

**Old & New GFX Technology**  
*Same Performance-Less Copper*

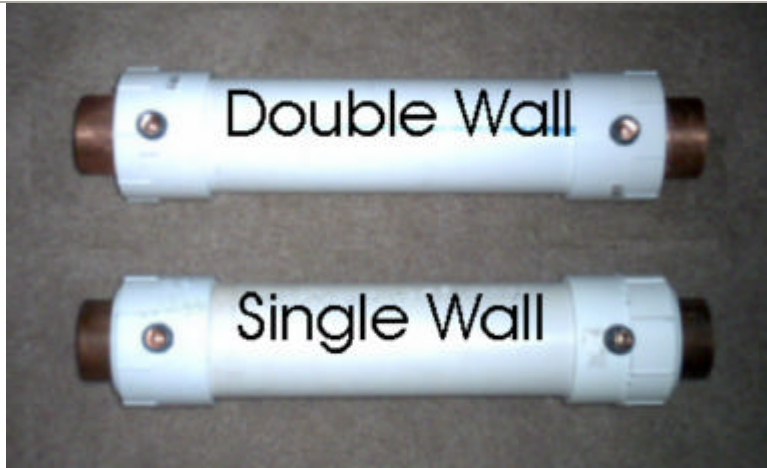


**Next Generation GFX Model G+3-30-SW**  
**(All Copper, Single-Wall ~7.5 lbs)**

**Original GFX Model G3-30**  
**(All Copper, Double-Wall-Vented ~16.5 lbs)**

# Advanced Gravity-Film & Double-Helix Heat Exchangers (“GFX+™” & “DHX™”)

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**Fig. 1 GFX+ Prototype Models  
GP3-24-DW  
(Vented-Double-Wall)  
&  
GP3-24-SW  
(Single Wall)**

**Note:** UL Certification File SA8583 covers vented-double-wall GFX+ Model shown. Both single & double wall models use much less copper than coil & tube GFX models currently in production and offer comparable effectiveness values. They can also be made of stainless, titanium, aluminum, etc.

## Patent Application Abstract

This invention teaches how to reduce the copper content of a commercially available, all-copper, double-wall-vented, coil & tube Gravity Film Heat Exchangers (“GFX”) developed for the GFX™ system of U.S. Patent No. 4,619,311. For example, a GFX+™ equivalent of a residential Model G3-60 GFX can be made using 71% less copper. Such significant copper-savings, with comparable heat transfer coefficient (“U”), effectiveness and coil pressure drop, is achieved by improvements in innovations disclosed in Provisional Patent Application 60/709,889 (Filing date: August 22, 2005). Unlike conventional, single and multi-coil GFX’s currently produced by several manufacturers, the present invention enables the use of a variety of metal and/or plastic components to achieve either single or vented-double-wall construction and lower manufacturing costs. In fact, higher U-values can be achieved by increasing the potable-water pressure drop of a GFX+ equivalent of any coil & tube GFX. The present invention also teaches how to simultaneously optimize U-values & pressure drop[s] and means of introducing controlled turbulence & mixing. Such trade-offs cannot be achieved in a conventional GFX design having one or more coils wound singly or in parallel. It also teaches how to manufacture an improved version of the Double-Helix Heat Exchanger (“DHX”), which is also disclosed in said Provisional Patent Application 60/709,889. Unlike a GFX, which must be installed vertically for best effectiveness, a DHX can be operated in any orientation. For applications permitting higher pressure drop, a DHX can be designed with a much higher U-value than a comparable GFX or GFX+.

**Table A: Copper Savings Provided By Various GFX+ Versions of a Model G3-60 GFX**

Standard All-Copper GFX	Weight of Copper	GFX+ Equivalent of Model G3-60 GFX	Approx. Copper Weight (lbs)	Approx. Copper-Savings
Model G3-60	37 lbs	Single-Wall/PVC Jacket	9.5	74%
		Double-Wall/PVC Jacket	10.8	71%
		Single-Wall/All Copper 4” Type-DWV Shell	23.3	37%
		Double-Wall/All Copper 4” Type-DWV Shell	24.0	35%
		Single-Wall/All Copper 3.5” Type-M Shell	25.6	31%
		Double-Wall/All Copper 3.5” Type-M Shell	27.3	26%