

## 4. FOUNDATION PROPOSAL AND RECOMMENDATIONS

**SAL.1010** can be founded on top of bedrock with 600...1000 mm layer of crushed/blasted rock under the foundation. Estimated excavation/blasting level with gravity foundation is +56.0...+56.4.

Foundation could be possible to make as a rock anchored foundation on top of bedrock that lies 0.8...2.8 meters below ground. Estimated minimum blasting level for rock anchored foundation is +56.0. Based on video photography results the bedrock quality is suitable for rock anchored foundation.

**SAL.1020** can be founded on top of medium density subsoil with 1000 mm layer of crushed/blasted rock under the foundation. Estimated excavation level with gravity foundation is +58.0.

**SAL.1030** can be founded on top of dense subsoil/bedrock with 1000...1500 mm layer of crushed/blasted rock under the foundation. Estimated excavation level with gravity foundation is +56.0...+56.5.

Foundation could be possible to make as a rock anchored foundation on top of bedrock that lies 3.2...5.0 meters below ground. Estimated minimum blasting level for rock anchored foundation is +54.5. Higher level can also be used if additional casting is made. Based on video photography results the bedrock quality is suitable for rock anchored foundation.

**SAL.1040** can be founded on top of bedrock with 600...1000 mm layer of crushed/blasted rock under the foundation. Estimated excavation/blasting level with gravity foundation is +59.5...+59.9.

Foundation could be possible to make as a rock anchored foundation on top of bedrock that lies 2.0...2.6 meters below ground. Estimated minimum blasting level for rock anchored foundation is +60.0. Based on video photography results the bedrock quality is suitable for rock anchored foundation.

**SAL.1050** can be founded on top of bedrock with 1000...1500 mm layer of crushed/blasted rock under the foundation. Estimated excavation/blasting level with gravity foundation is +58.0...+58.5.

Foundation could be possible to make as a rock anchored foundation on top of bedrock that lies 1.8...3.0 meters below ground. Estimated minimum blasting level for rock anchored foundation is +58.0. Based on video photography results there is a need for grouting between levels +57...+58. Otherwise the bedrock quality is suitable for rock anchored foundation.

**SAL.1060** can be founded on top of bedrock with 600 mm layer of crushed/blasted rock under the foundation. Estimated excavation/blasting level with gravity foundation is +56.9.

Foundation could be possible to make as a rock anchored foundation on top of bedrock that lies 1.2...2.0 meters below ground. Estimated minimum blasting level for rock anchored foundation is +57.0. Based on video photography results the bedrock quality is suitable for rock anchored foundation.

**SAL.1070** can be founded on top of bedrock with approximately 1000 mm layer of crushed/blasted rock under the foundation. Estimated excavation/blasting level with gravity foundation is +58.0.

Foundation could be possible to make as a rock anchored foundation on top of bedrock that lies 1.2...1.5 meters below ground. Estimated minimum blasting level for rock anchored foundation is +58.0. Based on video photography results there is a need for grouting between levels +57...+58. Otherwise the bedrock quality is suitable for rock anchored foundation.

If rock anchored foundations are used the following recommendations apply. Foundation is anchored to bedrock with soldered and pre-tensioned steel anchors. The bedrock is levelled with concrete before the actual foundation is casted. The quality of bedrock must be investigated with water consumption measurements. The bedrock must be grouted if cracks are discovered. After grouting the water consumption measurements are repeated and if necessary, the grouting will be made again.

In calculations following bedrock parameters can be used:

- Characteristic bearing resistance of intact bedrock,  $q_k = 8 \text{ MPa}$
- Theoretical maximum characteristic bearing resistance of bedrock,  $q_k = 20 \text{ MPa}$ 
  - NB: Using this value requires additional geological evaluation
- Unit weight of rock,  $\gamma = 26.5 \text{ kN/m}^3$
- Cone half-angle,  $\varphi_c = 30^\circ$

Basic presumption in this table is that the foundation bottom is approximately 2 meters below average ground level and substructure layer is 1000 mm thick. Drainage has not been taken into consideration in soil table and it must be revised when levels of foundations are determined during later stage of design.

All organic material and possible loose soil layers must be removed under structure layers. The bottom of excavation must be held dry and undisturbed during excavation work. Structure layers are recommended to be installed as soon as possible after excavation.

The effect of buoyancy can be reduced by lifting the foundation or with drainage. Final dimensioning of foundations must be made during detailed planning.

### **Frost**

The soil in the area is frost susceptible. The frost amount once in every 20/50 years in Kauhava/Kortesjärvi region is approximately 38 000/43 000 Kh. This means that the frost-free depth with crushed rock in the area is in 2.3/2.6 meters based on which design time is used. Frost protection must be used if bottom of crushed rock layers is above this level.

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