

Equipment Selection—The Key to a Successful Soil Nailing Project

By Craig McDonald

There are many things to consider when selecting the appropriate equipment for a soil nailing project. The job location may be in the center of a bustling city or in a remote area of wilderness miles away from any type of services. Each will present its own unique challenges that will determine the process and therefore the equipment being used.

Wet-mix shotcrete supplied by a local ready mix supplier can be a simple and viable option, provided that all the site logistics are in place. If the concrete trucks are able to access the site as required and can reach within close proximity to the area to be sprayed, the wet-mix process is often the way to go. The wet-mix process can allow for continuous, high-production application without the need for secondary equipment such as water-booster pumps, lift trucks, and high-volume air compressors (greater than 185 ft³/min [5.24 m³/min]). Wet-mix equipment also operates with less wear parts when compared to the equipment used in a dry-mix application. In many cases, wet-mix concrete pumps provide a quick, efficient, and reliable option for spraying concrete.

In many cases, however, access to a continuous supply of wet-mix shotcrete may be limited or the job site may not be accessible by concrete trucks at all. In these cases, because of its flexibility, dry-mix shotcrete will often be a preferred method of placement. Once delivered to the site, prepackaged, dry-mix shotcrete can be stored and used as required, and when material is available “on demand,” productivity can be dramatically improved. The dry-mix process is also beneficial if material placement is intermittent. Shotcrete placement can easily be stopped and restarted without emptying hoses or cleaning out machines.

Another advantage of the dry-mix process over wet-process shotcrete is the ability to convey shotcrete material over long distances. The thin-stream process allows material to be easily conveyed over 985 ft (300 m) horizontally from the location of the actual pump and up to 330 ft (100 m) vertically. This benefit

is of particular importance when access to the face is difficult or the distance from the pump to the face is excessive. Consideration should be given, however, to the compressed air requirements. Air-driven equipment will require a minimum 375 ft³/min (10.62 m³/min) air compressor, and for larger machines and long distances, air compressors of up to 1000 ft³/min (28.32 m³/min) may be required. Also, water pressure exceeding 75 psi (0.52 MPa) will be required to ensure a sufficient, consistent supply of water at the nozzle.

Equipment selection options may start at the machine (wet-mix pumps versus dry-mix machines), but they also extend to the point of placement. Handheld spraying is the most common method for placing shotcrete; however, as the area being sprayed gets larger and particularly higher, the need for equipment to assist in the nozzling process increases. Tools such as scissor lifts and boom lifts are often used to assist the nozzleman in reaching areas that cannot be shot from the ground level.

Spray arms can also be used to apply shotcrete on areas that cannot be reached by a nozzleman. Shotcrete spray arms can reach heights ranging from 10 ft (3 m) to over 72 ft (22 m) and are operated via remote control. Spray arms still require the use of a shotcrete pump and can be used with both the wet-mix and dry-mix processes. There have been many different adaptations for mounting spray arms on mobile equipment. Most equipment manufacturers sell spray arms already mounted on carriers. Spray arms have also been mounted on rail cars, excavators, tractors, on the buckets of load-haul dump equipment, and even on the front of pickup trucks. Of course, proper engineering is required to ensure that the host carrier can accept the weight of the boom, provide sufficient counterweight, and also be able to withstand the additional forces applied during the shotcrete application process. Remote-controlled spray arms provide a safe and simple means of spraying concrete in areas that cannot be reached by a nozzleman.



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Similar to most construction equipment, the equipment used for soil nailing can range from rudimentary machines to the latest technology involving programmable logic controller (PLC) spray arms that operate on a preprogrammed spraying pattern. Once the machinery is matched with the task at hand, even the largest shotcrete projects become more manageable and cost-effective. If in doubt, never hesitate to contact your local shotcrete equipment expert to help match your equipment needs to your project.



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