



# Pre-Preg Carbon Fabrication Revolutionized Orthotics

By Bio-Mechanical Composites Inc.



## Evolution Dynamic Carbon Designs

We have all experienced the effect of "Dynamic Response" through application of prefabricated carbon AFOs. These prefabricated, off-the-shelf designs opened the pathway to the practical application of energy-storing carbon-fiber designs in orthotics. These devices stopped short, however, in tackling our more complicated pathologies by providing only dorsiflexion assistance with a minimal energy return through the "spring" characteristics of the foot plate.

This new design creates an additional dynamic action in the anterior carbon strut, providing practitioners the ability to select a moderate to firm energy return force, achieving higher functional outcomes.

Now, taking from the initial fabrication procedures and materials designated to create these pre-manufactured designs, it has been possible to experiment with these materials, to create a fabrication system that allows this design to be custom-fabricated to the patient model. Evolving this energy-storing composite design into a custom orthosis allows us to address the more complex deformities that we encounter with a majority of our lower-limb orthotic patients.



Prefabricated: (Small, Medium, Large)  
**Anterior Dynamic AFO**  
*Custom Molded Available*



Custom:  
**Posterior Dynamic AFO**

### PLS

Probably the most common flexible "foot drop" orthosis is the plastic Posterior Leaf Spring (PLS), but when the material composition changes to Pre-Preg carbon fiber, the dynamic energy return characteristics emerge. A flat leaf spring will only allow for dorsi/plantar flexion in one direction while the strength of the resistance force is able to be adjusted to the specifications of the practitioner. This direction of motion offers a tremendous control of valgus/varus when the foot is maintained with total contact. Currently we utilize a heat-adjustable laminated inner boot to maintain the patient to the carbon structure.

This design offers a full range of motion with a slower gradient increase of resistance force in comparison to an anterior design.

## Fabricating Complexity

The fabrication procedures for this advanced orthosis are complicated and require a high quantity of orthosis fabrication to make the process cost-effective. Each particular orthosis design requires pre-engineering of the direction of fibers, the percentage of resin, and the appropriate pressure during the curing process. These protocols must be strictly adhered to and monitored to produce consistent strengths in the carbon structures.

This is similar to the Custom Knee Orthosis fabrication. The design of the orthosis is engineered for the desired outcomes and the template of the design is then applied to the characteristics of each patient model.

The most important step in the entire process is sufficient information gathering to be performed by the ordering practitioner. The proper selection of the orthosis design and the desired resistance strength in conjunction with the proper casting procedure is needed to yield the best possible orthosis outcomes. The complicated deformities of the patient will be addressed in the orthosis upon modification of the custom model to ensure that the exact patient anatomy will be reflected in the finished orthosis.

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## How do we apply this technology to patients?

This technology is advanced, yes; however we have designated a simplistic system of evaluation criteria, that will ensure a properly fitting orthosis. In addition to the evaluation procedure, we have designed a pre-manufactured diagnostic set of the orthoses. These diagnostic orthoses are available in a variety of sizes and strengths to fit the left and right leg of a majority of patient limb sizes.

These diagnostic orthoses can be used in your clinic to more accurately establish the appropriateness of this technology and to better determine the characteristics that your custom-fabricated orthosis will have. The anatomy of the patient will not be precisely represented in this diagnostic orthosis, though it is fabricated to be identical to the custom fabricated orthosis.



**Diagnostic Dynamic Posterior AFO**  
Prefabricated sizes with variable resistance strengths. These orthoses are available to use during patient evaluation to determine the best resistance strength for the custom orthosis.

## Cost-Effective?

Is this type of a bracing system cost-effective?

As practitioners in a specialized medical field, we are constantly having to pay attention to our bottom line, and the cost efficiency of the devices we are ordering. We have created a suggested billing code breakdown to more than effectively cover the additional cost for this more advanced fabrication process. Further information is available on our website or by contacting one of our experts.

## Why don't I order one of these and try it out?

That's a good question. The evaluation procedure is complex at first, though it will greatly simplify the evaluation procedure by designating variables. The work orders for each design are available on our web page at [www.phatbraces.com](http://www.phatbraces.com). The casting procedure is simple, although some key procedures during casting can make the difference between a device that fits the patient and one that would never work.

## Casting Procedure:

Position the patient on a 1/4" casting board. The patient must be positioned so that the ankle is at true 90 degree neutral position. The patient should be corrected in the frontal plane so that any valgus/varus is corrected during the modeling.

**Please note:** Contact us directly with any questions regarding the evaluation procedure or patient modeling.

*"I was amazed! I opened the box, put it on the patient, and didn't have to make a single adjustment. My patient loved the brace, and the natural gait improvement was evident immediately!"*

## Guaranteed Success!

**If you are not 100% satisfied with the results of our orthosis on your patient, simply return the orthosis within 30 days for a complete refund.**

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