How FRP Pipe is Constructed

Three different processes are commonly used to fabricate fiber reinforced plastic pipe: filament winding, centrifugal casting and hand lay-up. Filament winding and centrifugal casting are used to make pipe up to approximately 12 inches in diameter, with filament winding being the most common. Hand lay-up is generally used for larger diameter pipe, and for asymmetric shapes.

Filament Winding

In filament winding, continuous fiberglass filaments, called rovings, are saturated with catalyzed liquid resin and helically wound around polished steel mandrels. Typically, the fibers are fed through a mechanical device that moves up and down the length of the rotating mandrels. The resin is then cured at elevated temperatures and the finished pipe removed from the mandrel.

Filament winding results in the highest fiber-to-resin ratio of the three fabrication methods and consequently offers the highest strength-to weight ratio. This is the method used by Waco Boom.

Centrifugal Casting

The centrifugal casting process involves layering glass cloth on the inside walls of a tubular mold which is rotated at high speed. Catalyzed liquid resin is then injected into the rotating mold. Centrifugal force ensures that the reinforcing fibers are thoroughly saturated with resin and serves to drive out air bubbles that might compromise the physical properties of the pipe. The mold continues to rotate while the resin cures.

Centrifugal casting typically results in a 100% resin liner, which acts as an excellent chemical barrier. The resin liner also resists abrasion and protects the fiber reinforcement.

Hand Lay-up

As the name suggests, hand lay-up is a manual fabrication process. It involves building up layers of chopped glass or woven glass mat impregnated with catalyzed resin around a suitable mold. Special metal rollers are used to improve glass wet-out and force out trapped air bubbles. Hand lay-up is generally used only for custom shapes or for large-diameter pipe where filament winding or centrifugal casting is not practical.