Technology Information	
Area	5 (Select the number from “Areas of Technologies Requested”)
Title	Management measures to block groundwater from flowing into the site
Submitted by	Bouygues Construction Services Nucléaires

1. Overview of Technologies (features, specification, functions, owners, etc.)

Challenge:

Impermeability wall construction at the O.P.+10 m mountain-side slope

The challenge consists of erecting quickly a slurry wall to block the groundwater arising from the sloppy terrain located above the plant.

Slurry walls provide for the best fitted techniques, in particular when the slurry excavator can . However, the equipment required are of important dimensions. The slurry wall technique assumes drilling of the soil under bentonite grouts, injection of the rebar cage and progressive grouting under the bentonite.

In order to consider the possible exiguity of the working area, it is recommended to use a rotary head (hydrofraise) instead of Kelly buckets as usual. Moreover, in order to increase efficiency and minimize time, it is also recommended to include the water stop seal in the drilling machine so as to implement it with the drilling operation.

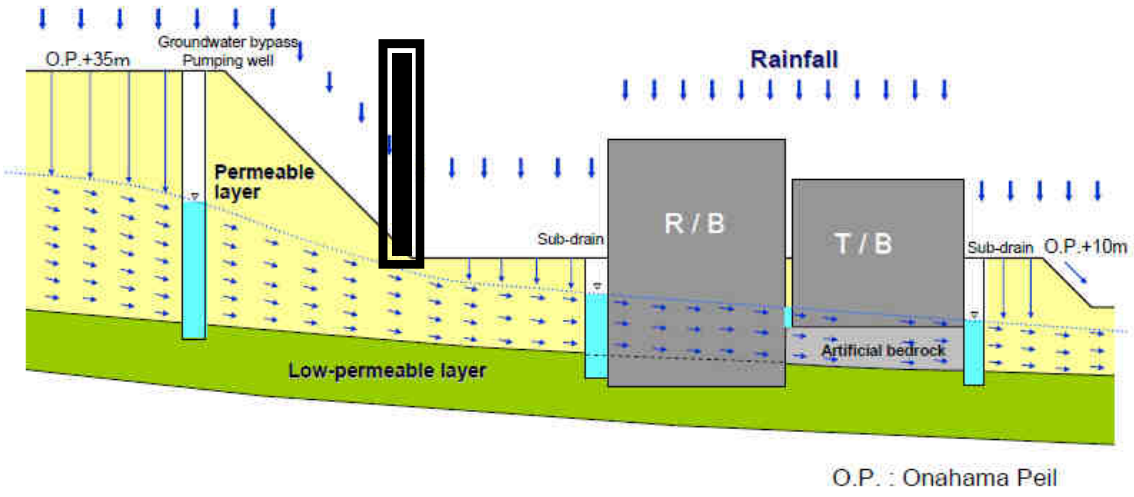
The construction of a slurry wall does not require important workforces whereas most operations are performed using heavy duty mechanisms (drilling machine, rebar insertion crane and grouting pumps).

The capacity to build slurry walls depends extensively of the ground characteristics and work organization. In general terms, one or two sections of walls can be constructed per day.

Another important concern for the slurry wall is the size of the slurry treatment facility. A detailed assessment is required to determine the proper position on the floor map of this equipment and, ultimately, if the **on-line** processing of bentonite is required or not and envision other possibilities to minimize the ground occupation close to the construction area. The capacity of the facility shall be determined depending on the size, shape, thickness and depth of the slurry wall.

Additional concern

Depending on the results, it might be deemed necessary to install an additional protection wall to prevent large rainwater flowing from the hill as follows.



The wall has to main criteria: sustain the loads undergone (self-weight, tilting efforts due to wind or ground pressure, earthquake…) and to remain tight.

The narrowness of the area and the expected height makes the structural resistance the main design basis criterion.

The construction of such walls implies necessary limitation of man attendance nearby the slope and minimization of excavations to minimize waste balance and exposure to radiations.

Structural options

Based on BCSN and ByTP practice and acquired experience (for instance in the framework of NOVARKA project), an efficient and quick option of tower-supported wall can be envisioned:

Tower-supported wall is a very rapid construction principle. It is based on constructing steel structure to support concrete panels. Such a wall was constructed on Chernobyl site to ensure protection against radiation. Such towers are laid on concrete rafts cast in place.

Example of tower-supported walls implemented by NOVARKA at Chernobyl (total height: 27 m)

Note from the above figure. If implemented at Fukushima, the towers shall be located on the side of the road, not on the side of the slope.

The number of tower and blocks can only be determined depending on the ground characteristics.

Tightness option

After the concrete is placed, tightening can take place using conventional methods (membrane – neoprene covering…).

Such a wall might be subject to stringent design requirements such as the seismic design and resistance to wind. Based on the design basic data, it shall be analysed option to back-fill the void space between the wall and the slope and, possibly grout the backfill to increase tightness.

2. Notes (Please provide following information if possible.)

- Technology readiness level (including cases of application, not limited to nuclear industry, time line for application)

The technologies are standard and well documented however, as for all structural works, additional data are required for further adaptation to the specificities of Fukushima site.

- Others (referential information on patent if any)

【Areas of Technologies Requested】

(1) Accumulation of contaminated water (Storage Tanks, etc.)

(2) Treatment of contaminated water (Tritium, etc.)

(3) Removal of radioactive materials from the seawater in the harbor

(4) Management of contaminated water inside the buildings

(5) Management measures to block groundwater from flowing into the site

(6) Understanding the groundwater flow