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## **PFOLA Technical Standards Document: Foot Orthotic Classifications, Definitions, and Summary of Manufacturing Processes Document.**

### **FOREWARD**

There is considerable confusion surrounding foot orthotic terminology and the various processes by which foot orthotics can be created. The purpose of this document is to serve as a reference for foot orthotic terminology, to provide for the classification and categorization of foot orthotics, to define the types of foot orthotics, and to provide a brief and concise description of the multiple processes by which foot orthotics are created.

Standard terminology is essential for communication within and between disciplines, professions, occupations, agencies, and individuals who deal directly or indirectly with foot orthotics and foot orthotic therapy. Foot orthotic practitioners, manufactures, researchers, educators, as well as individuals who work in government, insurance, the legal profession, etc. and who have an interest in foot orthotic therapy must have a common language for effective communication to be possible. Unfortunately, effective communication about foot orthotics and foot orthotic therapy has been hindered by improper, inaccurate, inconsistent, poorly defined, or misunderstood terminology.

In the performance of its mission, it is PFOLA's desire that this document will serve to improve communication, increase understanding, and promote awareness of and within the prescription foot orthotic industry. This document must be both accurate and current and to that end PFOLA welcomes any and all comments on subject matter related to this document and will update this document as necessary for enhancement, correction, clarification and due to changes associated with changes or advancements in terminology, technology, methodology, materials, and processes, etc.

Those who desire to provide comment or make recommendations to improve this document may do so by writing PFOLA directly or by e-mail addressed to the Technical Standards Committee at [info@pfola.org](mailto:info@pfola.org).

## **Foot Orthotic Classifications, Definitions, and Summary of Manufacturing Processes**

**Document.** Updated January 24, 2006

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## **PFOLA Technical Standards Definitions – DRAFT Revisions: January 24, 2006**

### **Foot Modeling Definitions**

**Anatomical Volumetric Foot Model (AVFM).** A digital or physical model that captures a person's three dimensional plantar foot anatomy when the foot is non-weightbearing, semi-weightbearing, or fullyweightbearing.

A digital AVFM must use actual 3 dimensional data points taken directly from the foot to duplicate plantar foot anatomy. The most common examples include laser 3D scanners, stereo-digital 3D imaging systems, and pin array systems.

A physical AVFM captures foot anatomy through direct contact to duplicate plantar foot anatomy. The most common examples are plaster of paris casts or foam impressions taken directly from the foot. Any material or method that uses direct capture of the entire plantar foot anatomy creates an AVFM.

**Extrapolated Volumetric Foot Model (EVFM).** A digital model that approximates a person's three dimensional plantar foot anatomy through application of mathematical models that extrapolate pressure data, or extrapolate temperature data, or extrapolate light data to form the digital model when the foot is non-weightbearing, semi-weightbearing, or fully-weightbearing. The most common examples are pressure mapping systems, photographs and ink or carbon paper imprinting systems.

### **Orthotic Device Definitions**

**Foot Orthotic.** An in shoe device that braces, supports, or protects the foot or part of the foot.

**Prescription Foot Orthotic.** An in shoe device that is prescribed by a qualified healthcare professional to brace, support, or protect the foot or part of the foot.

**Anatomical Custom Foot Orthotic (ACFO).** An in shoe device that is made directly from an Anatomical Volumetric Foot Model (AVFM). The AVFM is modified with the appropriate medial and/or lateral arch fill, lateral column expansion, heel expansion, and intrinsic forefoot and/or rearfoot corrections as defined by the prescribing physician. The entire dorsal surface of said custom device matches the surface of the modified, or corrected, AVFM.

**Extrapolation System Foot Orthotic (ESFO).** An in shoe device that is made directly from an Extrapolated Volumetric Foot Model (EVFM). The EVFM is modified with the appropriate medial and/or lateral arch fill, lateral column expansion, heel expansion, and intrinsic forefoot and/or rearfoot corrections as defined by the prescribing physician. The entire dorsal surface of said custom device matches the surface of the modified, or corrected, EVFM.

**Library System Foot Orthotic (LSFO).** An in shoe device that is made from a library of pre-manufactured shells, pre-manufactured corrected positive molds or pre-determined digital shape files



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(from which shells or molds are milled.) The foot orthotic shape is chosen by matching a library shape with either an AVFM or EVFM.

**Functional Foot Orthotic.** An orthotic device that is designed to control abnormal motion or abnormal position of the foot and to control the abnormal motion or abnormal position of the lower extremity that is affected by the position and/or motion of the foot.

**Root Functional Foot Orthotic.** A Functional foot orthotic made from an Anatomical Volumetric Foot Model (AVFM) that is taken with the foot non-weightbearing, the ankle joint dorsiflexed to resistance, the subtalar joint held in its neutral position, and the midtarsal joint fully pronated.

### **Manufacturing Process Summaries**

The following summaries are generic descriptions of various foot orthotic manufacturing processes

#### **Anatomical Custom Foot Orthoses**

##### 1. A physical AVFM – Manual Corrected Model -- Manual Orthotic Shell

An AVFM is filled with plaster to create positive model > lateral and medial expansions and intrinsic corrections are added manually as per prescription > orthotic shell is vacuum formed over corrected positive model > shell is ground to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished.

##### 2. A physical AVFM -- CAD/CAM Corrected Model -- Manual Orthotic Shell

An AVFM is digitized using a 3D scanner > digital 3D model is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > corrected positive model is milled using CAM software > orthotic shell is vacuum formed over corrected positive model > shell is ground to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

##### 3. A physical AVFM -- CAD/CAM Corrected Model -- CAD/CAM Orthotic Shell

An AVFM is digitized using a 3D scanner > digital 3D model is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > orthotic shell is milled directly from orthotic material to fit shoe and patient's foot using CAM software > extrinsic components and top cover are added > orthotic device is finished

##### 4. A Digital AVFM – CAD/CAM Corrected Model -- Manual Orthotic Shell

A digital AVFM is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > corrected positive model is milled using CAM software > orthotic shell is vacuum formed over corrected positive model > shell is ground to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished



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## 5. A Digital AVFM – CAD/CAM Corrected Model -- CAD/CAM Orthotic Shell

A digital AVFM is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > orthotic shell is milled directly from orthotic material to fit shoe and patient's foot using CAM software > extrinsic components and top cover are added > orthotic device is finished

### **Extrapolation System Foot Orthoses**

#### 1. EVFM – CAD/CAM Corrected Model -- Manual Orthotic Shell

An EVFM digital file is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > corrected positive model is milled using CAM software > orthotic shell is vacuum formed over corrected positive model > shell is ground to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

#### 2. EVFM – CAD/CAM Corrected Model -- CAD/CAM Orthotic Shell

An EVFM digital file is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > orthotic shell is milled directly from orthotic material to fit shoe and patient's foot using CAM software > extrinsic components and top cover are added > orthotic device is finished

### **Library System Foot Orthoses**

#### 1. Physical AVFM -- CAD/CAM Corrected Model -- Library of Pre-made Orthotic Shells

A physical AVFM is digitized using a 3D scanner > digital model is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > corrected digital model is compared to a library of shell shapes and appropriate shell is chosen > library shell may be modified to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

#### 2. Physical AVFM -- Library of Corrected Models -- Manual Orthotic Shell

A physical AVFM is measured manually or digitized using a 3D scanner > measurements or digital 3D model is compared to a library of corrected model shapes and the appropriate model is chosen > orthotic shell is vacuum formed over library model > shell is ground to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

#### 3. Physical AVFM -- Library of pre-made Orthotic Shells

A physical AVFM is compared to a library of shell shapes and appropriate shell is chosen > library shell may be modified to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished



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#### 4. Physical AVFM -- Library of Shell Shape Files -- CAD/CAM Orthotic Shell

A physical AVFM is measured manually or digitized using a 3D scanner > measurements or digital 3D model is compared to a library of shell shape files and the appropriate file is chosen > orthotic shell is milled directly from orthotic material to fit shoe and patient's foot using CAM software > extrinsic components and top cover are added > orthotic device is finished

#### 5. Digital AVFM -- CAD/CAM Corrected Model -- Library of Pre-made Orthotic Shells

A digital AVFM is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > corrected digital model is compared to a library of shell shapes and appropriate shell is chosen > library shell may be modified to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

#### 6. Digital AVFM -- Library of Corrected Models -- Manual Orthotic Shell

A digital AVFM is compared to a library of corrected model shapes and the appropriate model is chosen > orthotic shell is vacuum formed over library model > shell is ground to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

#### 7. Digital AVFM -- Library of pre-made Orthotic Shells

A digital AVFM is compared to a library of shell shapes and appropriate shell is chosen > library shell may be modified to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

#### 8. Digital AVFM -- Library of Shell Shape Files -- CAD/CAM Orthotic Shell

A digital AVFM is compared to a library of corrected shell shape files and the appropriate file is chosen > orthotic shell is milled directly from orthotic material to fit shoe and patient's foot using CAM software > extrinsic components and top cover are added > orthotic device is finished

#### 9. EVFM -- CAD/CAM Corrected Model -- Library of Pre-made Orthotic Shells

An EVFM digital file is modified with lateral and medial expansions and intrinsic corrections using CAD software as per prescription > corrected digital model is compared to a library of shell shapes and appropriate shell is chosen > library shell may be modified to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

#### 10. EVFM -- Library of Corrected Models -- Manual Orthotic Shell

A EVFM digital file is compared to a library of corrected model shapes and the appropriate model is chosen > orthotic shell is vacuum formed over library model > shell is ground to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished



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#### 11. EVFM -- Library of pre-made Orthotic Shells

An EVFM digital file is compared to a library of shell shapes and appropriate shell is chosen > library shell may be modified to fit shoe and patient's foot > extrinsic components and top cover are added > orthotic device is finished

#### 12. EVFM -- Library of Shell Shape Files -- CAD/CAM Orthotic Shell

An EVFM digital file is compared to a library of shell shape files and the appropriate file is chosen > orthotic shell is milled directly from orthotic material to fit shoe and patient's foot using CAM software > extrinsic components and top cover are added > orthotic device is finished