

## STRONG MEASURES TO COMBAT SITE NOISE

Bouygues Construction is deploying substantial resources on most of its construction sites to combat noise.

To reduce construction sites' impact on their direct environment and to facilitate the smooth progress of works, the Group is implementing a series of highly demanding measures and innovative tools.

### **Site noise simulation software ("Byoasis")**

Developed in conjunction with a building research body, Centre Scientifique et Technique du Bâtiment (CSTB), the program means management can predict and therefore plan to control the noise generated by work on site. Its many functionalities make for better design of the facilities (layout, noise barriers, etc.) and optimisation of construction phasing. Using a multitude of parameters studied on sites and integrated into a 3D virtual model, several scenarios can be tested in real time to enable the quietest viable solution to be chosen at the earliest possible opportunity. Sound feedback reproduces the predicted noise before work even starts. This innovation was awarded a prize at the Tenth International Virtual Reality Conference in Laval, France, in April 2008, in the "Industrial Design and Simulation" category.

### **"Silens" program**

Also developed in conjunction with CSTB, the Silens program is used to adapt the organisation of a construction site to its immediate surroundings (day-care centre, school, hospital, etc.). Once supplied with some simple but precise data (work to be carried out, machines used, location of machines, etc.), the program calculates a noise curve for different times of day. This therefore makes it possible, right at the design stage, to make the necessary adaptations to the organisation of work (methods and procedures, times, etc.).

### **Eco-equipment**

The Bouygues Construction plant and equipment consortium also regularly comes up with new products aimed at reducing site noise: soundproofed electric compressor, quick coupler with integrated cutoff to prevent the noise of leakage, special prop spanners, new systems for installing wall forms, etc.

A catalogue listing more than 50 items of 'eco-plant' has been made available to each jobsite since 2005. It is divided into six key topics: anti-pollution, protection of natural resources, protection of energy resources, ergonomics and wellbeing, noise reduction, and dust reduction.

### **Self-compacting concrete**

Because it is so fluid, self-compacting concrete flows into place without any need for vibration, totally eliminating the noise of poker vibrators and their compressors.

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### Site organisation

Before starting work on a site, the engineering departments examine a great many aspects of the work to reduce noise levels, including:

- installation of noise barriers
- installation of site accommodation adjacent to housing to reduce noise
- housing-in of some noisy equipment like compressors
- implementation of a delivery management program: delivery trucks are allocated 'slots' for arrival and unloading, which prevents multiple vehicles arriving at the same time and thereby cuts down on noise, pollution, and traffic congestion.
- use of electric plant whenever possible, since it is much less noisy than plant powered by internal-combustion engines.

These innovations and initiatives are all part of Bouygues Construction's sustainable development policy ("Actitudes"). They help protect the health and wellbeing of workers and residents and minimise intrusion into the immediate environment of the places where the Group works.

Bouygues Construction has for several years also been working towards making its construction sites more discreet (concept of 'stealth sites'), through the work of the "Ville et Mobilité durables" <sup>(1)</sup> competitive-advantage task force.

All these innovations constitute value-added service and a distinct competitive advantage that can be offered to clients seeking to be increasingly considerate of environmental issues.

<sup>(1)</sup> "Ville et Mobilité durables" is a competitive-advantage task force of Marne-La-Vallée University. It is chaired by Michel Cote, Deputy CEO of Bouygues Construction.

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Bouygues Construction is a global leader with top-ranking positions in the building, civil works and electrical contracting/maintenance markets. It combines the power of a large group with the responsiveness of a network of local companies which deliver innovative solutions for the financing, design, construction, operation and maintenance of buildings and infrastructure. Bouygues Construction employs 53,700 people in 60 countries and generated sales of 9.5 billion euros in 2008.



1 - Sound-level meters are installed on particularly sensitive sites (near hospitals, schools or hotels, for example).

2 - A special quick coupler for air and water hoses automatically cuts off the supply in the event of accidental disconnection, preventing both noise and leakage.

3 - Super silent electric compressors reduce sound levels 25%, to about 64 dB on average. Buffer tanks can also be used to reduce noise by a further 50%.

4 - Wall forms are tightened with standard nuts requiring spanners in order to prevent hammer blows to the wingnuts used previously.

5 - Delivery drivers are instructed to turn their engines off, thereby reducing noise and pollution.

6 - Self-compacting concrete is so fluid it flows into place without any need for compacting.

7 - A new type of prop spanner makes it possible to undo props without striking them with hammers. It simplifies site work and reduces noise.

8 - Boring of holes for concrete piles or, when ground conditions permit, silent piling using a press-in machine for sheet piles are preferred to impact driving of steel piles, the noisiest activity on a construction site.

9 - Site workers are given training on respectful ways of working. While they improve their own working conditions, they help reduce noise.

10 - The "Silens" and "Byoasis" programs enable engineers to predict noise levels on construction sites and better plan works so as cause as little disturbance as possible.

11 - Wherever possible, site accommodation is placed so as to constitute a noise barrier between the site and housing.