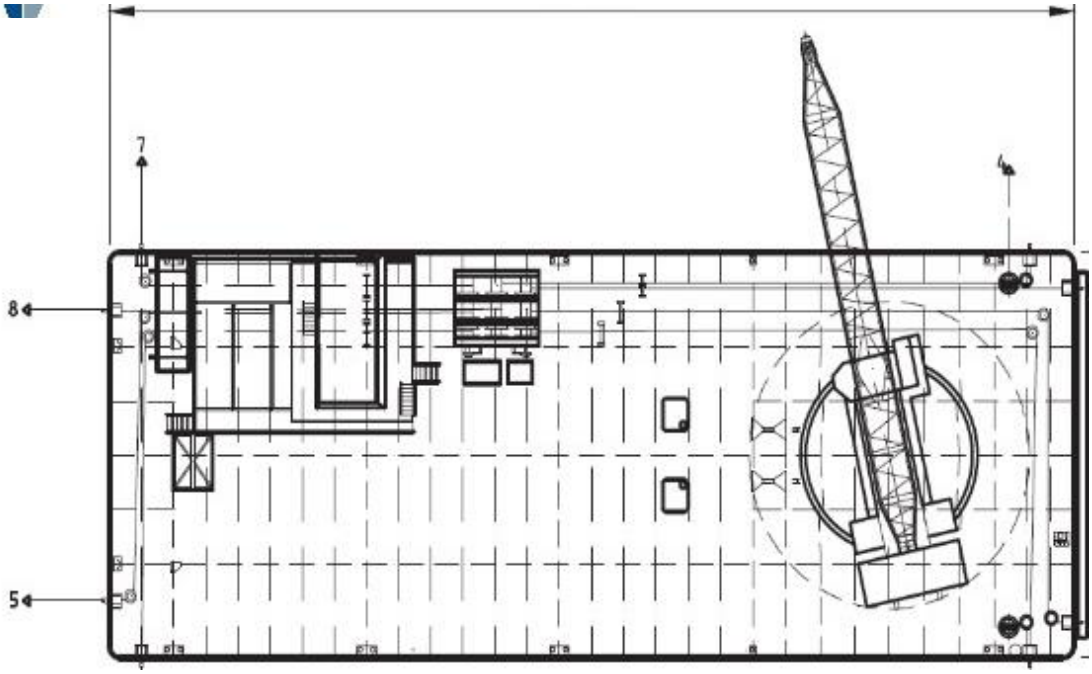

Figure 1. Typical barge layout with crane hoist (Catalano, n.d.).

Once the materials arrive to the remote property, additional planning must take place to determine the best mode of transportation from the barge to the site. Multiple options are available regarding the layout of the barge used. Some utilize a stationary crane that can lift materials in bulk off the barge onto land. However, in some cases, this is not very helpful since the materials may need to be brought further up a hillside or into the forest. If this is the case, a cable lift can be employed. This involves using a winch, which may be fastened on the barge, to pull wire rope through a pully attached on a tree closest to where the supplies are to be staged. If such system is available for use, it can save hours of manual labor simply bringing the materials to the staging area. In more extreme cases, for large piece of equipment such as a steel water cistern, helicopters become an effective alternative. While moving large masses of equipment and material can be intimidating to a remote build in Southeast Alaska, a myriad of options is accessible to overcome accompanying challenges (Fairbanks, 2019).

Utility Acquisition

Building off the grid in Southeast Alaska requires owners of remote properties to procure their own utilities. Typically, the two prominent utilities that must be accounted for to ensure comfortable living are electricity and water. Waste must also be accounted for yet is not the most important aspect of determining remote residential systems. Additionally, depending on the requirements made by the owner, gas systems may be incorporated into a project design. Unfortunately, this creates another entity to maintain, as gas canisters or tanks must be filled and changed regularly (McQuarrie, 2019). Due to the complications of incorporating a propane system, this paper will negate the need to go into further depth regarding gas as a remote utility. Electricity and water satisfy all utility needs determined by residence of such properties. The methods discussed below have been accepted by both residents and builders as most efficient, sustainable, and effective to satisfy utility requirements of remote homes in Southeast Alaska (Fairbanks, 2019).

Water Capture, Filtration, and Heating

Although obtaining water remotely may seem to be a daunting task, the Southeast Alaska region offers an abundance of small streams in most locations as a result of frequent rainfall. As a result of the water capture system put in place, a remote home can go upwards of 3 weeks without rain. The most accepted water system consists of a 1,000-gallon cistern (depending on size of residence) and a basic filtration system. Essentially, water is gathered through a standard HDPE pipe gravity fed into a cistern sized according to owner desired specifications. The collection pipe is located in any area with consistent water run-off. Common practice suggests that a small dam is created to allow for pooling, so that space is available for a primary screen to dispose of large matter in the water. From there, the cistern provides water to a number of acceptable filtration systems, which then runs to the house for basic water use. Electric hot water heaters best accompany a remote property since they do not require the addition of gas as a utility (Fairbanks, 2019). Below depicts what is considered an excessive remote water system using multiple pumps and filters to purify ground water (Off Grid Water, 2015).

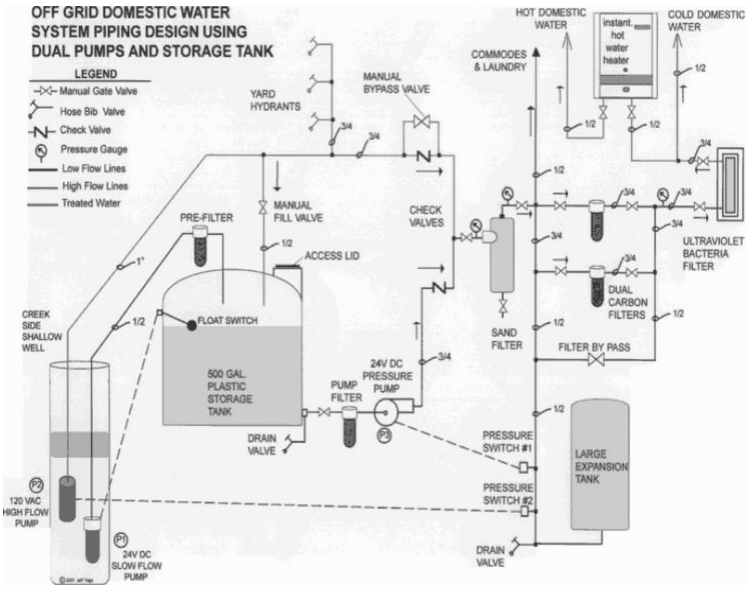

Figure 2. Standard Off-Grid Water Filtration System (Off Grid Water, 2015).

Sustainable Electricity Supply

Developing an off-grid electricity source catered to a specific landowner depends on the time of year the residence will be in use as well as the geographic location of the property. The residence interviewed utilize a diesel generator system requiring an additional fuel storage tank and frequent fuel shipments. They never considered a solar system due to the initial cost of panels and converters. However, when presented with the savings a solar power system could offer long term, this option became much more desirable. When more batteries are offered in the system, the longer the structure could operate properly without sunlight. Given the fact that summer daylight can exceed 18 hours in day in this region, solar power becomes a viable option to homeowners living in Southeast Alaska off the grid (Matsuura, 2019).

Although solar panels are more sustainable, they are not as effective in winter months due to short hours of daylight. Solar panel systems can be utilized with generated power in this case, providing electricity to the residence at a minimal fuel cost at all times in the year. The diagram below depicts a solar panel system in coherence with a generated power system (Dufresne, 2011).

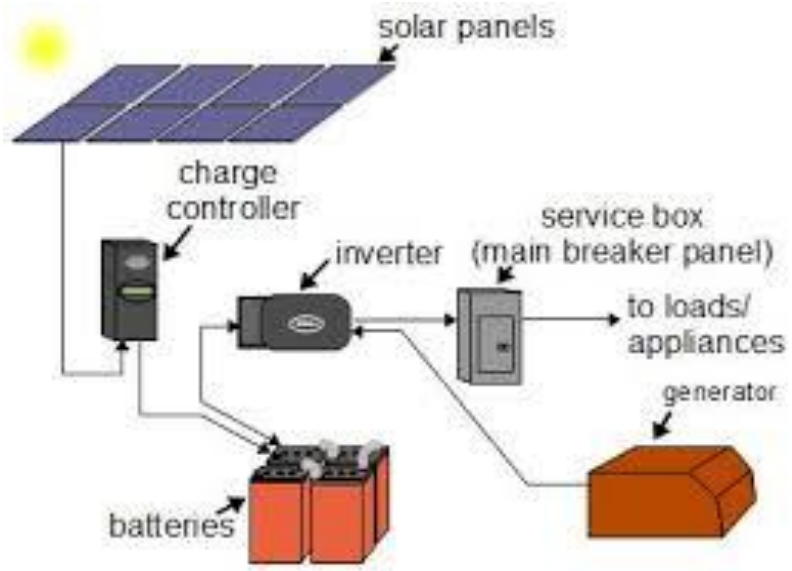

Figure 3. Solar Panels with Generated Power Diagram (Dufresne, 2011).

Waste Management System

While waste management living off the grid may not seem to be worth noting, depending on the number of occupants a secluded home might house at once, waste becomes a much more important aspect of living remotely. Residence living in this region, although not necessarily following waste disposal laws set by the Department of Natural Resources, utilize an isolated sanitary system that breaks apart black matter and then runs into the ocean by means of a long HDPE pipe. In order to be in accordance with the codes set in place regarding sewage management, the waste must be properly processed through a septic system then saturated into the ground via distribution pipes. This prevents toxic runoff from entering the ocean while creating a barrier between gray/black water and the residence of the remote property (Bryant, 2018).

Weather/Daylight Complications

Building in Southeast Alaska brings the issue of weather and daylight interference. Any time a project occurs in this region, project phases must be executed with specific regards to the time of year they are to take place. Extra precaution towards progress protection must also be a consideration, given that projects could be put on hold for the duration of an entire winter. Mitigating these two naturally occurring obstacles is performed by delicate planning and schematic phasing (Mallott, 2019).

Typical weather patterns for the Southeast Alaska region are shown below. As shown in the graphs, winter and spring months tend to bring colder temperatures and lots of rain. The best means of avoiding construction during this period is to phase the project based off the most effective time of the year to build, which is generally April-August. This entails that once a phase is complete, the fall and winter months will have minimal impact on the project's current status. To further ensure that a remote build will not be damaged, tarps and water barriers should cover any areas that are subject to water damage (Fairbanks, 2019).

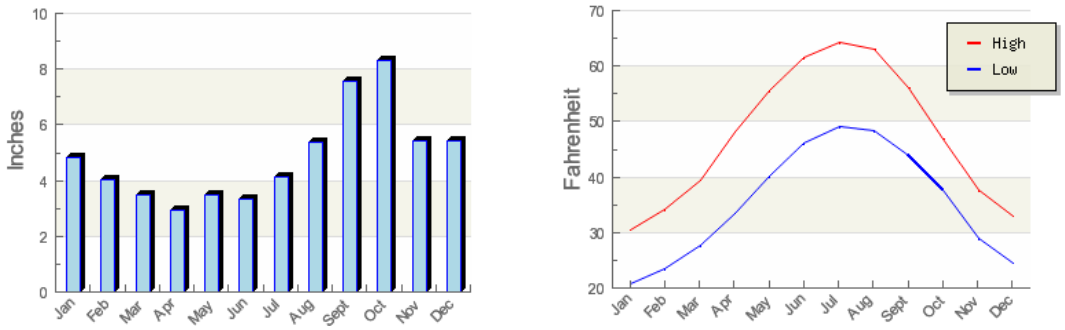

Figure 4. Average monthly weather in Juneau (Climate for Juneau, n.d.).

Daylight hours also play a huge factor in the time of year a project is being built. When building in a remote location, mode of travel to the site as well as housing logistics for crew members need to be considered so that daylight does not become a limitation when building. To minimize expenses and maximize efficiency on a remote project in Southeast Alaska, work should be limited to the five months in the year that allows the most progress. Phasing projects according to the annual weather and daylight patterns will ensure the shortest total build duration (Mallott, 2019). Below shows a graph that depicts the daylight hours for each month in the Southeast Alaska region.

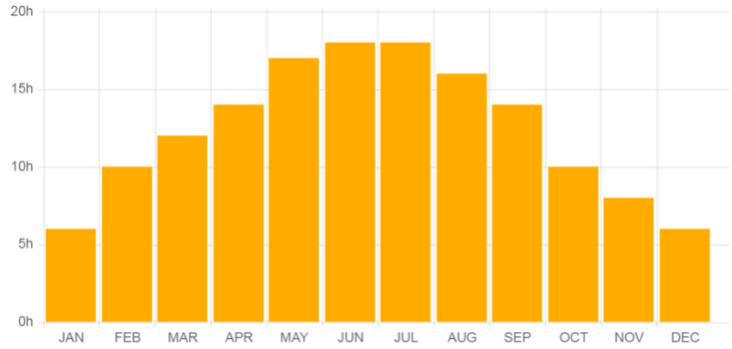

Figure 5. Hours of daylight per month (About Alaska Weather, n.d.).

Code Accordance

Fortunately for remote property owners in the Southeast Alaska region, very few building codes exist regarding the remote structure itself. However, the Alaska Department of Natural Resources (DNR) requires special permits pertaining to water use and rights. The two most prominent permits that may apply to such properties includes *Authorization to Construct a Dam*, and a *Water Use Permit*. Essentially, if an owner plans on either creating a small dam to allow for water collection or wants to build over the property line meeting the coast, special permitting must take place to be in accordance with the law. Additionally, a *Land Use Performance Guaranty* form may apply to some remote properties. This form must be completed and submitted with the required payment, stating what the owner intends to do with the land per state regulation *11 AAC 96.060* and the *Alaska Land Act, AS 38.05* (Alaska DNR, n.d.). Once all the necessary permitting is complete for a given property, the owner is free to build as they so desire (Fairbanks, 2019).

Conclusion

The current market for contractors and owners looking to build amongst the hundreds of remote properties located throughout the majority of Southeast Alaska is relatively unexplored in the residential construction world. Many of these remote properties hold promise and potential as to what could come of their existence, but the complications associated with this type of construction initially appear to make such projects near impossible to complete. With the creation of a standardize guide discussing means and methods of construction and design, this paper aims to open the door to perhaps a new niche in construction. In using the techniques suggested by both residence and professionals who have experience in this area of construction, building off the grid has been made much simpler and can be performed with efficiency and sustainability in mind. By mitigating the five major complications associated with remote construction in the panhandle of Alaska, this area of construction can be considered by anyone with an ambitious attitude and a vision.

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