

Light-Weight Steel Pipe for Forepiling Made with High-Strength Material "AGF Tuff & Light"

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The standard forepiling method (AGF method) uses a steel pipes of ϕ 114.3mm in outer diameter and $t=6$ mm in thickness are driven into the upper part of the tunnel face prior to excavation work to reinforce the bedrock. Four 3-m-long steel pipes connected as a 12-m section are driven into the rock at each location. As each 3-m-long pipe weighs 50 kg, it was a heavy burden for the workers.

So, we developed a lightweight steel pipe for AGF that uses high-strength materials, which are increasingly being applied in the automotive and other industries. The quality of the new pipe is equal to or better than conventional AGF pipes, while being thinner and lighter in weight. This reduces the burden on workers and improves productivity and safety.

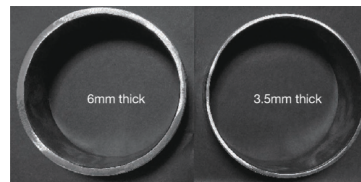


Photo 1 A Cross-sectional Comparison of the Conventional Steel Pipe (left) and the New AGF Tuff & Light Pipe (right)

Features of AGF Tuff & Light

(1) Thinner pipes from using high-strength material
AGF Tuff & Light uses high-strength materials with tensile strength of 730 N/mm^2 . The thickness of the steel pipe is reduced from 6mm to 3.5mm, and the weight per pipe is reduced from 50kg to 29.4kg (60%).

(2) Improved quality of joints (threaded sections)

The threaded portion is specially processed to ensure higher quality than the bare portion of conventional AGF steel pipe (bending strength: 53% higher, tensile strength: 15% higher).

Table 1 Comparison of bending and tensile strength of AGF Tuff & Light and conventional steel pipe

	Bending	Tensile
AGF Tuff & Light Threaded portion	18.8kN.m*	550kN*
Conventional AGF Bare portion	12.3kN.m	480kN

*Actual measures

(3) Reduced construction time

Construction time of the AGF method can be reduced by 10% because of the weight is less.



Photo 2 AGF Tuff & Light Being Used in Construction