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Colonel E.L. Hardin continues to talk about the Effects of the environment on design considerations. He said where there are large bodies of unfrozen water that may be used as a water source. In Galena they were able to drill 200 feet through the permafrost and located a freshwater source. This is not possible on the North Slope where the permafrost is much deeper. The pathogenic organisms live a long time in the extreme cold and they had to be careful to treat water and to treat waste. There is still a great deal of research to be done in terms of water supply. Waste disposal because of the extremely short summer season in the arctic biological oxygen demand is a critical problem. Aerated lagoons may not be possible as they are in the subarctic. He explained aerated lagoon treatment. There are a few packaged sewage disposal units operating in the arctic, but the problem of sewage disposal in the arctic has not been solved. He discussed above ground utility corridors which have been used.

Relative humidity in the arctic is about two or three percent causing problems for humans and materials. Adding water vapor creates frosting. In the Anchorage area they can humidify up to 25 percent by using thermopane windows. In the arctic there is the increased expense of triple thermopane windows. Ice crystals build up in insulation in the walls and high heat losses. There are also problems at the time of thaw. A vapor barrier can control the migration of water molecules. He discussed heating and ventilation problems. Some buildings come with a ventilation pressure that causes internal pressure and prevents the invasion of cold air. He said waste heat recovery measures are used. Zone temperature controls will need to be used. Heating systems will be sophisticated and proper care is important.

Design of roofs needs research. He talked about ice on roofs. Black roofs were used at one time, but the roofing materials could not stand pooling of water. He discussed their solution for a roof on the barracks at Fort Wainwright. They created a cold attic to prevent problems with thaw. Large buildings have a problem with snow. They used gently sloping roofs with internal drains. They are now installing a liquid neoprene covering on the roof of a building at Fort Wainwright. He talked about prefabricated buildings. Provisions must be made for use in the arctic. He talked about use of a single composite building. They have used panels and foam at Cape Lisburne. He discussed construction of the building. The heating plant and facilities are located in a separate building. They are trying to create a pleasant environment for the occupants. He discussed construction of a military building at Whittier. It was seven stories high and contained all necessary facilities. Another fourteen story building was also constructed for families. In 1960 when Anchorage became an all-weather port Whittier began to fade out. The buildings were

damaged in the 1964 earthquake and only the bottom floors are used now. He talked about opinions of the buildings. He said they would do it differently today.

Military construction in Alaska has been a laboratory. They have learned that it takes careful design, attention to details, imaginative use of new materials and quality construction.

Janet McCabe talked about the distribution of cities within a region. Regional planning has relevance to the distribution of communities in Native Alaska. It has been found that regions that there is little interaction between people there is what is called a primate distribution within a region. There are a number of small cities of similar sizes and a few larger ones. This often happens in regions where there is little interaction, often in a subsistence economy. This is very typical of western Alaska. There are approximately 178 villages in Alaska and the median size is 155 people. Ninety percent of the villages have a population under 500 people. There are five cities that have become the distributions hubs: Barrow, Nome, Kotzebue, Bethel and Dillingham. In contrast to the primate pattern, regional planners have identified a rank size distribution of cities which seems to occur in areas where there is a great deal of interaction. This can be found in communities in older countries often with a self-contained economy where many diverse factors work on effect of the communities. She said right now there are factors which are increasing interaction and communication between Native communities in Alaska. Education is improving. The snow mobile has widened the range of travel. There is more contact with the modern economy. Native Alaska will change from a primate distribution to a wider range of city sizes. Investment in Native Alaska has been increasing lately partly because of the land claims and Native housing. She talked about the different programs in Native Alaska. The rate of investment will accelerate. She thinks the study of community distribution is a good subject for study.

Robert Armstrong talked about the slides presented by Mr. Crittenden, settlement planning and proper construction and development. He said in Canada they have tried to anticipate problems in these areas and take steps to rectify the situation. He outlined the history of their development planning. He talked the lifestyle of Eskimos before western civilization came to Canada. With the establishment of communities it was only natural for the Eskimos to come to these areas. Land for development was at a premium and they needed settlement planning. In 1964 a program to establish 1600 homes for Eskimo families across the north in 47 settlements was started. This program was to last four years. He talked about problems with locating the housing and services. This type of conventional community presents no new planning concepts there was a problem of providing housing without disturbing their method of living. Their policy was to consult with their northern people and where possible accede to their wishes. The move to community living was a rapid change and they needed to slow down the process to enable a assimilation into the twentieth century. Most of the communities have a population of 200-600 people. There are about forty settlements in the arctic region. Other settlements of larger size above the tree line are expanding rapidly from migration of Eskimos into the communities. He talked about the construction project at Frobisher Bay. He talked about the creation of the resource town of Faro in

Yukon. The town will house 1200 people but expand to 36000 after the mine is in operation. It was decided that planning should begin with a central complex of high density. He talked about timing of development and consideration of social, environmental and the needs and wishes of the northern people.

David Hitchcock talked about the possibility of a community in the North Slope oil development area. There are seven to ten million acres between the foothills of the Brooks Range and the Beaufort Sea. The sedimentary basin is open to exploration and production of oil. In his opinion there will be communities coming to this area. They will come in connection with three or four things. First there may be a port connected with the Manhattan project and there will be a community there. If the railroad or road ends somewhere there will be a town. Another factor is the application of public land laws. Once the land freeze is lifted a surface estate can be filed on in many ways by people. He thinks if they don't have planning there will be irrational business arrangements move in. They will come. He talked about the application of Alaska Native Land Claims which might encourage the establishment of communities. This is a concern. The communities need to be in the right places to avoid the social cost as experienced in many parts of the country. Fairbanks is an example of a mining community located in a flood plain of the Chena River. Many mining companies have located many of their major properties in the flood plain of the Sag River. He talked about the frequency of flooding on the river. If a community does come and it is in the wrong place then it becomes a government cost. He has been looking at a number of environmental factors in the arctic. He has been looking for a site for the location of a town. Along the coast there is a fog belt which would complicate air travel. He believes you have to go at least thirty miles inland. In the winter along the coast there is a salt water intrusion in the ground aquifers. Some places have permafrost which is not a big factor against getting a water supply such as in the Franklin Bluffs. There are good soils where drainage can be established for sanitary concerns. There are a number of environmental factors which will determine where a community will be located. He thinks it is incumbent on industry, state and federal government, and academia to get together now and do a site selection study. Industry must have internal appraisal of their operations to see about design criteria or operational criteria of such a community. He talked about Native hire in the arctic and communities. He said there are firms that are hiring Native people and allowing them time for subsistence activities with their work schedules. The Eskimo is very much a family man and there needs to be consideration of this factor. Social structures must be considered, too.

A question and answer period follows.