United States District Court,
W.D. Pennsylvania, Johnstown Division.

MARTIN MARIETTA MATERIALS, INC,
Plaintiff.
v.
BEDFORD REINFORCED PLASTICS, INC., West Virginia University Research Corporation, and Hota V. Gangarao,
Defendants.

Civil Action No. 03-57J

Aug. 3, 2005.

Dennis R. Very, James M. Singer, Pepper Hamilton, Pittsburgh, PA, Donald E. Knebel, Paul B. Hunt, Barnes & Thornburg, Indianapolis, IN, Helen R. Haynes, Martin Marietta Materials, Inc., Raleigh, NC, Kendall H. Millard, Barnes & Thornburg, South Bend, IN, for Plaintiff.

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SPECIAL MASTER'S FINAL REPORT AND RECOMMENDATION ON CLAIM CONSTRUCTION

GALE R. PETERSON, Special Master.

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I.

Introduction

A. Background

Martin Marietta Materials, Inc. ("Martin Marietta") has charged Bedford Reinforced Plastics, Inc., West Virginia University Research Corporation, and Hota V. GangaRao (collectively "defendants") with infringing two patents, namely, U.S. Patent Nos. 6,467,118 (the '118 patent) and 6,070,378 (the ' 378 patent), both drawn to a load bearing deck structure made from at least one "sandwich panel" formed of a polymeric matrix composite material.

B. Referral to the Special Master

This Court's Order of October 27, 2003, appointed the undersigned as a special master in this cause. The master has construed the Court's order as requiring the master to prepare a report and recommendation to the Court on claim construction. Accordingly, the parties have provided briefs and submissions to the special master addressing their proposed forms of construction.

The master's appointment in this case occurred prior to amendments to Rule 53, FED. R. CIV. P. Rule 53, as amended, does not expressly address draft reports and recommendations, as did prior Rule 53(e)(5)("(5) *Draft Report*. Before filing the master's report a master may submit a draft thereof to counsel for all parties for the purpose of receiving their suggestions."). Nevertheless, after reviewing the briefs and submissions offered by both parties, the special master believed that the parties' comments and suggestions would be helpful before issuing a final report and recommendation on claim construction.

Therefore, in accordance with prior Rule 53(e)(5), a draft report and recommendation dated January 8,

2005, was served on the parties for their comments. The parties were given 30 days in which to file such comments, and 10 days to file any responses, such times being subject to enlargement. The parties were directed that they need not, and should not, repeat arguments that had been raised in their briefs and which had been addressed in the draft report and recommendation. The parties were directed to limit comment to those instances where the parties believed that the draft report and recommendation contained clear errors of law or fact, or otherwise required clarification.

Accordingly, the defendants served comments on February 9, 2005 ("Defendants' Comments") to which Martin Marietta responded on February 18, 2005 ("MM's Resp. Comments"). The defendants served a reply on February 21, 2005 ("Defendants' Reply Comments"). Martin Marietta also advised through a letter submission of January 31, 2005, that it did not seek reconsideration of the draft report and recommendation. Lastly, through an e-mail submission dated April 19, 2005, the defendants enclosed the Court's Memorandum Opinion and Order granting Bedford's Motion to Compel 1) The Production of Documents Based on Waiver of Privilege and 2) The Continued Deposition Once the Underlying Documents are Produced (Document No. 88-1). The defendants advised that "[w]hile we do not wish to delay in any manner the issuance of the Final Report and Recommendation, Bedford reserves its right to supplement its claim construction motions based on the discovery recently ordered by the Court." No further submissions have been received from the parties.

Some of the parties' initial submissions were designated "CONFIDENTIAL" although the draft report and recommendation noted that the substance of the submissions appeared to relate to materials already subject to public scrutiny, *e.g.,* the patents-in-suit and the prosecution histories thereof. Accordingly, the draft report and recommendation was likewise designated "CONFIDENTIAL-FILED UNDER SEAL." However, the draft report and recommendation noted that the public nature of the proceedings should be preserved to the fullest extent possible, and the parties were requested to advise the special master and the Court (1) which portions, if any, of the draft report and recommendation truly revealed "confidential" information requiring filing under seal, and (2) the specific "confidential" information disclosed that may be deleted in the final report and recommendation. In response, the parties have all indicated that this final report and recommendation may be issued as non-confidential. MM's letter of January 31, 2005; Defendants' Comments at 1.

II.

Claim Construction Principles

A. The Parties' Dispute Over Claim Construction Principles

The parties' submissions and the draft report and recommendation were, of course, filed prior to the Federal Circuit's recent *en banc* opinion in *Phillips v. AWH Corp.,* --- F.3d ---- (Fed.Cir.2005) (*en banc*). In general terms, Martin Marietta in its submissions urged the Court to follow the methodology of Texas Digital Systems, Inc. v. Telegenix, Inc., 308 F.3d 1193 (Fed.Cir.2002), *i.e.,* "[i]n construing claims, the analytical focus must begin and remain centered on the language of the claims themselves," and "[t]he terms used in the claims bear a 'heavy presumption' that they mean what they say and have the ordinary meaning that would be attributed to those words by persons skilled in the relevant art." Id. at 1201-02. Martin Marietta Material Inc.'s Opening Brief on Claim Construction ("MM's Opening Brief") at 2. Consequently, Martin Marietta focused principally on discerning the ordinary meaning of claim terms using, for example,

various dictionary definitions. Martin Marietta, under the heading "The Elephant in the Room," charged that the defendants, on the other hand, proposed claim constructions that improperly limited the claims to an embodiment illustrated in the patent drawings and described in the specification in an effort to avoid infringement. Martin Marietta Materials, Inc.'s Reply Brief in Support of Its Claim Construction ("MM's Reply") at 5.

The defendants countered that claim construction was not "primarily a dictionary exercise." The defendants urged that "[t]he purpose of claim construction, in the end, is to determine what the inventor intended to claim with his/her choice of words appears in the claims," Defendants' Joint Response Brief on Claim Construction ("Defendants' Response Brief") at 1, citing Renishaw PLC v. Marposs Societa' Per Azioni, 158 F.3d 1243, 1249 (Fed.Cir.1998) ("The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction."). The defendants, accordingly, emphasized the importance of the specification in properly construing the claims, noting, *inter alia,* that "[i]f a claim limitation has no established ordinary meaning, it is the specification and other intrinsic records that must provide the necessary guidance for construing the claim," Defendants' Response Brief at 3, citing Toro Co. v. White Consolidated Indus., Inc., 199 F.3d 1295, 1299 (Fed.Cir.1999). The defendants also urged that "the specification must also be consulted because a claim cannot be construed in a manner that would give the claim a broader scope than can be supported by the patent's written description-an inventor cannot claim what he/she did not invent," Defendants' Response Brief at 3, citing Wang Labs., Inc. v. Am. Online, Inc., 197 F.3d 1377, 1384 (Fed.Cir.1999) and *N.* Am. Vaccine, Inc. v. Am. Cyanamid Co., 7 F.3d 1571, 1577 (Fed.Cir.1993). The defendants further urged that the competing canons of construing claims in light of the specification yet not improperly importing limitations from the specification into the claims must be balanced, citing Alloc, Inc. v. United States Int'l Trade Comm'n, 342 F.3d 1361, 1167 (Fed.Cir.2003) ("where the specification makes clear at various points that the claimed invention is narrower than the claim language might imply, it is entirely permissible and proper to limit the claims."), *cert. denied,* 541 U.S. 1063, 124 S.Ct. 2390, 158 L.Ed.2d 963 (2004). Defendants' Response Brief at 4. The defendants maintained that their proposed construction did not violate the canon of improperly importing limitations from the specification into the claims, but rather was based on how one of ordinary skill in the art would construe the claims "given the patent's specification and prosecution history." *Id.* at 5.

B. Discussion

The draft report noted that a patent is a fully integrated written instrument. Markman v. Westview Instrs., Inc., 52 F.3d 967, 978 (Fed.Cir.1995) (*en banc*), *aff'd,* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). A patent, by statute, must provide a written description of the invention, a disclosure that would enable one of ordinary skill in the art to make and use the invention, and a disclosure of the best mode known to the inventor for practicing the invention. 35 U.S.C. s. 112(1). FN1 A patent must also contain claims "particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. s. 112(2). FN2 The claims of a patent provide the measure of a patentee's right to exclude others from practicing the claimed invention. 35 U.S.C. s. 154. The Federal Circuit in *Phillips* similarly observed that "[t]hose two paragraphs of section 112 frame the issue of claim interpretation for us. The second paragraph requires us to look to the language of the claims to determine what 'the applicant regards as his invention.' On the other hand, the first paragraph requires that the specification describe the invention set forth in the claims." --- F.3d at ----.

FN1. 35 U.S.C. s. 112(1) provides:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.
FN2. 35 U.S.C. s. 112(2) provides:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
The draft report further noted that patent claims, as properly interpreted in light of the specification and prosecution history, provide a public notice function. Merrill v. Yeomans, 94 U.S. 568, 573-74, 24 L.Ed. 235 ("It seems to us that nothing can be more just and fair, both to the patentee and to the public, than that the former should understand, and correctly describe, just what he has invented, and for what he claims a patent."). *See also* Tate Access Floors, Inc. v. Interface Architectural Res., Inc., 279 F.3d 1357, 1367 (Fed.Cir.2002) ("Fairness and the public notice function of the patent law require courts to afford patentees the full breadth of clear claim language, and bind them to it as well."). Parties frequently, though, disagree over how specific terms or phrases in patent claims should be interpreted or construed.

Accordingly, the draft report explained that the court is obliged to resolve such disputes and to "construe" the claims to determine their true meaning and scope. Markman, 52 F.3d at 976. That is typically referred to as "claim construction," and is a matter of law for the court on the rationale that "it is only fair (and statutorily required) that competitors be able to ascertain to a reasonable degree the scope of the patentee's right to exclude" and that "competitors should be able to rest assured, if infringement litigation occurs, that a judge, trained in the law, will similarly analyze the text of the patent and its associated public record and apply the established rules of construction, and in that way arrive at the true and consistent scope of the patent owner's rights to be given legal effect." 52 F.3d at 978-79.

"The role [of claim construction] is neither to limit nor to broaden the claims, but to define, as a matter of law, the invention that has been patented." Netword, LLC v. Centraal Corp., 242 F.3d 1347, 1352 (Fed.Cir.2001). In construing the claims, courts are not permitted to re-write the claims. *See* Chef Am., Inc. v. Lamb-Weston, Inc., 358 F.3d 1371, 1373 (Fed.Cir.2004) (in construing the term "heating the resulting batter-coated dough to a temperature in the range of about 400 (deg.) F. to 850 (deg.) F," the court explained "courts may not redraft claims, whether to make them operable or to sustain their validity. * * * Thus, in accord with our settled practice we construe the claim as written, not as the patentees wish they had written it. As written, the claim unambiguously requires that the dough be heated to a temperature range of 400 (deg.) F. to 850 (deg.) F"-even if "the resultant product of such heating will be something that, in the words of one of the attorneys in this case, resembles a charcoal briquet."); Becton Dickinson & Co. v. C.R. Bard Inc., 922 F.2d 792, 799 n. 6 (Fed.Cir.1990) ("Nothing in any precedent permits judicial redrafting of claims."). Rather, " '[c]laim construction' is the judicial statement of what is and is not covered by the technical terms and other words of the claims." Netword, 242 F.3d at 1352.

The draft report nevertheless noted that all of that being said, there were, of course, decisions from the Federal Circuit that differed somewhat on the role played by the written description FN3 in claim construction. As the Federal Circuit explained: "We have had many occasions to cite one or both of the twin axioms regarding the role of the specification in claim construction: On the one hand, claims 'must be read in view of the specification, of which they are a part.' * * * On the other hand, it is improper to read a limitation from the specification into the claims. * * * Although parties frequently cite one or the other of these axioms to us as if the axiom were sufficient, standing alone, to resolve the claim construction issues we are called upon to decide, the axioms themselves seldom provide an answer, but instead merely frame

the question to be resolved." [Citations omitted.] Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 904 (Fed.Cir.2004).

FN3. The written description requirement too is creating some divisions among the Federal Circuit. *See* Univ. of Rochester v. G.D. Searle & Co., 375 F.3d 1303 (Fed.Cir.2004) (on order denying a petition for rehearing *en banc,* concurring opinions by Circuit Judges Lourie and Dyk, dissenting opinions by Circuit Judges Rader and Linn).

Also, the draft report noted, judges on the Federal Circuit have voiced disagreement over the proper role of the specification in claim construction. For example, Circuit Judge Newman writing in dissent in Housey Pharms., Inc. v. Astrazeneca UK Ltd., 366 F.3d 1348, 1356-57 (Fed.Cir.2004) (Newman, J. dissenting), noted:

The panel majority propounds the rule that the "plain and ordinary meaning of the claim language" should be used to define the scope of the claims unless the inventor "has explicitly disclaimed or clearly disavowed this meaning." * * * The panel majority states that absent such disclaimer, claims are "inimical to any narrower construction." * * * Precedent is exactly contrary: a claim is "inimical" to any broader construction than the invention set forth in the specification, and reliance on dictionaries, even technical dictionaries, without due consideration of the context of the invention may lead to "absurd results" * * *

* * * Claims to an invention that is not described in the specification are an anachronism. Many inventions concern complex and detailed technology, and the terse style of the patent claim is not a replacement for the elaboration in the written description. The claims are the concluding portion of the specification, and their statutory function is "particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. s. 112. A claim has no meaning out of the context of the invention that is described, enabled, and prosecuted. [Citations omitted.]

Judge Newman also observed:

This case again illustrates the conflict generated in the court's recent jurisprudence of claim construction. The panel majority reinforces the recently created dominance of general definitions, wherein the court created a "heavy presumption" in contravention of precedent. It is an established rule of the construction of legal documents that technical terms are presumed to have the meaning of the technical field of the document, not a "general meaning." Technical terms take their meaning from the technology and context in which they are used, not from general usages of the same word. Thus terms in patent claims are understood in the technical/scientific context of the specification; the presumption is that they have their technical meaning, not a general meaning.

366 F.3d at 1357. *See also* Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 1373 (Fed.Cir.2004) (Schall, J. concurring-in-part, dissenting-in-part) ("If the meaning of a claim term is clear on its face, consideration of the remaining intrinsic evidence is restricted to determining if a deviation from the clear language of the claim is specified."); Nystrom v. Trex Co., Inc., 374 F.3d 1105, 1120 (Fed.Cir.2004) (Gajarsa, dissenting-in-part) ("The majority gives heed to the general rules of construction but then proceeds to ascertain the 'plain and ordinary meaning' of the term 'board' from various dictionaries. * * * It establishes a duel between dictionary definitions and then selects one of the various definitions to support its results. The majority fails to recognize that the written description and the prosecution history clearly

prescribe that the decking board of the invention is derived from a wood log.").

The draft report and recommendation noted that the Federal Circuit, on July 21, 2004, had granted a petition for rehearing *en banc* in Phillips v. AWH Corp., 376 F.3d 1382 (Fed.Cir.2004), and had invited the parties, and interested *amicus curiae,* to file briefs addressing seven questions, including, *inter alia,* whether the public notice function was better served by primarily referencing technical and general purpose dictionaries and similar sources to interpret a claim term, or by referencing the intrinsic record. The draft report explained that it was impossible to predict how the *en banc* Federal Circuit would resolve those questions, and thus that the Federal Circuit's ultimate opinion in *Phillips* may-or *may not*-affect the recommended constructions in that draft. However, the draft explained that, in general, the report summarized the disclosure of the patents-in-suit, as well as the prosecution history that the parties had provided. In terms of claim construction, the recommended construction of the draft began with the actual claim language, and attempted to discern how one of ordinary skill in the relevant art in the relevant time frame would have understood the disputed terms and phrases in the asserted claims. Various objective resources, including technical and other dictionary definitions, as well as the submissions of the parties, were used as aids in that attempt.

The draft also explained, though, that the recommended constructions attempted to account for the fact that claims are not, in fact or theory, interpreted as divorced from the specification of which they are a part. That is, the draft explained, claim construction does not require one to adopt a construction that, in effect, would result from physically cutting the claims from the patent-in-suit, and asking one of ordinary skill in the art to interpret such claims in a vacuum. No case authority exists for such an analysis. The *en banc* court in *Phillips* confirmed that analysis: "the person of or dinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification," --- F.3d at ----, citing, *inter alia,* Medrad, Inc. v. MRI Devices Corp., 401 F.3d 1313, 1319 (Fed.Cir.2005) ("We cannot look at the ordinary meaning of the term * * * in a vacuum. Rather, we must look at the ordinary meaning in the context of the written description and the prosecution history.").

On the other hand, the draft explained, claim constructions that depend too heavily on, or that are limited to the embodiment or embodiments disclosed in the specification, similarly may not reflect the true and accurate scope of the claimed invention. The specification, by statute, no doubt concludes with the claims, 35 U.S.C. s. 112(2), but the claims, not the specification, define "the subject matter which the applicant regards as his invention." *Id. See Phillips,* --- F.3d at ---- ("It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude,' " quoting Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc., 381 F.3d 1111, 1115 (Fed.Cir.2004)).

In general terms, therefore, the draft report and recommendation concluded that the defendants were correct that claim construction was not "primarily a dictionary exercise." To simply focus on a definition from a selected dictionary, or perhaps on a sentence or two plucked from the written description or prosecution history, would invite error. The draft noted that while there was some "inherent tension" involved in claim construction, *see* E-Pass Techs., Inc. v. 3Com Corp., 343 F.3d 1364, 1369 (Fed.Cir.2003), the various principles of claim construction recited by the parties were not viewed as necessarily polarized, but rather as a collection of guidelines that as a group assisted in ascertaining proper claim scope. Those guidelines too, the draft explained, must be considered in the context of the cases in which they were articulated. By definition, a valid patent describes and claims a novel and non-obvious invention. Guidelines applicable to how an inventor chose to describe her invention in one case may-or may not-be equally applicable in a case

involving a different technology, specification, drawings and claims.

Moreover, the draft noted, claim construction is not an exacting science. Reasonable minds may not always agree on how a claim term or phrase should be construed, as perhaps exemplified by the foregoing cases. Nevertheless, the task of the Court is to determine how one of ordinary skill in the art would have reasonably construed a disputed term or phrase, and to do so based on the record and resources available to the court. "We have frequently stated that the words of a claim 'are generally given their ordinary and customary meaning.' * * * We have made clear, moreover, that the ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Phillips,* --- F.3d at ----. Toward that end, the Federal Circuit has provided both procedural and substantive guidance, as discussed in the draft report and recommendation, and discussed again below in view of *Phillips*.

Overall, although the parties' comments were directed primarily to three areas of the draft report and recommendation, the draft has been reviewed again, in its entirety, in light of *Phillips*. Also, the parties' comments have been considered, not only in terms of the draft, but in light of *Phillips* as well.

1. Patent Claims

The Federal Circuit has instructed the courts that "[t]he actual words of the claim are the controlling focus." Digital Biometrics, Inc. v. Identix, Inc., 149 F.3d 1335, 1344 (Fed.Cir.1998). The Federal Circuit in *Phillips* reiterated that principle:

It is a "bedrock principle" of patent law that "the claims of a patent define the invention to which the patentee is entitled the right to exclude." Innova, 381 F.3d at 1115; *see also Vitronics,* 90 F.3d at 1582 ("we look to the words of the claims themselves * * * to define the scope of the patented invention"); Markman, 52 F.3d at 980 ("The written description part of the specification itself does not delimit the right to exclude. That is the function and purpose of claims."). That principle has been recognized since at least 1836, when Congress first required that the specification include a portion in which the inventor "shall particularly specify and point out the part, improvement, or combination, which he claims as his own invention or discovery." Act of July 4, 1836, ch. 357, s. 6, 5 Stat. 117, 119. In the following years, the Supreme Court made clear that the claims are "of primary importance, in the effort to ascertain precisely what it is that is patented." Merrill v. Yeomans, 94 U.S. 568, 570, 24 L.Ed. 235 (1876). Because the patentee is required to "define precisely what his invention is," the Court explained, it is "unjust to the public, as well as an evasion of the law, to construe it in a manner different from the plain import of its terms." White v. Dunbar, 119 U.S. 47, 52, 7 S.Ct. 72, 30 L.Ed. 303 (1886); *see also Cont'l* Paper Bag Co. v. E. Paper Bag Co., 210 U.S. 405, 419, 28 S.Ct. 748, 52 L.Ed. 1122 (1908) ("the claims measure the invention"); McCarty v. Lehigh Valley R.R. Co., 160 U.S. 110, 116, 16 S.Ct. 240, 40 L.Ed. 358 (1895) ("if we once begin to include elements not mentioned in the claim, in order to limit such claim * * *, we should never know where to stop"); Aro Mfg. Co. v. Convertible Top Replacement Co., 365 U.S. 336, 339, 81 S.Ct. 599, 5 L.Ed.2d 592 (1961) ("the claims made in the patent are the sole measure of the grant").

--- F.3d at ----.

The actual words of the claims, however, are viewed in conjunction with the patent specification of which they are a part and the public record of the exchanges between patent applicants and the U.S. Patent and Trademark Office ("PTO"), namely, the prosecution history: "It is well-settled that, in interpreting an

asserted claim, the court should look first to the intrinsic evidence of record, *i.e.,* the patent itself, including the claims, the specification and, if in evidence, the prosecution his tory * * * * Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language." Bell Atl. Network Servs., Inc. v. Covad Communications Group, Inc., 262 F.3d 1258, 1267 (Fed.Cir.2001), quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996). As noted above, in *Phillips,* the Federal Circuit explained that "[i]mportantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." --- F.3d at ----. The Federal Circuit further explained that:

It is the person of ordinary skill in the field of the invention through whose eyes the claims are construed. Such person is deemed to read the words used in the patent documents with an understanding of their meaning in the field, and to have knowledge of any special meaning and usage in the field. The inventor's words that are used to describe the invention-the inventor's lexicography-must be understood and interpreted by the court as they would be understood and interpreted by a person in that field of technology. Thus the court starts the decisionmaking process by reviewing the same resources as would that person, viz., the patent specification and the prosecution history.

--- F.3d at ----, quoting Multiform Desiccants, Inc. v. Medzam, Ltd., 133 F.3d 1473, 1477 (Fed.Cir.1998). The court also cited V-Formation, Inc. v. Benetton Group SpA, 401 F.3d 1307, 1310 (Fed.Cir.2005) (intrinsic record "usually provides the technological and temporal context to enable the court to ascertain the meaning of the claim to one of ordinary skill in the art at the time of the invention"); and Unitherm Food Sys., Inc. v. Swift-Eckrich, Inc., 375 F.3d 1341, 1351 (Fed.Cir.2004) (proper definition is the "definition that one of ordinary skill in the art could ascertain from the intrinsic evidence in the record"), *inter alia,* with approval.

Procedurally, the Federal Circuit has instructed trial courts in the past to look first to the claim language itself to define the scope of the patented invention, and, as a starting point, to give claim terms their ordinary and accustomed meaning as understood by one of ordinary skill in the art. "The claim construction analysis begins with the words of the claim." Int'l Rectifier Corp. v. IXYS Corp., 361 F.3d 1363, 1369 (Fed.Cir.2004). *See also* Hockerson-Halberstadt, Inc. v. Avia Group Int'l, Inc., 222 F.3d 951, 955 (Fed.Cir.2000). *See also* Ferguson Beauregard/Logic Controls v. Mega Sys., LLC, 350 F.3d 1327, 1347 (Fed.Cir.2003) (Rader J. concurring) ("This court often uses the term 'ordinary and customary meaning.' While the 'ordinary' meaning, often represented by the first listing in a reputable dictionary, can occasionally have relevance to construing terms in a patent claim, this court's case law requires primary reliance on the 'customary' meaning. The 'customary meaning' of a term in a patent claim links the inquiry to the understanding of one of ordinary skill in the art at the time of invention."). In *Phillips,* the Federal Circuit likewise noted that "[t]he inquiry into how a person of ordinary skill in the art understands a claim term provides an objective baseline from which to begin claim interpretation," and "[t]hat starting point is based on the well-settled understanding that inventors are typically persons skilled in the field of the invention and that patents are addressed to and intended to be read by others of skill in the pertinent art." --- F.3d at ----. Nevertheless, the court in *Phillips* also noted that a court is not required to analyze sources "in any specific sequence." "For example, a judge who encounters a claim term while reading a patent might consult a general purpose or specialized dictionary to begin to understand the meaning of the term, before reviewing the remainder of the patent to determine how the patentee has used the term." --- F.3d at ----. In particular, the court explained that "[t]he sequence of steps used by the judge in consulting various sources is not important; what matters is for the court to attach the appropriate weight to be assigned to those sources in light of the statutes and policies that inform patent law." --- F.3d at ----, citing Vitromcs, 90 F.3d at 1582.

In Texas Digital, 308 F.3d at 1204, the court cautioned that "[c]onsulting the written description and prosecution history as a threshold step in the claim construction process, before any effort is made to discern the ordinary and customary meanings attributed to the words themselves, invites a violation of our precedent counseling against importing limitations into the claims." Thus, *Texas Digital* was sometimes characterized as a "dictionaries first" analysis; an analysis that was criticized by virtually all of the some 28 organizations that filed amicus briefs.FN4 To the extent that analysis places the specification in a secondary role to dictionary and like definitions, the *en banc* court in *Phillips* plainly rejected that analysis. *Phillips,* --- F.3d at ---- ("Assigning such a limited role to the specification, and in particular requiring that any definition of claim language in the specification be ex press, is inconsistent with our rulings that the specification is 'the single best guide to the meaning of a disputed term,' and that the specification 'acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication,' " quoting Vitronics, 90 F.3d at 1582.).

FN4. *See, e.g.,* Brief for the Government as *Amicus Curiae* at 9 (urging that the court return to the analysis of Vitronics v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996) ("The specification contains a written description of the invention which must be clear and complete enough to enable those of ordinary skill in the art to make and use it. Thus, the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." (citations omitted.)); Brief of *Amicus Curiae* Intellectual Property Owners Association at ("IPO submits that precedent and policy both suggest that claims should be construed primarily in light of the specification and prosecution history. As the Supreme Court and this Court have found, a patent's claims are part of the patent specification and are the product of prosecution and should be read in that context. In addition, as the primary components of the public record, the specification and prosecution history also best serve the function of putting the public on notice of the patentee's protected rights. Primary reliance on this public record also serves to minimize disputes over which other resources, if any, those of skill in the art would consider in determining claim scope.").

Nevertheless, the Federal Circuit in *Phillips* further commented: "We also acknowledge that the purpose underlying the *Texas Digital* line of cases-to avoid the danger of reading limitations from the specification into the claim-is sound. Moreover, we recognize that the distinction between using the specification to interpret the meaning of a claim and importing limitations from the specification into the claim can be a difficult one to apply in practice. * * * However, the line between construing terms and importing limitations can be discerned with reasonable certainty and predictability if the court's focus remains on understanding how a person of ordinary skill in the art would understand the claim terms." *Phillips,* --- F.3d at ----.

That is, the Federal Circuit has repeatedly emphasized that claims are construed through the "viewing glass" of a person skilled in the art. Interactive Gift Express, Inc. v. CompuServe Inc., 256 F.3d 1323, 1332 (Fed.Cir.2001). *See also* Eastman Kodak Co. v. Goodyear Tire & Rubber Co., 114 F.3d 1547, 1554 (Fed.Cir.1997). "We have made clear, moreover, that the ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, *i.e.,* as of the effective filing date of the patent application." FN5 *Phillips,* --- F.3d at ----. Accordingly, a term used in a patent is interpreted as having the meaning a person of ordinary skill in the field of the invention would give such term in the relevant art at the time of invention, unless the specification or prosecution history indicates that the inventor adopted or advocated a different meaning for

such term. *See* Metabolite, 370 F.3d at 1360 ("The touchstone for discerning the usage of claim language is the understanding of those terms among artisans of ordinary skill in the relevant art at the time of invention. * * * Thus, this court sets the meaning of claim terms by ascertaining their technological and temporal context."); SmithKline Beecham Corp. v. Apotex Corp., 365 F.3d 1306, 1313 (Fed.Cir.2004) ("Claim interpretation requires the court to ascertain the meaning of the claim to one of ordinary skill in the art at the time of invention. * * * This task requires the court to place the claim language in its proper technological and temporal context. The best tools for this enterprise are the various forms of intrinsic evidence and, when appropriate, extrinsic evidence."). *See also* Nat'l Recovery Techs., Inc. v. Magnetic Separation, 166 F.3d 1190, 1195 (Fed.Cir.1999). "Absent a special and particular definition created by the patent applicant, terms in a claim are to be given their ordinary and accustomed meaning." Renishaw PLC v. Marposs Societa' Per Azioni, 158 F.3d 1243, 1249 (Fed.Cir.1998).

FN5. The Federal Circuit thus resolved an open question. The court has not always been consistent in stating whether the controlling date for claim construction purposes is the date of filing or the date of issuance. *See* Inverness Med. Switz. GmbH v. Warner Lambert Co., 309 F.3d 1373, 1378 n. 2 (Fed.Cir.2002) ("Our decisions have not always been consistent as to whether the pertinent date is the filing date of the application or the issue date of the patent."). Most frequently, though, the Federal Circuit seems to have referred to the "time of invention" as the temporal context for construing claim language. *See* Metabolite, 370 F.3d at 1360; SmithKline, 365 F.3d at 1313; Alloc, 342 F.3d at 1368 ("[T]o determine claim meaning, a court immerses itself in the specification, the prior art, and other evidence, such as the understanding of skilled artisans *at the time of invention,* to discern the context and normal usage of the words in the patent claim."); Eastman Kodak, 114 F.3d at 1555 ("the testimony of one skilled in the art about the meaning of claims terms *at the time of invention* will almost always qualify as relevant evidence."). [Emphasis added.] Most recently, the Federal Circuit has explained that the relevant time for construing the meaning of claim terms is the patent's effective filing date. *See* PC Connector Solutions LLC v. SmartDisk Corp., 406 F.3d 1359, 1363 (Fed.Cir.2005) ("A claim cannot have different meanings at different times; its meaning must be interpreted as of its effective filing date.").

The question then becomes what sources a court may justifiably rely on in ascertaining the understanding of one of ordinary skill in the art. The Federal Circuit in *Phillips* noted that "[i]n some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words." --- F.3d at ----. The court noted that "[i]n such circumstances, general purpose dictionaries may be helpful. *Id*. However, the court also noted that "[i]n many cases that give rise to litigation, * * * determining the ordinary and customary meaning of the claim requires examination of terms that have a particular meaning in a field of art. Because the meaning of a claim term as understood by persons of skill in the art is often not immediately apparent, and because patentees frequently use terms idiosyncratically, the court looks to 'those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean.' * * * Those sources include 'the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.' " *Phillips,* --- F.3d at ----, quoting Innova, 381 F.3d at 1116.

The Federal Circuit has held that dictionaries and technical treatises may, in appropriate circumstances, be considered along with other intrinsic evidence in resolving the disputed meaning of claim terms. Vitronics, 90 F.3d at 1584 n. 6. In *Phillips,* the court also explained that dictionaries and treatises may be useful in

claim construction, in the sense of providing the Court with a background understanding of the technology, but clearly and pointedly placed dictionaries and the like in the category of "extrinsic evidence" ("[w]ithin the class of extrinsic evidence, the court has observed that dictionaries and treatises can be useful in claim construction."), along with expert testimony, and gave five reasons why such evidence was less reliable than intrinsic evidence:

-> "First, extrinsic evidence by definition is not part of the patent and does not have the specification's virtue of being created at the time of patent prosecution for the purpose of explaining the patent's scope and meaning."

-> "Second, while claims are construed as they would be understood by a hypothetical person of skill in the art, extrinsic publications may not be written by or for skilled artisans and therefore may not reflect the understanding of a skilled artisan in the field of the patent."

-> "Third, extrinsic evidence consisting of expert reports and testimony is generated at the time of and for the purpose of litigation and thus can suffer from bias that is not present in intrinsic evidence. The effect of that bias can be exacerbated if the expert is not one of skill in the relevant art or if the expert's opinion is offered in a form that is not subject to cross-examination."

-> "Fourth, there is a virtually unbounded universe of potential extrinsic evidence of some marginal relevance that could be brought to bear on any claim construction question. In the course of litigation, each party will naturally choose the pieces of extrinsic evidence most favorable to its cause, leaving the court with the considerable task of filtering the useful extrinsic evidence from the fluff."

-> "Finally, undue reliance on extrinsic evidence poses the risk that it will be used to change the meaning of claims in derogation of the 'indisputable public records consisting of the claims, the specification and the prosecution history,' thereby undermining the public notice function of patents."

--- F.3d at ----.

In rejecting the "dictionaries first" analysis of *Texas Digital,* the *en banc* court in *Phillips* also explained that focusing on a dictionary definition distorts the underlying claim analysis:

The main problem with elevating the dictionary to such prominence is that it focuses the inquiry on the abstract meaning of words rather than on the meaning of claim terms within the context of the patent. Properly viewed, the "ordinary meaning" of a claim term is its meaning to the ordinary artisan after reading the entire patent. Yet heavy reliance on the dictionary divorced from the intrinsic evidence risks transforming the meaning of the claim term to the artisan into the meaning of the term in the abstract, out of its particular context, which is the specification. The patent system is based on the proposition that claims cover only the invented subject matter. As the Supreme Court has stated, "[i]t seems to us that nothing can be more just and fair, both to the patentee and the public, than that the former should understand, and correctly describe, just what he has invented, and for what he claims a patent." Merrill v. Yeomans, 94 U.S. at 573-74. The use of a dictionary definition can conflict with that directive because the patent applicant did not create the dictionary to describe the invention. Thus, there may be a disconnect between the patentee's responsibility to describe and claim his invention, and the dictionary editors' objective of aggregating all possible definitions for particular words.

--- F.3d at ----, and "[t]he problem is that if the district court starts with the broad dictionary definition in every case and fails to fully appreciate how the specification implicitly limits that definition, the error will systematically cause the construction of the claim to be unduly expansive. The risk of systematic overbreadth is greatly reduced if the court instead focuses at the outset on how the patentee used the claim term in the claims, specification, and prosecution history, rather than starting with a broad definition and whittling it down." --- F.3d at ----.

Phillips, however, was not the first case to criticize reliance on dictionary definitions. As the draft report and recommendation noted, the Federal Circuit has previously explained that abstract dictionary definitions are not necessarily determinative of the meaning of claim language. Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc., 334 F.3d 1294, 1300 (Fed.Cir.2003); DeMarini Sports, Inc. v. Worth, Inc., 239 F.3d 1314, 1324 (Fed.Cir.2001) ("We cannot look at the ordinary meaning of the term 'frame' in a vacuum')." Indeed, the Federal Circuit and one of its predecessor courts, the CCPA, has long cautioned against over-reliance on dictionary definitions alone in construing claims:

Words are used in many senses and often have diametrically opposed meanings, depending upon the sense in which they are used * * * But the words in which a claim is couched may not be read in a vacuum. One need not arbitrarily pick and choose from the various accepted definitions of a word to decide which meaning was intended as the word is used in a given claim. The subject matter, the context, etc., will more often than not lead to the correct conclusion.

Liebscher v. Boothroyd, 46 C.C.P.A. 701, 258 F.2d 948, 951 (C.C.P.A.1958).

The Federal Circuit has also cautioned against the use of non-scientific dictionaries to define technical terms "lest dictionary definitions * * * be converted into technical terms of art having legal, not linguistic significance." Multiform Desiccants, Inc. v. Medzam, Ltd., 133 F.3d 1473, 1478 (Fed.Cir.1998). Non-technical dictionaries, of course, may be used as a guide to the intended or ordinary meaning of non-technical terms being used in a non-technical context, or even technical terms being used in an "ordinary way." *See* Dow Chem. Co. v. Sumitomo Chem. Co., 257 F.3d 1364, 1373 (Fed.Cir.2001) ("technical terms often have an 'ordinary meaning' as understood by one of ordinary skill in the art, although these same terms may not be readily familiar to a judge, or may be familiar only in a different context."). But, general-usage dictionaries are not helpful where artisans in the field attach a special meaning to a claim term-or no meaning at all. *See* Vanderlande Indus. Nederland BV v. United States Int'l Trade Comm'n, 366 F.3d 1311, 1321 (Fed.Cir.2004) ("Claims are to be construed from the vantage point of a person skilled in the relevant art. To the extent that this artisan would understand a claim term to have the same meaning in the art as that term has in common, lay usage, a general-usage dictionary can be a helpful aid to claim construction. But where evidence-such as expert testimony credited by the factfinder, or technical dictionaries-demonstrates that artisans would attach a special meaning to a claim term, or, as here, would attach no meaning at all to that claim term (independent of the specification), general-usage dictionaries are rendered irrelevant with respect to that term; a general-usage dictionary cannot overcome credible art-specific evidence of the meaning or lack of meaning of a claim term.").

In *Phillips,* the court expanded its criticism of using general dictionaries to define claim terms: "Dictionaries, by their nature, provide an expansive array of definitions. General dictionaries, in particular, strive to collect all uses of particular words, from the common to the obscure. By design, general dictionaries collect the definitions of a term as used not only in a particular art field, but in many different settings. In such circumstances, it is inevitable that the multiple dictionary definitions for a term will extend

beyond the 'construction of the patent [that] is confirmed by the avowed un derstanding of the patentee, expressed by him, or on his behalf, when his application for the original patent was pending.' * * * Thus, the use of the dictionary may extend patent protection beyond what should properly be afforded by the inventor's patent." [Citation omitted.] --- F.3d at ----.

The court also criticized the use of technical dictionaries, "[e]ven technical dictionaries or treatises, under certain circumstances, may suffer from some of these deficiencies. There is no guarantee that a term is used in the same way in a treatise as it would be by the patentee. In fact, discrepancies between the patent and treatises are apt to be common because the patent by its nature de scribes something novel," and dictionaries in general: "Moreover, different dictionaries may contain somewhat different sets of definitions for the same words. A claim should not rise or fall based upon the preferences of a particular dictionary editor, or the court's independent decision, uninformed by the specification, to rely on one dictionary rather than another. Finally, the authors of dictionaries or treatises may simplify ideas to communicate them most effectively to the public and may thus choose a meaning that is not pertinent to the understanding of particular claim language. * * * The resulting definitions therefore do not necessarily reflect the inventor's goal of distinctly setting forth his invention as a person of ordinary skill in that particular art would understand it." --- F.3d at ----.

Thus, while the court in *Phillips* acknowledged that "[a] dictionary definition has the value of being an unbiased source 'accessible to the public in advance of litigation,' " --- F.3d at ----, quoting Vitronics, 90 F.3d at 1585, and reiterated its holding in *Vitronics,* that judges are free to consult dictionaries and technical treatises:

at any time in order to better understand the underlying technology and may also rely on dictionary definitions when construing claim terms, so long as the dictionary definition does contradict any definition found in or ascertained by a reading of the patent documents.

Id. at 1584 n. 6, clearly the Federal Circuit has communicated that the specification, and secondly, the prosecution history, is of paramount importance in construing disputed claim language.FN6

FN6. That was the position advocated, *inter alia,* by the government, *i.e.,* the PTO, Federal Trade Commission and the Department of Justice. *See* Brief for the United States as *Amicus Curiae* at 9-13. For example, although the government noted that sources such as dictionaries could be used as background in assessing how one of ordinary skill in the art would construe a term or phrase, the government also urged that "[t]he very nature of a patent as a legal document demands that the specification, rather than evidence extrinsic to the patent like dictionaries, serve as the primary source for determining its legal scope." *Id*. at 15. Some of the organizations filing amicus briefs urged a balanced approach. For example, the ABA urged that "[r]egarding the dictionary-versus-specification dispute, the ABA supports a middle ground, whereby neither has primacy and both must be considered. In construing a patent claim term, the court should consider the ordinary meaning of the term to one of ordinary skill in the art as used in the context of the patent, unless (a) the patentee has acted as his or her own lexicographer, in which case the patentee's definition should control; or (b) there has been a clear disavowal of claim scope, in which case the patentee should be bound by such action. The ordinary meaning of the term, as used in the context of the patent, is determined by reference to the primary sources (*i.e.,* the specification, the prosecution history, dictionaries and similar objective sources). Secondary sources, such as expert testimony, may not be used to contradict the ordinary meaning of a claim term discernible from the primary sources. Trial courts are, however, always free to receive such evidence because expert testimony and other secondary sources can educate the

Court on the technology and may assist the court in determining the ordinary meaning of a term." Brief of the American Bar Association As *Amicus Curiae* at 2-3. The AIPLA similarly urged that the court should adopt a "balanced" approach, beginning with the "fundamental standard" that "a claim term must be construed from the perspective of a person of ordinary skill in the relevant art at the time the patent issued seeking to understand the term's meaning from a study of the entire intrinsic record." Brief for *Amicus Curiae* American Intellectual Property Law Association at 2. The Association of the Bar of the City of New York urged that "[t]he public notice function patent claims is better served by construing the claims with reference to the patent specification, including the drawings, as well as the file history. General purpose and technical dictionaries, treatises and the like should be consulted as needed to help elucidate the ordinary meaning of claim terms to one skilled in the art. While dictionaries are potentially useful tools for construing the meaning of claim terms, they should not trump the understanding of the term by skilled artisans. The approach to construction should be multi-factored rather than hierarchical." Brief for *Amicus Curiae* The Association of the Bar of the City of New York at 5.

"The written description is considered, in particular to determine if the patentee acted as his own lexicographer, as our law permits, and ascribed a certain meaning to those claim terms." Digital Biometrics, 149 F.3d at 1344. In that sense, the specification functions more or less as a dictionary "when it expressly defines terms used in the claims or when it defines terms by implication." Vitronics, 90 F.3d at 1582. Even beyond that, though, the Federal Circuit has noted that "the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Id*. Claims, for that reason, are construed in light of the specification. *See* Fuji Photo Film Co., v. United States Int'l Trade Comm'n, 386 F.3d 1095, 1098 (Fed.Cir.2004) ("[c]laims must be read in the context of the specification of which they are a part,"); ATD Corp. v. Lydall, Inc., 159 F.3d 534, 540 (Fed.Cir.1999). Doing so puts the claims in the context of the invention actually disclosed, Astrazeneca AB v. Mutual Pharmaceutical Co., 384 F.3d 1333 (Fed.Cir.2004) ("On this view, the patent is an integrated document, with the claims 'pointing out and distinctly claiming,' 35 U.S.C. s. 112, the invention described in the rest of the specification and the goal of claim construction is to determine what an ordinary artisan would deem the invention claimed by the patent, taking the claims together with the rest of the specification."), and permits one to determine whether a patentee disclaimed subject matter, or described a particular embodiment as being important to the invention, or used a term that simply requires reference to the specification or prosecution history to determine the scope of the claim. *See* CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366-67 (Fed.Cir.2002).

The court, in construing disputed terms and phrases may, and perhaps must, consider other unasserted claims as well. Vitronics, 90 F.3d at 1582. "The fact that we must look to other claims using the same term when interpreting a term in an asserted claim mandates that the term be interpreted consistently in all claims," Southwall Techs., Inc. v. Cardinal IG Co., 54 F.3d 1570, 1579 (Fed.Cir.1995), *cert. denied,* 516 U.S. 987, 116 S.Ct. 515, 133 L.Ed.2d 424 (1995), unless "the language of the written description is sufficient to put a reader on notice of the different uses of a term, and where those uses are further apparent from publicly-available documents referenced in the patent file." In such a case "it is appropriate to depart from the normal rule of construing seemingly identical terms in the same manner." Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1311 (Fed.Cir.1999). Dependent claims may aid in interpreting the scope of the claims from which they depend, Laitram Corp. v. NEC Corp., 62 F.3d 1388, 1392 (Fed.Cir.1995), because the court should "not interpret an independent claim in a way that is inconsistent with a claim which depends from it." Wright Med. Tech., Inc. v. Osteonics Corp., 122 F.3d 1440, 1445 (Fed.Cir.1997). The court in *Phillips* reiterated those principles: "Other claims of the patent in question, both

asserted and unasserted, can also be valuable sources of enlightenment as to the meaning of a claim term. * * * Because claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. * * * Differences among claims can also be a useful guide in understanding the meaning of particular claim terms. * * * For example, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim." --- F.3d at ----.

Lastly, a court must give meaning to all of the words in a claim, Ethicon Endo-Surgery, Inc. v. United States Surgical Corp., 93 F.3d 1572, 1577 (Fed.Cir.1996), and is not free to read any limitations out of a claim. Exxon Chem. Patents, Inc. v. Lubrizol Corp., 64 F.3d 1553, 1555 (Fed.Cir.1995), *cert. denied,* 518 U.S. 1020, 116 S.Ct. 2554, 135 L.Ed.2d 1073 (1996).

2. Construction In Light of the Specification

Although the specification, as the court explained in *Phillips,* is the principal guide to the meaning of the claims, courts must also guard against improperly reading limitations from the specification into the claims, as discussed above. The familiar claim construction canons are: "(a) one may not read a limitation into a claim from the written description, but (b) one may look to the writ ten description to define a term already in a claim limitation, for a claim must be read in view of the specification of which it is a part. These two rules lay out the general relationship between the claims and the written description. * * * As rules at the core of claim construction methodology, they provide guideposts for a spectrum of claim construction problems." Renishaw, 158 F.3d at 1248. The Federal Circuit has recognized, though, "that there is sometimes a fine line between reading a claim in light of the specification, and reading a limitation into a claim from the specification." Comark Communications, Inc. v. Harris Corp., 156 F.3d 1182, 1186 (Fed.Cir.1998); Liebel-Flarsheim, 358 F.3d at 904. In *Phillips* as well, the court noted that "we recognize that the distinction between using the specification to interpret the meaning of a claim and importing limitations from the specification into the claim can be a difficult one to apply in practice," and advised that "the line between construing terms and importing limitations can be discerned with reasonable certainty and predictability if the court's focus remains on understanding how a person of ordinary skill in the art would under stand the claim terms." --- F.3d at ----. And, once again, the court in *Phillips* emphasized that one of ordinary skill in the art reads the claims as part of the patent as a whole ("Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." --- F.3d at ----.)

The difference between reading claims in light of the specification and reading limitations from the specification into the claims, the Federal Circuit has said, may thus turn on how the specification characterizes the claimed invention. SunRace Roots Enter. Co. v. SRAM Corp., 336 F.3d 1298, 1305 (Fed.Cir.2003). In *Phillips,* the court explained that "[t]o avoid importing limitations from the specification into the claims, it is important to keep in mind that the purposes of the specification are to teach and enable those of skill in the art to make and use the invention and to provide a best mode for doing so. * * * One of the best ways to teach a person of ordinary skill in the art how to make and use the invention is to provide an example of how to practice the invention in a particular case." --- F.3d at ----. According to the court, "[m]uch of the time, upon reading the specification in that context, it will become clear whether the patentee is setting out specific examples of the invention to accomplish those goals, or whether the patentee instead intends for the claims and the embodiments in the specification to be strictly coextensive." *Phillips,* --- F.3d at ----. "The manner in which the patentee uses a term within the specification and claims usually will make

the distinction apparent." *Phillips,* --- F.3d at ----, citing Snow v. Lake Shore & M.S. Ry. Co., 121 U.S. 617, 630, 7 S.Ct. 1343, 30 L.Ed. 1004 (1887). *See also Rhodia* Chimie v. PPG Industries, Inc., 402 F.3d 1371, 1378 (Fed.Cir.2005) ("[b]ecause the only measurement of the dust produced by Examples 5 and 10 was articulated in terms of the DIN 53 583 standard, the district court properly incorporated that articulation into its construction of the term 'dust-free and non-dusting.' The results of the DIN testing showed that Example 5 produced more dust than Example 10. Accordingly, the court defined the outer limit for the level of dust created by the invention by reference to the DIN test results for Example 5.").

Accordingly, the Federal Circuit has said that one must "look[ ] to whether the specification refers to a limitation only as a part of less than all possible embodiments or whether the specification read as a whole suggests that the very character of the invention requires the limitation be a part of every embodiment." Alloc, 342 F.3d at 1370. The Federal Circuit has also observed that "[a]lthough a statement's location is not 'determinative,' the location can signal the likelihood that the statement will support a limiting definition of a claim term. Statements that describe the invention as a whole, rather than statements that describe only preferred embodiments, are more likely to support a limiting definition of a claim term. * * * Statements that describe the invention as a whole are more likely to be found in certain sections of the specification, such as the Summary of the Invention. * * * Accordingly, other things being equal, certain sections of the specification are more likely to contain statements that support a limiting definition of a claim term than other sections, although what import to give language from the specification must, of course, be determined on a case-by-case basis." C.R. Bard, Inc. v. United States Surgical Corp., 388 F.3d 858, 864 (Fed.Cir.2004) [Internal citations omitted.].

Nevertheless, the Federal Circuit has made clear that "[i]t is improper for a court to add 'extraneous' limitations to a claim, that is, limitations added wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim." Hoganas AB v. Dresser Indus., Inc., 9 F.3d 948, 950 (Fed.Cir.1993). *See also* Glaxo Wellcome, Inc. v. Andrx Pharms., Inc., 344 F.3d 1226, 1233 (Fed.Cir.2003) ("When a claim term has an accepted scientific meaning, that meaning is generally not subject to restriction to the specific examples in the specification."). That is, "[t]he written description * * * is not a substitute for, nor can it be used to rewrite, the chosen claim language." SuperGuide Corp. v. DirecTV Enters., Inc., 358 F.3d 870, 875 (Fed.Cir.2004). If the court does not need to rely on a limitation to interpret what a patentee meant by a particular term or phrase in a claim, "that limitation is 'extraneous' and cannot constrain the claim." Renishaw, 158 F.3d at 1249.

The Federal Circuit has also cautioned that a "preferred embodiment" disclosed in a specification "is just that, and the scope of a patentee's claims is not necessarily or automatically limited to the preferred embodiment." Amhil Enters. Ltd. v. Wawa, Inc., 81 F.3d 1554, 1559 (Fed.Cir.1996). *See also* Home Diagnostics, Inc. v. LifeScan, Inc., 381 F.3d 1352, 1357 (Fed.Cir.2004) ("The district court erred by placing too much emphasis on the specification's discussion of the preferred embodiments, rather than the meaning of the claims themselves."). On the other hand, in some instances, the written description requirement of 35 U.S.C. s. 112(1) warrants a claim construction that encompasses only the disclosed embodiment. *See* Laitram Corp. v. Morehouse Indus., 143 F.3d 1456, 1463; *N.* Am. Vaccine, Inc. v. Am. Cyanamid Co., 7 F.3d 1571, 1576-77 (Fed.Cir.1993). "Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim. * * * The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." Renishaw, 158 F.3d at 1250; *Phillips,* --- F.3d at ---- (adopting the same).

3. Prosecution History

In similar fashion, "[t]he prosecution history is relevant because it may contain contemporaneous exchanges between the patent applicant and the PTO about what the claims mean." Digital Biometrics, 149 F.3d at 1344. "The prosecution history, which we have designated as part of the 'intrinsic evidence,' consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent." *Phillips,* --- F.3d at ----. "[A]rguments made during prosecution shed light on what the applicant meant by its various terms," Morehouse Industries, 143 F.3d at 1462 (Fed.Cir.1998); *see also* Vitronics, 90 F.3d at 1582, "whether relied on by the examiner or not." Microsoft Corp. v. Multi-Tech Sys., Inc., 357 F.3d 1340, 1350 (Fed.Cir.2004). Thus, the trial court may be required to examine the prosecution history, when it is of record, to determine whether the patentee has explained what was meant by language used in a claim or has "disclaimed" a potential claim construction in an amendment to the claim or in an argument. Southwall, 54 F.3d at 1576; Interactive Gift, 256 F.3d at 1331. Among other things, the "doctrine of prosecution disclaimer" precludes patentees from recapturing through claim interpretation specific meanings disclaimed during prosecution. *See* Omega Eng'g, Inc. v. Raytek Corp., 334 F.3d 1314, 1324 (Fed.Cir.2003). Also, prior art listed in a patent may be used to guide claim construction. *See V-* Formation, 401 F.3d 1307.

In *Phillips,* the court explained that "[l]ike the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent. * * * Furthermore, like the specification, the prosecution history was created by the patentee in attempting to explain and obtain the patent." --- F.3d at ----. However, the court explained, "because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes." --- F.3d at ----. "Nonetheless, the prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." --- F.3d at ----. Also, the prosecution history of related patents may *sometimes* be used to aid in claim construction if that relationship is familial or such other patents have been incorporated by reference. *See* Goldenberg v. Cytogen, 373 F.3d 1158, 1167 (Fed.Cir.2004) ("[i]n the absence of an incorporation into the intrinsic evidence, this court's precedent takes a narrow view on when a related patent or its prosecution history is available to construe the claims of a patent at issue and draws a distinct line between patents that have a familial relationship and those that do not").

4. Extrinsic Evidence

The Federal Circuit has explained that "[i]n most situations, an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term. In such circumstances, it is improper to rely on extrinsic evidence." Vitronics, 90 F.3d at 1583. However, the court has also recognized that "the testimony of one skilled in the art about the meaning of claim terms at the time of the invention will almost always qualify as relevant evidence." Eastman Kodak 114 F.3d at 1555. In *Phillips,* the court reiterated that "[w]e have also held that extrinsic evidence in the form of expert testimony can be useful to a court for a variety of purposes, such as to provide background on the technology at issue, to explain how an invention works, to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field." --- F.3d at ----.

Thus, a court may admit and accept testimony by the parties' expert witnesses as background in the technical

area at issue, Mantech Envtl. Corp. v. Hudson Envtl. Sys., Inc., 152 F.3d 1368, 1372-1373 (Fed.Cir.1998), and "it is entirely appropriate, perhaps even preferable, for a court to consult trustworthy extrinsic evidence to ensure that the claim construction it is tending to from the patent file is not inconsistent with clearly expressed, plainly apposite, and widely held understandings in the pertinent technical field." Pitney Bowes, 182 F.3d at 1309. "But testimony on the technology is far different from other expert testimony, whether it be of an attorney, a technical expert, or the inventor, on the proper construction of a disputed claim term * * *. The latter kind of testimony may only be relied upon if the patent documents, taken as a whole, are insufficient to enable the court to construe disputed claim terms." Id. at 1308-09. Thus, extrinsic evidence may be used by the court to assist in the proper understanding of a disputed limitation. But, such evidence may not be used to vary, contradict, expand, or limit the claim language from how it is defined in the specification or file history. Vitronics, 90 F.3d at 1584-85. In particular, the court has held that "conclusory, unsupported assertions by experts as to the definition of a claim term are not useful to a court. Similarly, a court should discount any expert testimony 'that is clearly at odds with the claim construction mandated by the claims themselves, the written description, and the prosecution history, in other words, with the written record of the patent.' " *Phillips,* --- F.3d at ----, quoting Key Pharms. v. Hercon Labs. Corp., 161 F.3d 709, 716 (Fed.Cir.1998).

The following report and recommendations concerning the claim terms in dispute are made with the foregoing principles and guidelines in mind.

III.

Disclosures of the Patents-In-Issue

The following description of the patents-in-suit is simply that, and should not be interpreted as adopting either of the parties' proposed claim constructions. The actual disclosures of those patents are discussed in greater detail below in conjunction with deciding the construction of the particular disputed terms and phrases.

A. Brief Description of the Patents-In-Suit

1. U.S. Patent No. 6,070,378-**the** '378 Patent

a) Description

The '378 patent issued on June 6, 2000, from application No. 09/139,566, filed on August 25, 1998. Application No. 09/139,566 was filed as a division of application No. 09/037,888 filed on March 10, 1998, which, in turn was a division of application No. 08/723,109 filed on September 30, 1996, now U.S. Patent No. 5,794,402. The '378 patent lists Chris Dumlao and Eric Abrahamson as inventors, and indicates that the patent has been assigned to Martin Marietta Materials, Inc.

The abstract FN7 of the ' 378 patent explains that the patent relates to a "load bearing deck of a modular structural section for use in support structures such as a load bearing deck or highway bridge," having "a load bearing deck preferably formed of a polymer matrix composite material." In particular, the ' 378 patent explains that the patent "relates to support structures such as bridges, piers, docks, load bearing decking applications, such as hulls and decks of barges, and load bearing walls. More particularly, this invention

relates to a modular composite load bearing support structure including a polymer matrix composite modular structural section for use in constructing bridges and other load bearing structures and components." Col. 1, lines 11-18. In general terms, the "modular load bearing support structure" provides a replacement for-and asserted improvements over-concrete, steel and wood structures.

FN7. The Federal Circuit has held that an abstract may be used when construing claims, despite the contrary language of 37 C.F.R. s. 1.72(b), PTO Rule 72(b). *See* Hill-Rom Co. v. Kinetic Concepts, Inc., 209 F.3d 1337, 1341 n. 1 (Fed.Cir.2000).

Fig. 2, according to the specification, "is an exploded partial perspective view of a modular structural section of the bridge according to the present invention." Col. 5, lines 50-52.

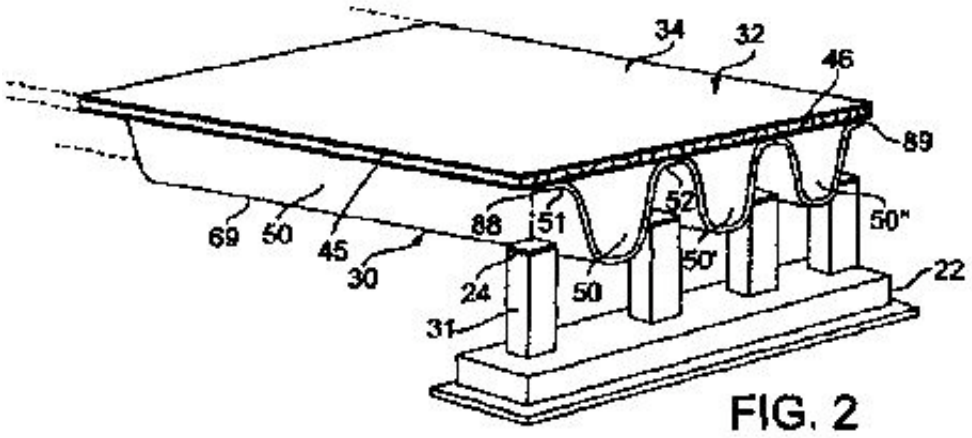


FIG. 2

Of particular interest, insofar as the disputed claim terms are concerned, is deck panel 32, shown in more detail in Fig. 3:

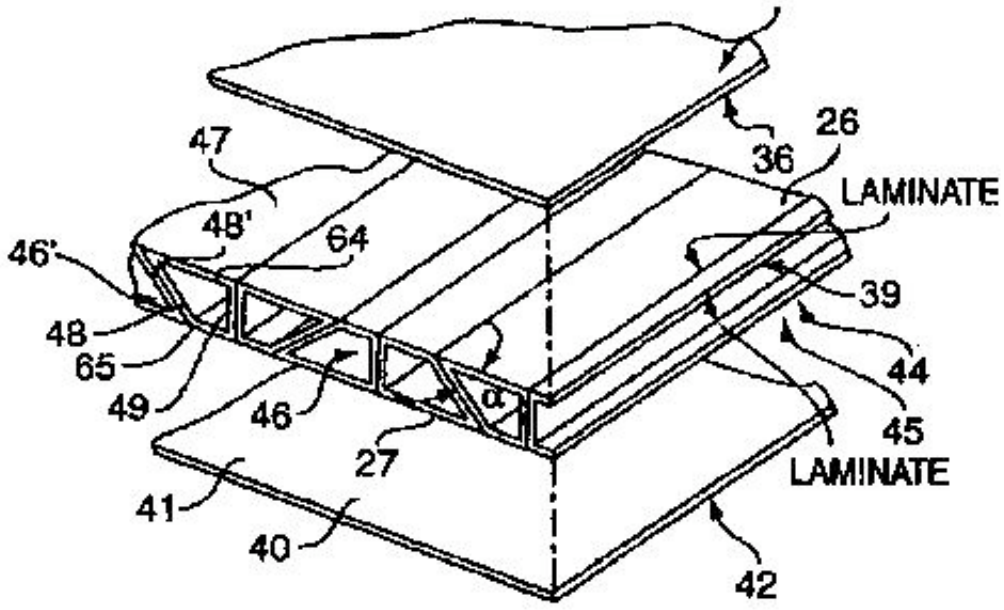
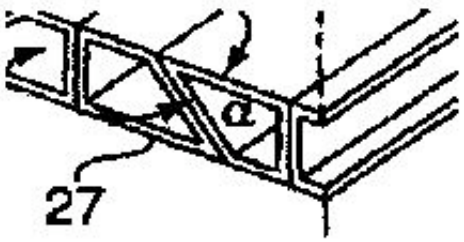


FIG. 3

The specification explains that "[a]s shown in FIG. 3, each sandwich panel 34 comprises an upper surface shown as an upper facesheet 35,FN8 a lower surface shown as a lower facesheet 40 and a core 45 including a plurality of elongate core members 46." Col. 8, lines 21-25. The specification also explains that "[t]he core members 46 are shown as hollow tubes of trapezoidal cross-section (FIGS. 2-3 and 5-7). Each of the trapezoidal tubes 46 includes a pair of side walls 48, 49. One of the side walls 48 is disposed at an oblique angle a to one of the upper and lower facesheets 35, 40 such that the side walls 48, 49 and the upper wall 64 and lower wall 65, when viewed in cross-section, define a polygonal shape such as a trapezoidal cross-section (FIG.3)." The specification explains that "[t]he oblique angle a of the side wall 48 with respect to the upper wall 64 is preferably about 45 (deg.), but angles between about 30 (deg.) and 45 (deg.) can be provided in alternative embodiments. Each tube 46 has a side wall 48 positioned generally adjacent to a side wall 48' of an adjacent tube 46' (FIG.3). Alternatively, the tubes 46 could be aligned in other configurations such as having a space between adjacent side walls." Col. 8, lines 26-40.

FN8. It appears that when the patent was printed, the reference numeral "35" was deleted from the figure. A similar Fig. 3 from the '118 patent illustrates the following:

That angle a is shown in the following exploded view of Fig. 3:



Although the "core members 46" are described in the foregoing embodiment as defining a polygonal shape, the specification explains that "[a] variety of sizes, shapes and configurations of the elongate core members can be provided. Various other polygonal cross-sectional shapes can also be employed, such as quadrilaterals, parallelograms, other trapezoids, pentagons, and the like," and "[f]urther, alternatively, tubes and other polygonal core members of a variety of lengths and cross-sectional heights and width dimensions can be provided in forming a deck of the modular structural section according to the present invention." Col. 9, lines 1-5, 12-16.

The specification also explains that the function of the sidewalls, configured as discussed above at an oblique angle, provide transverse shear stiffness, and the sidewalls configured vertically provide "structural support for localized loads":

The side walls 48, 48' disposed at an oblique angle (alpha) provide transverse shear stiffness for the deck core 45. This increases the transverse bending stiffness of the overall deck 32. The sidewall 48 shown at the preferred 45 (deg.) angle (alpha) provides the highest bending stiffness. The trapezoidal tubes 46 also preferably have a vertical side wall 49 positioned between adjacent diagonal side walls 48, 48'. The vertical sidewall 49 provides structural support for localized loads subjected on the deck 32 to prevent excessive deflection of the top facesheet 35 along the span between the intersection of the diagonal walls 48, 48' and the upper facesheet 35.

Thus, the shape including the angled side wall 48 of the trapezoidal tube 46 provides stiffness across the cross-section of the tube 46. An adjacent tube 46' includes a side wall 48' angled in an opposite orientation between the upper and lower surface from the adjacent angled side wall 48. Providing side walls 48, 49 at varying orientations preserves the mathematical symmetry of the cross-section of the tubes 46. When normalized by weight between the side wall 48 and one of the upper wall 64 and lower wall 65, the trapezoidal tube 46 with at least a 45 (deg.) angle has a transverse shear stiffness 2.6 times that of a tube with a square cross-section. Alternatively, for a tube with an oblique angle of about 30 (deg.), the transverse shear stiffness is 2.2 times that of a tube with a square shaped cross-section.

Col. 8, lines 41-64.

As noted above, the invention of the '378 patent includes the use of a "polymer matrix composite." The specification explains that such composite is formed using reinforcing fibers and a polymer resin: "In the embodiment of FIGS. 1-7, the modular structural section 30, including the deck 32 and preferably the beams 50, 50', 50" is formed of a polymer matrix composite comprising reinforcing fibers and a polymer resin." Col. 7, lines 35-38. The specification gives several examples of such reinforcing fibers: "Suitable reinforcing fibers include glass fibers, including but not limited to E-glass and S-glass, as well as carbon, metal, high modulus organic fibers (e.g., aromatic polyamides, polybenzamidazoles, and aromatic polyimides), and other organic fibers (e.g., polyethylene and nylon). Blends and hybrids of the various

fibers can be used. Other suitable composite materials could be utilized including whiskers and fibers such as boron, aluminum silicate and basalt." Col. 7, lines 38-46.

The specification also gives examples of preferred resins: "The resin material in the modular structural section 30, including the deck 32 is preferably a thermosetting resin, and more preferably a vinyl ester resin. The term 'thermosetting' as used herein refers to resins which irreversibly solidify or 'set' when completely cured. Useful thermosetting resins include unsaturated polyester resins, phenolic resins, vinyl ester resins, polyurethanes, and the like, and mixtures and blends thereof. The thermosetting resins useful in the present invention may be used alone or mixed with other thermosetting or thermoplastic resins. Exemplary other thermosetting resins include epoxies. Exemplary thermoplastic resins include polyvinylacetate, styrenebutadiene copolymers, polymethylmethacrylate, polystyrene, cellulose acetatebutyrate, saturated polyesters, urethane-extended saturated polyesters, methacrylate copolymers and the like." Col. 7, lines 48-61.

The specification further explains, though, that the polymer matrix composites can be tailored to provide certain mechanical properties by selectively mixing and orienting the fibers, resins and material forms:

Polymer matrix composites can, through the selective mixing and orientation of fibers, resins and material forms, be tailored to provide mechanical properties as needed. These polymer matrix composite materials possess high specific strength, high specific stiffness and excellent corrosion resistance. In the embodiment shown in FIGS. 1-7, a polymer matrix composite material of the type commonly referred to as a fiberglass reinforced polymer (FRP) or sometimes, as glass fiber reinforced polymer (GFRP) is utilized in the deck 32 and preferably the beams 50, 50', 50". The reinforcing fibers of the modular structural section 30, including the deck 32 and the beams 50, 50', 50", are glass fibers, particularly E-glass fibers, and the resin is a vinylester resin. Glass fibers are readily available and low in cost. E-glass fibers have a tensile strength of approximately 3450 MPa (practical). Higher tensile strengths can alternatively be accomplished with S-glass fibers having a tensile strength of approximately 4600 MPa (practical). Polymer matrix composite materials, such as a fiber reinforced polymer formed of E-glass and a vinylester resin have exceptionally high strength, good electrical resistivity, weather and corrosion-resistance, low thermal conductivity, and low flammability.

Col. 7, line 62-Col. 8, line 16.

According to the specification, "core members" or "tubes" 46 may be formed of the same material: "The tubes 46 are also preferably formed of a polymer matrix composite material comprising reinforcing fibers and a polymer resin. Suitable materials are the same polymer matrix composite materials as previously discussed herein, the discussion is hereby incorporated by reference. The tubes 46, are most preferably E-glass fibers in a vinylester resin (FIG.3)." Col. 9, lines 17-23.

With respect to how "tubes" 46 are made, the specification explains that "tubes" 46 may be fabricated using several different processes: "The tubes 46 can be fabricated by pultrusion, hand lay-up or other suitable methods including resin transfer molding (RTM), vacuum curing and filament winding, automated layup methods and other methods known to one of skill in the art of composite fabrication and are therefore not described in detail herein. The details of these methods are discussed in *Engineered Materials Handbook, Composites,* Vol. 1, ASM International (1993)." Col. 9, lines 24-31.

According to the specification, upper facesheet 35 and lower facesheet 40 are also preferably formed of

polymer matrix composite materials, which then "sandwich" "tubes" 46: "the sandwich panels 34 each also have an upper surface shown as an upper facesheet 35 and a lower surface shown as facesheet 40 (FIG.3). The tubes 46 are sandwiched between a lower surface 36 of the upper facesheet 35 and the upper surface 41 of the lower facesheet 40. As seen in FIG. 3, the lower face sheet 40 and the upper face sheet 35 are sheets preferably formed of polymer matrix composite materials and more preferably formed of fiberglass fibers and a polymer or vinylester resin as described herein." Col. 9, lines 52-61.

When so constructed, according to the specification, upper and lower facesheets 35, 40 are then preferably "laminated or adhered" to "tubes 46" using a resin "and/or other bonding means" and "joined with the tubes 46 by mechanical or fastening means" such as bolts or screws:

Having fabricated the upper and lower facesheets 35, 40 as described herein, the lower surface 36 of the upper face sheet 35 is preferably laminated or adhered to the upper surface 47 of the tubes 46 by a resin 26 and/or other bonding means and joined with the tubes 46 by mechanical or fastening means including, but not limited to, bolts or screws. Likewise, the upper surface 41 of the lower facesheet 40 is preferably laminated to the lower surface 27 of the tubes 46 by resin 26 or other bonding means and joined with the tubes 46 by mechanical fastening means including, but not limited to, bolts or screws.

Col. 9, line 62-Col. 10, line 5.

The specification, though, also explains that the core 45 may be joined to upper and lower facesheets 35, 40 using (1) fasteners alone, or (2) adhesives or other "bonding means" alone: "The core 45, including the tubes 46, and the upper and lower facesheets 35, 40 can be alternatively joined with fasteners alone, including bolts and screws, or by adhesives or other bonding means alone. Suitable adhesives include room temperature cure epoxies and silicones and the like." Col. 10, lines 6-10. Also, according to the specification, "alternatively, the tubes could be provided integrally formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods." Col. 10, lines 11-14.

Specifically, the specification describes and illustrates fabricating upper and lower facesheets 35, 40 using a "hand lay-up" method: "In the deck shown in FIGS. 1-7, the upper and lower face-sheets 35, 40 are hand laid of polymer matrix composite material. In the deck 32 shown in FIGS. 1-7, the upper and lower facesheets 35, 40 are hand-laid, heavy weight, knitted, fiberglass fabric." Col. 10, lines 21-25. *See also* Col. 10, lines 26-57. The specification also explains, however, that the face-sheets may be fabricated using automated layup methods. Col. 10, lines 53-54.

The specification explains, though, that the facesheets and core may be fabricated using other methods: "While the upper and lower facesheets 35, 40, are fabricated using a hand-layup process, the core 45 including the facesheets 35, 40 can alternatively be fabricated by other methods such as pultrusion, resin transfer molding (RTM), vacuum curing and filament winding and other methods known to one of skill in the art of composite fabrication, which, therefore, are not discussed in detail herein. The details of these methods are discussed in *Engineered Materials Handbook: Composites,* Vol. 1, AJM International (1993)." Col. 10, lines 58-67. Additionally, the specification explains that the facesheets and core may be fabricated as a single component: "Further, the face-sheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes." Col. 10, line 67-Col. 11, line 3.

Lastly, insofar as pertinent here, the specification explains that although Fig. 3 illustrates upper and lower facesheets 35, 40 being adhered to a plurality of "tubes" 46, other alternatives are available:

As shown in FIG. 3, a single upper face sheet 35 and a single lower face sheet 40 can each [be] adhered to a plurality of tubes. Alternatively, any number of face-sheets and any number of tubes can be connected to form the sandwich panel of the deck for a modular section. Also, alternatively, various sizes and configurations of facesheets and cores can be provided to accommodate various applications. The resulting deck 32 is provided as a unitary structural component which can be used by itself or as a component of a modular section 30 for thereby constructing a support structure including a bridge or other structure therefrom. The deck 32 can be utilized in other structural applications as described herein.

Col. 11, lines 4-15.

b) Prosecution History

(1) Original Application

As noted above, the '378 patent issued on June 6, 2000, from application No. 09/139,566, filed on August 25, 1998, which was filed as a division of application No. 09/037,888 filed on March 10, 1998, which, in turn was a division of application No. 08/723,109 filed on September 30, 1996, now U.S. Patent No. 5,794,402. The parties have not submitted, and the record therefore does not contain, the file histories of the earlier applications.

Application No. 09/139,566, as a divisional, was filed with original claims 1-31, however, the applicants' filing transmittal form requested cancellation of claims 2-31, and entry of a preliminary amendment that added claims 32-42. Application claim 32 was the only independent claim, and ultimately became patent claim 1 of the '378 patent. As pertinent here, application claim 34 ultimately became patent claim 3.

Martin Marietta is asserting claims 4-10, 15 and 17 of the '378 patent, all of which are dependent on claims 1 and 3 of the '378 patent. The disputed terms appear in those two claims. MM's Opening Brief at 27.

Application claims 32-42 added in the preliminary amendment provided:

32. A load bearing support structure comprising:

an upper surface;

a lower surface; and

a core between said upper surface and said lower surface, said core comprising a plurality of elongated core members being defined by said upper surface, said lower surface and side walls positioned generally adjacent one another, said elongated core members being configured in at least one polygonal shape.

33. The load bearing support structure of claim 32, wherein said at least one polygonal shape is selected from the group consisting of square, rectangle, parallelogram, trapezoid, pentagon and hexagon.

34. The load bearing support structure of claim 32, wherein at least one of said elongated core members comprises two polygonal shapes having one common wall.

35. The load bearing support structure of claim 34, wherein said polygonal shape is a trapezoid.

36. The load bearing support structure of claim 33, wherein adjacent elongated core members are configured in two alternating polygonal shapes.

37. The load bearing support structure of claim 36, wherein adjacent elongated core members are configured in alternating trapezoidal and hexagonal shapes.

38. The load bearing support structure of claim 32, wherein one or more of said elongated core members comprise one or more interior walls that are substantially parallel to said upper surface and said lower surface.

39. The load bearing support structure of claim 38, wherein said interior walls of said one or more elongated core members, said top surface and said bottom surface define two or more polygonal shapes within said one or more elongated core member.

40. The load bearing support structure of claim 39, wherein said adjacent elongated core members are configured in alternating single polygonal shapes within an elongated core member and two or more polygonal shapes within an elongated core member.

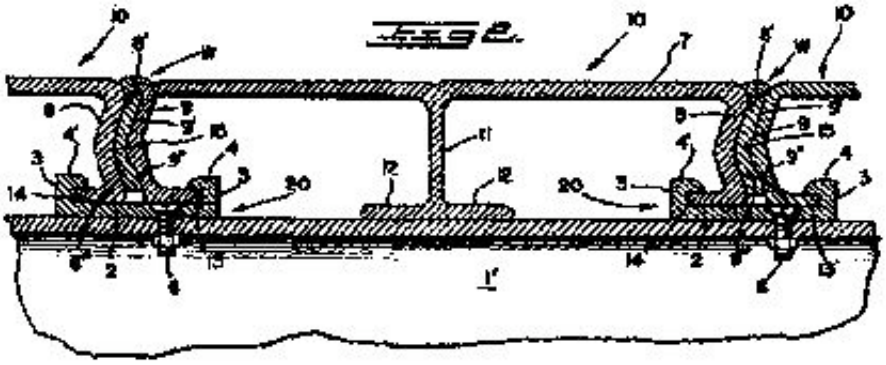
41. The load bearing structure of claim 34, wherein said elongated core member includes an upper surface and a lower surface extending beyond said polygonal shape to define a receiving opening to receive another member between said up per surface and said lower surface of said polygonal shape.

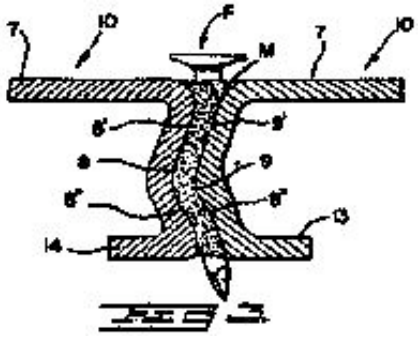
42. The load bearing support structure of claim 41, wherein said receiving opening and said elongated core member define at least three mating surfaces.

(2) Office Action-January 21, 1999

In an Office Action of January 21, 1999, all pending claims were rejected under 35 U.S.C. s. 112(2), as being indefinite (discussed further below), and for obviousness-type double patenting over claims 1, 4, 11 and 14 of U.S. Patent No. 5,794,402. Claim 1 was also provisionally rejected for statutory double patenting in light of then-pending Application No. 08/037,865.

Additionally, claims 32-34, 36 and 39-40 were rejected under 35 U.S.C. s. 102(b) as being anticipated by U.S. Patent No. 2,907,417 to Doerr. Doerr illustrates, *inter alia,* the following:





The examiner reasoned that: "Doerr teaches a load bearing support structure comprising an upper surface (7), a lower surface (plate on 1'), and a core between the upper surface and lower surface, the core comprising a plurality of core members being defined by the upper and lower surface and side walls (8, 9, 11) positioned generally adjacent one another, the core members being configured in at least one polygonal shape, at least one of the core members comprises two polygonal shapes having a common wall or two alternating polygonal shapes (left portion 9, 7, 11, and right portion 11, 7, 8 reversed from left portion), the core members comprise at least one interior wall (12, 13) substantially parallel to the upper surface and lower surface." Office Action at 6.FN9

FN9. Claims 41 and 42 were rejected under 35 U.S.C. s. 103 over Doerr in view of Whipkey *et al.,* U.S. Patent No. 5,603,134, but that rejection does not appear to have any relevancy to the present disputes on claim construction.

The examiner indicated that claims 35 and 37 would be allowable if amended to overcome the rejections under s. 112(2), and as independent claims. The examiner commented: "No prior art of record shows the core member having a trapezoidal shape, nor any motivation to do so." Office Action at 8.

(3) Applicant's Response-May 20, 1999

The applicants responded by amending claims 32-42 as follows (brackets and strikethroughs showing deleted matter, and underlining showing added matter-claims as renumbered in the '378 patent shown in brackets):

32 [Patent Claim 1]. A load bearing support structure comprising:

an upper [surface] *sheet;*

a lower [surface] *sheet:* and

a core *positioned* between said upper [surface] *sheet* and said lower [surface] *sheet,* said core comprising a plurality of *substantially hollow,* elongated core members *having at least three walls* [being defined by said upper surface, said lower surface and side walls positioned generally adjacent one another, said elongated core members being configured in at least one] *defining a closed* polygonal shape *when viewed in cross-section.*

33 [Patent Claim 2]. The load bearing support structure of claim 32 [patent claim 1], wherein said [at least one] polygonal shape is selected from the group consisting of square, rectangle, parallelogram, trapezoid, pentagon and hexagon.

34 [Patent Claim 3]. The load bearing support structure of claim 32 [patent claim 1], wherein at least one of said [elongated] *plurality of* core members comprises two polygonal shapes having one common wall.

35 [Patent Claim 4]. The load bearing support structure of claim 34 [patent claim 3], wherein said polygonal shape is a trapezoid.

36 [Patent Claim 5]. The load bearing support structure of claim 33 [patent claim 2], wherein [adjacent elongated] *at least two of said plurality of* core members are *positioned to abut one another and* configured in *at least* two [or more] alternating polygonal shapes.

37 [Patent Claim 6]. The load bearing support structure of claim 36 [patent claim 5], wherein adjacent elongated core members are configured in alternating trapezoidal and hexagonal shapes.FN10

FN10. The applicant's response directed that "adjacent elongated" should be changed to "said at least two of said plurality of," such that the claim after amendment would read:
37 [Patent Claim 6]. The load bearing support structure of claim 36 [patent claim 5], wherein [adjacent elongated] *said at least two of said plurality of* core members are configured in alternating trapezoidal and hexagonal shapes.

It appears from the prosecution history, however, that the U.S. Patent and Trademark Office overlooked making that amendment.
38 [Patent Claim 7]. The load bearing support structure of claim 32 [patent claim 1], wherein *at least* one [or more] of said *plurality of* [elongated] core members [comprise] *comprises at least* one [or more interior walls that are] *interior wall that is* substantially parallel to said upper [surface] *sheet* and said lower [surface] *sheet.*
39 [Patent Claim 8]. The load bearing support structure of claim 38 [patent claim 7], wherein said [interior walla of said one or more elongated core members, said top surface and said bottom surface define] *at least one of said plurality of core* members defines at least two [or more] polygonal shapes [within said one or more elongated core member].

40 [Patent Claim 9]. The load bearing support structure of claim 39 [patent claim 8], wherein said [adjacent elongated] *plurality of* core members *when viewed in cross-section* are configured in *a pattern* alternating *between a* single polygonal *shape* [shapes within an elongated core member] and *at least* two [or more] polygonal shapes [within an elongated member].

41 [Patent Claim 10]. The load bearing support structure of claim 34 [patent claim 2], wherein *at least one of* said [elongated] *plurality of* core [member] *members* includes an upper [surface] *wall* and a lower [surface] *wall* extending beyond said polygonal shape to define a receiving opening [to receive another member between 3aid upper surface and 3aid lower surface of said polygonal shape].

42 [Patent Claim 11]. The load bearing support structure of claim 41 [patent claim 10], wherein said receiving opening *defines* [and said elongated core member define] at least three mating surfaces.FN11

FN11. An Office Action dated July 16, 1999 (Paper No. 12) says that the amendment to claim 42 had not been entered, however, the prosecution history indicates that amendment *was* entered. That has not been addressed by the parties, and is not believed to impact on the issues currently before the Court.

Also, the applicants added claims 43-48, which became patent claims 12-17.

43 [Patent Claim 12]. The load bearing support structure of claim 32 [patent claim 1], wherein at least one of said at least three walls is oriented at an oblique angle to one of said upper sheet and said lower sheet.

44 [Patent Claim 13]. The load bearing support structure of claim 32 [patent claim 1], wherein at least two of said plurality of core members abut one another.

45 [Patent Claim 14]. The load bearing support structure of claim 32 [patent claim 1], wherein said upper sheet is a laminate material.

46 [Patent Claim 15]. The load bearing support structure of claim 32 [patent claim 1], wherein said upper sheet is made of a plurality of layers of material.

47 [Patent Claim 16]. The load bearing support structure of claim 32 [patent claim 1], wherein said lower sheet is a laminate material.

48 [Patent Claim 17]. The load bearing support structure of claim 32 [patent claim 1], wherein said lower sheet is made of a plurality of layers of material.

In remarks accompanying those amendments, the applicants argued, *inter alia,* that the "Doerr reference fails to disclose a load bearing support structure comprising *an upper and a lower sheet,* and consequently fails to disclose a core *positioned between the upper sheet and a lower sheet*. The Doerr reference fails to disclose the sandwiched structure defined in claim 32 which includes two plates with a core positioned therebetween in a sandwich-like structure. * * * The Doerr reference describes elongated plank-like extrusions (10) mounted on top of transversely oriented I-beam support members (1 and 1'). The structure of the floor construction described in the Doerr reference differs substantially in construction from the structure * * * [defined in claim 32]." [Emphasis in original.]

The claims were ultimately allowed in a Notice of Allowability dated October 20, 1999.FN12

FN12. The prosecution history also includes an Office Action dated July 16, 1999 (Paper No. 12), but no formal response. That Office Action says that a terminal disclaimer filed on May 20, 1999, was not entered because it did not include the serial number of the application being disclaimed. However, the terminal disclaimer in the prosecution history does include that serial number, and the "Contents" page of the prosecution history indicates that a terminal disclaimer was entered on May 20, 1999. Moreover, the face of the '378 patent indicates that a terminal disclaimer was filed. The Notice of Allowability (Paper No. 13) refers to "the amendment filed July 16, 1999," *i.e.*, the same date as prior Office Action (Paper No. 12). That is somewhat unusual. Also, that amendment-if there was an amendment-is not in the prosecution history provided by the parties. The foregoing is unexplained in the parties' submissions, but if there is something missing from the prosecution history (and the "Contents" pages indicates that there is not), it does not appear to relate to claim amendments or something else that might affect clam construction.

c) The Asserted Claims

As noted above, Martin Marietta is asserting claims 4-10, 15 and 17 of the ' 378 patent, all of which are dependent on claims 1 and 3 of the '378 patent. Those claims provide:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, said core comprising a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

* * *

3. The load bearing support structure of claim 1, wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall.

4. The load bearing support structure of claim 3, wherein said polygonal shape is a trapezoid.

5. The load bearing support structure of claim 2, wherein at least two of said plurality of core members are positioned to abut one another and configured in at least two alternating polygonal shapes.

6. The load bearing support structure of claim 5, wherein adjacent elongated core members are configured in alternating trapezoidal and hexagonal shapes.

7. The load bearing support structure of claim 1, wherein at least one of said plurality of core members comprises at least one interior wall that is substantially parallel to said upper sheet and said lower sheet.

8. The load bearing support structure of claim 7, wherein said at least one of said plurality of core members defines at least two polygonal shapes.

9. The load bearing support structure of claim 8, wherein said plurality of core members when viewed in cross-section are configured in a pattern alternating between a single polygonal shape and at least two polygonal shapes.

10. The load bearing support structure of claim 2, wherein at least one of said plurality of core members includes an upper wall and a lower wall extending be yond said polygonal shape to define a receiving opening.

* * *

15. The load bearing support structure of claim 1, wherein said upper sheet is made of a plurality of layers of material.

* * *

17. The load bearing support structure of claim 1, wherein said lower sheet is made of a plurality of layers of material.

2. U.S. Patent No. 6,467,118-**the** '118 Patent

a) Description

The '118 patent issued on October 22, 2002, from application No. 09/886,219, filed on June 22, 2001. Application No. 09/886,219 was filed as a continuation of application No. 09/495,474, filed on February 1, 2000, now abandoned, which was filed as a division of application No. 09/723,098, FN13 filed on September 30, 1998, now U.S. Patent No. 6,023,806. Thus, although the subject matter is related, the ' 118 patent has a different lineage from the ' 378 patent. The ' 118 patent lists Chris Dumlao, Kristina Laurairis, Les Fisher, Alan Miller, and Eric Abrahamson as inventors. That is, Chris Dumlao and Eric Abrahamson are listed as inventors on both the ' 378 and ' 118 patents. The ' 118 patent indicates that it has been assigned to "Martin Marietta Materials" which is understood to mean Martin Marietta Materials, Inc.

FN13. Although the face of the patent refers to "09/723,098," the series number is actually "0 *8*" *i.e.,* 08/723 098 *See* U.S. Patent No. 6,023,806.

The '118 patent, like the '378 patent, is generally drawn to a load bearing structure made from at least one "sandwich" panel formed of a polymer matrix composite material. For example, the "Field of the Invention" set out in the '118 and '378 specifications are the same:

'118 Patent

FIELD OF THE INVENTION

This invention relates to support structures such as bridges, piers, docks, load bearing decking applications, such as hulls and decks of barges, and load bearing walls. More particularly, this invention relates to a modular composite load bearing support structure including a polymer matrix composite modular structural section for use in constructing bridges and other load bearing structures and components.
'378 Patent

FIELD OF THE INVENTION

This invention relates to support structures such as bridges, piers, docks, load bearing decking applications, such as hulls and decks of barges, and load bearing walls. More particularly, this invention relates to a modular composite load bearing support structure including a polymer matrix composite modular structural section for use in constructing bridges and other load bearing structures and components.
In particular, however, the '118 patent is drawn to such a "sandwich" panel in which the facesheets are formed integrally with the side walls of the core members, and in which at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets. That is reflected, *inter alia,* in the abstract of the '118 patent (as compared to the abstract of the ' 378 patent):

Abstract '118 Patent

A load bearing deck structure is made from at least one sandwich panel formed of a ploymer [*sic*] matrix composite material. The sandwich panel comprises a plurality of substantially hollow, elongated core members having side walls, the core members being provided with an upper face-sheet and a lower facesheet. *Each facesheet is formed integrally with the side walls of the core members and at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets* so that the side walls and facesheets define a polygonal shape when viewed in cross section. [Emphasis added.]

Abstract '378 Patent

A load bearing deck of amodular structural section for use in support structures such as a load bearing deck or highway bridge. The at least one modular structural section includes at least one beam and a load bearing deck preferably formed of a polymer matrix composite material. The deck includes a core having elongate core members having a polygonal shape, preferably a trapezoidal shape. Alternatively, the load bearing deck comprising at least one sandwich panel is suitable for applications such as barge decks, hatchcovers, and other load bearing wall applications. Methods of constructing a support structure utilizing the modular structural section including the polygonal, preferably trapezoidal core deck, and support members are also provided.
and claim 1 of each patent-the sole independent claim in each patent providing:

Claim 1 '118 Patent

1. A load bearing deck structure comprising:
at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower

facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section. [Para-graphing added, emphasis added.]

Claim 1 '378 Patent

1. A load bearing support structure comprising:
an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, said core comprising a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

b) Prosecution History

(1) Original Application

As noted above, the '118 patent issued on October 22, 2002, from application No. 09/886,219, filed on June 22, 2001, which was filed as a continuation of application No. 09/495,474, filed on February 1, 2000, now abandoned, which, in turn, was filed as a division of application No. 08/723,098, filed on September 30, 1998, now U.S. Patent No. 6,023,806.

The original application was filed with 62 claims. A preliminary amendment filed on June 22, 2001, canceled those claims, and added claims 63-82, which became patent claims 1-20. Those claims provided (with the subsequent patent claim numbers shown in brackets):

63. [Patent claim 1] A load bearing deck structure comprising:

at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising a plurality of substantially hollow, elongated core members having side walls, said core members being provided with an upper facesheet and a lower facesheet wherein said facesheets are formed integrally with the side walls of the core members, and wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

64. [Patent claim 2] A deck as defined in claim 63 [patent claim 1], wherein at least one of said facesheets is formed of a plurality of substrate layers, wherein alternating layers are formed of different reinforcing fibers and a polymer resin.

65. [Patent claim 7] A deck according to claim 63 [patent claim 1], wherein said polygonal shape is selected from the group consisting of trapezoidal shapes, quadrilateral shapes, parallelogram shapes, and pentagonal shapes.

66. [Patent claim 8] A deck according to claim 65 [patent claim 7], wherein the polygonal shape is a trapezoid.

67. [Patent claim 9] A deck according to claim 63 [patent claim 1], wherein at least two of said plurality of

core members are positioned to abut one another and configured in at least two alternating polygonal shapes.

68. [Patent claim 10] A deck according to claim 63 [patent claim 1], wherein at least one of said plurality of core members comprises at least one interior wall that is substantially parallel to said upper sheet and said lower sheet.

69. [Patent claim 11] A deck according to claim 68 [patent claim 10], wherein said at least one of said plurality of core members defines at least two polygonal shapes.

70. [Patent claim 12] A deck according to claim 63 [patent claim 1], wherein said plurality of core members when viewed in cross-section are configured in a pat tern alternating between a single polygonal shape and at least two polygonal shapes.

71. [Patent claim 13] A deck according to claim 63 [patent claim 1], wherein at least one of said plurality of core members includes an upper wall and a lower wall extending beyond said polygonal shape to define a receiving opening.

72. [Patent claim 14] A deck according to claim 63 [patent claim 1], wherein at least two of said plurality of core members abut one another.

73. [Patent claim 15] A deck according to claim 63 [patent claim 1], wherein said upper sheet is a laminate material.

74. [Patent claim 16]. A deck according to claim 63 [patent claim 1], wherein said lower sheet is a laminate material.

75. [Patent claim 17] A deck according to claim 63 [patent claim 1], wherein said at least one sandwich panel comprises a plurality of interconnected sandwich panels.

76. [Patent claim 18] A deck according to claim 63 [patent claim 1], wherein said at least one sandwich panel is an integrally formed, unitary pultruded sandwich panel comprising pultruded facesheets and at least one pultruded core member.

77. [Patent claim 19] A deck according to claim 63 [patent claim 1], further comprising a wear surface overlaying an upper surface of said deck for withstanding foot and vehicular traffic.

78. [Patent claim 20] A deck according to claim 63 [patent claim 1], wherein said sandwich panel is formed of a polymer matrix composite material comprising reinforcing fibers and a polymer resin and said fibers and said resin are selected such mat said support structure will have a positive margin of safety under a predetermined required lane load and a predetermined safety factor using a first-ply failure as failure criteria.

79. [Patent claim 3] A deck according to claim 64 [patent claim 2], wherein said alternating layers are formed in a first layer of carbon fibers and a vinylester resin and in a second layer glass fibers and a vinylester resin.

80. [Patent claim 4] A deck according to claim 64 [patent claim 2], wherein an outer layer of said

alternating layers of at least one of said lower facesheet and said upper facesheet is formed of fibers having a quasi-isotropic orientation.

81. [Patent claim 6]. A deck according to claim 64 [patent claim 2], wherein an interior layer of said alternating layers adjacent to said outer layer is formed of a graphite and vinylester.

82. [Patent claim 5] A deck as defined in claim 80 [patent claim 4], wherein said fibers of said at least one of said upper and lower facesheets comprises about 42 percent graphite and about 58 percent E-glass.

(2) Office Action-February 13, 2002

The examiner, in an Office Action of February 13, 2002, rejected all pending claims, *i.e.*, claims 63-82, under 35 U.S.C. s. 103 as having been obvious over U.S. Patent No. 5,007,225 to Teasdale in view of U.S. Patent No. 4,428,791 to Reinke, or, alternatively, Reinke in view of Teasdale.

Teasdale disclosed a sandwich metal structure made from plate material that could be used in ship building for hulls, superstructure, deckhouses, bulkheads *etc.*, and also for other structures "such as linkspans, bridges, oil rigs, offshore structures, platforms, containers, buildings, columns, pontoons, tubes, pipes, and like large welded constructions." '225 patent, col. 1, lines 1-16. As illustrated, for example, in Fig. 2 of Teasdale:

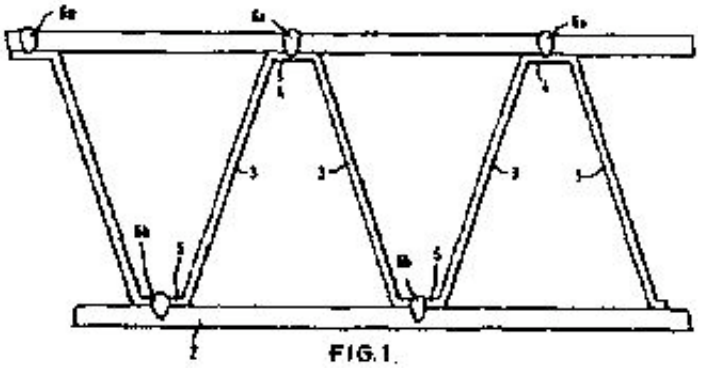


FIG.1.

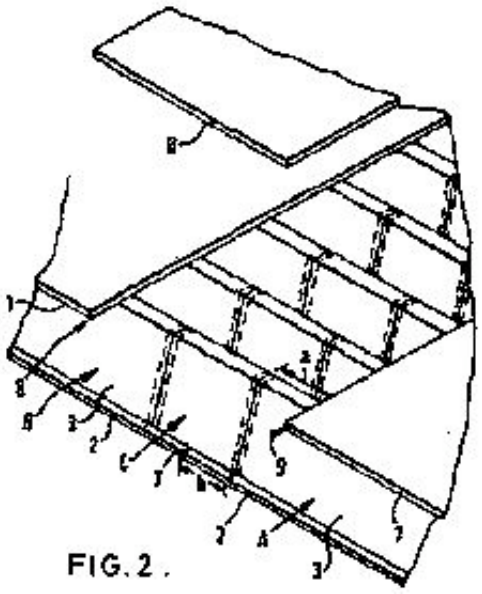


FIG. 2.

Teasdale disclosed composite metal panels made from two parallel plates 1, 2 that were laser-welded to a sandwiched corrugated "stiffener plate" 3. '225 patent, abstract.

Reinke disclosed a method and apparatus for producing composite building panels for the outside walls of buildings and the like using strips in various configurations, such as shown in Figs. 3-14:

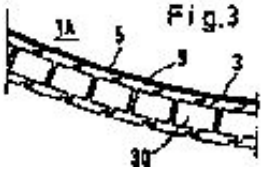


Fig.3

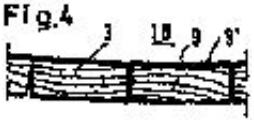


Fig.4

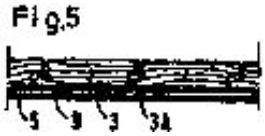


Fig.5

Fig.6

Fig.7

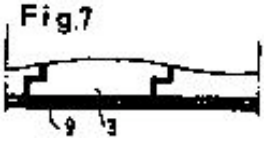


Fig.8

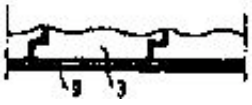


Fig.9

Fig.10

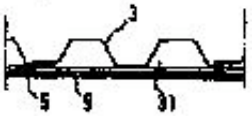
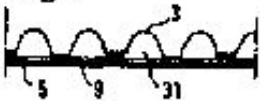
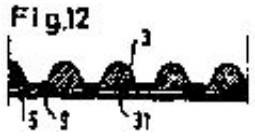
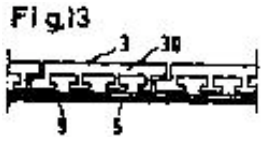
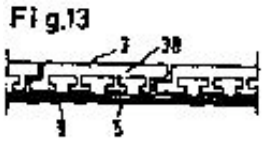


Fig.11

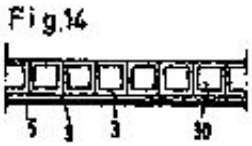








that were then subsequently joined together to form a composite panel, such as shown in Fig. 15:



The examiner reasoned that "Teasdale discloses the deck structure including the sandwich panels having upper (1) and lower (2) facesheets and elongated core members (3) having sidewalls. Some sidewalls are disposed at an oblique angle to a facesheet (Figure 1, for example)." The examiner acknowledged that "Teasdale does not teach the polymer matrix composite material," but reasoned that "Reinke discloses forming polymer matrix panel structures in a variety of configurations (Figures 3-14) in order to best suit desired applications." The examiner concluded that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a combination of the material of Reinke with the structural configuration of Teasdale in order to [produce] a lightweight and strong deck structure suitable for a desired application." Office Action at 2-3.

(3) Applicants' Response-May 13, 2002

The applicants responded on May 13, 2002, by, *inter alia,* adding claims 83 and 84, which subsequently became patent claims 21 and 22:

83. [Patent claim 21] A load bearing deck structure according to claim 63 [patent claim 1] wherein said polymer matrix fiber reinforced composite material is a pultruded polymer composite.

84. [Patent claim 22] A load bearing deck structure according to claim 63 [patent claim 1] wherein said polymer matrix composite material comprises reinforcing fibers contained at a thermosetting polymeric resin.

In remarks arguing over the rejections based on Teasdale and Reinke, the applicants urged that (1) Teasdale disclosed composite metal panels-no more, and (2) the references did not suggest the combination proposed by the examiner. For example, the applicants argued that Reinke distinguished his structure from a sandwich construction such as disclosed in Teasdale. Response at 5. The applicants also emphasized that the claims were drawn to a "load bearing deck structure," arguing that "the Teasdale structure is not a load bearing structure where stress is involved," and that "Reinke is not concerned with a load bearing deck structure such as that of the present invention." Id. at 6.

Ultimately, claims 63-84 were allowed without further rejection or amendment.

c) The Asserted Claims

Martin Marietta is asserting claims 1, 7, 8, 9, 10, 11, 12, 13, 14, 18 and 21 of the '118 patent, of which only claim 1 is independent:

1. A load bearing deck structure comprising:

at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising a plurality of substantially hollow, elongated core members having side walls, said core members being provided with an upper facesheet and a lower facesheet wherein said facesheets are formed integrally with the side walls of the core members, and wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

* * *

7. A deck according to claim 1, wherein said polygonal shape is selected from the group consisting of trapezoidal shapes, quadrilateral shapes, parallelogram shapes, and pentagonal shapes.

8. A deck according to claim 7, wherein the polygonal shape is a trapezoid.

9. A deck according to claim 1, wherein at least two of said plurality of core members are positioned to abut one another and configured in at least two alternating polygonal shapes.

10. A deck according to claim 1, wherein at least one of said plurality of core members comprises at least one interior wall that is substantially parallel to said upper sheet and said lower sheet.

11. A deck according to claim 10, wherein said at least one of said plurality of core members defines at least two polygonal shapes.

12. A deck according to claim 1, wherein said plurality of core members when viewed in cross-section are configured in a pattern alternating between a single polygonal shape and at least two polygonal shapes.

13. A deck according to claim 1, wherein at least one of said plurality of core members includes an upper wall and a lower wall extending beyond said polygonal shape to define a receiving opening.

14. A deck according to claim 1, wherein at least two of said plurality of core members abut one another.

* * *

18. A deck according to claim 1, wherein said at least one sandwich panel is an integrally formed, unitary pultruded sandwich panel comprising pultruded face-sheets and at least one pultruded core member.

* * *

21. A load bearing deck structure according to claim 1 wherein said polymer matrix fiber reinforced composite material is a pultruded polymer composite.

All of the disputed terms appear in independent claim 1.

IV.

Construction of the '378 Patent Claims

Martin Marietta has addressed the disputed claim terms in the '378 and '118 patents in separate sections of its opening brief, while the defendants have presented a consolidated discussion. As noted above, although the '378 and ' 118 patents are drawn to related subject matter, the patents have different lineages. Accordingly, it is most appropriate to address the patents individually despite that some disputed claim terms appear in similar forms in both patents.

A. "load bearing support structure"

1. Terms in Context

In the context of claims 1 and 3 of the '378 patent, the disputed phrase appears as follows:

1. A **load bearing support structure** comprising:

an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, said core comprising a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

* * *

3. The **load bearing support structure** of claim 1, wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"load bearing support structure" is "a structure that supports, or holds up, a mass or weight"
MM's Opening Brief at 27

Defendants

"load" is a "substantial stress"
"structure" is an "arrangement of parts or elements; anything composed of parts arranged together in some way;" arrangement of the parts defined in the remainder of the claim

Defendants' Response at 9

Despite the foregoing differences, the defendants have indicated that Martin Marietta's proposed construction is acceptable. Defendants' Response at 9-10. Although the defendants additionally propose that "structure" be defined, there does not appear to be any continuing dispute over the meaning of that term. Defendants' Response at 10, MM's Reply at 8. Moreover, "structure" is a common, readily understood term. Accordingly, there does not appear to be any need to further construe the term.

3. Recommended Construction

Accordingly, the special master recommends that the Court construe "load bearing support structure" in the '378 patent as follows:

The phrase "load bearing support structure" means a structure that supports, or holds up, a mass or weight.

B. "an upper sheet" and "a lower sheet"

1. Terms in Context

In the context of claims 1 and 3 of the '378 patent, the disputed phrases appear as follows:

1. A load bearing support structure comprising:

an **upper sheet;**

a **lower sheet;** and

a core positioned between said **upper sheet** and said **lower sheet,** said core comprising a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape

when viewed in cross-section.

* * *

3. The load bearing support structure of claim 1, wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"upper sheet" is "a flat, broad piece of material high in physical position"
"lower sheet" is "a flat, broad piece of material low in physical position."

MM's Opening Brief at 28

Defendants

"Upper sheet" means a broad, flat piece of material that is not merely a surface of the core, but rather a single, flat piece of the support structure that is distinct from the lower sheet and the core members. A sheet is not a beam, a coating, or a wear surface.
"Lower sheet" means a broad, flat piece of material that is not merely a surface of the core, but rather a single, flat piece of the support structure that is distinct from the upper sheet and the core members. A sheet is not a beam, a coating, or a wear surface.

Defendants' Response at 17-18

The parties thus agree that a "sheet" should be construed as "a flat, broad piece of material." The defendants further do not "object" to Martin Marietta's references to "high in physical position" and "lower in physical position," but say that explanation is "unhelpful" because there is no reference point. Defendants' Response at 18.

Terms such as "upper" and "lower" are sometimes used in patent claims to indicate placement relative to some reference point, as the defendants suggest. In some instances, for example, an invention may require a component to be located "above" another component. Other times, however, "upper" and "lower" are used to simply identify or name elements or components without indicating relative placement where terms such as "first" and "second" (or other nominative terms) may have been more appropriate. *See, e.g.,* Anchor Wall Sys., Inc. v. Rockwood Retaining Walls, Inc., 340 F.3d 1298, 1304 (Fed.Cir.2003) ("first and second sidewall surfaces"); Springs Window Fashions LP v. Novo Indus., L.P., 323 F.3d 989, 992 (Fed.Cir.2003) ("first and second opposed ends"). In other words, the apparatus depicted in patent drawings need not always and necessarily be oriented as shown in the drawings. Here, in Fig. 3, for example:

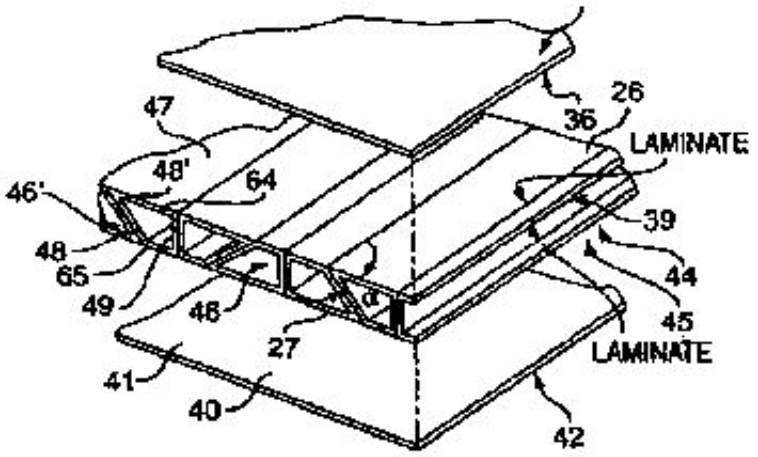
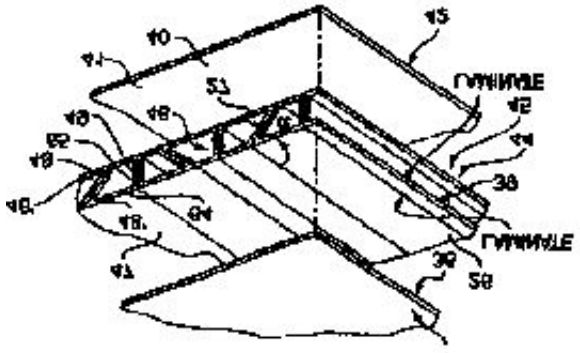


FIG. 3

sheets 35 (number missing from drawing) and 40 of deck panel 32 are illustrated with sheet 35 in an "upper" position relative to sheet 40. However, it seems clear from the '378 patent as a whole that, in this drawing, that orientation is merely for illustration. That is, if the drawing figure is inverted or rotated 90 (deg.):

FIG. 3



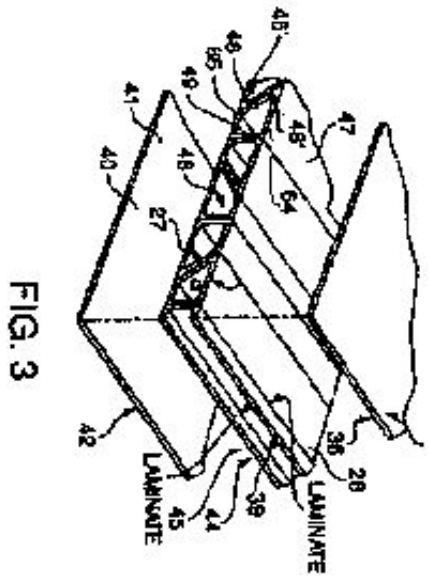


FIG. 3

the structure of the deck panel as otherwise described remains the same, although the "upper" and "lower" designations would no longer be entirely accurate.

In this instance, it is thus apparent that the terms "upper" and "lower" were used in a nominative sense, *i.e.*, to give a "name" or designation to the respective sheets, rather than to imply some true "upper" and "lower," or "above" and "under," relationship. In the claim, therefore, it seems clear that "upper sheet" merely refers to a first flat, broad piece of material, and "lower sheet" refers to a second flat, broad piece of material.

Although that would seem to resolve the meaning of "upper sheet" and "lower sheet," the defendants urge that there are three remaining controversies, namely (1) whether "facesheet" as used in the claims of the '118 patent should be construed the same as "sheet" in the claims of the '378 patent, (2) whether the claims require that each facesheet/sheet be "distinct" from the core members, and (3) whether a beam, coating or wear surface may qualify as a facesheet/sheet. Defendants' Response at 18. Each of those contentions will be addressed in turn.

First, whether "facesheet" as used in the claims of the '118 patent should be construed the same as "sheet" in the claims of the '378 patent is addressed below in conjunction with the other disputed terms in the claims of the '118 patent.

As for the second point of contention, the defendants urge that the "upper sheet" is "distinct from [1] the lower sheet and [2] the core members," and that the "lower sheet" is similarly "distinct" from the upper sheet and the core members. In short, the defendants urge that the upper and lower sheets are (1) distinct from each other, and (2) from the core. Defendants' Response at 19-21. The defendants contend that "[t]his plain requirement should be evident from the simple fact that these apparatus claims (in both the '118 and '378 Patents) recite these structures as separate elements." Id. at 20. The defendants further assert that the specification "is replete with support for this construction." Id.

Specifically, the defendants point to Fig. 3 of the '378 patent illustrating, according to the defendants, "upper facesheet/sheet (element 35) being separate from the core (element 45), which in turn is distinct from the lower facesheet/sheet (element 40)." Id. The defendants also urge that the specification teaches that "the

upper and lower facesheets/sheets are formed in a completely different manner as the core," *i.e.*, the "facesheets/sheets are formed using 'rolls of knitted quasi-isotropic fabric,' while the various core members (*i.e.*, tubes) of the core are formed by bonding two C-shaped components to form the tubes." Id. The defendants argue that "[i]f the facesheets/sheets and core are formed in different processes, then the facesheets/sheets are clearly distinct from the core (and its tubes). Furthermore, the patents go on to describe how a 'single upper face sheet 35 and a single lower face sheet 40 can be adhered to a plurality of tubes.' " Id.

Martin Marietta, on the other hand, contends that the defendants are attempting to limit the claims to the embodiment illustrated in Fig. 3. Martin Marietta urges that there is nothing in the '378 patent that *requires* the "upper sheet" and "lower sheet" be distinct from other structures in the sandwich panel. Specifically, Martin Marietta points out that the '378 patent discloses that the facesheets/sheets may be formed by processes such as pultrusion:

While the upper and lower facesheets 35, 40, are fabricated using a hand-layup process, the core 45 including the facesheets 35, 40 can alternatively be fabricated by other methods such as pultrusion, resin transfer molding (RTM), vacuum curing and filament winding and other methods known to one of skill in the art of composite fabrication, which, therefore, are not discussed in detail herein. The details of these methods are discussed in Engineered Materials Handbook: Composites, Vol. 1, AJM International (1993).

'378 patent, col. 10, lines 58-67, and that the facesheets/sheets and core members may be formed as a single component:

Further, the facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes.

'378 patent, col. 10, line 67-col. 11, line 3. MM's Opening Brief at 29, MM's Reply at 15 ("Since the Martin Marietta patents, themselves, clearly disclose that the facesheets and sheets need not be 'distinct' from one another-or from the core-any definition that contemplates otherwise improperly limits these claim terms."). The defendants, in response, urge that "[h]ad the patentees wanted to claim this alternate embodiment, they should not have recited the core and facesheets/sheets as separate and distinct elements in the claims." Defendants' Response at 21.

The defendants enlarge on that argument in their surreply. First, the defendants contend that the specification does not support Martin Marietta's argument, urging that, at least in the '118 patent, the specification uses the term "unitary" to also refer to a resulting deck structure when separate facesheets are "adhered" to a core. Defendants' Sur-Reply at 3, n. 2.

Second, the defendants again urge that not only Fig. 3, but every drawing figure of the '378 patent, illustrates core tubes being "distinct" from the upper and lower facesheets. Id. at 3-4. The defendants contend that because 37 C.F.R. s. 1.83(a) FN14 requires that "[t]he drawing[s] in a nonprovisional application must show every feature of the invention specified in the claims * * *," if the patent examiner had "understood the claims to require 'indistinct' sheets and core members, the application would have been rejected for failing to comply with 37 C.F.R. s. 1.83." Id. at 4.

FN14. 37 C.F.R. part 1 contains the rules of practice of the U.S. Patent & Trademark Office in patent cases.

3. Discussion

The first issue is thus whether the claim language itself *requires* that the upper and lower sheets be separate structural components. It does not.

Once again, claim 1 of the '378 patent calls for:

1. A load bearing support structure comprising:

an **upper sheet;**

a **lower sheet;** and

a core positioned between said **upper sheet** and said **lower sheet,** said core comprising a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

The claim clearly calls for the upper sheet, lower sheet, and core in three separate *claim* elements, but that does not *necessarily* require three separate (or "distinct") *structural* components. Patent claims frequently introduce a structural component in a claim element, but separate claim elements may also address different aspects of what may be a single structural component. That is, a claim element *may* be drawn to a separate structural component, but neither the statute (35 U.S.C. s.s. 1 et seq.) nor the Rules of Practice of the U.S. Patent and Trademark Office (37 C.F.R. part 1) so require. Thus, the defendants' contention that "the structures are recited separately in the claims," Defendants' Sur-Reply at 3, is not decisive. The claim is directed to a "load bearing support structure" that is further defined as having "an upper sheet," "a lower sheet," and a "core" as described. An accused "load bearing support structure" must meet the limitations of those claim elements in order to infringe, and therefore must have the recited "structure." But because the upper and lower sheets, and the core, are contained in three separate claim elements does not *alone* mean that those must be three separate structural components.

Nevertheless, beginning, as always, with the language of the claim, the terms "an upper sheet" and "a lower sheet," especially in view of the parties' apparent agreement that a "sheet" means "a flat, broad piece of material," certainly suggests two separate structural components (three separate structural components when the core is included), especially when viewed in the context of the claim as a whole that essentially calls for three components making up the "load bearing support structure."

Turning to the specification, the defendants are correct that the specification offers support for that construction. The specification and drawings clearly describe and illustrate an embodiment in which the facesheets/sheets are separate structural components from each other and also from the core. However, the Federal Circuit has emphasized that claims are not necessarily limited to the disclosed embodiment, even if there is only one disclosed embodiment. *See Phillips,* --- F.3d at ---- ("In particular, we have expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment. * * * That is not just because section 112 of the Patent Act requires that the claims themselves set forth the limits of the patent grant, but also because persons of ordinary skill in the art rarely would confine their definitions of terms to the exact representations depicted in the embodiments."); Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1327 (Fed.Cir.2003) ("the

number of embodiments disclosed in the specification is not determinative of disputed claim terms."); Apex, Inc. v. Raritan Computer, Inc., 325 F.3d 1364, 1377 (Fed.Cir.2003) ("Raritan further attempts to limit the claims to the preferred embodiment by stating that 'since the Apex patents do not teach any alternatives, the patent-in-suit [*sic*] must therefore be limited to this one embodiment.' That is not the law. * * * The description of the preferred embodiment is one particular example of the claimed invention that is consistent with the ordinary meaning of the claim terms as we currently understand them.").

There are, of course, instances in which a patentee may describe a particular embodiment in terms that make clear that the patentee considers the claims as being limited to that embodiment. *See, e.g.,* Astrazeneca, 384 F.3d at 1339 ("[t]he solubilizers suitable according to the invention are defined below," and "[t]he solubilizers suitable for the preparations according to the invention are semi-solid or liquid non-ionic surface active agents" [emphasis omitted]); C.R. Bard, 388 F.3d at 866 (Bard had "clearly defined the terms 'implant' and 'plug' in claim 20 as requiring a pleated surface.").FN15 However, the defendants point to no such description here, and on independent review, no such description has been found. Rather, the specification makes clear that the disclosed and illustrated embodiment is simply that-one particular example of the claimed invention.FN16 *See* Northrop Grumman Corp. v. Intel Corp., 325 F.3d 1346, 1354 (Fed.Cir.2003) ("This is not a case in which the specification disavows any embodiment other than one operating in a bus controller/remote terminal environment. Nor does the patent in any way indicate that the invention was intended solely for use in such an environment.").

FN15. In *C.R. Bard,* the panel majority also noted, in a footnote, that when it used the word "define," that did not necessarily mean in a lexicographic sense, but rather "to denote that 'the specification makes clear at various points that the claimed invention is narrower than the claim language might imply' based on a reading of the specification as a whole." 388 F.3d at 879 n. 3, quoting Alloc, 342 F.3d at 1370.

FN16. For example, at the outset of the detailed written description portion of the specification, the patentees explain that: "The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention can, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, Applicant provides these embodiments so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art." '378 patent, col. 6, lines 3-12. Further, the patent lists seven objectives of the invention:
In view of the foregoing, it is therefore an object of the present invention to provide a load bearing deck included in a modular structural section for a support structure suitable for a highway bridge structure or decking system in marine and other construction applications, constructed of modular sections formed of a lightweight, high performance, environmentally resistant material.
It is another object of the invention to provide a support structure having a deck, such as a highway bridge structure, which satisfies accepted design, performance, safety and durability criteria for traffic bearing bridges of various types.
It is another object of the present invention to provide such a deck as a part of a modular structural section of a support structure in the form of a traffic-bearing bridge in a variety of designs and sizes constructed of modular sections which can be constructed quickly, cost-effectively and with limited heavy machinery and labor.
It is also an object of the present invention to provide such a load bearing deck for a modular structural section for a support structure, such as a bridge, the bridge being constructed of components which can easily and cost-effectively be shipped to the site of construction as a complete kit.

It is likewise an object of the present invention to provide a support structure including a modular section which can be utilized to quickly repair or replace a damaged bridge, bridge section or Eke support structure.
It is another object of the present invention to provide a load bearing support structure including a modular structural section having a deck which can be used in decking, hull, and wall applications.
It is still another object of the invention to provide a support structure or bridge which requires minimal maintenance and upkeep with respect to surface treatment or painting.

'378 patent, col. 3, line 57-col. 4, line 26. The defendants have not pointed to any of those objects that would require the facesheets/sheets being separate structural components from each other and also from the core. Also, the prosecution history suggests that the claims should not be limited to the embodiment illustrated in the drawings. First, the patentees in their specification differentiate between upper and lower *surfaces* and upper and lower facesheets/sheets. For example, the patentees explain that:

The load bearing deck of the modular section also includes at least one sandwich panel including an upper surface, a lower surface and a core. * * * The upper and lower surfaces are preferably an upper facesheet and lower facesheet formed of a polymer matrix composite material.

'378 patent, col. 4, lines 39-55. That is, the sandwich panel is disclosed as having three structural elements, an upper surface, a lower surface and a core. The patentees disclose that the upper and lower surfaces are "preferably" an "upper facesheet and lower facesheet formed of a polymer matrix composite material." FN17 And, the patentees disclose that such a "preferred" embodiment is illustrated in Fig. 3:

FN17. *See also* the description under the "Summary of the Invention":
The load bearing deck of the modular section also includes at least one sandwich panel including an upper surface, a lower surface and a core. * * * The upper and lower surfaces are *preferably* an upper facesheet and lower facesheet formed of a polymer matrix composite material. [Emphasis added.]

'378 patent, col. 4, lines 39-55.
As shown in FIG. 3, each sandwich panel 34 comprises an upper surface shown as an upper facesheet 35, a lower surface shown as a lower facesheet 40 and a core 45 including a plurality of elongate core members 46.
'378 patent, col. 8, lines 21-25. Later, the patentees reiterate ("as described above") that the sandwich panels have an upper surface and a lower surface, and that the drawings illustrate the preferred form in which those upper and lower surfaces take the form of upper and lower facesheets 35 and 40:
Also, as described above, the sandwich panels 34 each also have an upper surface shown as an upper facesheet 35 and a lower surface shown as facesheet 40 (FIG 3). The tubes 46 are sandwiched between a lower surface 36 of the upper face-sheet 35 and the upper surface 41 of the lower facesheet 40. As seen in FIG. 3, the lower face sheet 40 and the upper face sheet 35 are sheets preferably formed of polymer matrix composite materials and more preferably formed of fiberglass fibers and a polymer or vinylester resin as described herein. [Emphasis added.]

'378 patent, col. 9, lines 52-61. Thus, it seems clear that the sandwich panel that the patentees described was one having upper and lower *surfaces*. In the preferred embodiment illustrated in the drawing, those upper and lower surfaces are shown as upper and lower facesheets 35 and 40. A sandwich panel having upper and lower surfaces does not, of course, require that those surfaces consist of physically separate structural

components.
If claim 1 had called for upper and lower "surfaces," for example:

1. A load bearing support structure comprising:

an **upper *surface;***

a **lower *surface;*** and

a core positioned between said **upper *surface*** and said **lower *surface,*** said core comprising a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

there would seem to be little difficulty in concluding that the claim encompassed, but did not *require,* three separate structural components.

And, indeed, as noted above, patent claim 1 (application claim 32) originally called for "an upper surface" and "a lower surface," but was amended as follows:

32 [Patent Claim 1]. A load bearing support structure comprising:

an upper [surface] *sheet;*

a lower [surface] *sheet;* and

a core *positioned* between said upper [surface] *sheet* and said lower [surface] *sheet,* said core comprising a plurality of *substantially hollow,* elongated core members *having at least three walls* [being defined by said upper surface, said lower surface and side walls positioned generally adjacent one another, said elongated core members being configured in at least one] *defining a closed* polygonal shape *when viewed in cross-section*.

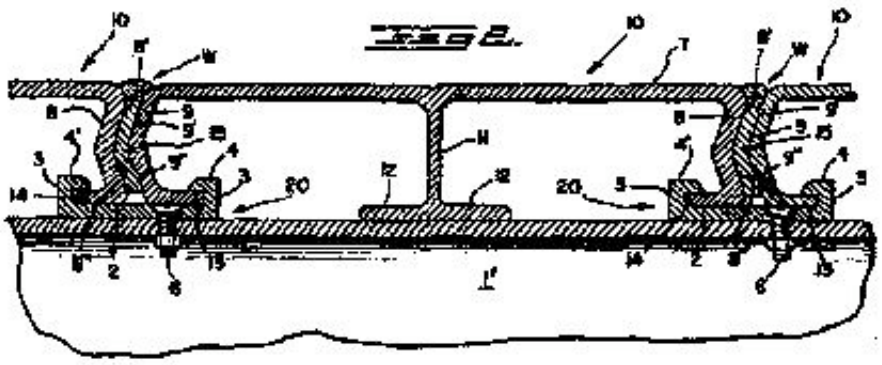
in the Response of May 20, 1999, at 2. The claim was so amended in response to a rejection under 35 U.S.C. s. 112(2) for indefiniteness. The examiner reasoned that "[i]n claim 32, it is unclear how the upper and lower surfaces define the core member(s) when each core member has a separate upper and lower surface." Office Action of Jan. 21, 1999, at 2. In remarks accompanying that amendment, the patentees explained that:

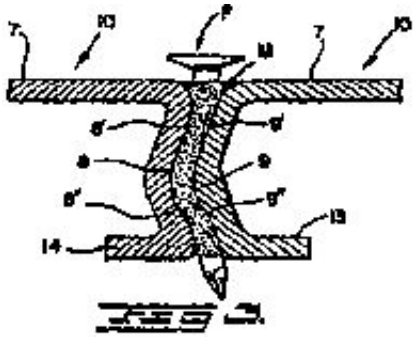
In order to clarify the structure recited in claim 32 and overcome the indefiniteness rejection thereof, the elongated core members are no longer described as being defined by the upper and lower surfaces (or sheets).

Response at 4.

There is, consequently, an argument that the foregoing amendment narrowed the claim to one having three separate structural components, namely (1) an upper sheet, (2) a lower sheet, and (3) a core, as defined. Further support for that argument is found in the patentees' remarks urging that the amended claims now define over the Doerr reference.

As noted above, in the Office Action of January 21, 1999, claims 32-34, 36 and 39-40 were rejected under 35 U.S.C. s. 102(b) as being anticipated by U.S. Patent No. 2,907,418 to Doerr illustrating the following:





Once again, the examiner reasoned that: "Doerr teaches a load bearing support structure comprising an upper surface (7), a lower surface (plate on 1'), and core between the upper surface and lower surface, the core comprising a plurality of core members being defined by the upper and lower surface and side walls (8, 9, 11) positioned generally adjacent one another, the core members being configured in at least one polygonal shape, at least one of the core members comprises two polygonal shapes having a common wall or two alternating polygonal shapes (left portion 9, 7, 11, and right portion 11, 7, 8 reversed from left portion), the core members comprise at least one interior wall (12, 13) substantially parallel to the upper surface and lower surface." Office Action of Jan. 21, 1999, at 6. In other words, the examiner viewed "upper surface" and "lower surface" in claim 32 as reading on the upper and lower surfaces of the structure in Doerr that the examiner viewed as corresponding to the "core."

In remarks urging that the amended claims were not anticipated, the applicants argued that the "Doerr reference fails to disclose a load bearing support structure comprising *an upper and a lower sheet,* and consequently fails to disclose a core *positioned between the upper sheet and a lower sheet*. The Doerr reference fails to disclose the sandwiched structure defined in claim 32 which includes two plates with a core positioned therebetween in a sandwich-like structure. * * * The Doerr reference describes elongated plank-like extrusions (10) mounted on top of transversely oriented I-beam support members (1 and 1'). The

structure of the floor construction described in the Doerr reference differs substantially in construction from the structure * * * [defined in claim 32]." [Emphasis in original.] Response at 6.

Those remarks, and especially the remark that claim 32 as amended "includes two plates with a core positioned therebetween," provide support for an argument that the claim, as amended, contemplated three separate structural components. However, that argument is weakened by the description in the specification.

The specification describes various methods for constructing the sandwich structure. In the embodiment illustrated in the drawings, the upper and lower facesheets are formed using a hand laid up process. "In the deck shown in FIGS. 1-7, the upper and lower facesheets 35, 40 are hand laid of polymer matrix composite material. In the deck 32 shown in FIGS. 1-7, the upper and lower face-sheets 35, 40 are hand-laid, heavy weight, knitted, fiberglass fabric." ' 378 patent, col. 10, lines 21-25. When so formed, the patentees explain that facesheets 35 and 40 are preferably laminated or otherwise joined to the core:

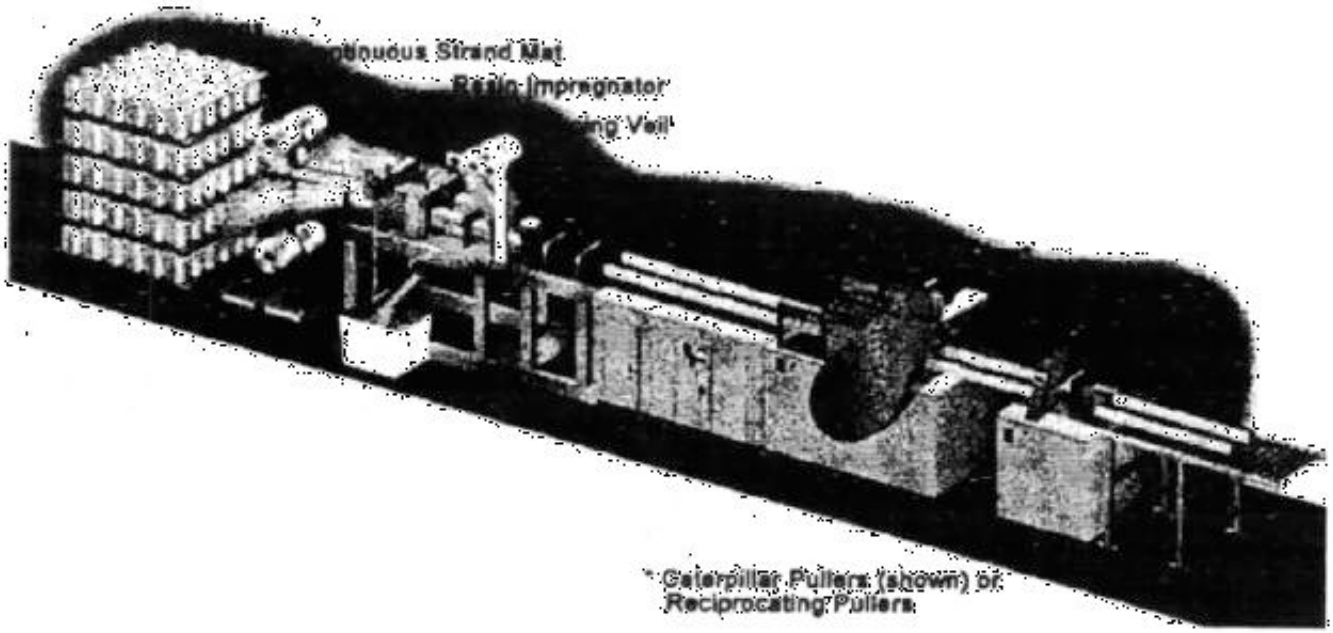
Having fabricated the upper and lower facesheets 35, 40 as described herein, the lower surface 36 of the upper face sheet 35 is preferably laminated or adhered to the upper surface 47 of the tubes 46 by a resin 26 and/or other bonding means and joined with the tubes 46 by mechanical or fastening means including, but not limited to, bolts or screws. Likewise, the upper surface 41 of the lower facesheet 40 is preferably laminated to the lower surface 27 of the tubes 46 by resin 26 or other bonding means and joined with the tubes 46 by mechanical fastening means including, but not limited to, bolts or screws.

The core 45, including the tubes 46, and the upper and lower facesheets 35, 40 can be alternatively joined with fasteners alone, including bolts and screws, or by adhesives or other bonding means alone. Suitable adhesives include room temperature cure epoxies and silicones and the like. Further, alternatively, the tubes could be provided integrally formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods.

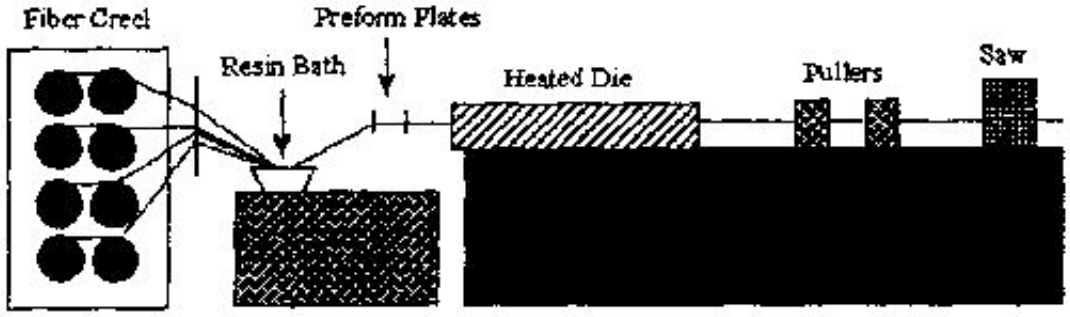
'378 patent, col. 9, line 62-col. 10, line 14.

The patentees also, though, disclose alternative methods of construction: "While the upper and lower facesheets 35, 40, are fabricated using a hand-layup process, the core 45 including the facesheets 35, 40 can alternatively be fabricated by other methods such as *pultrusion*. resin transfer molding (RTM), vacuum curing and filament winding and other methods known to one of skill in the art of composite fabrication, which, therefore, are not discussed in detail herein. The details of these methods are discussed in Engineered Materials Handbook: Composites, Vol. 1, AJM International (1993)." [Emphasis added.] ' 378 patent, col. 10, lines 58-67.

The term "pultrusion" refers to "[a] process for producing continuous fibers for advanced composites which involves pulling reinforcements through tanks of thermoset resins, a preformer, and then a die, where the product is formed into its final shape." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 1608. Further descriptions of pultrusion are available at various websites, *e.g.,* http://www.pultruders.com (the website for the European Pultrusion Technology Association); http:// www.acmanet.org/pic/products/description.htm (the website for the Pultrusion Industry Council, which offers the following diagram):



and http:// www.olemiss.edu/depts/compmatl/pultrusion.html (the website for the University of Mississippi, Composite Materials Research Group, which offers the following diagram of the pultrusion process):



Schematic Diagram of the Pultrusion Process

The patentees, in the specification of the '378 patent, explain that by using the pultrusion process, the facesheets and core members can be fabricated as a *single component:* "Further, the facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes." '378 patent, col. 10, line 67-col. 11, line 3.

The defendants urge that the specification uses the term "unitary" to refer to a resulting deck structure when separate facesheets are "adhered" to a core. Defendants' Reply at 3, n. 2. And that is true: The patentees disclose that "[a]s shown in FIG. 3, a single upper face sheet 35 and a single lower face sheet 40 can each [be] adhered to a plurality of tubes. * * * The resulting deck 32 is provided as a unitary structural component * * *." '378 patent, col. 11, lines 4-12. However, as noted, the specification also specifically teaches forming the facesheets and core members "as a single component," *i.e.,* "the facesheets and core members alternatively can be fabricated *as a single component* such as *by pultruding a single sandwich*

panel having an upper and lower facesheet and a core of tubes." '378 patent, col. 10, line 67-col. 11, line 3. In context, and in light of the nature of the pultrusion process, it would seem that "as a single component" means precisely that.

In terms of the present dispute, the patentees thus clearly disclose an alternative embodiment to that depicted in Fig. 3, in which the upper and lower facesheets, and core members, are not initially formed from three separate structural components which are thereafter bonded or otherwise fastened together, but rather an embodiment in which the upper and lower facesheets and core members (and a single sandwich panel), are formed "as a single component." There is thus support in the specification for a claim scope that is not limited as the defendants propose, *i.e.,* upper and lower facesheets/sheets that are separate physical components from each other and the core.

The question thus becomes whether the amendment changing "upper surface" and "lower surface" to "upper sheet" and "lower sheet," respectively, taken in conjunction with the patentees' remarks, effectively narrowed the claims to exclude that alternative embodiment. The question is debatable.

Several factors, however, appear to tip the balance against the construction proposed by the defendants. First, the claim language itself does not *require* that the upper and lower facesheets/sheets (and core) consist of separate physical components. Although, as already noted, the terms "an upper sheet" and "a lower sheet" and "a core" may, at first blush, suggest separate components, that suggestion is dispelled by the specification. The patentees, in describing the formation of the upper and lower facesheets and core members as a single component, also use the terms "facesheets" and "core members": "Further, the facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes." '378 patent, col. 10, line 67-col. 11, line 3. That is, although formed structurally as a single component, that single component nevertheless has what the patentees characterize as "facesheets" and "core members."

Second, in that context, the patentees' argument over the Doerr reference, namely that "Doerr reference fails to disclose a load bearing support structure comprising *an upper and a lower* sheet, and consequently fails to disclose a core *positioned between the upper sheet and a lower sheet,*" [emphasis in original] would also apply to formation of the structure as a single component, *i.e.,* that single component, as described in the specification, too has upper and lower sheets and a core positioned therebetween. That argument thus does not compel a conclusion that the patentees intended to abandon claim coverage for the alternative embodiment or that the claims should be limited to the embodiment illustrated in Fig. 3.

Third, in the response and amendment of May 20, 1999, in addition to amending "upper surface" and "lower surface" to "upper sheet" and "lower sheet," respectively, the patentees added, *inter alia,* claims 45-48 (patent claims 14-17) further defining the upper and lower sheets as, alternatively, a laminate material or made of a plurality of layers of material:

45 [Patent Claim 14]. The load bearing support structure of claim 32 [patent claim 1], wherein said upper sheet is a laminate material.

46 [Patent Claim 15]. The load bearing support structure of claim 32 [patent claim 1], wherein said upper sheet is made of a plurality of layers of material.

47 [Patent Claim 16]. The load bearing support structure of claim 32 [patent claim 1], wherein said lower

sheet is a laminate material.

48 [Patent Claim 17]. The load bearing support structure of claim 32 [patent claim 1], wherein said lower sheet is made of a plurality of layers of material.

Although that does not invoke the doctrine of claim differentiation *per se,* and would not alone preclude reading the claims as proposed by the defendants, adding those claims to define the specific construction of the upper and lower sheets, as described in the preferred embodiment, raises at least a caution against adopting the construction proposed by the defendants.

Fourth, other claim language counsels against the defendants' proposed construction. For example, in amending the claim, the patentees added the word "positioned" to describe the placement of the core member: "a core *positioned* between said upper [surface] *sheet* and said lower [surface] *sheet*." Thus, the patentees chose a term that described the position or location of the core *vis-a-vis* the upper and lower sheets, rather than a word or words expressly or implicitly requiring separate physical components. For example, if the patentees had referred to "a core" that was "bonded" or "adhered" or "laminated to" or "fastened" to the upper and lower sheets, that would seem to require that there were separate physical components that were then joined together in some fashion. The claim, however, is silent, in a literal sense, on whether and how the upper and lower sheets are attached to-or formed with-the core. That claim language is thus generic to the preferred embodiment of Fig. 3 as well as the alternative disclosed embodiment in which the face-sheets and core members are fabricated as a single component.

Lastly, the defendants' contention that 37 C.F.R. s. 1.83(a) provides support for their proposed construction is simply misplaced. First, contrary to the defendants' argument that if the patent examiner had "understood the claims to require 'indistinct' sheets and core members, the application would have been rejected for failing to comply with 37 C.F.R. s. 1.83(a)," Rule 83(a) does not provide grounds for "rejecting" an application (or claims). If an examiner detects a violation of Rule 83(a), the examiner is directed to call for additional illustrations. 37 C.F.R. s. 1.83(c). *See also* M.P.E.P. s. 608.02.

Second, the issue here is one of claim scope. The drawings of the '378 patent, consistent with the requirement of Rule 83(a), do, in fact, "show every feature of the invention specified in the claims," *i.e.,* an upper sheet, a lower sheet, and a core as defined in the claim. Fig. 3, for example, illustrates an embodiment of the claimed invention containing the features specified in the claim. Rule 83(a), however, does not require drawings illustrating every possible embodiment encompassed by the scope of claim. If that were so, patents would soon become massive.

There have been, of course, instances in which the drawings have provided support for a particular claim construction where the specification does not admit of a construction broader than what is depicted in the drawings. *See, e.g.,* Toro Co. v. White Consolidated Indus., Inc., 199 F.3d 1295 (Fed.Cir.1999). Here, however, the specification plainly discloses an alternative embodiment to that illustrated in Fig. 3. Consequently, it would be improper to limit the scope of the claim to what is depicted in, for example, Fig. 3. *See* Advanced Cardiovascular Sys., Inc. v. SciMed Life Sys., Inc., 261 F.3d 1329, 1339 (Fed.Cir.2001) ("Scimed correctly notes that all of the drawings in the asserted patents depict the connecting elements in parallel alignment both with each other and the stent's longitudinal axis. However, this fact, by itself, does not support adding such a limitation to the claims. * * * Without a 'generally parallel' limitation in the claim or a discussion in the specification about the claimed connecting elements being generally parallel both to each other and to the stent's longitudinal axis, the drawings' depiction of the connecting elements in parallel

relationship both with each other and the stent's longitudinal axis can not support the conclusion that such a limitation exists. Since nothing in the specification assigns significance to the fact that the drawings align the connecting elements parallel both to each other and to the stent's longitudinal axis, we will not allow this aspect of the drawings to be imported into the claims as a limitation.").

That, though, is not the end of the matter. Once again, the defendants assert that the "upper sheet" must be "distinct from the lower sheet and the core members" and similarly that the "lower sheet" must be "distinct from the upper sheet and the core members." To the extent that the defendants use "distinct" to mean separate physical components, that must be rejected for the reasons given above. The claim language itself, particularly in light of the specification and prosecution history, is most reasonably interpreted as encompassing both the preferred embodiment of Fig. 3 as well as the alternative embodiment disclosed in the specification in which the upper and lower sheets and core members are formed as a single component.

Nevertheless, as described in the specification, even such a single component must have "an upper sheet," "a lower sheet" and "a core" as claimed. That was further emphasized by the patentees' remarks urging that the amended claims defined over the Doerr reference. In short, claim 1, as an apparatus claim, does not speak to how the apparatus is fabricated, *i.e.,* whether as a single component formed using pultrusion or some other method, or by starting with physically separate components that are then joined, or adhered, or bonded, or otherwise fastened together. *See, e.g., Howmedica Osteoma Corp. v. Tranquil Prospects, Ltd.,* 401 F.3d 1637 (Fed.Cir.2005). But however fabricated, the resulting structure, in order to fall within the language of claim 1, must have "an upper sheet," "a lower sheet" and "a core" as claimed.

That is to say, claim 1 of the '378 patent defines the "core" as comprising "a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section." FN18 Second, *and in addition thereto,* claim 1 requires "an upper sheet." Third, and in addition thereto, claim 1 requires "a lower sheet." Fourth, claim 1 requires that the core be "positioned between" the upper and lower sheets. The word that the defendants have chosen, "distinct," connotes separate components and claim 1 does not require separate components. If, however, the defendants mean to say that claim 1 requires (1) a core as claimed, (2) and in addition thereto an upper sheet, and (3) in addition thereto a lower sheet, then the defendants are correct.

FN18. Dependent claim 3, of course, further defines the core as "wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall."

It is, naturally, recognized that the issue of infringement *vel non* may not be entirely clear if an accused structure is not formed from separate components that may be characterized prior to assembly as upper and lower sheets and a core. For example, if a structure is fabricated pursuant to the written description of the '378 patent as a single component, deciding whether a structure actually has (1) a core as claimed, (2) and in addition thereto an upper sheet, and (3) in addition thereto a lower sheet, may be open to debate. That, however, is a question for the finder of fact when the issue of infringement is addressed. Here, the sole issue is claim construction, and claim construction is done with a blind eye to the possible impact on the issue of infringement. Although claim construction frequently resolves the question of infringement, that is not always the case.

Finally, the defendants propose explaining that "[a] sheet is not a beam, a coating, or a wear surface." In light of the foregoing, however, such a further explanation is unnecessary. As noted above, the parties have

agreed that "sheet" means "a flat, broad piece of material." In terms of claim construction, that is all that is required. Whether an accused structure has such a "sheet" or simply a "wear surface" is a question of infringement reserved for the finder of fact.

4. Recommended Construction

In *Renishaw,* the Federal Circuit, once again, advised that:

Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim. The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction.

158 F.3d at 1250 (citations omitted), quoted with approval, *Phillips,* --- F.3d at ----.

In light of the foregoing, the special master recommends that the Court construe claim 1 of the '378 patent as follows:

In claim 1 of the '378 patent, "an upper sheet" refers to a first flat, broad piece of material, and "a lower sheet" refers to a second flat, broad piece of material. Claim 1 requires a "core" defined as comprising "a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section." Second, *and in addition thereto,* claim 1 requires "an upper sheet" as defined. Third, *and in addition thereto,* claim 1 requires "a lower sheet" as defined. Fourth, claim 1 requires that the core be "positioned between" the upper and lower sheets. Claim 1 is drawn to a structure, not how the structure is made. Accordingly, the structure may be made from physically separate components consisting of "an upper sheet," "a lower sheet" and "a core" as defined. But that is not required. The structure may also be formed as a single component. Nevertheless, and however fabricated, the structure must comprise (1) a "core" comprising "a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section, and (2) *in addition thereto,* "an upper sheet," as defined, and (3) *in addition thereto,* "a lower sheet," as defined, and (4) the core must be "positioned between" the upper and lower sheets.

That construction stays true to the claim language and most naturally aligns with the patent's description of the invention.

C. a core "positioned between said upper sheet and said lower sheet"

1. Terms in Context

In the context of claims 1 and 3 of the '378 patent, the disputed phrase appears as follows:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core **positioned between said upper sheet and said lower sheet,** said core comprising a plurality of

substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

* * *

3. The load bearing support structure of claim 1, wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"located between the upper and lower sheet."
MM's Opening Brief at 30

Defendants

"positioned between said upper sheet and said lower sheet" means the core is connected to the upper sheet on one side and the lower sheet on an opposite side.
This is a product by process limitation.

Defendants' Response at 28-29

Martin Marietta urges that according to MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1994) at 908, the ordinary meaning of "positioned" is "to put in the proper position or place; locate," and that the ordinary meaning of "between" is "1b: in common to, shared by; 2a: in the time, space or interval that separates, b: in intermediate relation to." *Id*. at 109. MM's Opening Brief at 30. Martin Marietta contends that the '378 patent uses the term "positioned between" according to its ordinary meaning, pointing to the following:

The core includes a plurality of substantially hollow, elongated core members positioned between the upper surface and the lower surface.

* * *

The tubes 46 are sandwiched between a lower surface 36 of the upper facesheet 35 and the upper surface 41 of the lower facesheet 40.

'378 patent, col. 4, lines 41-43; col. 9, lines 54-57. Martin Marietta further disputes the defendants' contention that claim 1 is drawn in terms of a product by process, and contends that nothing in the '378 patent or its prosecution history limits the claimed invention to any particular form of manufacture. MM's Opening Brief at 31.

The defendants, on the other hand, rely on a definition for "position" taken from THE NEW OXFORD

AMERICAN DICTIONARY 2001, at 1331, namely "a particular way in which someone or something is placed or arranged." The defendants contend that "[t]he particular way used in the '378 Patent is shown, for example, in Fig. 3. There, the sandwich panels have the core (element 45) located between the lower sheet (element 40) on one side, and the upper sheet (element 35) on an opposite side, and is connected to both sheets." Defendants' Response at 29.

The defendants further contend that their construction is supported by the patentees' remarks in the amendment of May 20, 1999, discussed above, in which the patentees distinguished their amended claims over the Doerr reference by urging that "[t]he Doerr reference fails to disclose the sandwiched structure defined in claim 32 which includes two plates with a core positioned therebetween *in a sandwich-like structure*." [Emphasis by the defendants.] Defendants' Response at 30. The defendants argued that "[n]o one of ordinary skill; and no one who's ever had a sandwich for that matter, would fail to recognize that the sheets and the core must be connected to one another." *Id*.

That analogy did not go unchallenged. Martin Marietta contended in its reply that "[o]ne would not claim that a BLT sandwich is not a 'sandwich' because either of [*sic*] the bacon, lettuce or tomato is not 'bonded' to the bread," MM's Reply at 10, to which the defendants respond that "sandwich" is a commonly understood term in the field of composite structural materials, and "there is no need to be discussing tomatoes, bread or BLT 'sandwiches,' as Martin insists on doing." Defendants' Sur-Reply at 5.

The defendants also urge that Martin Marietta's construction is too broad: "Under Martin's hopelessly broad definition, a core located in Houston, Texas may well be considered to be 'positioned' between a sheet in the Pacific Ocean and a sheet in the Atlantic Ocean because it is 'located' there * * *." Defendants' Response at 30.

3. Discussion

This issue has been largely resolved in the preceding section of this report and recommendation. In general, the defendants' proposed construction bolsters their primary argument that claim 1 of the '378 patent requires three physically separate structural components, namely the upper sheet, the lower sheet and the core. Requiring that "the core is *connected* to the upper sheet on one side and the lower sheet on an opposite side" would presumptively require three physically separate structural components that are then "connected."

Claim 1, though, simply requires that the "core" be "*positioned* between said upper sheet and said lower sheet." The literal language of the claim requires nothing more. This limitation defines *where* the core is located, but is silent, in a literal sense, on whether or how the upper and lower sheets are attached to-or formed with-the core, as discussed above.

That, of course, is entirely consistent with the patentees' description of their invention. Under the heading "Summary of the Invention," for example, the patentees explain:

The load bearing deck of the modular section also includes at least one sandwich panel including an upper surface, a lower surface and a core. *The core includes a plurality of substantially hollow, elongated core members positioned between the upper surface and the lower surface*. * * * The upper and lower surfaces are preferably an upper facesheet and lower facesheet formed of a polymer matrix composite material. [Emphasis added.]

'378 patent, col. 4, lines 39-55. Later, under the heading "Detailed Description of the Preferred Embodiments," the patentees explain:

As shown in FIG. 3, each sandwich panel 34 comprises an upper surface shown as an upper facesheet 35, a lower surface shown as a lower facesheet 40 and a core 45 including a plurality of elongate core members 46.

'378 patent, col. 8, lines 21-25.

Also, as described above, the sandwich panels 34 each also have an upper surface shown as an upper facesheet 35 and a lower surface shown as facesheet 40 (FIG.3). The tubes 46 are sandwiched between a lower surface 36 of the upper face-sheet 35 and the upper surface 41 of the lower facesheet 40. As seen in FIG. 3, the lower face sheet 40 and the upper face sheet 35 are sheets preferably formed of polymer matrix composite materials and more preferably formed of fiberglass fibers and a polymer or vinylester resin as described herein.

'378 patent, col. 9, lines 52-61. None of those passages, *per se,* say anything about whether or how the upper and lower sheets are attached to-or formed with-the core (except, perhaps, the reference to "sandwiched" as discussed further below).

Following the foregoing description, of course, the patentees further describe their preferred embodiment. That is, the patentees first describe their invention in broad terms followed by a more specific example of a preferred embodiment. In that preferred embodiment, according to the patentees, upper and lower facesheets 35 and 40 are formed using a hand laid up process:

In the deck shown in FIGS. 1-7, the upper and lower facesheets 35, 40 are hand laid of polymer matrix composite material. In the deck 32 shown in FIGS. 1-7, the upper and lower facesheets 35, 40 are hand-laid, heavy weight, knitted, fiber-glass fabric.

'378 patent, col. 10, lines 21-25. Indeed, the patentees further explain that in the preferred form of the invention, upper and lower facesheets 35 and 40 are formed with "multipleply quasi-isotropic fabric," and the patentees explain what that means:

The upper and lower facesheets 35, 40 are each fabricated in this embodiment with multiple-ply quasi-isotropic fabric. Quasi-isotropic as used herein means an orientation of fibers approaching isotropy by orientation of fibers in several or more directions. In other words, quasi-isotropic refers to fibers oriented such that the resulting material has uniform properties in nearly all directions, but at least in two directions. The lay-up of the fabric in the facesheets 35, 40 is quasi-isotropic having fibers with an orientation of 0 (deg.)/ 90 (deg.)/45 (deg.)/-45 (deg.). The fibers are approximately evenly distributed in orientations having approximately 25 percent with a 0 (deg.) orientation, approximately 25 percent with a 90 (deg.) orientation, approximately 25 percent with a 45 (deg.) orientation, and approximately 25 percent with a-45 (deg.) orientation.

'378 patent, col. 10, lines 26-39, and why that method and fiber orientation is preferred, although other orientations could be used:

The quasi-isotropic layup of the upper and lower facesheets 35, 40 prevent warping from non-uniform

shrinkage during fabrication. The orientation of the face-sheets also provides a nearly uniform stiffness in all directions of the facesheets 35, 40. Alternatively, other types of composite materials, with varying orientations, can be used to fabricate the upper and lower facesheets 35, 40. For example, alternatively, the facesheets can be formed with orientations other than quasi-isotropic layup.

'378 patent, col. 10, lines 40-48.

The patentees also explain the steps for fabricating upper and lower facesheets 35 and 40:

The upper and lower facesheets 35, 40 are fabricated in the present embodiment by the following steps. First, the lower facesheets 40 and upper facesheets 35 are fabricated by hand layup using rolls of knitted quasi-isotropic fabric. Alternatively, the facesheets 35, 40 preferably can be fabricated by automated layup methods. The fibers of the upper and lower facesheets 35, 40 are given a predetermined orientation such as described depending on the desired properties.

'378 patent, col. 10, lines 49-57.

As noted above, patent applicants are required by 35 U.S.C. s. 112(1) to provide in their specification (1) a disclosure of how to make and use their invention, *i.e.,* an enabling disclosure, "in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same," (2) a written description of the invention,FN19 and (3) a description of "the best mode contemplated by the inventor of carrying out his invention." Additionally, patent applicants are required by 35 U.S.C. s. 112(2) to provide, at the end or conclusion of the specification, "one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."

FN19. There is currently some disagreement within the Federal Circuit whether the statute imposes a separate written description requirement outside the context of asserting priority under 35 U.S.C. s.s. 119, 120. *See* Univ. of Rochester v. G.D. Searle & Co., 375 F.3d 1303 (Fed.Cir.2004) (on order denying a petition for rehearing *en banc,* concurring opinions by Circuit Judges Lourie and Dyk, dissenting opinions by Circuit Judges Rader and Linn); Enzo Biochem, Inc. v. Gen-Probe Inc., 323 F.3d 956, 970 (Fed.Cir.2002) (opinions on order declining to hear case *en banc*). That disagreement is not implicated here. The point is simply that s. 112 imposes certain statutory disclosure obligations.

There is, to be sure, a tight-knit relationship between patent claims and the specification of which they are a part. *Phillips,* --- F.3d at ---- ("The importance of the specification in claim construction derives from its statutory role. The close kinship between the written description and the claims is enforced by the statutory requirement that the specification describe the claimed invention in 'full, clear, concise, and exact terms.' 35 U.S.C. s. 112, para. 1; * * * In light of the statutory directive that the inventor provide a 'full' and 'exact' description of the claimed invention, the specification necessarily informs the proper construction of the claims."). *See also* Networld, 242 F.3d at 1352 ("The claims are directed to the invention that is described in the specification; they do not have meaning removed from the context from which they arose."); Markman 517 U.S. at 389 ("[A claim] term can be defined only in a way that comports with the instrument as a whole."). But once one starts down the path of "construing" claims (which many times means "limiting" claims) to the embodiment or embodiments disclosed in a patent specification, or yet further to the preferred embodiment disclosed in such a specification, where does one reasonably and fairly stop? McCarty v.

Lehigh Valley R.R. Co., 160 U.S. 110, 116, 16 S.Ct. 240, 40 L.Ed. 358 (1895) ("if we once begin to include elements not mentioned in the claim, in order to limit such claim * * *, we should never know where to stop").

Claim 1 of the '378 patent, for example, refers to "facesheets" which is discussed above. The '378 patent describes the foregoing preferred process for producing such "facesheets," yet neither Martin Marietta nor the defendants have suggested that "facesheets" should be limited to that preferred process, *i.e.*, an quasi-isotropic layup *etc*. The reason, of course, is that claim 1 is an apparatus claim that does not, by its terms, implicate or restrict how the "facesheets" are made (despite the defendants' "product-by-process" argument), including whether they are quasi-isotropic or otherwise. Further, in disclosing one or more embodiments of an invention-or a preferred embodiment of an invention-patent applicants are simply attempting to fulfill their statutory disclosure obligations under s. 112(1) by giving an example or two (or three or four *etc*) of how to actually implement the invention, *i.e.*, how to make and use an embodiment of the invention, and/or to describe a known best mode, and/or to fulfill the written description requirement. *See, e.g., Phillips,* --- F.3d at ---- ("To avoid importing limitations from the specification into the claims, it is important to keep in mind that the purposes of the specification are to teach and enable those of skill in the art to make and use the invention and to provide a best mode for doing so. * * * One of the best ways to teach a person of ordinary skill in the art how to make and use the invention is to provide an example of how to practice the invention in a particular case."); Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc., 381 F.3d 1111, 115-17 (Fed.Cir.2004) ("It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." * * * "Accordingly, particular embodiments appearing in the written description will not be used to limit claim language that has broader effect."); Liebel-Flarsheim, 358 F.3d at 905-06 ("That problem [construing claims 'in light of the specification] can present particular difficulties in a case such as this, in which the written description of the invention is narrow, but the claim language is sufficiently broad that it can be read to encompass features not described in the written description, either by general characterization or by example in any of the illustrative embodiments," but specifically rejecting the contention that "if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment."); Home Diagnostics, 381 F.3d at 1357 ("The district court erred by placing too much emphasis on the specification's discussion of the preferred embodiments, rather than the meaning of the claims themselves. Because the specification discussed only predetermined timing methods, the district court concluded incorrectly that the applicant had disavowed other ways to reach an endpoint. * * * Because the specification described no other embodiments in detail, the district court apparently interpreted the specification's silence regarding alternative embodiments as a disavowal. However, the applicant's choice to describe only a single embodiment does not mean that the patent clearly and unambiguously disavowed other embodiments. * * *.").

Certainly, as mentioned above, there are instances in which a specification describes an embodiment, albeit exemplary, as having some feature or construction or combination that is central and essential (or perhaps just disclosed as important for some reason) to the invention itself. In such instances, it may be appropriate and necessary to adopt a construction that "stays true to the claim language" and yet "most naturally aligns with the patent's description of the invention." Renishaw, 158 F.3d at 1249. In some instances doing so is necessary to avoid subverting the patent system by allowing a literal construction of patent terms to expand the scope of a patent claim to ensnare technology beyond that reasonably contemplated by the patentee(s). *See, e.g.,* Microsoft Corp., 357 F.3d at 1348 ("[i]n light of those clear statements in the specification that the invention ('the present system') is directed to communications 'over a standard telephone line,' we cannot read the claims of the [three patents-in-suit] to encompass data transmission over a packet-switched network such as the Internet."); Alloc, 342 F.3d at 1370 ("In so concluding, this court recognizes that it

must interpret the claims in light of the specification, * * *, yet avoid impermissibly importing limitations from the specification. * * * That balance turns on how the specification characterizes the claimed invention. * * * In this respect, this court looks to whether the specification refers to a limitation only as a part of less than all possible embodiments or whether the specification read as a whole suggests that the very character of the invention requires the limitation be a part of every embodiment. For example, it is impermissible to read the one and only disclosed embodiment into a claim without other indicia that the patentee so intended to limit the invention. * * * On the other hand, where the specification makes clear at various points that the claimed invention is narrower than the claim language might imply, it is entirely permissible and proper to limit the claims.").

In other cases, though, the specification is written in terms of, and thus must be accepted for, what it is-an exemplary description of one or more embodiments of an invention so that one of ordinary skill in the art will have the statutorily mandated (1) enabling disclosure, (2) written description, and (3) description of the applicant's contemplated best mode for carrying out the invention. It is, perhaps, inaccurate or overbroad to refer to such cases as "normal" or "generally," but it may be accurate to say that, subject to exceptions, depending on how the specification is written and phrased, claims are construed with an eye on the specification, and with the specification firmly in mind, but also mindful that the claims-not the remainder of the specification of which they are a part-set out what the applicant regards as his invention under s. 112(2), and which define the scope of the patent property right.

In *Liebel-Flarsheim,* for example, the Federal Circuit explained that in cases such as Biogen, Inc. v. Berlex Laboratories, Inc., 318 F.3d 1132, 1139-40 (Fed.Cir.2003); Watts v. XL Systems, Inc., 232 F.3d 877, 882-83 (Fed.Cir.2000); Cultor Corp. v. A.E. Staley Manufacturing Co., 224 F.3d 1328, 1331 (Fed.Cir.2000); Toro Co. v. White Consolidated Industries, Inc., 199 F.3d 1295, 1301-02 (Fed.Cir.1999); General American Transportation Corp. v. Cryo-Trans, Inc., 93 F.3d 766, 770 (Fed.Cir.1996); and Modine Manufacturing. Co. v. United States International Trade Commission, 75 F.3d 1545, 1550-51 (Fed.Cir.1996), "there were specific reasons dictating a narrow claim construction beyond the mere fact that the specification disclosed only a single embodiment or a particular structure." 358 F.3d at 907. Specifically, the court distinguished those cases as follows:

Thus, in *Watts,* the court held that the applicants specifically "limit[ed] the invention" to particular structures by specifying that the invention uses those structures, and further limited the scope of the invention by distinguishing close prior art in the prosecution history. * * * Likewise, in the *Cultor* and *Biogen* cases, the court construed the pertinent claim language restrictively based on an express limiting definition of that language in the specification, * * * as well as the fact that the inventors had "repeatedly distinguished their invention from the prior art" by characterizing their invention narrowly * * *. As the court explained in *Cultor,* "Whether a claim must, in any particular case, be limited to the specific embodiment presented in the specification, depends in each case on the specificity of the description of the invention and on the prosecution history. * * * Claims are not correctly construed to cover what was expressly disclaimed." * * *.

The court employed the same approach in the *Toro, General American Transportation,* and *Modine Manufacturing* cases. In those cases, this court interpreted the pertinent claim language narrowly, not merely because the specification did not describe a broader embodiment, but because the specification, claim, or prosecution history made clear that the invention was limited to a particular structure. * * *.

Id. at 907-08.

Here, the patentees describe in their specification, as discussed above, an exemplary method of fabricating upper and lower facesheets 35 and 40 (and elsewhere disclose an exemplary method of fabricating the core members). The patentees also describe the construction of a preferred form of "sandwich" panel when the foregoing method is adopted in which the upper and lower facesheets are joined in some fashion to the structural components making up the core:

Having fabricated the upper and lower facesheets 35, 40 as described herein, the lower surface 36 of the upper face sheet 35 is preferably laminated or adhered to the upper surface 47 of the tubes 46 by a resin 26 and/or other bonding means and joined with the tubes 46 by mechanical or fastening means including, but not limited to, bolts or screws. Likewise, the upper surface 41 of the lower facesheet 40 is preferably laminated to the lower surface 27 of the tubes 46 by resin 26 or other bonding means and joined with the tubes 46 by mechanical fastening means including, but not limited to, bolts or screws.

'378 patent, col. 9, line 62-col. 10, line 5, including alternative embodiments:

The core 45, including the tubes 46, and the upper and lower facesheets 35, 40 can be alternatively joined with fasteners alone, including bolts and screws, or by adhesives or other bonding means alone. Suitable adhesives include room temperature cure epoxies and silicones and the like.

'378 patent, col. 10, lines 6-10, as well as an alternative embodiment in which the "tubes" in the "core" are "formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods":

Further, alternatively, the tubes could be provided integrally formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods.

'378 patent, col. 10, lines 11-14.

The patentees further explain in their specification that, when the preferred embodiment is adopted, various alternative constructions are within the scope of what the patentees contemplated as their invention:

As shown in FIG. 3, a single upper face sheet 35 and a single lower face sheet 40 can each [be] adhered to a plurality of tubes. Alternatively, any number of face-sheets and any number of tubes can be connected to form the sandwich panel of the deck for a modular section. Also, alternatively, various sizes and configurations of facesheets and cores can be provided to accommodate various applications. The resulting deck 32 is provided as a unitary structural component which can be used by itself or as a component of a modular section 30 for thereby constructing a support structure including a bridge or other structure therefrom. The deck 32 can be utilized in other structural applications as described herein.

'378 patent, col. 11, lines 4-15.

Additionally, the patentees disclosed that alternative methods of fabrication are within the scope of their invention:

While the upper and lower facesheets 35, 40, are fabricated using a hand-layup process, the core 45 including the facesheets 35, 40 can alternatively be fabricated by other methods such as pultrusion, resin transfer molding (RTM), vacuum curing and filament winding and other methods known to one of skill in

the art of composite fabrication, which, therefore, are not discussed in detail herein. The details of these methods are discussed in Engineered Materials Handbook: Composites, Vol. 1, AJM International (1993).

'378 patent, col. 10, lines 58-67, including one in which the facesheets and core members were fabricated as a "single component," as discussed above:

Further, the facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes.

'378 patent, col. 10, line 67-col. 11, line 3.

In all, the specification of the '378 patent cannot be fairly read as suggesting that "the invention" contemplated by the inventors should be limited to the preferred embodiment, for example as illustrated in Fig. 3. The inventors clearly expressed their view that alternatives to the preferred embodiment were possible and were intended to fall within the scope of what they regarded as their invention. The example discussed in which upper and lower facesheets 35 and 40 are preferably laminated or adhered or otherwise joined to the upper surface 47 of tubes 46, in terms of the specification, appears to be precisely that-an example of an embodiment of the invention.

The defendants' contention that Martin Marietta's proposed construction could encompass a "sheet" in the Pacific Ocean and a "sheet" in the Atlantic Ocean with a "core" somewhere in between (perhaps in St. Louis) is an exaggeration. Claim 1 of the '378 patent is drawn to:

1. A load bearing support structure comprising:

* * *

a core positioned between said upper sheet and said lower sheet * * *

A "sheet" in the Pacific Ocean and a "sheet" in the Adantic Ocean with a "core" in, for example, St. Louis, could hardly be reasonably characterized as a "load bearing support structure."

Nevertheless, even though the specification does not reasonably support the defendants' contention that claim 1 should, more or less, be limited to the disclosed preferred embodiment, the prosecution history may indicate that the claims should be construed in a fashion other than what the literal language of the claim may suggest. *See* Kinik Co. v. United States Int'l Trade Comm'n., 362 F.3d 1359, 1364 (Fed.Cir.2004) ("3M is correct in that when the specification describes the invention in broad terms, accompanied by specific examples or embodiments, the claims are generally not restricted to the specific examples or the preferred embodiments *unless that scope was limited during prosecution*." [Emphasis added.]).

In the broad sense urged, the defendants' argument that the prosecution history compels their construction must be rejected on the present record. The defendants point out that the patentees argued in their May 20, 1999, response that the Doerr reference did not disclose "the sand-wiched structure defined in claim 32 which includes two plates with a core positioned therebetween in a sandwich-like structure." Defendants' Response at 30. The defendants, once again, are contending that "a core positioned between said upper sheet and said lower sheet" also includes the requirement that "the core is connected to the upper sheet on one

side and the lower sheet on an opposite side." The issue thus framed is whether that claim language, considered in conjunction with the patentees' argument in that amendment, requires that the upper and lower sheets be "connected" to the core, implying that there must be three separate structural components that are then "connected."

Returning to the claim language itself, the claim does not say that. The claim language, once again, simply requires that the "core" be "positioned between" the upper and lower sheets. And, as discussed above, that is how the specification describes the invention generally before turning to the specifics of the preferred embodiment. That is to say, the patentees' general description of the invention reproduced above refers only to the placement of the core between the upper and lower sheets.

The defendants, however, urge that the patentees in that amendment touted the "superior rigidity and strength" of their structure, Defendants' Response at 30, and contend that "if the core was not connected to the sheets, the structure would hardly support any weight at all." Defendants' Response at 29.

What the patentees actually said in their amendment, though, does not differ from the actual claim language. The patentees urged that "[t]he Doerr reference fails to disclose the sandwiched structure defined in claim 32 which includes two plates with a core *positioned therebetween* in a sandwich-like structure. The structure recited in claim 32 provides superior rigidity and strength in a lightweight modular construction." [Emphasis added.] Amendment of May 20, 1999, at 6. That is, the patentees urged that the structure *as claimed, i.e.,* a core "positioned" between two plates, produced a "sandwich-like" structure that provided superior rigidity and strength.

Additionally, the defendants' argument that if the core was not connected to the sheets, the structure would "hardly support any weight at all" is lawyer argument that is not supported with any expert declarations or other evidence in the record. Besides, in general terms, that argument departs from common experience. Many, if not most, engineering students have experienced the example of the ease with which one pencil may be broken, as opposed to breaking a bundle of two or three or more pencils, even though such pencils are not "connected" other than in the sense that such pencils are treated, in terms of force, as a bundle. There are other common examples. On a scaffold, for instance, a painter feeling insecure with a single 2x12 inch board, may add two more boards such that there is a "sandwich" of multiple boards. Even though such boards are not "connected" or "adhered" *etc*. to one another other than through friction surfaces, common experience indicates that the load carrying ability of such a "sandwich" structure is increased to some extent, albeit perhaps marginally and certainly not as much as if the components had been "adhered" or joined together in some fashion.

Those examples depart from the subject matter of the '378 patent and may not be truly analogous. Nevertheless, the point remains that the present record does not support the defendants' broad contention that if the core was not connected to the sheets, the structure would "hardly support any weight at all." FN20

FN20. It is noted, though, that in the example given in the '378 patent, col. 17, line 34-col.18, line 29, the facesheets were 0.85 inches thick, and the core members were 0.25 inch thick trapezoidal sections.

Overall, however, the Federal Circuit has emphasized that "[a] court construing a patent claim seeks to accord a claim the meaning it would have to a person of ordinary skill in the art at the time of the invention." Innova/Pure Water, 381 F.3d at 1116. "The inquiry into the meaning that claim terms would

have to a person of skill in the art at the time of the invention is an objective one. This being the case, a court looks to those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean. Those sources include the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art." *Id*. *See also Phillips,* --- F.3d at ----, quoting the foregoing with approval.

As noted above, in the amendment of May 20, 1999, the patentees urged that "[t]he Doerr reference fails to disclose the sandwiched structure defined in claim 32 * * *." Application claim 32, now claim 1, of the '378 patent does not call for a "sandwich panel" *per se,* as does, for example, claim 1 of the '118 patent. Nevertheless, the patentees' remarks in that amendment say that a "sandwiched structure" was defined by application claim 32.

In connection with claim 1 of the '118 patent, Martin Marietta has urged that the dictionary definition of "sandwich" is:

1a: two or more slices of bread or a split roll having a filling in between; b: one slice of bread covered with food; 2: something resembling a sandwich; *esp*. composite structural material consisting of layers often of high-strength facings bonded to a low-strength central core."

MM's Opening Brief at 12-13, quoting MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1994) at 1035. Martin Marietta urges that the general sense of the word "sandwich" simply means "that there is a top, a bottom and something placed between," and "[e]ven the more specific definition of sandwich that is related to composite structural materials * * * simply indicates that layers, or facings, are positioned on either side of a central core." *Id*. at 13.

Actually, however, the "more specific definition" that Martin Marietta relies on and that is related to composite structural material also includes the explanation that the layers are "*bonded* to a low-strength central core." That is also consistent with other technical definitions. For example, the MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMSS (5th ed.1999) at 1751 defines "sandwich construction" as "[c]omposite construction of alloys, plastics, wood, or other materials consisting of a foam or honeycomb layer laminated and glued between two hard outer sheets. Also known as sandwich laminate." That also appears to be the definition or connotation given "sand wich construction" by the composites industry. *See, e.g.,* A Glossary of Terms in Composites, Fibre Glast Developments Corp., http:// www.fibreglast.com/contentpages-glossary+of+terms+in+composites-163.html (defining "sandwich construction" as "[a] composite composed of lightweight core material (usually honeycomb or foamed plastic) to which two relatively thin, dense, high strength, functional, or decorative skins (also called faces) are adhered."); Fiberset Incorporated's Glossary of Composite Terms, http:// www.fiberset.com/html/glossary/gloss.htm (defining "sandwich construction" as "[a] composite composed of a lightweight core material (usually honeycomb or foamed plastic) to which two relatively thin, dense, high-strength, functional, or decorative skins (also called faces) are adhered."); Glossary of Terms, YLA Incorporated, http://www.ylainc.com/glossary/glossary.htm (defining "sandwich structure" as a "[c]omposite composed of lightweight core material (usually honeycomb or foam) to which two relatively thin, dense, high-strength, functional or decorative skins are adhered."); Glossary of Terms, Building Research Establishment Ltd., http:// projects.bre.co.uk/composites/glossary.html (defining "sandwich structure" as "composite composed of lightweight core material to which two relatively thin, dense, high strength, functional or decorative skins are adhered."); K & A Glossary of Terms, Kreysler & Associates, http://

www.kreysler.eom/glossary/glossary.htm# S (defining "sandwich structure" as "[a] laminate with two composite skins separated by, but bonded to, a structural core material. Used to create stiff, lightweight structures."); Composite Words Explained, Network Group for Composites in Construction, http://www.ngcc.org.uk/info/glossary.html (defining "sandwich structure" as "composite composed of lightweight core material to which two relatively thin, dense, high strength, functional or decorative skins are adhered.").

Although it may be that "[o]ne would not claim that a BLT sandwich is not a 'sandwich' because either of [*sic*] the bacon, lettuce or tomato is not 'bonded' to the bread," as Martin Marietta contended in reply to the defendants' "sandwich" comment, MM's Reply at 10, the foregoing, including the general dictionary definition offered by Martin Marietta, indicates that the defendants are correct that "sandwich structure" appears to be a commonly understood term in the field of composite structural materials. Defendants' Sur-Reply at 5. Further, the foregoing definitions and explanations aU refer to the faces or "skins" being "bonded" or "adhered" to the "core." That is also confirmed by numerous other academic and industry websites as well.

The website for the University of Cambridge, Department of Materials Science and Metallurgy, Composites and Coating Group, http://www.msm.cam.ac.uk/mmc, for example, offers the following explanation of "sandwich structures":

Principles of Sandwich Structures

Typical sandwich materials always exhibit a particular fundamental pattern of two face-plates (facings), which are comparatively thin but of high strength and stiffness, enclosing a core structure, which is relatively thick but light-weight, and possesses sufficient stiffness in the direction normal to the plane of the faceplates. *The components of the sandwich material must also be bonded together, using either adhesives or mechanical fastenings, such that they can act as a composite load-bearing unit*. In principle, the basic concept of a sandwich panel is that the faceplates carry the bending stresses whereas the core carries the shear stresses. Fig.1 shows the elements of a typical sandwich structure. [Emphasis added.]

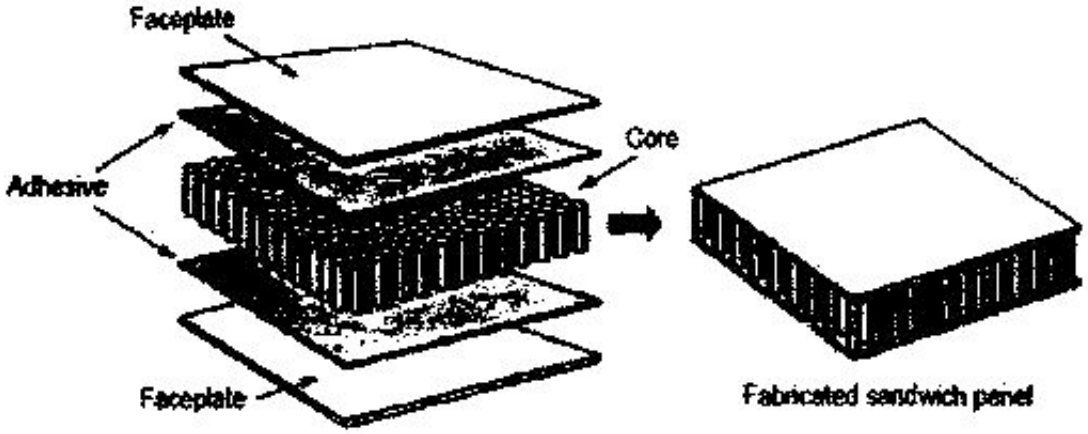


Fig. 1. A typical sandwich structure which consists of a core bonded in between two faceplates using adhesive [1].

In most cases, an efficient sandwich panel is obtained when the weight of the core is almost equivalent to

the combined weight of the faceplates [2]. By separating the face-plates using a low density core, the moment of inertia of the panel is increased and hence resulted in improved bending stiffness. Therefore, the bending stiffness of a sandwich structure greatly exceeds that of a solid structure having the same total weight and made of the same material as the facings. Furthermore, due to the porous nature of the core material, sandwich structure has inherent exceptional thermal insulation and acoustic damping properties.

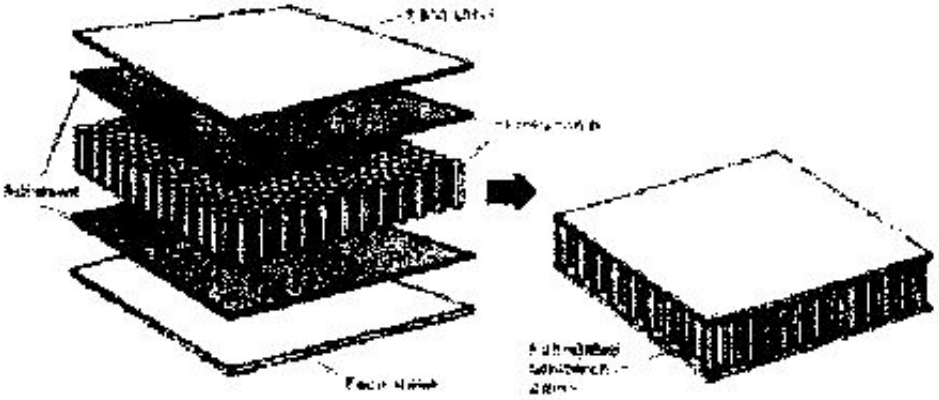
http://www.msm.cam.ac.uk/m mc/research/steelsheet/sandwichbase/principlesofsandwiches.htm.
Similarly, the website for the American Composites Manufacturers Association explains:

Bonded sandwich structures have been a basic component of the composites industry for over 45 years. *The concept of using relatively thin, strong face sheets bonded to thicker, lightweight core materials has allowed the industry to build strong, stiff, light and highly durable structures that otherwise would not be practical*. This technology has been demonstrated in boats, trucks, and building panels. A 3% weight increase can increase the flexural strength and stiffness by a magnitude of 3.5 times and 7 times respectively if cores and skins are properly chosen. *The structure then acts more or less monolithically*.

* * * In a sandwich structure, the core will generally have the same width and length dimensions as the skins, but can be much weaker than the skins since it primarily experiences shear stresses. Care must be taken in design to ensure that the shear carrying capability of the expected loads does not exceed both the core and the adhesive.

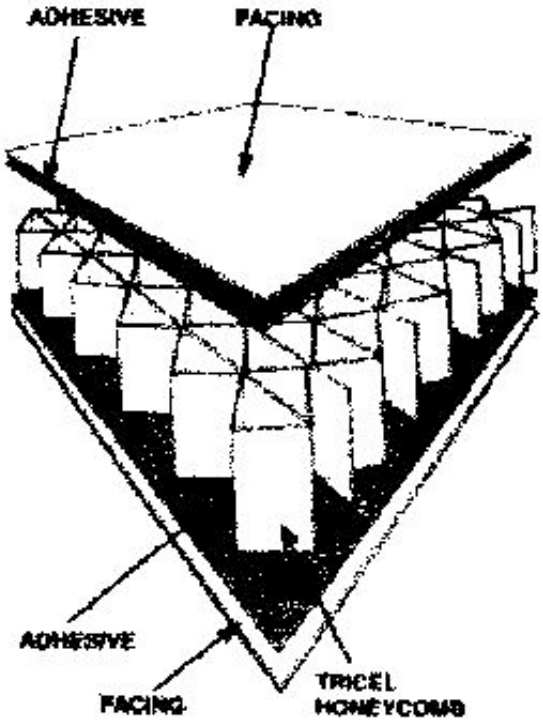
* * * *

Face sheets can be of almost any material. In the composites industry, the most common face sheets are glass and carbon. The common core materials are foam, syntactic foam, honeycomb, and balsa wood. Some core materials can be shaped, such as a waffle pattern or corrugation to achieve the desired mechanical properties.



http://www.mdacomposites.o rg/mda/psgbridge_cb_materials4_other_ constituents.html.

The website for the University of Alabama at Birmingham, School of Engineering, offers similar description:

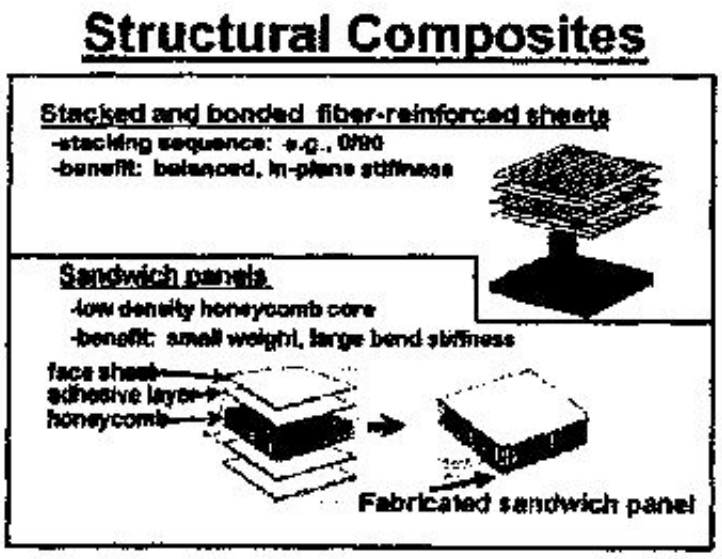


A structural sandwich is a special form of a laminated composite comprising a combination of different materials that are bonded to each other so as to utilize the properties of each separate component to the structural advantage of the whole assembly. Typically a sandwich composite consists of three main parts; two thin, stiff and strong faces separated by a thick, light and weaker core. *The faces are adhesively bonded to the core to obtain a load transfer between the components*.
The design principle of a sandwich composite is based on an I-beam, which is an efficient structural shape because as much as possible of the material is placed in the flanges situated farthest from the center of bending or neutral axis. Only enough material is left in the connecting web to make the flanges act in concert and to resist shear and buckling loads. In a sandwich, the faces take the place of the flanges and the core takes the place of the web. The difference is that the core of a sandwich is of a different material from the faces and it is spread out as a continuous support for the faces rather than concentrated in narrow web. *The faces act together to form an efficient stress couple or resisting moment counteracting the external bending moment. The core resists shear and stabilize the faces against buckling or wrinkling. The bond between the faces and the core must be strong enough to resist the shear and tensile stresses set up between them. The adhesive that bonds the faces to the core is of critical importance*.

[Emphasis added.] http://www.eng.uab.edu/compositesLab/F_sandwch3.htm.
The website for the Farmingdale State University of New York, School of Engineering Technologies, explains and illustrates "sandwich panels" in a similar fashion:

Sandwich Panels: Consist of two strong outer sheets which are called face sheets and may be made of aluminum alloys, fiber reinforced plastics, titanium alloys, steel. Face sheets carry most of the loading and stresses. Core may be a honeycomb structure which has less density than the face sheets and resists perpendicular stresses and provides shear rigidity. Sandwich panels can be used in variety of applications

which include roofs, floors, walls of buildings and in aircraft, for wings, fuselage and tailplane skins.



http://info.lu.farmingdale.edu/depts/met/met205/composites.html.

In general terms, and in principle, therefore, it appears that the core of a "sandwich" panel provides "stiffness" to the panel and is designed to support shear stresses, as, for example, explained in the '378 patent ("The side walls 48, 48' disposed at an oblique angle a provide transverse shear stiffness for the deck core 45."). The foregoing definitions and explanations refer to the sheets or facings as being bonded or fastened to the core in some fashion presumably to transmit shear forces (or, as explained at the University of Alabama at Birmingham site: "[t]he faces are adhesively bonded to the core to obtain a load transfer between the components," or as explained at the American Composites Manufacturers Association's website, so that the "structure then acts more or less monolithically," or as explained at the University of Cambridge's website, so that the components of the structure "can act as a composite load-bearing unit"). An unglued deck of cards, for example, may be easily bent because the individual cards are free to slide relative to one another, *i.e.*, they do not transmit shear forces.

The foregoing indicates that the term "sandwich structure" has a generally understood meaning in the field of technology identified in the '378 patent ("this invention relates to a modular composite load bearing support structure including a polymer matrix composite modular structural section for use in constructing bridges and other load bearing structures and components." '378 patent, col. 1, lines 14-18). The foregoing indicates that meaning includes that the "faces" or "sheets" or "skins" are "bonded" or "adhered" to the "core" in order to transmit shear forces, or "to obtain a load transfer between the components," or so that the "structure then acts more or less monolithically," or so that the components of the structure "can act as a composite load-bearing unit," which all, in this context, convey the same understanding.

Thus, in the foregoing example, although three (or more) 2x12 inch boards simply stacked or laid on top of one another on a scaffold may offer a painter greater support than a single 2x12 inch board, and although such a stack may resemble a "sandwich" of sorts, it would appear, from currently available resources, that one of ordinary skill in the art of the '378 patent would not regard such an assembly as a "sandwich

structure." One might quibble whether frictional or other forces between adjacent board surfaces could or would transmit some portion of the shear forces involved, or could or would provide some degree of load transfer. But the foregoing objective resources indicate that one of ordinary skill in the art of the '378 patent would nevertheless not regard three (or more) boards (or individual composite structures) stacked or laid on top of one another, without being "bound" or "adhered" or "fastened" together so as to act more or less monolithically or as a composite load-bearing unit, as a "sandwich structure."

The question then becomes whether claim 1 of the '378 patent should be construed as being drawn to a "sandwich structure," as that term would be understood by one of ordinary skill in the art of the '378 patent, even though that term does not appear in the literal language of the claim, as it does, for example, in claim 1 of the '118 patent. As noted above, the '378 and '118 patents are drawn to related technologies, but do not share the same lineage. The Federal Circuit has cautioned that differences between claim language in related applications may lead to different constructions. *See, e.g.,* ResQNet.com, Inc. v. Lansa, Inc., 346 F.3d 1374, 1381 (Fed.Cir.2003).

In this case, however, the construction would be the same regardless whether the '118 patent was being asserted-or even existed. Claims 1 and 3 of the ' 378 patent, again, call for:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core **positioned between said upper sheet and said lower sheet,** said core comprising a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

* * *

3. The load bearing support structure of claim 1, wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall.

Cases such as *Phillips* and *Innova* emphasize that the words of the claims must be-and are-the primary focus of claim construction. Nevertheless, the Federal Circuit has never suggested that the claims should be-or must be-construed in a manner divorced from the specification of which they are a part, for example, by using a scissors to cut the claims from the end of a patent and presenting such claims to a court for a literal construction of the words used in the claims. And in Medrad, 401 F.3d at 1319, the Federal Circuit said precisely that: "We cannot look at the ordinary meaning of the term * * * in a vacuum. Rather, we must look at the ordinary meaning in the context of the written description and the prosecution history."), quoted with approval in *Phillips,* --- F.3d at ----. Nor can claims be construed in a vacuum divorced from the prosecution history. Here the specification and prosecution history of the '378 patent provide the appropriate context for understanding the ' 378 patent claims-not in the sense of necessarily "limiting" the claims-but rather in the sense of understanding what the claims actually mean.

As originally presented, application claim 32 broadly called for:

32. A load bearing support structure comprising:

an upper surface;

a lower surface; and

a core positioned between said upper surface and said lower surface, said core comprising a plurality of elongated core members being defined by said upper surface, said lower surface and side walls positioned generally adjacent one another, said elongated core members being configured in at least one polygonal shape.

As discussed above, it seems clear from the specification that the patentees were using "upper surface" and "lower surface" in the same fashion as those terms were used in the specification, namely to refer, in a generic fashion, to structures such as upper and lower facesheets/sheets 35 and 40. Nevertheless, the examiner, as she was entitled to do to, construed the claims as broadly as the terms would reasonably permit, and (1) rejected the claims as indefinite under s. 112(2), noting that "[i]n claim 32, it is unclear how the upper and lower surfaces define the core member(s) when each core member has a separate upper and lower surface," Office Action of January 21, 1999, at 2, and (2) on that broad construction, rejected, *inter alia,* application claim 32 as being anticipated by the Doerr reference.

The patentees then responded by amending application claim 32 as follows:

32 [Patent Claim 1]. A load bearing support structure comprising:

an upper [surface] *sheet;*

a lower [surface] *sheet;* and

a core *positioned* between said upper [surface] *sheet* and said lower [surface] *sheet,* said core comprising a plurality of *substantially hollow,* elongated core members *having at least three walls* [being defined by said upper surface, said lower surface and side walls positioned generally adjacent one another, said elongated core members being configured in at least one] *defining a closed* polygonal shape *when viewed in cross-section*.

and by arguing that "[t]he Doerr reference fails to disclose *the sandwiched structure defined in claim 32* which includes two plates with a core positioned therebetween in a sandwich-like structure. The structure recited in claim 32 provides superior rigidity and strength in a lightweight modular construction." [Emphasis added.] Amendment of May 20, 1999, at 6. While it is true that the patentees did not use the term or phrase "sandwich structure" in the claim language *per se,* that is what the patentees argued that application claim 32 required, and that is what the patentees argued as a distinguishing feature over the Doerr reference. The application was subsequendy allowed with no further amendments to application claim 32. Having argued that application claim 32/patent claim 1 of the '378 patent defines a "sandwich structure," the patentees cannot now avoid that same construction. *See* Omega Engineering, 334 F.3d at 1324.

Second, one is told at the beginning of the specification that the invention broadly "is directed to a polymer matrix composite modular load bearing deck as a part of a modular structural section for a support

structure." One is next told that such support structure, again in broad terms, "includes a plurality of support members and at least one modular section positioned on and supported by the support members." One is further told that "preferably" the modular section "is formed of a polymer matrix composite," and "includes at least one beam and a load bearing deck positioned above and supported by the beam." ' 378 patent, col. 4, lines 26-38.

One is additionally told that the modular section "also includes at least one sandwich panel including an upper surface, a lower surface and a core," and that the core includes a plurality of elongated core members having a polygonal shape in cross-section. '378 patent, col. 4, lines 39-41. One of ordinary skill in the art, presumably familiar with the foregoing definitions, descriptions and explanations of "sandwich structure," is thus told at the beginning of the specification that the invention includes "at least one sandwich panel" having that construction. Claim 32, as originally presented, used virtually identical language. It seems clear that claim 32 was drawn to what the patentees themselves described in the specification as a "sandwich panel," and that one of ordinary skill in the art, knowledgeable of what "sandwich structure" connoted in the art, would likewise so construe the claim. And, of course, the patentees so characterized the claim in their remarks in the May 20, 1999, amendment.

Moreover, the patentees throughout the specification refer to the panels making up deck 32 as "sandwich panels" 34, *e.g.,* "In the bridge 20 including the modular section 30 shown in FIGS. 1-2, the deck 32 includes three sandwich panels 34, 34' 34". Alternatively, any number of panels can be utilized in a deck depending on the length of the desired span." '378 patent, col. 8, lines 15-21. The patentees further explain that "[a]s shown in FIG. 3, each sandwich panel 34 comprises an upper surface shown as an upper facesheet 35, a lower surface shown as a lower facesheet 40 and a core 45 including a plurality of elongate core members 46." '378 patent, col. 8, lines 21-25.

Lasdy, although, as discussed above, Fig. 3 illustrates *an* embodiment of the invention, the patentees nevertheless also disclose that the invention "includes *at least one* sandwich panel including an upper surface, a lower surface and a core." '378 patent, col. 4, lines 40-41. That is, Fig. 3 illustrates one form of such a "sandwich panel," but the invention described in the '378 patent as a whole contemplates "*at least one sandwich panel* including an upper surface, a lower surface and a core."

Accordingly, in terms of overall context, claim 1 of the '378 patent:

1. A load bearing support structure comprising:3

an upper sheet;

a lower sheet; and

a core **positioned between said upper sheet and said lower sheet,** * * *.

should be construed to mean precisely what the patentees represented to the U.S. PTO, namely a "sandwich structure" as such would be understood by one of ordinary skill in the art in the field of the '378 patent. And, the foregoing resources indicate that one of ordinary skill would view "sandwich structure" in this art as one in which the upper and lower sheets are "bound" or "adhered" or "fastened" to the core (or formed as single component) so as to act more or less monolithically or as a composite load-bearing unit.

Once again, though, as an apparatus claim, claim 1 is not limited to *how* the structure is formed. The specification discloses several alternatives, including laminating upper and lower sheets to the core, or "adhering" the upper and lower sheets to the core "by resin 26 and/or other bonding means and joined with the tubes 46 by mechanical or fastening means including, but not limited to, bolts or screws," or "joined with fasteners alone, including bolts and screws," or "by adhesives or other bonding means alone," or by forming the tubes integrally with the upper and lower sheets "as a unitary structural component * * * by pultrusion or other suitable forming methods." '378 patent, col. 9, line 65-col. 10, line 14.

Also, the defendants' contention that claim 1 recites a product-by-process must be rejected. A product-by-process claim defines a product in terms of a process for making it, and originally was limited to those situations where a product could not otherwise be accurately defined. *See* In re Hughes, 496 F.2d 1216, 1218 (C.C.P.A.1974). *See also* 3-8 CHISUM ON PATENTS s. 8.05 (2004) ("A 'product-by-process' claim is one in which the product is defined at least in part in terms of the method or process by which it is made.").FN21 The defendants urge that the various processes for forming the claimed structure "all require that the core * * * be connected to one facesheet * * * on one side, and another facesheet * * * on an opposite side." Defendants' Response at 31. However, "[t]he method of manufacture, even when cited as advantageous, does not of itself convert product claims into claims limited to a particular process. * * * A novel product that meets the criteria of patentability is not limited to the process by which it was made." Vanguard Prods. Corp. v. Parker Hannifin Corp., 234 F.3d 1370, 1373 (Fed.Cir.2000). Here, claim 1 of the '378 patent is clearly drawn in apparatus terms that define the claimed structure. The language of the claim does not invoke any process limitations, and patentability of the claim did not depend on the process for producing the claimed product. The phrase "a core positioned between said upper sheet and said lower sheet" describes the relationship between the core and the upper and lower sheets, not a method or process for producing the claimed product. *See* Id., 234 F.3d at 1372 ("We agree with the district court that the word 'integral' describes the relationship between the elastomeric layers, not the means of joining them."). This is not a product-by-process limitation.

FN21. The defendants also assert that "formed integrally," as used in claim 1 of the '118 patent, constitutes a "product-by-process" limitation. Accordingly, the issues involved with "product-by-process" claims are also addressed below in connection with the '118 patent.

4. The Defendants' Comments on the Draft Report and Recommendation

The defendants urge that the foregoing establishes an "ordinary meaning" for "sandwich panel" in which the core and facesheets are distinct from one another, but then improperly departs from that "ordinary meaning." The defendants urge that departure is based on "two sentences in the patents," namely:

Further, alternatively, the tubes could be provided integrally formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods.

'378 patent, col. 10, lines 11-14, and

Further, the facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes.

'378 patent, col. 10, line 67-col. 11, line 3, which the defendants urge "do not provide the type of

justification required to discard the phrase's ordinary and customary meaning in the art." Defendant's Comments at 3-4. The defendants contend that the "Draft Report interprets the pultrusion process discussed in the specification in the phrase 'pultruding a single sandwich panel' as *necessarily* requiring a departure from the ordinary and customary meaning of 'sandwich panel.' * * * The Draft Report is wholly dependent on the assumption that the pultrusion process necessarily requires a product to be built with indistinct pieces." [Emphasis in original.] Id. at 4. The defendants argue, however, that "the pultrusion process does not necessarily result in a product that has either distinct or indistinct pieces. The ambiguity arises because there is also a pultrusion technique in which pre-existing cores are pultruded to form a sandwich panel by adding facesheets." Id.

In particular, the defendants urge that a publication entitled "Advanced Composite Materials With Application to Bridges," (Canadian Society for Civil Engineering, May 1991) at 116, and U.S. Patent No. 5,730,485, disclose pultrusions using wooden cores. The defendants argue that "[i]n short, there is a perfectly plausible interpretation of the above cited sentences that is fully consistent with the established ordinary meaning of the term 'sandwich panel,' and as such, these sentences do not overcome the heavy presumption [that claim terms should be given their ordinary meaning] and do not justify the broadening departure from the established ordinary meaning applied in the Draft Report. Even if it were possible to interpret these sentences as supporting a broader definition of sandwich, these sentences certainly are not a clear disavowal of the ordinary meaning and are best ambiguous." Id. at 5.

In the end, the defendants contend that "[t]he express recitations of the claim constructions should reflect that the core and the facesheets are distinct components of the 'sandwich panel' or 'sandwich structure.' In light of this correction, Defendants also request that [the] Draft Report be modified accordingly and particularly the construction * * * be clarified in that the construction of the structure that 'may be formed as a single component' still requires that the core and the face-sheets are distinct and different building blocks of the formed 'sandwich panel' or 'sandwich constructure.' " Id. at 6.

First, as discussed in the draft report and again above, claim 1 of the '378 patent:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, * * *.

is clearly drawn in apparatus terms that define the claimed structure. The claim is simply not dependent on what process was used to make the claimed structure, whether through pultrusion or otherwise.

Second, neither the draft report nor this final report assumes that pultrusion *necessarily* requires a product to be built with indistinct pieces. The "Advanced Composite Materials With Application to Bridges" publication discloses that "[c]ombination of glass fibres and wood core by pultrusion process was reported by Mufti et al. (1990). A wood section was co-pultruded through a die with the reinforcing fibres to form composite beams with wood core and unidirectional glass fibre composite 'skin.' " The '485 patent discloses, *inter alia,* "[t]o form the edge boards 36, a core member 38 is co-pultruded with the fiber reinforced plastic composite material to form the shell 40. Co-pultrusion is accomplished by drawing the core member 38 and

the filamentary material through a resin bath then through a die to form an edge board pultrusion that is cut to desired lengths to form the edge boards 36. When formed in this way the shell 40 forms a seamless and unitary skin that integrally bonds to the core member 38. In a preferred embodiment, the shell 40 completely encases or encapsulates the core member 38 on all four sides to seal and protect the core member 38." '485 patent, col. 4, lines 30-40.

The defendants suggest, and Martin Marietta does not deny, that the claimed "load bearing support structure" could be formed using such a process, *i.e.,* one in which the "core" is "co-pultruded" with the upper and lower sheets. The defendants contend, and again Martin Marietta does not deny, that the resulting structure could accurately be described as "unitary" and "a single component." Also, perhaps (neither Martin Marietta nor the defendants say), an interface between the "core" and the upper and lower sheets could be detected in the finished product when viewed in cross-section.

What the defendants do not, in their comments to the draft report and recommendation, deny-or furnish any reliable evidence concerning-is that a pultrusion process could also be used to make the claimed "load bearing support structure" in which the "core" and/or upper and lower sheets are not first formed in distinct components, but rather are "fabricated as a single component." In short, neither the draft report nor this final report assume that pultrusion *necessarily* requires a product to be built with indistinct pieces. Likewise, however, neither the draft report nor this final report assume that pultrusion *necessarily* requires a product to be built with *distinct* pieces.

At the bottom line, the defendants through their several proposed constructions contend that the claim language *requires* that the "core" and upper and lower sheets be separate structural components, at least prior to joining. For the reasons discussed in the draft report and recommendation, and again in this final report and recommendation, that contention has been rejected. The claim language, when viewed in light of the specification and prosecution history, simply does not reasonably require such a limitation. In terms of the "notice" function served by the claims, although the claim language *per se* could be read, at first blush, as suggesting three structural components, the claim language likewise is not limited to any particular method of manufacture, and the specification and prosecution history as a whole, as discussed above, do not reasonably support limiting the claims to separate components. Also in terms of the "notice" function, the written description discloses several alternative methods of construction, including:

Further, alternatively, the tubes could be provided integrally formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods.

and

Further, the facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes.

As noted above, the law has long been-and the *en banc* court in *Phillips* confirmed-that one of ordinary skill in the art, and consequently the court, reads claims in the context of the specification as a whole. Thus, in addition to recognizing that the claim language does not limit the claims to any particular method of manufacture, the specification further tells one of ordinary skill in the art that several alternative methods of manufacture are possible, including forming the tubes "as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods" or fabricating the facesheets and core members "as a single component such as by pultruding a single sandwich panel having

an upper and lower facesheet and a core of tubes." On the current record, although one of ordinary skill in the art may understand that as *including* co-pultrusion such as disclosed in the "Advanced Composite Materials With Application to Bridges" publication and the '485 patent,FN22 that does not mean the written description would be understood by one of ordinary skill in the art as being *limited* to the same, especially in view of the broader understanding of the pultrusion process.

FN22. Among other arguments, the defendants urge that because the foregoing portions of the specification refer to "tubes" forming the core, "[g]rammatically, the sentences are clearly more consistent with the pultrusion fabrication technique described by Defendants (where [a] preexisting core of tubes are [*sic*] passed through the pultrusion process) than by the technique described by the Draft Report." Defendants' Comments at 5. Well-perhaps. The English language many times permits reasonable disagreements. However, at least the disclosure that "the facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes" would seem to be abundantly clear on its face and is *not* grammatically more consistent with a co-pultrusion process in which the cores, at a minimum, are fabricated beforehand. In any event, even if these disclosures were construed as the defendants contend, the fact remains that defendants have provided no reliable evidence that one of ordinary skill in the art would understand that disclosure to mean that the "core" and/or the upper and lower sheets would, by necessity, consist of separate components.

That is not to say, of course, that the scope of the claims otherwise meet the statutory requirements of s. 112(1). One of the *en banc* questions posed in *Phillips* was "5. When, if ever, should claim language be narrowly construed for the sole purpose of avoiding invalidity under, e.g., 35 U.S.C. s.s. 102, 103 and 112?" The ABA urged in its amicus brief that "invalidity issues should play no role in claim construction." Brief of the American Bar Association As *Amicus Curiae* at 3. The *en banc* court in *Phillips* held that "[w]hile we have acknowledged the maxim that claims should be construed to preserve their validity, we have not applied that principle broadly, and we have certainly not endorsed a regime in which validity analysis is a regular component of claim construction. * * * Instead, we have limited the maxim to cases in which 'the court concludes, after applying all the available tools of claim construction, that the claim is still ambiguous.' " --- F.3d at ----, quoting Liebel-Flarsheim, 358 F.3d at 911, in which the issue was alleged lack of written description and enablement support.FN23

FN23. The district court had noted that it is "unlikely that the specification, which was drafted for claims that disclosed an injector that included a pressure jacket, would describe an injector that does not require a pressure jacket, much less enable one skilled in the art to make and use such a device." The Federal Circuit responded: "[U]nless the court concludes, after applying all the available tools of claim construction, that the claim is still ambiguous, the axiom regarding the construction to preserve the validity of the claim does not apply." 358 F.3d at 911.

Here, the claims, after applying the appropriate claim construction guidelines, are not ambiguous. Whether the claims as so construed have proper enabling and written description support is not a matter for claim construction, and, in any event, can not be decided on this record. For example, whether a patent specification would enable one of ordinary skill in the art to practice an invention without undue experimentation, namely whether the specification contains an enabling disclosure, requires the Court to consider several factors such as (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the

state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims. *See* In re Wands, 858 F.2d 731, 737 (Fed.Cir.1988). The present record simply does not permit that analysis. Additionally, asserting that a particular claim construction would result in the claim being invalid requires clear and convincing proof of the same. That generally requires more than the parties' arguments. A party "cannot avoid a full-blown validity analysis by raising the spectre of invalidity during the claim construction process." Rhine v. Casio, Inc., 183 F.3d 1342, 1346 (Fed.Cir.1999).

Lastly, neither the analysis in the draft report and recommendation, nor the analysis repeated herein, changes or departs from or expands the "ordinary" meaning of "sandwich panel." As discussed above, available resources indicate that the term "sandwich structure" connotes that the "faces" or "sheets" or "skins" of such a structure are "bonded" or "adhered" to a "core" in order to transmit shear forces, or "to obtain a load transfer between the components," or so that the "structure then acts more or less monolithically," or so that the components of the structure "can act as a composite load-bearing unit," which, in the present context, all convey the same understanding. Although those resources refer to a "typical" sandwich construction as having separate components that are then bonded together, the underlying concept is to use "relatively thin, strong face sheets bonded to thicker, lightweight core materials" which "has allowed the industry to build strong, stiff, light and highly durable structures that otherwise would not be practical."

The fundamental point, of course, is "bonding" the "faces" or "sheets" to the core such that the resulting structure acts "more or less monolithically." The connotation of "sandwich structure," though, at least from the foregoing resources, does not depend on *how* the bonding occurs. The specification discloses that pultrusion may be used to produce such a structure. The sources cited by the defendants also disclose that pultrusion (or co-pultrusion) may be used to provide the type of bond required for a sandwich structure to act "more or less monolithically." For example, the '485 patent discloses, *inter alia,* "[w]hen formed in this way the shell 40 forms a seamless and unitary skin that *integrally bonds* to the core member 38." [Emphasis added.] There is simply no indication in the current record that one of ordinary skill in the art would, consistent with the "ordinary" connotation of "sandwich structure," construe "sandwich panel 34":

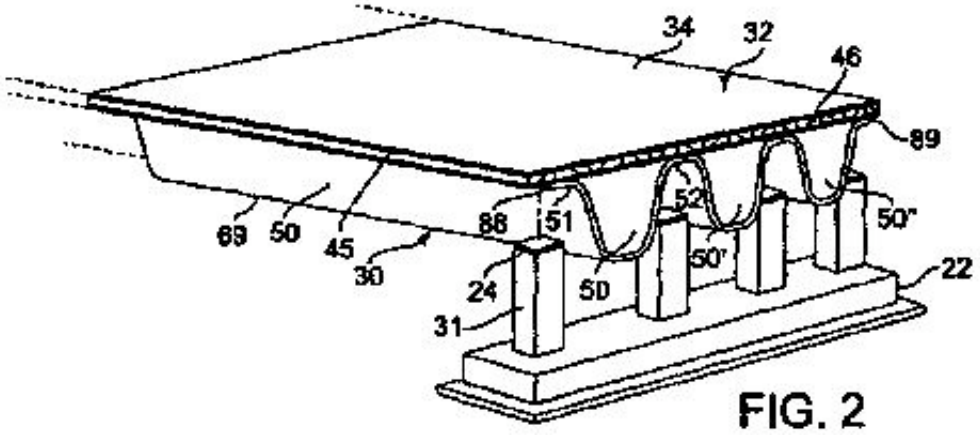


FIG. 2

as being a "sandwich panel" if manufactured by bonding separate components, or by co-pultruding a "core" to form an "integral" or "single component" with upper and lower face sheets, but would *not* regard such a

structure as a "sandwich panel" if the structure was formed by pultrusion from non-distinct components as a single component.

5. Recommended Construction

Accordingly, the special master recommends that the Court construe claim 1 of the '378 patent as follows. The following recommended construction incorporates the recommended construction in the foregoing section addressing the upper and lower sheets:

In claim 1 of the '378 patent, "an upper sheet" refers to a first flat, broad piece of material, and "a lower sheet" refers to a second flat, broad piece of material. Claim 1 requires a "core" defined as comprising "a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section." Second, *and in addition thereto*. claim 1 requires "an upper sheet" as defined. Third, *and in addition thereto,* claim 1 requires "a lower sheet" as defined. Fourth, claim 1 requires that the core be "positioned between" the upper and lower sheets. Claim 1 is drawn to a structure, not how the structure is made. Accordingly, the structure may be made from physically separate components consisting of "an upper sheet," "a lower sheet" and "a core" as defined. But that is not required. The structure may also be formed as a single component. Nevertheless, and however fabricated, the structure must comprise (1) a "core" comprising "a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section," and (2) *in addition thereto,* "an upper sheet," as defined, and (3) *in addition thereto,* "a lower sheet," as defined, and (4) the core must be "positioned between" the upper and lower sheets.

Also, the patentees described claim 1 as defining a "sandwiched structure." A "sandwich structure" in the field of the invention means a structure in which the "upper" and "lower" "sheets" are "bonded" or "adhered" or "fastened" to the "core" in order "to obtain a load transfer between the components," or so that the "structure then acts more or less monolithically," or so that the components of the structure "can act as a composite load-bearing unit." But again, claim 1 is drawn to a structure, not how the structure is made. Accordingly, the structure may be made from physically separate components consisting of "an upper sheet," "a lower sheet" and "a core" as defined, and in which the upper and lower sheets are "bonded" or "adhered" or "fastened" to the core. But that is not required. The structure may also be formed as a single component.

D. "a core * * * said core comprising a plurality of substantially hollow, elongated core members"

1. Terms in Context

In the context of claims 1 and 3 of the '378 patent, the disputed terms appear as follows:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, **said core comprising a plurality of substantially hollow, elongated core members** having at least three walls defining a closed polygonal shape when viewed in cross-section.

* * *

3. The load bearing support structure of claim 1, wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"substantially hollow, elongated core members" means "slender structures that make up the core."
"core" means "a central and often foundational part usually distinct from the enveloping part by a difference in nature."

MM's Opening Brief at 14, 17, 31-33.

Defendants

"substantially hollow, elongated core members" means that "the core members each have a substantial cavity within when viewed in cross-section, where the cavity is a closed polygonal shape.
"core" means "the central foundational part of a body separate and distinct from the enveloping part; a preexisting central part upon which the sheets are attached.

Defendants' Response at 15.

Martin Marietta urges that according to MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1994) at 257, the ordinary meaning of "core" is "a central and often foundational part usually distinct from the enveloping part by a difference in nature as; a: the usually inedible central part of some fruits * * *." MM's Opening Brief at 14, 31. Martin Marietta contends that the '378 patent uses the term "core" to refer to the central part of the sandwich panel. Id. Martin Marietta urges that nothing in the '387 patent (or the '118 patent) or the prosecution histories thereof require the "core" to be "separate and distinct" from an enveloping part, or that such a "core" must be "preexisting" as the defendants contend, noting, *inter alia,* the disclosure repeatedly referred to above that the tubes of the core members and the upper and lower facesheets may be formed as a unitary structural component. Id. at 16, 32.

With respect to the phrase "substantially hollow, elongated core members," Martin Marietta relies on general dictionary definitions (again from MERRIAM-WEBSTER'S COLLEGIATE DICTIONARYY (10th ed.1994)) for (1) "substantially," *i.e.,* "significantly great" or "being largely but not wholly that which is specified," (2) "hollow," *i.e.,* "unfilled space," and (3) "elongated," *i.e.,* "long in proportion to width; slender." Martin Marietta combines the definitions for "substantially" and "hollow" such that "substantially hollow" is construed to mean "largely unfilled space," and combines that with the definition of "elongated" to arrive at its proposed construction, *i.e.,* "slender structures, consisting of largely unfilled space, that make up the core."

In connection with the '378 patent, Martin Marietta again urges that the "core members" need not be

"distinct" from the upper and lower sheets. MM's Opening Brief at 33. In connection with claim 1 of the '118 patent, Martin Marietta contends that the claim should not be limited to "where the cavity is a closed polygonal shape" as the defendants contend. Id. at 17.

Insofar as "core" is concerned, the defendants rely on one of the definitions for "core" found in WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY (1981), namely "the central or foundational part of a body," and say that remainder of their proposed construction "flows from the fact that the claims, when read as a whole, and the specification, require that 'the central part,' (tubes 46), of the structure is distinct from the sheets to which the core is attached. See, e.g., Fig. 3 to both patents." Defendants' Response at 17.

The defendants similarly urge that there is no "ordinary meaning" for "core members," and therefore the term should be construed to cover what is disclosed in the drawings, namely "the hollow core tube 46, which has a polygonal cross-section." Id. at 16. Defendants' Sur-Reply at 5-6.

The defendants also criticize Martin Marietta's choice of a definition for "hollow" saying that definition is overbroad and would result in construing the letter "T" as hollow because there is unused space to the left and right of the vertical line. Defendants' Response at 16. The defendants urge that the Court should adopt a different dictionary definition for "hollow," *i.e.,* "having a cavity within." Id. The defendants further rely on a dictionary definition for "polygon" as "a closed plane figure bounded by straight lines" as support for their construction requiring that the cavity in the core members is a closed polygonal shape. Id. at 17.

In its reply, Martin Marietta contends that both the '378 and '118 patents disclose that "a variety of sizes, shapes and configurations of the elongated core members can be provided," and that, although the core members may be shaped as polygons, neither patent *requires* that configuration. MM's Reply at 13. Martin Marietta also contends that there is nothing in either patent that requires the core members to be "tubes." Id. at 14.

3. Discussion

The defendants' contention that the core must be "separate and distinct" has been resolved in the preceding sections of this report and recommendation. For the reasons discussed above, claim 1 of the '378 patent does not require the core to be "separate and distinct," but requires (1) a core, and (2) in addition thereto, an upper sheet, and (3) in addition thereto, a lower sheet. Claim 1 is drawn to a structure, not how the structure is made. Accordingly, the structure may be made from physically separate components consisting of "an upper sheet," "a lower sheet" and "a core" as defined. But that is not required. The structure may also be formed as a single component, as disclosed in the specification, *i.e.,* that the core members may be formed integrally with the upper and lower sheets "as a unitary structural component * * * by pultrusion or other suitable forming methods." '378 patent, col. 10, lines 11-14.

As for the parties' proposed definition of "core," this is a prime example of when general usage dictionaries are not particularly helpful. MERRIAM WEBSTER'S COLLEGIATE DICTIONARY, for example, lists a number of definitions for "core" ranging from usages as "the core of the city," to the "core" of a fruit, to foundry molds, to elevator shafts *etc.,* all of which have little if anything to do with the technology of the '378 or '118 patents. In the general field of science and technology, a "core" is simply "[t]he central part of a body or structure." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 462. That is also how "core" is used in the definitions, descriptions and explanations of

"sandwich structures" discussed in the preceding section of this report and recommendation, and how "core" is used in the '378 and '118 patent specifications.

As for "substantially hollow," the Federal Circuit has construed "substantially" in a number of cases, concluding most recently:

This court is asked, once again, to construe the meaning of the term "substantially" in a patent claim. See, e.g., Epcon Gas Sys., Inc. v. Bauer Compressors, Inc., 279 F.3d 1022 (Fed.Cir.2002) (construing the terms "substantially constant" and "substantially below"); Zodiac Pool Care, Inc. v. Hoffinger Indus., Inc., 206 F.3d 1408 (Fed.Cir.2000) (construing the term "substantially inward"); York Prods., Inc. v. Cent. Tractor Farm & Family Ctr., 99 F.3d 1568 (Fed.Cir.1996) (construing the term "substantially the entire height thereof"); Tex. Instruments Inc. v. Cypress Semi-conductor Corp., 90 F.3d 1558 (Fed.Cir.1996) (construing the term "substantially in the common plane"). In conducting this analysis, we begin with the ordinary meaning of the claim terms to one of ordinary skill in the art. *Prima Tek,* 318 F.3d at 1148 [Prima Tek II, L.L.C. v. Polypap S.A.R.L., 318 F.3d 1143 (Fed.Cir.2003)]; Reference to dictionaries and our cases indicates that the term "substantially" has numerous ordinary meanings. As the district court stated, "substantially" can mean "significantly" or "considerably." The term "substantially" can also mean "largely" or "essentially." Webster's New 20th Century Dictionary 1817 (1983). Indeed, our cases recognize the dual ordinary meaning of this term as connoting a term of approximation or a term of magnitude. See Epcon, 279 F.3d at 1031 ("The phrase 'substantially constant' denotes language of approximation, while the phrase 'substantially below' signifies language of magnitude, i.e., not insubstantial.").

Since the term "substantially" is capable of multiple interpretations, we turn to the intrinsic evidence to determine which interpretation should be adopted. *Ecolab,* 264 F.3d at 1366 [Ecolab, Inc. v. Envirochem, Inc., 264 F.3d 1358 (Fed.Cir.2001)]; *Gart,* 254 F.3d at 1339-40 [Gart v. Logitech, 254 F.3d 1334 (Fed.Cir.2001)].

Deering Precision Instr., L.L.C. v. Vector Distribution Sys., Inc., 347 F.3d 1314, 1322-23 (Fed.Cir.2003).

Accordingly, turning to the specification of the '378 patent, the specification explains, using language virtually identical to the claim language, that "[t]he core includes a plurality of substantially hollow, elongated core members positioned between the upper surface and the lower surface." In context, it seems clear that "substantially" is being used to mean "largely" or "essentially." There also does not appear to be any substantive disagreement between the parties *vis-a-vis* "substantially."

As for "hollow," that is a commonly used and readily understood word that does not require further "construction." Furthermore, despite the defendants' overly zealous argument that the letter "T" could be construed as "hollow" if Martin Marietta's construction was adopted, there is no actual controversy between the parties on the meaning of the term. Martin Marietta uses the MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1994). The same Tenth Edition will be used here, but one bearing a copyright date of 1999 because it is at hand and is more legible than the photocopy included with Martin Marietta's brief. The definition that Martin Marietta refers to is the *noun* form of "hollow." In claim 1, in the phrase "substantially hollow, elongated core members," "hollow" is used as an adjective. Martin Marietta erred. Nevertheless, the definition is substantively applicable. The entire definition that Martin Marietta pointed to is "1: an unfilled space: CAVITY, HOLE." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999) at 553. Thus, "cavity" and "hole" are indicated as a "synonymous cross-reference." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999), "Explanatory Chart." The defendants point to

the adjective form of "hollow," and the definition: "2: having a cavity within (tree)," namely, an illustration of usage as in a "hollow tree." Id. at 553. Substantively, though, there is no difference between the parties' views *vis-a-vis* "hollow."

Furthermore, and perhaps most importantly, in the field of science and technology, "hollow" simply means "[h]aving an interior cavity." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 944.

As for "elongated," the defendants do not appear to dispute Martin Marietta's proposed construction, *i.e.*, "long in proportion to width; slender." Also, though, the term is readily understood. Accordingly, there is no need to depart from the claim language and further "construe" the term. In United States Surgical Corp. v. Ethicon, Inc., 103 F.3d 1554, 1568 (Fed.Cir.1997), *cert. denied,* 522 U.S. 950, 118 S.Ct. 369, 139 L.Ed.2d 287 (1997), the Federal Circuit explained that:

The *Markman* decisions do not hold that the trial judge must repeat or restate every claim term in order to comply with the ruling that claim construction is for the court. Claim construction is a matter of resolution of disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims, for use in the determination of infringement. *It is not an obligatory exercise in redundancy*. [Emphasis added.]

The last issue is the defendants' argument that "core members" has no "ordinary meaning" and therefore must be construed to mean "tubes" such as tubes 46 illustrated in Fig. 3, having a closed polygonal cross-section. The central question in construing a claim, however, is not whether "core members" has an "ordinary meaning"-in the sense that one can locate a dictionary definition for the term-but rather whether one of ordinary skill in the art would ascribe a meaning to the term. *Phillips,* --- F.3d at ---- ("The inquiry into how a person of ordinary skill in the art under stands a claim term provides an objective baseline from which to begin claim interpretation.") As noted at the outset, for example, in Ferguson Beauregard/Logic Controls v. Mega Sys., LLC, 350 F.3d 1327 (Fed.Cir.2003), Judge Rader, in a concurring opinion, explained: "This court often uses the term 'ordinary and customary meaning.' While the 'ordinary' meaning, often represented by the first listing in a reputable dictionary, can occasionally have relevance to construing terms in a patent claim, this court's case law requires primary reliance on the 'customary' meaning. The 'customary meaning' of a term in a patent claim links the inquiry to the understanding of one of ordinary skill in the art at the time of invention." Id. at 1347.

Here, once again, a "core" in the field of science and technology is simply "[t]he central part of a body or structure," MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 462, and that is also how "core" is used in the definitions, descriptions and explanations of "sandwich structures" discussed in the preceding section of this report and recommendation, as well as how "core" is used in the specifications of the '378 and '118 patents. Similarly, "member" in the field of civil engineering generally refers to "[a] structural unit such as a wall, column, beam or tie, or a combination of any of these." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 1237. *See also* CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359 (Fed.Cir.2002) ("member" has a generally understood meaning). The specifications of the '378 and '118 patents also clearly use the term "member" (as in "core *member*") to refer to a "structural unit." On the present record, therefore, the customary meaning of "core member" would appear to be "a structural unit of the central part of a body or structure." And that is precisely how the specifications of the '378 and ' 118 patents use the term, *e.g.:*

The load bearing deck of the modular section also includes at least one sandwich panel including an upper surface, a lower surface and a core. *The core includes a plurality of substantially hollow, elongated core members positioned between the upper surface and the lower surface*. Each of the elongate core members includes a pair of side walls. One of the side walls is disposed at an oblique angle to one of the upper and lower surfaces such that the side walls and the upper and lower surfaces, when viewed in cross-section, define a polygonal shape. Each core member has side walls positioned generally adjacent to a side wall of an adjacent core member. The polygonal shape of the core member preferably defines a trapezoidal cross-section formed of a polymer matrix composite material. The upper and lower surfaces are preferably an upper facesheet and lower facesheet formed of a polymer matrix composite material. [Emphasis added.]

'378 patent, col. 4, lines 39-55.FN24 The defendants' contention that "core members" should be construed as being limited to a closed polygonal shape in cross-section thus must be rejected for several reasons.

FN24. It may also be noted in passing that the Manual of Classification of the U.S. Patent & Trademark Office uses "core member" in the description of the scope of class 52, subclass 793.1 entitled "Multicellular core," *i.e.,* "[s]tructure in which the panel core member is formed having a plurality of completely enclosed chambers." Subclass 793.1 is within class 52, where the '378 patent is classified and the '118 patent is cross-referenced.

First, in the context of claim 1 of the '378 patent, which once again calls for:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, said core comprising a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

The "customary" meaning of the term "core members," derived from the customary meanings of "core" and "member," *i.e.,* "a structural unit of the central part of a body or structure," accurately describes the substance of the claim, and is consistent with the corresponding description in the specification. That "customary" meaning does not limit the term "core members" *per se* to any particular shape. Indeed, the foregoing resources that generally discuss "sandwich structures" suggest that the "core" of a sandwich structure can take a variety of forms depending on the materials used and the application.

Second, the claim itself goes on to further describe the core members as "having at least three walls defining a closed polygonal shape when viewed in cross-section." If the term "core members" *per se* connoted a closed polygonal shape when viewed in cross-section, that further limitation would be largely, if not entirely, redundant. *See Phillips,* --- F.3d at ---- ("To begin with, the context in which a term is used in the asserted claim can be highly instructive. To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel"). After all, although that further limitation also recites that the core members have " *at least three walls* defining a closed polygonal shape," a closed polygon by definition requires at least three points and line

segments. *See* MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 1542 (defining "polygon" as "[a] figure in the plane given by points p_1, p_2, ..., p_n, and line segments p_1p_2, p_2p_3, ..., $p_{n-1}p_n$, p_np_1."). Also, a "polygon" by definition is "closed." *Id*. *See also* MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999) at 903 (defining "polygon" as "a closed plane figure bounded by straight lines.").

Third, although the specification describes a preferred embodiment in which the "core members" have a "closed polygonal shape" in cross-section, and in particular a trapezoidal shape as illustrated in the drawings, the specification also discloses that "[a] variety of sizes, shapes and configurations of the elongate core members can be provided." '378 patent, col. 9, lines 1-2. Although, as the defendants' point out, Defendants' Sur-Reply at 6, the import of that disclosure is undercut somewhat by the next sentence in the specification, *i.e.,* "[v]arious other polygonal cross-sectional shapes can also be employed, such as quadrilaterals, parallelograms, other trapezoids, pentagons, and the like," '378 patent, col. 9, lines 3-5, the defendants have pointed to no disclosure in which the patentees disclaimed or disavowed shapes other than polygonal. And, of course, the Federal Circuit has repeatedly cautioned against placing too much emphasis on "the specification's discussion of the preferred embodiments, rather than the meaning of the claims themselves." Home Diagnostics, 381 F.3d at 1357.

Lastly, the defendants' contention that "core members" must be "tubes" because that is what is illustrated in the drawings and referenced in the specification, Defendants' Sur-Reply at 6, must be rejected for the same reason. The term "core members" does not *per se* connote or imply any particular shape or construction, including being formed as "tubes." The "tubes" illustrated in the drawings and referenced in the specification are in the context of disclosing a preferred embodiment, *e.g.,* "The core members 46 *are shown as* hollow tubes of trapezoidal cross-section (FIGS. 2-3 and 5-7)." [Emphasis added.] '378 patent, col. 8, lines 26-27. Additionally, the claim language requires that the "core members" be both "substantially hollow" and "elongated." The term "tube" usually connotes a cylindrical configuration that is both "hollow" and "elongated," *e.g.,* MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999) at 1270 (defining "tube" as "1: any of various usu. cylindrical structures or devices: as a: a hollow elongated cylinder; esp: one to convey fluids."); MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 2079 (defining "tube" as "[a] long cylindrical body with a hollow center used especially to convey fluid."). Limiting "core members" to "tubes" would render the additional limitations in the claim that such "core members" be both "substantially hollow" and "elongated" largely surplusage.

4. Recommended Construction

Accordingly, the special master recommends that the Court construe "a core * * * said core comprising a plurality of substantially hollow, elongated core members" in claim 1 of the '378 patent as follows:

A "core" in the context of the present invention means the central part of a body or structure. A "core member" means a structural unit of the central part of a body or structure.

In light of the foregoing, there is no need to further "construe" or "define" "substantially hollow" or "elongated."

E. "walls"

1. Term in Context

In the context of claims 1 and 3 of the '378 patent, the disputed term appears as follows:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, said core comprising a plurality of substantially hollow, elongated core members having at least three **walls** defining a closed polygonal shape when viewed in cross-section.

* * *

3. The load bearing support structure of claim 1, wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"a structure that encloses space."
MM's Opening Brief at 34.

Defendants

"a straight, flat structure"
Defendants' Response at 31.

Martin Marietta urges that according to MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1994) at 1329, the ordinary meaning of "wall" is "a structure or material layer enclosing space (the ~ of a container) (heart ~s)." Martin Marietta says that "the walls of the core member in the '378 patent define or enclose various polygonal shapes." MM's Opening Brief at 33. Therefore, according to Martin Marietta, "the ordinary meaning of 'wall' is 'a structure that encloses space." Id. at 34. Martin Marietta urges that the defendants' proposed construction does not comport with the use of "wall" in the '378 patent because it does not call for a structure defining or enclosing a space. Id.

The defendants urge that their proposed construction comes from the use of the term "polygon" in the claims, which, by definition, is "a closed plane figure bounded by straight lines." Defendants' Response at 31. Accordingly, the defendants say, "the walls recited in the claim must at least resemble, when viewed in cross-section, the straight lines that define a polygon." Id.

3. Discussion

In this case, the general meaning of "wall" comports with the scientific or technical meaning of the term. The MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 2148 defines "wall," in the field of engineering, as "[a] vertical structure or member forming an enclosure or defining a space." As used in the '378 patent, *e.g.*, "[e]ach of the trapezoidal tubes 46 includes a pair of side walls 48, 49. One of the side walls 48 is disposed at an oblique angle a to one of the upper and lower facesheets 35, 40 such that the side walls 48, 49 and the upper wall 64 and lower wall 65, when viewed in cross-section, define a polygonal shape such as a trapezoidal cross-section (FIG.3)," '378 patent, col. 8, lines 27-33, however, the "walls" are not necessarily "vertical." Accordingly, the ordinary *and* customary meaning of "wall" would appear to be a "structure or member forming an enclosure or defining a space."

As for the defendants' proposed construction, claim 1 of the '378 patent calls for "at least three walls" that define "a closed polygonal shape when viewed in cross-section." Although a "polygon" may be defined as "a closed plane figure bounded by straight lines," the term being construed here is "wall." A "wall" *per se* need not necessarily be "a straight, flat structure."

Accordingly, a "wall" means a structure or member forming an enclosure or defining a space. In the context of claim 1, "at least three walls defining a closed polygonal shape when viewed in cross-section" means that there are at least three structures or members (1) forming an enclosure or defining a space, and (2) the enclosure or space being defined is "a closed polygonal shape when viewed in cross-section." In this instance, the requirement that the "walls" define a "closed polygonal shape" also means that the walls are straight.

4. Recommended Construction

Accordingly, the special master recommends that the Court construe "walls" in claim 1 of the '378 patent as follows:

A "wall" means a structure or member forming an enclosure or defining a space. The limitation in claim 1 requiring "at least three walls defining a closed polygonal shape when viewed in cross-section" means that there are at least three structures or members (1) forming an enclosure or defining a space, and (2) the enclosure or space being defined is "a closed polygonal shape when viewed in cross-section." In this instance, the requirement that the "walls" define a "closed polygonal shape" also means that the walls are straight.

F. "at least one of said plurality of core members comprises two polygonal shapes having one common wall"

1. Terms in Context

In the context of claims 1 and 3 of the '378 patent, the disputed phrase appears as follows:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, said core comprising a plurality of

substantially hollow, elongated core members having at least three walls defining a closed polygonal shape when viewed in cross-section.

* * *

3. The load bearing support structure of claim 1, wherein **at least one of said plurality of core members comprises two polygonal shapes having one common wall.**

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"at least one of the core members comprises two polygon shapes, where the shapes share a wall or boundary"
MM's Opening Brief at 34.

Defendants

"One of the core members comprises two closed polygonal shapes that share a wall, meaning that in two core members, three polygonal shapes are present."
Defendants' Response at 32.

Martin Marietta notes that the only word found in the disputed phrase that has not been jointly defined by the parties, or addressed in the briefs in other contexts, is the word "common." Martin Marietta urges that, according to MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1994) at 232, "common" means "belonging to or shared by two or more individuals or things or by all members of a group." MM's Opening Brief at 34. As for the defendants' proposed construction, Martin Marietta urges that "[o]nce again, defendants have tried to limit the meaning of a term by adopting elements of only one embodiment of the '378 patent." Id. at 35. Martin Marietta contends that "nothing in the '378 patent states that there must be 'three polygonal shapes' present 'in two core members.' " Id. at 34-35.

The defendants respond that they "do not object to Martin's definition of the single term, 'common wall.' " Defendants' Response at 32. Nevertheless, the defendants say that their construction "focuses on two aspects that this term creates for the rest of the claim." Id. First, the defendants contend that although polygons are, by definition, closed, the closed nature of a polygon was "a point of contention during prosecution." Second, the defendants contend this "is a simple numbers exercise." The defendants reason that "[c]laim 1 already requires a plurality (more than one) of core members, each having at least three walls that define a closed polygonal shape when viewed in cross-section. Thus, claim 3 (which depends from claim 1) already requires that there be at least two polygonal shapes. If, as claim 3 requires, one of those members actually has two polygonal shapes, then there must be three polygonal shapes among two of the core members (one with one shape, one with two)." Id. at 32-33.

Martin Marietta replies that "[a]bsolutely nothing in the '378 patent or its prosecution history clearly and unequivocally limits the meaning of this term [presumably referred to the entire phrase in dispute] to require that 'three polygonal shapes' be present 'in two core members.' " MM's Reply at 23.

3. Discussion

First, with respect to the defendants' argument that the closed nature of a polygon was a point of contention during prosecution, that is not entirely accurate. In fact, the opposite occurred. In the May 20, 1999, amendment, the ' 378 patentees argued that the Doerr reference disclosed "extrusions (10)" in the form of U-shaped members. The patentees argued that "[t]herefore, the extrusions (10) fail to define a polygonal shape, as a polygonal shape is one that is generally defined as being of a closed configuration." Defendants' Response at 33. The patentees did not dispute, but rather urged, that "a polygonal shape" by definition means a closed configuration. Martin Marietta does not contend otherwise here. Accordingly, there is no need to further construe the otherwise clear claim language.

Second, the defendants say that they "do not object" to Martin Marietta's proposed construction of "common wall," *i.e.,* meaning a shared wall, which is also how the defendants have construed "common."

The true point of contention is whether claim 3, considered in conjunction with claim 1, requires that in two core members, three polygonal shapes are present. Martin Marietta says that nothing in the '378 patent so requires, and that the defendants are once again simply attempting to limit the claim to the embodiment of Fig. 3.

Here, however, the defendants' construction is not based on Fig. 3 *per se,* but rather on the language of the claims. Claim 1, once again, calls for:

1. A load bearing support structure comprising:

an upper sheet;

a lower sheet; and

a core positioned between said upper sheet and said lower sheet, said core comprising *a plurality of* substantially hollow, elongated *core members having at least three walls defining a closed polygonal shape* when viewed in cross-section. [Emphasis added.]

Thus, as the defendants correctly note, claim 1 requires at least two ("a plurality of") "core members having at least three walls defining a closed polygonal shape." Claim 3:

3. The load bearing support structure of claim 1, wherein at least one of said plurality of core members comprises two polygonal shapes having one common wall.

adds that "at least one" of the "said plurality" of core members required by claim 1 "comprise two polygonal shapes having a common wall." The defendants read "at least one of said plurality" to mean that one of the two or more core members required by claim 1 has two polygonal shapes, thus meaning that when there is the minimum number of core members required by claim 1, namely two, there is a minimum of three polygonal shapes-one core member with one shape, and one core member with two shapes.

The prosecution history, however, suggests-but only suggests-that is not what was intended. Once again, application claim 32, as originally presented, called for:

32. A load bearing support structure comprising:

an upper surface;

a lower surface; and

a core between said upper surface and said lower surface, said core comprising a plurality of elongated core members being defined by said upper surface, said lower surface and side walls positioned generally adjacent one another, said elongated core members being configured in at least one polygonal shape.

As drafted, the core members were defined by the upper and lower surfaces, and side walls. Thus, original application claim 32 called for a minimum of two core members ("a plurality of elongated core members") but also that the core members were "configured in at least one polygonal shape." That is, the claim language required a minimum of two core members, but a minimum of only one polygonal shape.

The genesis of patent claim 3 was application claim 34, which called for:

34. The load bearing support structure of claim 32, wherein at least one of said elongated core members comprises two polygonal shapes having one common wall.

Thus, original application claim 32 called for a minimum of two core members ("a plurality of elongated core members") and claim 34 added that "at least one" of those core members ("at least one of said elongated core members") "comprises two polygonal shapes having one common wall." Claim 32, as noted above, required a minimum of one polygonal shape. Claim 34 added, in the situation involving a minimum of two core members, that there would be a minimum of two polygonal shapes.

After receiving the office action discussed above, the patentees responded by amending application claim 32 as follows:

32 [Patent Claim 1]. A load bearing support structure comprising:

an upper [surface] *sheet;*

a lower [surface] *sheet;* and

a core *positioned* between said upper [surface] *sheet* and said lower [surface] *sheet,* said core comprising a plurality of *substantially hollow,* elongated core members *having at least three walls* [being defined by said upper surface, said lower surface and side walls positioned generally adjacent one another, said elongated core members being configured in at least one] *defining a closed* polygonal shape *when viewed in cross-section*.

Now, claim 32 continued to call for a minimum of two core members ("a plurality of * * * core members"), but also required that the core members have "at least three walls." Additionally, "core members being configured in at least one polygonal shape" was changed to read: "core members having at least three walls defining a closed polygonal shape * * *." After amendment, application claim 32 (patent claim 1) seems to clearly require a minimum of two core members (same as original claim 32), but also a minimum of two

polygonal shapes (unlike original application claim 32).

The amendment of May 20, 1999, also amended claim 34 as follows:

34. The load bearing support structure of claim 32, wherein at least one of said elongated *plurality of* core members comprises two polygonal shapes having one common wall.

That amendment is not explained in the patentees' remarks. Nor is that amendment addressed by the parties in their current submissions. Nor is the reason for that amendment evident from the examiner's prior office action.

Once again, as application claims 32 and 34 were originally presented, claim 32 called for a minimum of two core members ("a plurality of elongated core members") and dependent claim 34 added that at least one of those core members ("at least one of said elongated core members") comprised "two polygonal shapes having one common wall." That, however, did not necessarily require a total of three polygonal shapes because application claim 32, as originally presented, simply required that the core members were "configured in at least one polygonal shape."

Claim 32, as amended, however, now required a minimum of two polygonal shapes. Or, more specifically, amended claim 32 required "a plurality of substantially hollow, elongated core members having at least three walls defining a closed polygonal shape," *i.e.,* a minimum of two such core members each having "at least three walls defining a closed polygonal shape." Claim 34, as originally presented, further defined "one of said elongated core members," *i.e.,* one of the "plurality of elongated core members." Although at least two core members were required by original claim 32, claim 34 further limited, at a minimum, only one of those members.

If claim 34 had not been amended, claim 34 would have continued to limit only "at least one of said elongated core members." But, as already noted, claim 32, as amended, now required a minimum of two polygonal shapes, and claim 34, by its terms, requires two polygonal shapes. Thus, if claim 34 had not been amended, claim 34 would have required that "at least one of the said elongated core members," *i.e.,* one of the minimum of two core members required by claim 32, comprise "two polygonal shapes having one common wall." Consequently, an unamended form of claim 34 would have resulted in a minimum requirement that one of the two core members required by claim 32, as amended, have a polygonal shape, and the other have "two polygonal shapes having one common wall." That is, the scope of claim 34 would have changed by virtue of the amendments to parent claim 32 if claim 34 had not been amended.

The language used in claim 34, as amended/patent claim 3, namely:

3. The load bearing support structure of claim 1, *wherein at least one of said plurality of core members* comprises two polygonal shapes having one common wall.

seems reasonably susceptible, on its face, to two interpretations. One interpretation is that "at least one of said plurality of core members" refers to one of the minimum of two core members required by the word "plurality." That is the interpretation that the defendants have adopted. That also, however, would have been the interpretation if application claim 34 had not been amended. Another interpretation is that "at least one of said plurality of core members" refers, not to one of the core members included within the term "plurality," but rather to one of the "said plurality," *i.e.,* at least one of "said plurality" of core members has

"two polygonal shapes having one common wall." Under that interpretation, the amendment to application claim 34 served to preserve the original scope of the claim.

The issue is far from clear. Neither Martin Marietta nor the defendants point to any definitive portion of the specification or prosecution history as support for their respective positions-and, on independent review, none has been found other than as discussed above. Although it is true, as Martin Marietta contends, that nothing in the specification of the '378 patent nor its prosecution history clearly (or otherwise) limits the meaning of claim 3 to require that "three polygonal shapes" be present "in two core members," the plain language of claims 1 and 3, as the defendants point out, may be read as so requiring. If the claim language requires such a construction, the fact that the specification or prosecution history does not require such a limitation is not particularly persuasive.

On the present record though, and given the parties' current submissions, it is not clear that "at least one of said plurality of core members comprises two polygonal shapes having one common wall" in claim 3 of the '378 patent *necessarily* requires that "in two core members, three polygonal shapes are present," as proposed by the defendants.

4. The Defendants' Comments

The defendants contend that there are at least two errors in the foregoing. The first, according to the defendants, is that there is no basis on which to reach any assumption regarding the applicants' intent, and it is "clearly erroneous to arbitrarily choose which of two meanings should apply," Defendants' Comments at 7, citing Athletic Alternatives, Inc. v. Prince Mfg., Inc., 73 F.3d 1573, 1581 (Fed.Cir.1996) ("[w]here there is an equal choice between a broader and a narrower meaning of a claim, and there is an enabling disclosure that indicates that the applicant is at least entitled to the narrower meaning, we consider the notice function of the claim to be best served by adopting the narrower meaning.").

Neither the draft report nor this final report, however, "arbitrarily choose" between two meanings. "Like the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent." *Phillips,* --- F.3d at ----. The draft report and recommendation outlined how the claims were amended during prosecution, and that is repeated above. The simple fact of the matter is that the prosecution history is inconclusive. Accordingly, the draft re port and recommendation, and this final report and recommendation, returned to the actual claim language, and rejected the defendants' proposed construction that claim 3 of the '378 patent *necessarily* requires that "in two core members, three polygonal shapes are present," not based on the prosecution history, but rather based on the language of the claims.

Claim 1 calls for "a core positioned between said upper sheet and said lower sheet." Claim 1 further defines the "core" as "comprising" (*i.e.,* an open-ended term, meaning that what follows is not necessarily exclusive) "a plurality," meaning more than one, "of substantially hollow, elongated core members," and defines the core members as "having at least three walls defining a closed polygonal shape when viewed in cross-section." The draft report and recommendation noted that, prior to amendment, application claim 32 required a minimum of two core members ("a plurality of elongated core members"), but a minimum of only one polygonal shape ("said elongated core members being configured in at least one polygonal shape"). After amendment, application claim 32 (patent claim 1) continued to require a minimum of two core members, but now further defined the "core members" as being "substantially hollow" ("a plurality of substantially hollow elongated core members"), and also defined the "core members" as "having at least three walls defining a closed polygonal shape when viewed in cross-section." If a "core member" has "at

least three walls defining a closed polygonal shape when viewed in cross-section," and a "core" has a minimum of two "core members" ("a plurality of * * * core members"), then the "core" as defined by amended application claim 32 (patent claim 1) must have, by the language of the claim, a minimum of two polygonal shapes. The draft report so concluded, and none of the parties has commented or contended otherwise. That is also the conclusion reached in this final report above.

Turning to patent claim 3 (amended application claim 34), however, all the claim says is that "wherein at least one of said plurality of core members comprises [again, open-ended] two polygonal shapes having one common wall." The draft report recommended that the Court conclude that meant "that at least one of the core members comprises two polygonal shapes, where the shapes share a wall or boundary." That is the same construction recommended here. The draft report-and this final report-conclude that does not *necessarily* require that "in two core members, three polygonal shapes are present," as proposed by the defendants.

Once again, claim 1 calls for "said core *comprising* a plurality of * * * core members." Thus, the core may consist of two, or three, or ten or twenty or more "core members." All claim 3 says is that at least one of those core members has at least two polygonal shapes. That does not preclude a core member from having more than two polygonal shapes, and does not preclude every core member making up a "core" from having multiple polygonal shapes. In short, claim 3 does not *per se* require that "in two core members, three polygonal shapes are present," as the defendants propose. Multiple polygonal shapes may be present. Nor does claim 3 mean that in a "core" having two "core members," one must have two polygonal shapes and one must have a single polygonal shape. In a "core" having two "core members," all that claim 3 requires is that at least one of those core members have at least "two polygonal shapes having one common wall." The other "core member" may have one, or two, or three, or multiple polygonal shapes.

Second, the draft report notes that "[a]nother interpretation is that 'at least one of said plurality of core members' refers, not to one of the core members included within the term 'plurality,' but rather to one of the 'said plurality,' *i.e.,* at least one of 'said plurality' of core members has 'two polygonal shapes having one common wall.' " That is repeated in this final report. The defendants contend that "the second meaning makes no grammatical sense, as it would render completely redundant and meaningless the 'at least one of language recited in claim 3." Defendants' Comments at 7-8. In particular, the defendants urge that "[i]f the patentee had meant to refer to the entire plurality of core members as the single element in claim 3, then the 'said plurality' language already accomplishes that, and the 'at least one of preface is rendered meaningless and redundant, particularly since independent claim 1 makes no suggestion that there could be a plurality of pluralities (in which case specifying 'at least one of those pluralities in a dependent claim might make sense)." *Id.* at 8. The defendants note that " '[a]ll limitations in a claim must be considered meaningful,' " citing Lantech Inc. v. Keip Mach. Co., 32 F.3d 542, 546 (Fed.Cir.1994).

Once again, however, neither the draft report nor this final report adopted that interpretation. Rather, both the draft report and this final report recommend that the Court adopt the proposed construction on which the parties agree. Martin Marietta proposed that the disputed limitation in claim 3 meant "at least one of the core members comprises two polygon shapes, where the shapes share a wall or boundary." The defendants proposed that disputed limitation meant that "[o]ne of the core members comprises two closed polygonal shapes that share a wall * * *." Those portions of the proposed constructions are essentially the same. Martin Marietta's proposed construction was adopted because it remained truer to the actual words of the claim. The defendants' additional proposed construction, *i.e.,* "meaning that in two core members, three polygonal shapes are present," was rejected for the foregoing reasons.

The defendants are, of course, correct that a court must give meaning to all of the words in a claim, *see, e.g.,* Ethicon Endo-Surgery, 93 F.3d at 1578 ("If, as Ethicon argues, 'connected to' should be read broadly to include elements which are connected directly or indirectly, then this language would read on a lockout mechanism located anywhere in the surgical stapler, and the 'connected to' limitation would be meaninglessly empty."), and the court is not free to read any limitations out of a claim. *See, e.g.,* Exxon Chem. Patents, 64 F.3d at 1557 ("We must give meaning to all the words in Exxon's claims."). In *Lantech,* the district court, in reiterating the claim language, had omitted the phrase "at least two." The Federal Circuit noted that "[i]t is clear that the claims define two separate conveyor structures; otherwise the recitation of the 'at least two' limitation would be meaningless." 32 F.3d at 546.

Contrary to the defendants' argument, however, the possible interpretation gleaned from the prosecution history does not ignore "at least one of" in claim 3, or render that phrase meaningless. As discussed in the draft report and again above, application claim 34 was amended from "at least one of said elongated core members" to "at least one of said plurality of core members" for some reason, and one possible reason is that "at least one of said plurality of core members" refers, not to one of the core members within the term "plurality," but rather to one ("at least one") of the "said plurality." That is, at least one of the "said plurality" of core members has "two polygonal shapes having one common wall." Contrary to the defendants' comments, that does not read "at least one" out of the claim, *i.e.,* "*at least one of* said plurality of core members comprises two polygonal shapes having one common wall," does not mean the same thing as "said plurality of core members comprises two polygonal shapes having one common wall."

In any event, once again, neither the draft report nor this final report adopt that alternative interpretation. The recommended construction herein expressly includes the "at least one of" limitation, *i.e.,* the disputed limitation means that "*at least one of* the core members comprises two polygonal shapes, where the shapes share a wall or boundary." [Emphasis added.]

5. Recommended Construction

Accordingly, the special master recommends that the Court construe "at least one of said plurality of core members comprises two polygonal shapes having one common wall" in claim 3 of the '378 patent as follows:

In claim 3 of the '378 patent, "at least one of said plurality of core members comprises two polygonal shapes having one common wall" means that at least one of the core members comprises two polygonal shapes, where the shapes share a wall or boundary.

V.

Construction of the '118 Patent **Claims**

As noted above, although the '378 and '118 patents are drawn to related subject matter, the patents have different lineages, and, therefore, it is most appropriate to address the patents individually despite that some disputed claim terms appear in similar forms in both patents. However, the foregoing discussion of the disputed terms in the '378 patent has resolved at least some of the disputed terms in the '118 patent.

Once again, although Martin Marietta is asserting claims 1, 7-14, 18, and 21 of the '118 patent, all of the disputed terms and phrases appear in claim 1 of the '118 patent. MM's Opening Brief at 10.

A. "load bearing deck structure"

1. Terms in Context

In the context of claim 1 of the '118 patent, the phrase appears as follows, with paragraphing added:

1. A **load bearing deck structure** comprising:

at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

2. The Patties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"loading bearing deck structure" is "a roadway of a bridge that holds up a mass or weight"
Defendants' Response at 9 FN25

FN25. Martin Marietta actually proposed a slightly different construction in its opening brief, *i.e.*, "the ordinary meaning of 'load bearing deck structure,' when viewed in the context of the '118 patent, is a 'constructed structure resembling a deck of a ship, such as a story of a building or a roadway of a bridge that supports a mass or weight.' " MM's Opening Brief at 11. The defendants, however, have indicated that the construction above is "acceptable," and Martin Marietta has urged that the Court adopt that construction. MM's Reply at 7-8.

Defendants

"load" is a "substantial stress"
"structure" is an "arrangement of parts or elements; anything composed of parts arranged together in some way;" arrangement of the parts defined in the remainder of the claim

Defendants' Response at 9

As noted in connection with "load bearing support structure" in claim 1 of the '378 patent, the defendants have indicated that Martin Marietta's proposed construction is acceptable. Defendants' Response at 9-10. The defendants additionally propose that "structure" be defined, but there does not appear to be any

continuing dispute over the meaning of that term. Defendants' Response at 10, MM's Reply at 8. Moreover, "structure" is a common, readily understood term.

3. Recommended Construction

Accordingly, the special master recommends that the Court construe "load bearing deck structure" in the '118 patent as agreed by the parties and as follows:

The phrase "load bearing deck structure" means a roadway of a bridge that holds up a mass or weight.

B. "sandwich panel"

1. Term in Context

In the context of claim 1 of the '118 patent, the phrase appears as follows, with paragraphing added:

1. A load bearing deck structure comprising:

at least one **sandwich panel** formed of a polymer matrix composite material, said **sandwich panel** comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"a panel having a core positioned between two sheets"
MM's Opening Brief at 13

Defendants

A panel having a distinct upper sheet, a distinct lower sheet and a distinct core that exists prior to attachment to the sheets, in which the core is connected to the upper face sheet on one side, and the lower face sheet on an opposite side. The distinct upper sheet, lower sheet and core may be formed by pultrusion. However, each must be a distinct piece.
Defendants' Response at 10

As is perhaps apparent from the above proposed constructions, the parties' respective arguments *vis-a-vis*

"sandwich panel" in claim 1 of the '118 patent mirror those discussed previously in connection with "upper sheet"/ "lower sheet" and "a core positioned between said upper sheet and said lower sheet" in claim 1 of the '378 patent. Accordingly, the earlier discussion of those terms in connection with the '378 patent largely resolve the construction of "sandwich panel."

Martin Marietta bases its proposed construction on the general dictionary definition of "sandwich":

la: two or more slices of bread or a split roll having a filling in between; b: one slice of bread covered with food; 2: something resembling a sandwich; *esp*. composite structural material consisting of layers often of high-strength facings bonded to a low-strength central core.

MM's Opening Brief at 12-13, quoting MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1994) at 1035. Martin Marietta contends that its proposed construction comports with the "ordinary meaning" of the term "sandwich," and that the defendants' proposed construction simply attempts to further restrict that ordinary meaning. Id. at 13, MM's Reply at 8-12.

The defendants contend that the above general dictionary definition relating to composite structural material as well as the definition of "sandwich construction" in the MCGRAW-HILL DICTIONARY OF ENGINEERING (2d ed.2003) at 478, namely "[c]omposite construction of alloys, plastics, wood, or other materials consisting of a foam or honeycomb layer laminated and glued between two hard outer sheets," make clear that the sheets are distinct from the core elements. The defendants, as an alternative to the construction proposed above, therefore propose construing "sandwich panel" as "a panel having the claimed distinct upper and lower facesheets bonded to the central core members," which the defendants say is consistent with the drawings and disclosure of the '118 patent, for example Fig. 3. The defendants further urge that construction is consistent with the prosecution history of the '118 patent, and, in particular, the patentees' response of May 13, 2002, to the examiner's rejection of the then pending claims over U.S. Patent No. 5,007,225 to Teasdale. The defendants urge that the patentees conceded that Teasdale disclosed a sandwich structure: "As the Examiner correctly noted, while Teasdale discloses various sandwich structures, all the structures of Teasdale are composite metal panels." Amendment of May 13, 2002, at 4, reproduced, Defendants' Response at 13.

The defendants also urge that "the patents' own inventor, Chris Dumlao, admitted that his conception of the pieces as a single structure (as opposed to facesheets bonded to a core) is from the 1997 time frame, well *after* the patents in suit were filed." Defendants' Response at 13. Lastly, the defendants point to a letter dated December 20, 2000, from Grant Godwin, Vice President of Martin Marietta Composites to Dr. George G. Harker III of the West Virginia University Research Corporation stating, in connection with "sandwich construction," that "although neither design has separate facesheets one normally equates with 'pure' sandwich construction, the sandwich concept in each is evident (our patents initially covered separate components, but as we optimized the design, applications were expanded to not limit the design)." Defendants' Response, Exhibit T.

Thus, the dispute framed by the parties' contentions centers on whether the facesheets and core must be "distinct," *i.e.,* separate physical components that are thereafter bonded, or fastened, or otherwise joined together.

Martin Marietta, accordingly, emphasizes that both the '118 and '378 patents disclose that the "face sheets and core members * * * can be fabricated as a *single component* such as by pultruding a single sandwich

panel." [Emphasis by Martin Marietta.] MM's Reply at 8, pointing to the '118 patent, col. 12, lines 48-52, and the '378 patent, col. 10, line 65, col. 11, lines 1-13. Martin Marietta further notes that the '118 patent discloses that the "tubes [of the core members] could be provided integrally formed as a *unitary structural component* with an upper and lower surface such as a face-sheet by pultrusion." [Emphasis by Martin Marietta.] Id. pointing to the '118 patent, col. 11, lines 53-56. Martin Marietta lastly points out that Mr. Godwin is a marketing executive and his statements are neither relevant nor helpful in construing the disputed phrase. Martin Marietta notes that even the testimony of an inventor is not given deference when courts construe claim terms, id. at 11, citing Markman v. Westview Instruments, Inc., 52 F.3d 967, 983 (Fed.Cir.1995), and, in any event, his statements cannot "negate" the disclosure in the '118 and '378 patents that the sandwich panels may be formed as a unitary structural component. MM's Reply at 12.

The defendants counter that the claim language itself requires that the facesheets and core consist of separate structural components, and that is what is depicted in every drawing figure. The defendants contend, as discussed above in connection with the '378 patent, that because there is no drawing showing the facesheets and core as "indistinct," a claim construction that did not require that those facesheets and core be "distinct" is foreclosed by Rule 83(a) of the U.S. PTO's rules of practice, 37 C.F.R. s. 1.83(a), providing that "[t]he drawing in a nonprovisional application must show every feature of the invention specified in the claims." Defendants' Sur-Reply at 3-5.

3. Discussion

The analysis must begin, as always, with the language of the claim. In this instance, claim 1 of the '118 patent:

1. A load bearing deck structure comprising:

at least one **sandwich panel** formed of a polymer matrix composite material, said **sandwich panel** comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

begins the body of the claim by calling for "at least one sandwich panel formed of a polymer matrix composite material," and then further defines that "sandwich panel" as comprising

[1] a plurality of substantially hollow, elongated core members having side walls,

[2] said core members being provided with an upper facesheet and a lower face-sheet

That is, the claim language itself sets out that, irrespective of how a "sandwich panel" may be defined, at a minimum, such a "sandwich panel" must meet the foregoing limitations. Additionally, the claim specifies

the relationship of the facesheets to the side walls:

wherein said facesheets are formed integrally with the side walls of the core members, and

and, imposes the following additional limitation:

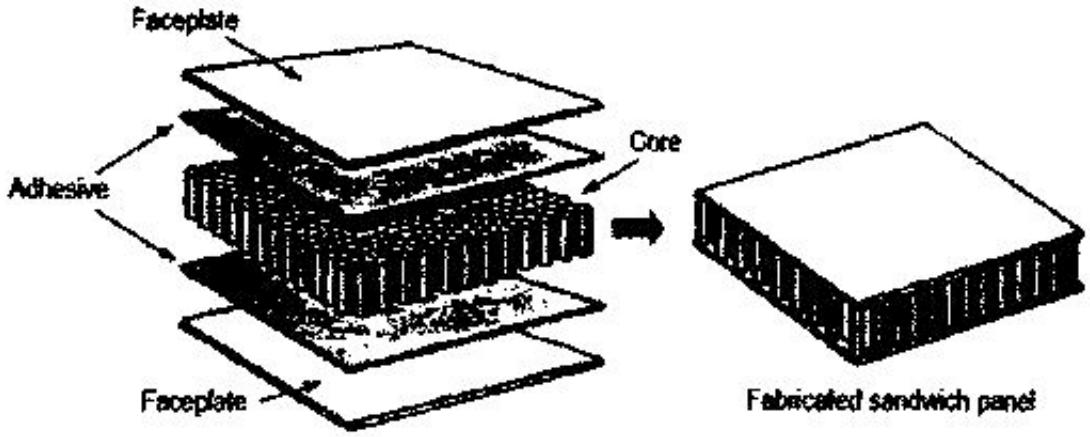
wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

With respect to the term "sandwich panel" *per se,* as discussed above, the question is not necessarily whether a claim term has an "ordinary meaning," but rather whether one of ordinary skill in the art would ascribe a meaning to the term. *See* Ferguson Beauregard/Logic Controls, 350 F.3d at 1347 (Rader, J. concurring). *See also* Combined Sys., Inc. v. Def. Tech. Corp. of Am., 350 F.3d 1207, 1216 n. 6 (Fed.Cir.2003) ("We note also here that when we, the district courts, and parties refer to the 'ordinary meaning' of a claim term, such references are 'short-hand' for the appropriate connotation under the law: the meaning, to a person of ordinary skill in the art."); K-2 Corp. v. Salomon S.A., 191 F.3d 1356, 1365 (Fed.Cir.1999) (noting that "claim construction is firmly anchored in reality by the understanding of those of ordinary skill in the art").

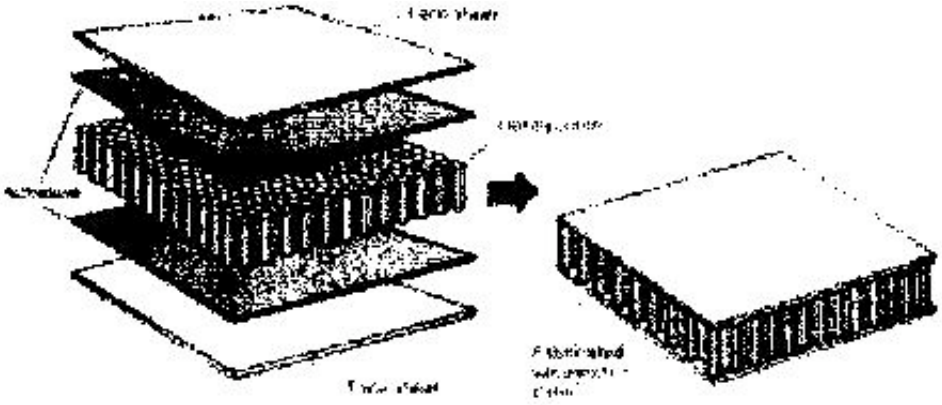
Here, "sandwich construction" has an "ordinary" meaning as reflected by the general dictionary definition "2: something resembling a sandwich; *esp*. composite structural material consisting of layers often of high-strength facings bonded to a low-strength central core," which comports with the scientific or technical connotation of the term as well, reflected by the definition appearing in the MCGRAW-HILL DICTIONARY OF ENGINEERING (2d ed.2003) at 478, namely "[c]omposite construction of alloys, plastics, wood, or other materials consisting of a foam or honeycomb layer laminated and glued between two hard outer sheets," which is the same definition given in the MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1999) at 1751, referenced above in connection with the '378 patent.

Those resources thus suggest that the "customary" understanding of "sandwich construction" by one of ordinary skill in the art would be the same or similar. In this case, the various composite industry websites discussed above in connection with the '378 patent all contain substantially similar explanations and definitions for "sandwich construction." Using the Glossary of Terms in Composites from the website for Fibre Glast Developments Corp., http://www.fibreglast.com/contentpages-glossary+of+terms+in+composites-163.html, defining "sandwich construction" as "[a] composite composed of lightweight core material (usually honeycomb or foamed plastic) to which two relatively thin, dense, high strength, functional, or decorative skins (also called faces) are adhered," simply as one example, all of the explanations and definitions describe "sandwich construction" as involving two "faces" or sheets bound or adhered or fastened to a core.

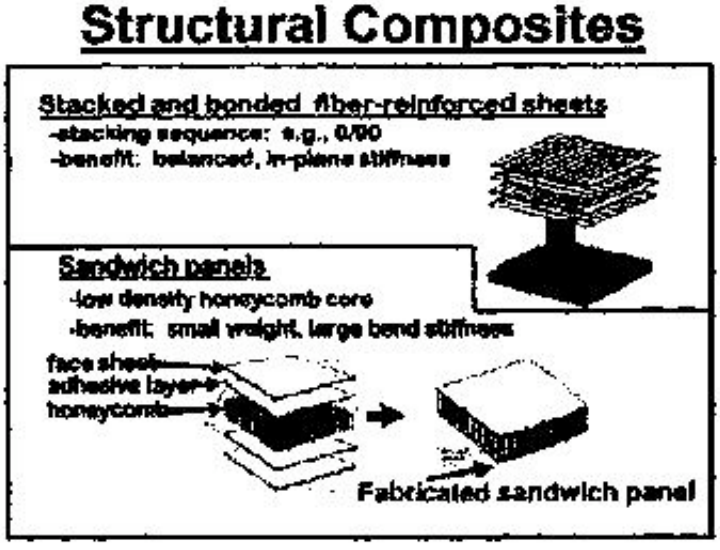
The various academic and industry websites discussed above, for example the website for the University of Cambridge, Department of Materials Science and Metallurgy, and the website for the American Composites Manufacturers Association *etc*. also all illustrate and describe the same construction. Those websites as well refer to the resulting structure as a "sandwich panel," *i.e.,* the same term used in claim 1 of the '118 patent:



http://www.msm.cam.ac.uk/m mc/research/steelsheet/sandwichbase/principlesofsandwiches.htm



http://www.mdacomposites.o rg/mda/psgbridge_cb_materials4_oliier_ constituents.html



It would therefore seem that there could be little doubt that "sandwich construction" and "sandwich panel" have a well-understood "customary" meaning in the art.

That "customary" meaning, as reflected in the foregoing resources, consistently refers to the "faces" or "sheets" or "face sheets" as being separate structural components from the core. And, the defendants are correct that all of the drawing figures in both the '118 and '378 patents similarly illustrate the facesheets and core as separate structural components. Further, the defendants are correct that the specifications of the '118 and '378 patents describe an embodiment in which the face-sheets are adhered or laminated or fastened to the core, *i.e.*, three separate structural components that are then joined together.

Martin Marietta, on the other hand, is also correct that both the '118 and ' 378 patents *additionally* contain the following identical disclosures:

'118 patent**, col. 11, lines 48-56**

The core 45, including the tubes 46, and the upper and lower facesheets 35, 40, can be alternatively joined with fasteners alone, including bolts and screws, or by adhesives or other bonding means alone. Suitable adhesives include room temperature cure epoxies and silicones and the like. *Further, alternatively, the tubes could be provided integrally formed as a unitary structural component with an upper and lower surface such as a face-sheet by pultrusion or other suitable forming methods*. [Emphasis added.]

'378 patent**, col. 10, lines 6-14**

The core 45, including the tubes 46, and the upper and lower facesheets 35, 40 can be alternatively joined with fasteners alone, including bolts and screws, or by adhesives or other bonding means alone. Suitable adhesives include room temperature cure epoxies and silicones and the like. *Further, alternatively, the tubes could be provided integrally formed as a unitary structural component with an upper and lower surface such as a face-sheet by pultrusion or other suitable forming methods*. [Emphasis added.]

And the following similar disclosures:

'118 patent, col. 12, lines 42-52	**'378 patent, col. 10, line 58-col. 11, line 3**
While the upper and lower facesheets 35, 40, are fabricated using a hand-layup process, the core 45 including the face-sheets 35, 40 can alternatively be fabricated by other methods such as pultrusion, resin transfer molding (RTM), vacuum curing and filament winding and other methods known to one of skill in the art of composite fabrication, which, therefore, are not discussed in detail herein. *Further, facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes*. [Emphasis added.]	While the upper and lower facesheets 35, 40, are fabricated using a hand-layup process, the core 45 including the face-sheets 35, 40 can alternatively be fabricated by other methods such as pultrusion, resin transfer molding (RTM), vacuum curing and filament winding and other methods known to one of skill in the art of composite fabrication, which, therefore, are not discussed in detail herein. The details of these methods are discussed in *Engineered Materials Handbook: Composites,* Vol. 1, AJM International (1993). *Further, the facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes*. [Emphasis added.]

The defendants, pointing to the '118 patent, col. 12, lines 53-65:

As shown in FIG. 3, *a single upper face sheet 35 and a single lower face sheet 40 can be adhered to a plurality of tubes*. Alternatively, any number of facesheets and any number of tubes can be connected to form the sandwich panel of a deck for a modular structural section. Also, alternatively, various sizes and configurations of facesheets and cores can be provided to accommodate various applications. *The resulting deck 32 is provided as a unitary structural component* which can be used by itself or as a component of a modular structural section 30 for thereby constructing a support structure including a bridge or other structure therefrom. The deck 32 can be utilized in other structural applications as described herein. [Emphasis by the defendants.]

argue that the patentees used the term "unitary" to refer to a structure that was formed of separate structural components. Defendants' Sur-Reply at 3 n. 2. Although that may be true, the foregoing quoted portions of the specifications of the '118 and '378 patents quite clearly disclose that the "facesheets and core members alternatively can be fabricated *as a single component* such as by pultruding *a single sandwich panel* having an upper and lower facesheet and a core of tubes." [Emphasis added.]

Thus, although "sandwich construction" or "sandwich panel" may have a "customary" meaning in which the "faces" or "sheets" or "facesheets" are separate structural components from the core, the '118 and '378 patents also quite clearly disclose an embodiment for a "sandwich panel" in which the "faces" or "sheets" or "facesheets" are *not* formed separately from the core, but rather one in which "a single sandwich panel" is formed "as a single component." In light of that disclosure, one of ordinary skill in the art is put on notice that the term "sandwich panel," as used in the '118 and '378 patents, includes, not only a construction in which the facesheets and core are separate structural components that are thereafter joined in some manner, but a construction in which "a single sandwich panel" is formed "as a single component."

Also, the general dictionary definition of "sandwich construction" refers to the "facings" as being "bonded" to the core, and the scientific and technical dictionaries refer to the "foam or honeycomb layer," *i.e.*, the core, as being "laminated and glued" to the outer sheets. The '118 patent, though, discloses that, in the embodiment in which the facesheets and core are separate structural components, several different methods may be used to secure the facesheets to the core:

Having fabricated the upper and lower facesheets 35, 40 as described herein, the lower surface 36 of the upper face sheet 35 is preferably laminated or adhered to the upper surface 47 of the tubes 46 by a resin 26 and/or other bonding means and joined with the tubes 46 by mechanical or fastening means including, but not limited to, bolts or screws. Likewise, the upper surface 41 of the lower facesheet 40 is preferably laminated to the lower surface 27 of the tubes 46 by resin 26 or other bonding means and joined with the tubes 46 by mechanical fastening means including, but not limited to, bolts or screws.

The core 45, including the tubes 46, and the upper and lower facesheets 35, 40, can be alternatively joined with fasteners alone, including bolts and screws, or by adhesives or other bonding means alone.

'118 patent, col. 11, lines 37-51.

Thus, "sandwich panel" in claim 1 of the '118 patent must be construed to include a structure in which the facesheets and core members are fabricated as a single component such as by pultruding a single sandwich

panel having an upper and lower facesheet and a core of tubes, as well as a structure in which the facesheets and core members are adhered or bonded or otherwise fastened together as disclosed in the specification.

Addressing the defendants' other arguments, the patentees' statement in the May 13, 2002, amendment that "Teasdale discloses various sandwich structures" is not inconsistent with the disclosure in the '118 or the foregoing construction. The testimony by Chris Dumlao that the defendants' rely on:

Q. Let me restate the question. What date do you have the earliest drawing which shows a single piece pultruded deck where the top sheet, the bottom sheet and the core are pultruded as a single piece?

A. By that definition I would have to say-now bear with me because I need to kind of figure out the timeline on all of this. And I believe the earliest drawings I would have, would have to be from the early 1997 time frame. Or in the 1997 time frame.

Defendants' Response at 13-14, shows only that drawings of a pultruded construction were prepared in the 1997 time frame, *i.e.,* after the September 30, 1996, filing date of application No. 08,723,098, now U.S. Patent No. 6,023,806, the grandparent to the application maturing into the '118 patent. The defendants say that is an admission that Mr. Dumlao's "conception of the pieces as a single structure" occurred after the 1996 effective filing date. As the defendants are no doubt aware, however, the filing of a United States patent application that complies with the statutory disclosure requirements constitutes a constructive reduction to practice of the invention so disclosed. *See, e.g.,* Hyatt v. Boone, 146 F.3d 1348, 1352 (Fed.Cir.1998) ("The filing of a patent application serves as conception and constructive reduction to practice of the subject matter described in the application."); Yasuko Kawai v. Metlesics, 480 F.2d 880, 885 (C.C.P.A.1973) ("The act of filing the United States application has the legal effect of being, constructively at least, a simultaneous conception and reduction to practice of the invention."). When Mr. Dumlao prepared such drawings may have some possible relevance to validity or first inventor issues if Martin Marietta was attempting to rely on a date of conception earlier than its effective filing date, but none of that is an issue here. "There is no need for proof or corroboration of the subject matter that is included in the application unless a date earlier than the filing date is sought to be established." Hyatt, 146 F.3d at 1352; Yasuko Kawai, 480 F.2d at 886 ("the written specification in the application is the evidence proving the invention of that which is reduced to practice").

Also, that the '118 and '378 patents did not contain drawings showing a structure in which the facesheets and core members are fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes has little, if any, bearing on the present issue of claim construction. As discussed above in connection with the '378 patent, a patent applicant is not required to include a drawing figure for every embodiment falling within the scope of the claims. That is also not required by 37 C.F.R. s. 1.83(a), as discussed above.

Lastly, Mr. Godwin's comments in his letter have been considered, but are not particularly helpful. The Court is obliged to decide claim construction issues on the intrinsic record of the patents-in-suit, and other extrinsic evidence that is reliable and relevant. Such extrinsic evidence, however, cannot be used to alter what a patentee has chosen to describe and claim.FN26

FN26. The defendants' post-draft report comments *vis-a-vis* "sandwich panel" are addressed above.

4. Recommended Construction

Accordingly, the special master recommends that the Court construe "sandwich panel" in the '118 patent as follows, which is consistent with the recommended construction above in connection with the '387 patent, but with some wording changes to account for differences in claim language:

The phrase "sandwich panel" in claim 1 of the '118 patent means a structure in which "upper" and "lower" "facesheets" are "bonded" or "adhered" or "fastened" to a "core" in order "to obtain a load transfer between the components," or so that the "structure then acts more or less monolithically," or so that the components of the structure "can act as a composite load-bearing unit." The structure may be made from physically separate components consisting of an upper facesheet, a lower facesheet and core members, and in which the upper and lower facesheets are "bonded" or "adhered" or "fastened" to the core members. But that is not required. The structure may also be formed as a single component.

C. "polymer"

1. Term in Context

In the context of claim 1 of the '118 patent, the term appears as follows, with paragraphing added:

1. A load bearing deck structure comprising:

at least one sandwich panel formed of a **polymer** matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"A chemical compound or mixture of compounds formed by polymerization and consisting essentially of repeating structural units."
MM's Opening Brief at 13

Defendants

"a macromolecule formed by the chemical union of five or more1 identical combining units called monomers. In most cases the number of monomers is quite large (3500 for pure cellulose) [and often is not

precisely known], (*e.g.,* starch cellulose *etc.*)." FN27
FN27. The defendants, in their brief, did not fully, or accurately, set out the definition from the chemical dictionary that they rely on. The full definition, going on at some length, appears in Exhibit I to the Defendants' Response.

Defendants' Response at 14
Martin Marietta takes its proposed construction from the definition of "polymer" in MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1994) at 903. The defendants take their definition from HAWLEY'S CONDENSED CHEMICAL DICTIONARY (14th ed.2001) at 897. The de fendants urge that "[s]ince the term is a scientific chemical one, Defendants take their definition from an actual technical dictionary on chemistry * * *." Defendants' Response at 14. Martin Marietta replies that "[a]pparently, defendants forgot that they defined 'one skilled in the art' as an 'engineer having several years of experience in designing or testing load bearing deck structures,' not a chemist." MM's Reply at 12. Martin Marietta urges that the '118 and '378 patents "do not require a polymer to have many of the features that defendants' definition requires, such as the requirements that polymers consist of 'five or more' structural units, or be 'quite large' in size," and notes that those patents "do not specify use of any particular polymer." Id.

3. Discussion

Once again, beginning with the language of the claim, claim 1:

1. A load bearing deck structure comprising:

at least one sandwich panel formed of a **polymer** matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

recites that the sandwich panel is formed, not of a "polymer" *per se,* but of "a polymer matrix composite material." The specification explains:

In the embodiment of FIGS. 1-5 and 7, the support members 22, and the modular structural section 30, including the deck 32 and beams 50 are formed of a polymer matrix composite comprising reinforcing fibers and a polymer resin. Suitable reinforcing fibers include glass fibers, including but not limited to E-glass and S-glass, as well as carbon, metal, high modulus organic fibers (e.g., aromatic polyamides, polybenzamidazoles, and aromatic polyimides), and other organic fibers (e.g., polyethylene and nylon). Blends and hybrids of the various fibers can be used. Other suitable composite materials could be utilized including whiskers and fibers such as boron, aluminum silicate and basalt.

The resin material in the support members 22 and the modular structural section 30, including the deck 32 and the beams 50, 50', 50", are preferably a thermosetting resin, and more preferably a vinyl ester resin. The term "thermosetting" as used herein refers to resins which irreversibly solidify or "set" when completely cured. Useful thermosetting resins include unsaturated polyester resins, phenolic resins, vinyl ester resins, polyurethanes, and the like, and mixtures and blends thereof. The thermosetting resins useful in the present invention may be used alone or mixed with other thermosetting or thermoplastic resins. Exemplary other thermosetting resins include epoxies. Exemplary thermoplastic resins include polyvinylacetate, styrene-butadiene copolymers, polymethylmethacrylate, polystyrene, cellulose acetatebutyrate, saturated polyesters, urethane-extended saturated polyesters, methacrylate copolymers and the like.

Polymer matrix composites can, through the selective mixing and orientation of fibers, resins and material forms, be tailored to provide mechanical properties as needed. These polymer matrix composite materials possess high specific strength, high specific stiffness and excellent corrosion resistance. In the embodiment shown in FIGS. 1-5 and 7, a polymer matrix composite material of the type commonly referred to as a fiberglass reinforced polymer (FRP) or sometimes, as glass fiber reinforced polymer (GFRP) is utilized in the support members 22, deck 32 and the beams 50, 50', 50". The reinforcing fibers of the support members 22 and the modular structural section 30, including the deck 32 and the beams 50, 50', 50", are glass fibers, particularly E-glass fibers, and the resin is a vinylester resin. Glass fibers are readily available and low in cost. E-glass fibers have a tensile strength of approximately 3450 MPa (practical). Higher tensile strengths can alternatively be accomplished with S-glass fibers having a tensile strength of approximately 4600 MPa (practical). Polymer matrix composite materials, such as a fiber reinforced polymer formed of E-glass and a vinylester resin have exceptionally high strength, good electrical resistivity, weather and corrosion-resistance, low thermal conductivity, and low flammability.

The support members 22 are preferably formed of fiberglass fibers in a vinylester resin. Alternatively, the support members 22 can be formed of other polymer matrix composite materials, as described herein, or other materials such as concrete in precast footings or poured in situ, steel, wood or other building materials. An alternative embodiment of the support member 122 shown in FIG. 6 is a pre-cast concrete footing having the contoured shape of the previously described support member 22.

* * *

The tubes 46 are also preferably formed of a polymer matrix composite material comprising reinforcing fibers and a polymer resin. Suitable materials are the same polymer matrix composite materials as previously discussed herein, the discussion is hereby incorporated by reference. The tubes 46, are most preferably E-glass fibers in a vinylester resin (FIG.3).

* * *

As described, the sandwich panels 34, 34', 34" of the deck 32, being formed of polymer matrix composite material, provide high through thickness, stiffness and strength to resist localized wheel loads of vehicles traveling over the bridge according to regulations such as those promulgated by AASHTO.

In the deck shown in FIGS. 1-5 and 7-8, the upper and lower facesheets 35, 40 are hand laid of polymer matrix composite material. Alternatively, the facesheets 35, 40 can be fabricated using automated layup

methods. The upper and lower facesheets 35, 40 are each formed of a plurality of substrate layers 61, 62 (in FIG. 8). Alternating layers of the substrate layers of the facesheets 35, 40 are preferably formed of different reinforcing fibers and a polymer resin.

Each of the facesheets 35, 40 shown in the embodiment of the deck 32 of FIG. 3 are formed of a hybrid of glass and carbon fibers, both with vinylester or alter-natively polymer resin. The facesheets 35, 40 each have an outer layer 60 formed of quasi-isotropic E-glass and a vinylester and an adjacent layer 61 formed of graphite and vinylester (FIG.8). The layers then alternate between E-glass 62, 62' and carbon 61' as shown in FIG. 8.

The outer layers 60, 63 forming the upper and lower surfaces of each facesheet 35, 40 are each formed of E-glass to provide impact resistance. The layup was determined with a percentage of graphite having the same stiffness as an all E-glass and vinylester. The facesheets 35, 40 have a layup of approximately 42 per cent graphite and 58 per cent E-glass. Alternatively, other types and combinations of composite materials can be used to fabricate the upper and lower face-sheets 35, 40 developing on the design criteria. For example, facesheets 35, 40 formed of all glass fibers can be provided in alternative embodiments.

'118 patent, col. 8, line 62-col. 12, line 21.

From the foregoing, it is clear that the patentees disclosed what they meant by "polymer matrix composite," namely a composite consisting of "reinforcing fibers and a polymer resin." That seems to be consistent with the use of the term generally. *See, e.g.,* the website for the U.S. Department of Labor, Occupational Safety & Health Administration, OSHA Technical Manual, http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_1.html. The patentees then give a number of examples of such fibers and resins. Any construction of "polymer" would, of course, have to be consistent with that disclosure. The defendants do not say whether their proposed chemical dictionary definition of "polymer" is-or is not-consistent with that disclosure.

In any event, a "polymer" is simply a combination of "monomers," *i.e.,* simple molecules. *See e.g.,* MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 1294, 1543 (defining "monomer" in the field of chemistry as "[a] simple molecule which is capable of combining with a number of like or unlike molecules to form a polymer; it is a repeating structure unit within a polymer," and defining "polymer" as "[s]ubstances made of giant molecules formed by the union of simple molecules (monomers); for example polymerization of ethylene forms a polyethylene chain, or condensation of phenol and formaldehyde (with production of water) forms phenol-formaldehyde resins."). There is no indication in either the '118 or '378 patents, or their prosecution histories, that the patentees used "polymer" other than in its most general sense.

4. Recommended Construction

Under the circumstances, it would not seem that any "construction" of "polymer" is necessary. However, to the extent that "polymer" is, or remains, an issue, the special master recommends that the Court adopt the following construction:

A "polymer matrix composite" means a composite consisting of reinforcing fibers and a polymer resin. A "polymer" is a combination of "monomers," *i.e.,* simple molecules.

D. "core" and "substantially hollow, elongated core members"

These terms are discussed in the preceding sections of this report and recommendation in connection with the '378 patent. There is nothing in the ' 118 patent or its prosecution history that would require a construction different from that recommended in connection with the '378 patent. Accordingly, the special master recommends that the Court adopt the same construction for the terms in connection with the '118 patent.

E. "upper facesheet" and "lower facesheet"

1. Terms in Context

In the context of claim 1 of the '118 patent, the terms appear as follows, with paragraphing added:

1. A load bearing deck structure comprising:

at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with **an upper facesheet** and **a lower face-sheet**

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"upper facesheet" means "a flat, broad piece of material high in physical position."
"lower facesheet" means "a flat broad piece of material low in physical position."

MM's Opening Brief at 19

Defendants

"Upper facesheet" means a broad, flat piece of material that is not merely a surface of the core, but rather a single, flat piece of the support structure that is distinct from the lower facesheet and the core members. A sheet is not a beam, a coating, or a wear surface.
"Lower facesheet" means a broad, flat piece of material that is not merely a surface of the core, but rather a single, flat piece of the support structure that is distinct from the upper facesheet and the core members. A sheet is not a beam, a coating, or a wear surface.

Defendants' Response at 17-18.

The parties' contentions have been discussed above in connection with "an upper sheet" and "a lower sheet" in claim 1 of the '378 patent.

3. Discussion

The defendants say that there are three disputes between the parties *vis-a-vis* these terms: "First, the parties appear to dispute whether a 'facesheet' is the same as a 'sheet.' Second, the parties dispute whether the facesheet/sheet is distinct from the core members. Third, the parties dispute whether a beam, coating or wear surface may qualify as a facesheet/sheet." Defendants' Response at 18.

As for the first point, although the defendants' sensed that Martin Marietta was drawing some difference between "facesheet" as used in the '118 patent and "sheet" as used in the '378 patent, that does not appear to be the case. The parties agree that a "facesheet" or a "sheet" means a "flat, broad piece of material."

The second point, *i.e.,* whether the facesheet/sheet is "distinct" from the core members, has been addressed above in connection with the '378 patent. The claim language of neither claim 1 of the '378 patent nor claim 1 of the '118 patent requires that the facesheets/sheets be "distinct," *i.e.,* formed as a separate structural component, from the core members. Furthermore, the disclosure in both patents discussed in connection with the '378 patent and above in connection with "sandwich panel" in claim 1 of the '118 patent, *inter alia,* that the "facesheets and core members alternatively can be fabricated *as a single component* such as by pultruding *a single sandwich panel* having an upper and lower facesheet and a core of tubes," weighs against adding a requirement to the claims that the facesheets/sheets must be "distinct" from the core members. Accordingly, that portion of the defendants' proposed construction must be rejected as it was in connection with the '378 patent.

The third point does not appear to be the subject of a dispute between the parties, or is one that must be left to a finder of fact in deciding infringement. The defendants point to testimony by Mr. Dumlao confirming that a "sheet" is different than a "beam." Defendants' Response at 21. Martin Marietta has not, in its submissions, contended otherwise. The defendants also point to a portion of the '118 patent discussing the addition of a wear surface, *i.e.:*

Also, as illustrated in FIG. 1, the bridge 20 preferably is provided with a wear surface 21 added to the upper surface 75 of the deck 32. The wear surface 21 is formed of polymer concrete or low temperature asphalt. Alternatively, the wear surface can be formed of a variety of materials including concrete, polymers, fiber reinforced polymers, wood, steel or a combination thereof, depending on the application.

'118 patent, col. 17, lines 15-21, which the defendants say means that a "facesheet" is not a mere wear surface. Although not noted by the defendants, dependent claim 19 also calls for:

19. A deck according to claim 1, further comprising a wear surface overlaying an upper surface of said deck for withstanding foot and vehicular traffic.

See, e.g., Amgen, Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1326 (Fed.Cir.2003) ("Our court has made clear that when a patent claim 'does not contain a certain limitation and another claim does, that limitation cannot be read into the former claim in determining either validity or infringement.' * * * There is a rebuttable presumption that different claims are of different scope."). In any event, Martin Marietta has not

disputed that a "wear surface" is something added to deck 32.

The defendants also point to the following disclosure in the '118 patent:

The sandwich panels 34 and the beams 50 are preferably gel coated or painted with an outer layer containing a UV inhibitor. Further, the sandwich panels 34 and the beams 50 can be utilized in applications in corrosive or chemically destructive environments such as in marine applications, chemical plants or areas with concentrations of environmental agents.

in urging that a facesheet is not a "coating." Defendants' Response at 21. But Martin Marietta has not disputed that either.

Accordingly, it is simply not necessary to further explain that "[a] sheet is not a beam, a coating, or a wear surface." The parties have agreed that "facesheet" means "a flat, broad piece of material." In terms of claim construction, that is all that is required. Whether an accused structure has such a "facesheet" or simply a "wear surface" is a question of infringement reserved for the finder of fact.

4. Recommended Construction

Accordingly, the special master recommends that the Court adopt the following construction:

In claim 1 of the '118 patent, "an upper facesheet" refers to a first flat, broad piece of material, and "a lower facesheet" refers to a second flat, broad piece of material.

F. "side walls"

1. Term in Context

In the context of claim 1 of the '118 patent, the term appears as follows, with paragraphing added:

1. A load bearing deck structure comprising:

at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having **side walls,**

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"any surface that serves to bound or en close a structure and is not a facesheet."
MM's Opening Brief at 20

"a wall that is not an *upper* wall and is not a *lower* wall." [Emphasis by Martin Marietta.]

MM's Reply at 15-16.

Defendants

"A wall that is not [a] top wall and is not a bottom wall."
Defendants' Response at 22.

The defendants urge that "[w]hen the claim is read as a whole, and in context, it is clear that the applicants did not use the word 'side' to merely refer to a 'boundary' of something; instead, they used the word 'side' as a contrast to 'upper' and 'lower.' * * * The claim has already recited that the facesheets are 'upper' and 'lower,' so in the recited polygonal cross-section, these upper and lower facesheets would clearly form the top and bottom of the polygon. The sidewalls complete the polygon, and as such, they clearly cannot be either the top or the bottom of the polygon, they are, for example, the left and right *sides* of the polygon." [Emphasis by the defendants.] Defendants' Response at 23.

Martin Marietta replies that "[w]ith one exception, Martin Marietta agrees with the defendants' proposed construction of 'side walls.' " MM's Reply at 15. That "exception" is that the '118 patent does not refer to "top" and "bottom" walls, but rather to "upper" and "lower" walls, *e.g.:*

Each of the trapezoidal tubes 46 includes a pair of side walls 48, 49. One of the side walls 48 is disposed at an oblique angle a to one of the upper and lower facesheets 35, 40 such that the side walls 48, 49 and the upper wall 64 and lower wall 65, when viewed in cross-section, define a polygonal shape such as a trapezoidal cross-section (FIG.3).

'118 patent, col. 9, line 65-col. 10, line 5.

Accordingly, Martin Marietta proposed construing "side walls" as "a wall that is not an upper wall and is not a lower wall." The defendants have not disputed that construction.

3. Recommended Construction

The special master recommends that the Court adopt the construction for "side walls" that the parties have agreed to, namely that "side walls" means "a wall that is not an upper wall and is not a lower wall."

G. "formed integrally"

1. Terms in Context

In the context of claim 1 of the '118 patent, the terms appear as follows, with paragraphing added:

1. A load bearing deck structure comprising:

at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are **formed integrally** with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

2. The Parties' Proposed Constructions

The parties' respective proposed constructions are:

Martin Marietta

"constructed together to constitute a whole"
MM's Opening Brief at 23.

Defendants

"a product by process limitation in which the preexisting core members are formed prior to attachment to the upper and lower face sheets in order to make a sandwich panel. The side walls are connected to the facesheets, and extend from the upper facesheet to the lower facesheet."
Defendants' Response at 24.

Martin Marietta draws its proposed construction from general dictionary definitions for "formed," *i.e.*, "to give form or shape to; fashion; construct; to make up; constitute," and for "integral," *i.e.*, "lacking nothing essential; entire; whole." Therefore, Martin Marietta concludes, "formed integrally" means "constructed together to constitute a whole." Martin Marietta contends that construction is consistent with the specification, which explains:

The core 45, including the tubes 46, and the upper and lower facesheets 35, 40, can be alternatively joined with fasteners alone, including bolts and screws, or by adhesives or other bonding means alone. Suitable adhesives include room temperature cure epoxies and silicones and the like. *Further, alternatively, the tubes could be provided integrally formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods*. [Emphasis added.]

'118 patent, col. 11, lines 48-56, MM's Opening Brief at 21. Martin Marietta also notes the disclosure at col. 12, lines 48-52, that:

Further, facesheets and core members alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes.

MM's Opening Brief at 22.

Martin Marietta argues that the claim is not drawn in product-by-process form, and that the '118 patent expressly discloses that the integral formation may be performed "by pultrusion or other suitable forming

methods." Id.

The defendants urge that this limitation is drawn in product-by-process form because the structure is defined in part by the process of formation, *i.e.,* "formed integrally." The defendants urge that their proposed construction follows from the description of the process in the specification, *i.e.:*

Having fabricated the upper and lower facesheets 35, 40 as described herein, the lower surface 36 of the upper face sheet 35 is preferably laminated or adhered to the upper surface 47 of the tubes 46 by a resin 26 and/or other bonding means and joined with the tubes 46 by mechanical or fastening means including, but not limited to, bolts or screws. Likewise, the upper surface 41 of the lower facesheet 40 is preferably laminated to the lower surface 27 of the tubes 46 by resin 26 or other bonding means and joined with the tubes 46 by mechanical fastening means including, but not limited to, bolts or screws.

'118 patent, col. 11, lines 37-47. Defendants' Response at 24.

The defendants contend that the different embodiment that Martin Marietta relies on "does not yield the claimed structure," because "the claim plainly requires a 'plurality' of core members, while the alternative process only produces a single core tube having its own upper and lower face-sheets." Id. at 24-25.

Martin Marietta replies that the specification plainly refers to "tube *s* " and "core member *s* ":

The core 45, including the *tubes* 46, and the upper and lower facesheets 35, 40, can be alternatively joined with fasteners alone * * * Further, alternatively, the *tubes* could be provided integrally formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods. [Emphasis by Martin Marietta.]

MM's Reply at 17-18, quoting the '118 patent, col. 11, lines 48-56, and:

Further, facesheets and *core members* alternatively can be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of *tubes*. [Emphasis by Martin Marietta.]

'118 patent, col. 12, lines 48-52.FN28

FN28. Martin Marietta actually quotes this section from the '378 patent, but, as noted in preceding sections of this report and recommendation, these portions of the '118 and '378 patents are substantively the same.

3. Discussion

With respect to the defendants' argument that "wherein said facesheets are formed integrally with the side walls of the core members" recites a product-by-process limitation, Vanguard Prods. Corp. v. Parker Hannifin Corp., 234 F.3d 1370 (Fed.Cir.2000) involved similar language. The claim at issue in *Vanguard* called for:

1. In a gasket shield for counteracting electromagnetic interference comprising a flexible gasket element, the improvement wherein said gasket element comprises a relatively thick elastomeric layer of good elasticity

and high tear resistance, and a relatively thin elastomeric outer layer *integral therewith,* said outer layer being metal filled and providing a high degree of attenuation of electrical energy. [Emphasis added.]

According to the court, "[t]he dispositive issue of claim construction is whether the term 'integral therewith' requires that the product be made by co-extrusion, the method of manufacture described in the specification." *Id*. at 1371. The Federal Circuit held that the limitation did not recite a product-by-process, even though "[t]he prosecution history shows that the inventors extolled the economy of manufacture and superior product made by co-extrusion, and told the examiner that 'our system requires only a one-step process as a result of the co-extrusion and tri-extrusion process.' " *Id*. at 1372. Although here the claim calls for "*formed* integrally" while the claim in *Vanguard* called for "integral therewith," that does not appear to be a distinguishing factor. The district court in *Vanguard* had charged the jury that:

"Integral" is used here in its ordinary sense to mean *formed as a unit with another part,* and therefore, "integral therewith" means that the outer layer of the gasket is formed as a unit and in direct contact with the inner layer of the gasket. [Emphasis added.]

which the Federal Circuit concluded was correct. *Id*. The Federal Circuit explained that: "The method of manufacture, even when cited as advantageous, does not of itself convert product claims into claims limited to a particular process. We agree with the district court that the word 'integral' describes the relationship between the elastomeric layers, not the means of joining them. This word did not limit the claim to the manufacturing process set forth in the specification." *Id*. The same principle would appear to be applicable here, *i.e.,* "wherein said facesheets are formed integrally with the side walls of the core members" describes the relationship between the facesheets and the side walls and does not limit the claim to a manufacturing process described in the specification. *See also* 3M Innovative Props. Co. v. Avery Dennison Corp., 350 F.3d 1365, 1371 (Fed.Cir.2003) ("The district court erred when it defined the term 'multiple embossed patterns' to include a limitation that the patterns be created sequentially. * * * Despite Avery's arguments to the contrary, the use of 'super-imposed' in this definition neither transforms claim 1 into a product-by-process claim nor even limits the scope of the claim to a serial method of manufacture; it describes only the structural relationship between the embossing patterns."); Hanzai v. United States Int'l Trade Comm'n, 126 F.3d 1473, 1479 (Fed.Cir.1997) (concluding that "chemically engraved" was not a process term). Further, the defendants point to no statement or argument in the prosecution history to the effect that the patentability of claim 1 of the '118 patent depended upon the process for producing the product defined by the claim. *See* 3M Innovative Properties, 350 F.3d at 1372 ("in explaining a subsequent anticipation rejection * * *, the examiner stated that claim 1 was 'drafted in the product-by-process format.' 3M never responded to this statement during the remainder of the prosecution because the objection was overcome without any need to address whether claim 1 was or was not a product-by-process claim. In this context, the examiner's statement does not constitute a clear and unmistakable surrender of claim scope.").

In Atlantic Thermoplastics Co. v. Faytex Corp., 970 F.2d 834 (Fed.Cir.1992), the case that the defendants rely on, the patent-in-suit was drawn to a method of manufacturing a shock-absorbing, molded innersole for insertion in footwear. Faytex distributed innersoles made by two different manufacturers-Surge and Sorbothane. The parties agreed that the Surge process infringed the method claims. The parties disputed whether the Sorbothane process infringed. More importantly, however, Faytex did not manufacture the innersoles, and therefore could not be charged with infringement of the method claims. Claim 24 of the patent-in-suit, though, called for: "The molded innersole produced by the method of claim 1," which is clearly a product-by-process claim. Atlantic argued that Faytex, by distributing products allegedly made by the claimed process, was liable as an infringer.

Apart from the merits, the majority of the case deals with the question whether process limitations in a product-by-process claim serve as limitations in determining infringement. Despite a contrary earlier decision, Scripps Clinic & Research Foundation v. Genentech, Inc., 927 F.2d 1565, 1583 (Fed.Cir.1991) ("The correct reading of product-by-process claims is that they are not limited to product prepared by the process set forth in the claims."), the panel in *Atlantic* concluded that it was not bound by the earlier contrary panel opinion,FN29 and that process terms in a product-by-process claim *do* serve as limitations in determining infringement. 970 F.2d at 846-47. That issue, though, has not necessarily been resolved. *See* 3-8 CHISUM ON PATENTS s. 8.05[1][b] (2004). A subsequent decision in *Atlantic* denying a petition for rehearing *en banc* drew four dissents, one exclaiming: "This [failure to follow the earlier panel opinion] is not only insulting to the *Scripps* panel * * *, it is mutiny. It is heresy. It is illegal," 974 F.2d 1279, 1281 (Rich, J.) and a concurrence by the author of the panel opinion. 974 F.2d 1299. Consequently, it is not necessarily clear that the conclusion reached by the panel in *Atlantic* accurately represents current law on product-by-process claims, at least as a bright line rule applicable in all cases or to all claims.FN30 *See, e.g.,* Trustees of Columbia Univ. v. Roche Diagnostics GmbH, 126 F.Supp.2d 16, 31-32 (D.Mass.2000) ("Plainly, the law on this issue is in a state of uncertainty. By denying the rehearing *en banc,* not only are lower courts left with little guidance, but so are the inventors and investors of the biotechnology and pharmaceutical industries who must make research and development decisions not knowing how much protection is available to a claim for a novel biological or chemical product.").

FN29. The rule in the Federal Circuit is that an earlier panel opinion controls until overruled by an *en banc* court. *See* Kimberly Clark Corp. v. Fort Howard Paper Co., 772 F.2d 860, 863 (Fed.Cir.1985).

FN30. For example, in dissenting from the decision denying the petition for rehearing *en banc* in *Atlantic,* Judge Newman explained:
As the cases illustrate, claims that contain both product and process terms appear in an assortment of factual situations, of which the most common are:

(1) when the product is new and unobvious, but is not capable of independent definition;

(2) when the product is old or obvious, but the process is new;

(3) when the product is new and unobvious, but has a process-based limitation (e.g. a "molded" product).

Type (2) includes the *Atlantic* class of claim; such claims are examined as process claims, their validity depends on the novelty and unobviousness of the process, and they are infringed only when the process is used. Type (1) is the *Scripps* class of claim; such claims are examined as product claims, their validity depends on the novelty and unobviousness of the product, and they are infringed by the product however

made. Indeed, claims of types (2) and (3) are not properly called "product-by-process" claims, if that term is used with precision.

* * * The *Atlantic* panel has simply lumped all of these classes and claims and inventions into a one-rule-fits-all law, in a distressingly superficial treatment.

974 F.2d at 1284 (Newman, J., dissenting from denial of petition for rehearing *en banc*). The "formed integrally" limitation involved here would seem to fall within the fact situation of "type (3)," and it is not at all clear that even under the analysis of the panel opinion in *Atlantic,* and even if the limitation were construed as a "product-by-process" limitation, that the claim would be limited to the process described in the specification.

It is unnecessary, however, to dive into that briar patch. For the reasons discussed above, there is ample basis for concluding that the present limitation is not-and should not be construed as-a "product-by-process" limitation. Indeed, the phrase "formed integrally" has on more than one occasion appeared in claims construed by the Federal Circuit, *see, e.g.,* Hanzai, 126 F.3d 1480 (claim calling for "said third conductive connecting means is a bit line of said array that is *integrally formed* in said substrate * * *."); Advanced Cardiovascular Sys. v. Scimed Life Sys., 887 F.2d 1070, 1071 (Fed.Cir.1989) (claim limitations included, *e.g.,* "an inflatable annular portion *formed integral* with the tubular member near the distal end thereof"), yet no case has been located in which "formed integral" has been construed as a process limitation-or, indeed, any case in which such a construction has been urged.

But even if the limitation *might* be characterized either as a structural limitation or as a "process" limitation, unlike claim language that truly does invoke a particular process, *e.g.,* "[t]he molded innersole produced by the method of claim 1," such as at issue in *Atlantic,* or other like language, the "default" is to interpret the limitation as a structural characteristic. "Furthermore, even words of limitation that can connote with equal force a structural characteristic of the product or a process of manufacture are commonly and by default interpreted in their structural sense, unless the patentee has demonstrated otherwise." 3M Innovative Properties, 350 F.3d at 1371.

Lastly, even if the instant claim language could be construed as a "process" limitation, the claim language is not limited to any particular process for forming the facesheets integrally with the side walls of the core members. That is, there is nothing in the language of claim 1 of the '118 patent that would limit the claim to the process described at column 11, lines 37-47, as the defendants contend. Martin Marietta correctly points out that the disclosed "alternative" processes in which the core tubes may be "provided integrally formed as a unitary structural component with an upper and lower surface such as a facesheet by pultrusion or other suitable forming methods," ' 118 patent, col. 11, lines 53-56, and in which the facesheets and core members may "be fabricated as a single component such as by pultruding a single sandwich panel having an upper and lower facesheet and a core of tubes," 118 patent, col. 12, lines 48-52, also result in the product as claimed.

Turning then to construing "formed integrally," the term "integral" has been frequently construed by the Federal Circuit and its predecessor, the U.S. Court of Customs and Patent Appeals. In construing claims involving the word "integral," two things are clear. First, the term "integral" covers more than a unitary construction, *i.e.,* "integral" covers, but is not limited to, a "one-piece" construction. *See, e.g.,* In re Morris,

127 F.3d 1048, 1055 (Fed.Cir.1997); Advanced Cardiovascular Systems, 887 F.2d at 1074 ("integral" not limited to mean "of one-piece" construction); In re Kohno, 55 C.C.P.A. 998, 391 F.2d 959 (C.C.P.A.1968); In re Dike, 55 C.C.P.A. 1172, 394 F.2d 584 (C.C.P.A.1968); In re Larson, 52 C.C.P.A. 930, 340 F.2d 965 (C.C.P.A.1965); In re Clark, 41 C.C.P.A. 974, 214 F.2d 148 (C.C.P.A.1954). *See also* In re Hotte, 475 F.2d 644, 647 (C.C.P.A.1973) (" 'integral' is sufficiently broad to embrace constructions united by such means as fastening and welding.").

Second, the Federal Circuit has relied on the dictionary definition of "integral" in situations involving a variety of technologies. In Advanced Cardiovascular Systems, 887 F.2d at 1073-74, involving certain dilating catheters, for example, the Federal Circuit noted:

The dictionary definition submitted by ACS also supports its contention. According to Webster's, "integral" means:

1 a: essential to completeness: CONSTITUENT * * * c: formed as a unit with another part 2: composed of integral parts: INTEGRATED 3: lacking nothing essential: ENTIRE

Webster's New Collegiate Dictionary 595 (8th ed.1981).

See also Epcon Gas Sys., Inc. v. Bauer Compressors, Inc., 279 F.3d 1022, 1030 (Fed.Cir.2002) ("Integral is defined to mean 'components that form a complete unit.' The Contractors' Dictionary of Equipment, Tools and Techniques 315 (1st ed.1995)); Tate Access Floors, Inc. v. Maxcess Techs., Inc., 222 F.3d 958, 967 (Fed.Cir.2000) ("We conclude that the district court did not err in construing the term 'integral' * * * The court's construction of those terms is consistent with their ordinary meaning. *See, e.g.,* Webster's New World Dictionary 479 (3d ed. 1988) * * * at 701 (defining 'integral' as 'made up of parts forming the whole'); Hazani v. United States Int'l Trade Comm'n, 126 F.3d 1473, 1480 (Fed.Cir.1997) ("the word 'integral' means 'complete' or 'entire,' * * *. See Webster's New International Dictionary * * * 1290 (2d ed.1939), and approving a jury charge: 'Integral' is used here in its ordinary sense to mean formed as a unit with another part, * * *.").

Martin Marietta has proposed using the third sense of the term, *i.e.,* "lacking nothing essential; entire; whole." That, however, potentially opens additional issues such as whether something is "essential" or not. And that is not the object of this claim limitation. It appears that in the phrase "wherein said facesheets are *formed integrally* with the side walls of the core members," the better sense of "integral," and the sense that has most frequently been adopted by the Federal Circuit in analogous contexts, is "formed as a unit with another part (a seat with ~ headrest)." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999) at 607. That is also the sense urged by the defendants. *See* Defendants' Response at 26.

4. Recommended Construction

Accordingly, the special master recommends that the Court adopt the following construction:

In claim 1 of the '118 patent, in the limitation "wherein said facesheets are formed integrally with the side walls of the core members," "formed integrally" means formed as a unit with another part.

H. "wherein said facesheets are formed integrally with the side walls of the core members"

1. Terms in Context

In the context of claim 1 of the '118 patent, the terms appear as follows, with paragraphing added:

1. A load bearing deck structure comprising:

at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

2. The Parties' Proposed Constructions

The parties' have proposed constructions this phrase in addition to their respective proposed constructions for "formed integrally." Those proposed constructions are:

Martin Marietta

"the facesheets and the side walls are constructed together to constitute or comprise parts of the panel." MM's Opening Brief at 23.

Defendants

"the upper and lower facesheets are attached to the side walls of each core member." Defendants' Response at 25.

3. Discussion

Martin Marietta's proposed construction follows from its proposed construction of "formed integrally." Martin Marietta urges that "[t]he ['118] patent specifically references the construction of the facesheets and side walls to form the complete panel, whether through use of 'resins and/or other bonding means,' 'mechanical or fastening means,' or 'by pultrusion or other suitable forming methods.' " MM's Opening Brief at 23, referencing the '118 patent, col. 11, lines 37-47, 53-56.

The defendants urge that the dictionary definition of "integral" that is most applicable is "formed as a unit with another part (a seat with ~ headrest)." Defendants' Response at 26. The special master agrees, and that is the recommendation above for construing "formed integrally." The defendants, however, additionally say that "Defendants have read this plain definition to require, at a minimum, that the two parts of the unit (*e.g.,* the seat and headrest given in the dictionary's example) be attached to one another in some way." Id. The defendants conclude that "formed integrally with the side walls of the core members" therefore "should be construed to mean that the facesheets are 'formed as a unit with' the side walls of the core members, such as by attaching the facesheets to the core members (as shown in Fig. 3 of the patent)." Id.

The defendants' proposed construction, of course, is another species of their overall argument that the facesheets and core must be "distinct." That argument has been rejected.

As for whether the dictionary definition of "integral," *i.e.,* "formed as a unit with another part <a seat with ~ headrest>," means, as the defendants say, that "the two parts of the unit * * * [are] attached to one another in some way," the term *includes* two parts being "attached," but is not limited to the same. It is clear that the dictionary definition of "integral" is neither limited to a one-piece construction, nor does the term preclude a one-piece construction. *See, e.g.,* Advanced Cardiovascular Systems, 887 F.2d 1070; In re Hotte, 475 F.2d at 647. The term "formed integrally" encompasses, as Martin Marietta correctly notes, "construction of the facesheets and side walls to form the complete panel, whether through use of 'resins and/or other bonding means,' 'mechanical or fastening means,' or 'by pultrusion or other suitable forming methods.' " as disclosed in the specification. '118 patent, col. 11, lines 37-47, 53-56.

4. Recommended Construction

In light of the recommended construction for "formed integrally" above, there is no need for a further construction of "wherein said facesheets are formed integrally with the side walls of the core members."

I. "oblique angle" and "disposed at an oblique angle"

1. Terms in Context

In the context of claim 1 of the '118 patent, the terms appear as follows, with paragraphing added:

1. A load bearing deck structure comprising:

at least one sandwich panel formed of a polymer matrix composite material, said sandwich panel comprising

a plurality of substantially hollow, elongated core members having side walls,

said core members being provided with an upper facesheet and a lower facesheet

wherein said facesheets are formed integrally with the side walls of the core members, and

wherein at least one of the side walls is **disposed at an oblique angle** to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section.

2. The Parties' Proposed Constructions

Martin Marietta addresses "oblique angle" and "disposed at an oblique angle" separately in its Opening Brief. The defendants address those terms together. It is believed most appropriate to construe those terms together. The parties' proposed constructions are:

Martin Marietta

"the ordinary meaning of the term 'oblique angle' that is consistent with the term's usage in the '118 patent is 'an angle that is not a right angle.' "
MM's Opening Brief at 24.

"the ordinary meaning for the term 'disposed at an oblique angle' is 'arranged at an angle that is not a right angle.' "

MM's Opening Brief at 25.

Defendants

"oblique angle" means an angle that is not substantially perpendicular, and is between about 30 and 45 degrees.
"disposed at an oblique angle" means connected to form an oblique angle.

Defendants' Response at 27.

Martin Marietta forms its proposed construction from the dictionary definition for "angle," *i.e.,* "the figure formed by two lines extending from the same point or by two surfaces diverging from the same line," and the dictionary definition for "oblique," *i.e.,* "la: neither perpendicular nor parallel, inclined; b: having the axis not perpendicular to the base; c: having no right angle (an oblique triangle)." MM's Opening Brief at 23-24.

Martin Marietta contends that "[w]hile the ['118] patent notes that 'the oblique angle' described in the '118 patent is ' *preferably* about 45 (deg.),' the patent does not unequivocally limit the degree of the angle, other than to state that it must be 'oblique,' " pointing to the following disclosure:

The oblique angle a of the side wall 48 with respect to the upper wall 64 is preferably about 45 (deg.), but angles between about 30 (deg.) and 45 (deg.) can be provided in alternative embodiments.

'118 patent, col. 10, lines 5-8. "Indeed," Martin Marietta says, "the patent stresses that its 'oblique angle' may be greater than 45 (deg.) in stating that

the trapezoidal tube [of a core member] with *at least a 45 (deg.) angle* between the sidewall and the upper wall and the lower wall has a transverse shear stiffness 2.6 times that of a tube with a square cross-section. Ex. B, col. 10, ll. 31-35 (emphasis added [by Martin Marietta]).

MM's Opening Brief at 24.

Martin Marietta contends that the defendants' proposed construction is based on only one embodiment of the '118 patent, and "violates two central tenets of claim construction." "Not only does defendants' proposed definition attempt to read into the claim specific features of one embodiment, but it also ignores portions of the '118 patent that are inconsistent with their definition." Id

With respect to the defendants' proposed construction of "disposed at an oblique angle," Martin Marietta notes that the dictionary definition of "disposed" is "to put in place, set in readiness, arrange," and concludes that the ordinary meaning of "disposed at an oblique angle" means "arranged at an angle that is not a right angle." Martin Marietta further contends that "[t]here is nothing in the '118 patent or its prosecution file history that requires or even suggests that any of the side walls must be 'connected' to one of the upper and lower facesheets,' " MM's Opening Brief at 25, pointing to the disclosure in the '118 patent: "wherein at

least one of the side walls is *disposed at an oblique angle* to one of the upper and lower facesheets * * *." [Emphasis by Martin Marietta, citing to the '118 patent, col. 24, lines 1-14.]

The defendants too rely on col. 10, lines 5-8 of the '118 patent:

The oblique angle a of the side wall 48 with respect to the upper wall 64 is preferably about 45 (deg.), but angles between about 30 (deg.) and 45 (deg.) can be provided in alternative embodiments.

but while Martin Marietta says that portion of the specification does not limit the degree of the angle, other than to state that it must be "oblique," the defendants contend that passage has an opposite purpose, *i.e.*, the defendants contend that this portion of the specification "defines the term [oblique angle]." Defendants' Response at 27.

The defendants also point to col. 10, lines 13-14 and 17, of the '118 patent urging that, according to the specification, "[t]he oblique angle provides 'transverse shear stiffness for the deck core 45,' and the patent makes clear that an angle of 45 (deg.) 'provides the highest bending stiffness.' " Defendants' Response at 27. The defendants contend that "[t]his custom-defined oblique angle is clearly important to realizing the advantages of the clamed invention," and that the claims must be limited. Id. at 27-28.

The defendants urge that "disposed at an oblique angle" thus requires that at least one side wall must be "connected" to the facesheet, and that "follows from the discussion of the claim and specification above that the side walls are already connected to the facesheets," and "the plain and ordinary definition of 'angle' requires that the two lines of an angle come together at a point." Id. at 28.

3. Discussion

Taking the "connected" issue first, the phrase "disposed at an oblique angle" says nothing about parts or components being "connected." Although this portion of the defendants' proposed construction evidently continues the underlying theme that the facesheets and core components are "distinct" and therefore must be "connected" together, the defendants are plainly trying to read far too much into this claim term. None of the definitions or senses of the term "disposed" have anything to do with "connecting" some part or component to some other part or component. *See* MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999) at 335. Martin Marietta is correct that "arranged" is indicated in the dictionary as a synonym for one of the senses of "disposed." Id. And that is how the term is used in the '118 patent when, for example, the patentees explain that "[e]ach of the trapezoidal tubes 46 includes a pair of side walls 48, 49. One of the side walls 48 is *disposed* at an oblique angle a to one of the upper and lower facesheets 35, 40 such that the side walls 48, 49 and the upper wall 64 and lower wall 65, when viewed in cross-section, define a polygonal shape such as a trapezoidal cross-section (FIG.3)." '118 patent, col. 9, line 67-col. 10, line 5. The patentees are obviously using "disposed" in the sense of "arranged."

That is not, of course, to say that claim 1 of the '118 patent, considered as a whole, fails to require that the facesheets and side walls must be joined in some fashion (or formed as a single component)-only that "disposed at an oblique angle" does not require the same. Claim 1 *in a different limitation* requires that "said facesheets are formed integrally with the side walls of the core members." As discussed above, that means that the facesheets are formed as a unit with the side walls of the core members.

There truly should be no dispute over what "*disposed* at an oblique angle" means. The bat-de over whether

the facesheets and core members must be "distinct," *i.e.*, separate physical structural components that are then joined together in some fashion, may be waged on several fronts in connection with various claim limitations-but this is not one of them. Insofar as "disposed" is concerned, the term has been used, both in the specification and in the claims of the '118 patent, according to its ordinary, everyday meaning. No further "construction" is warranted or necessary.

Turning to "oblique angle," and beginning once again with the language of the claim, claim 1 of the '118 patent simply calls for "wherein at least one of the side walls is *disposed at an oblique angle* to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section." [Emphasis added.] Putting aside, for the moment, the defendants' contention that the specification contains a "definition" of "oblique angle" (an issue addressed below), the claim language *per se* does not impose any further limitations on "oblique angle," except that when at least one of the side walls is so disposed, "the side walls and facesheets define a polygonal shape when viewed in cross-section." Nor does any of the other language in claim 1 impose any limitation, for example that the oblique angle must be between 30 (deg.) and 45 (deg.), and the other claims in the '118 patent do not directly or indirectly impose any such limitation as well. Looking at the other claims in the '118 patent, for example:

2. A deck as defined in claim 1, wherein at least one of said facesheets is formed of a plurality of substrate layers, wherein alternating layers are formed of different reinforcing fibers and a polymer resin.

3. A deck according to claim 2, wherein said alternating layers are formed in a first layer of carbon fibers and a vinylester resin and in a second layer glass fibers and a vinylester resin.

4. A deck according to claim 2, wherein an outer layer of said alternating layers of at least one of said lower facesheet and said upper facesheet is formed of fibers having a quasi-isotropic orientation.

5. A deck as defined in claim 4, wherein said fibers of said at least one of said upper and lower facesheets comprises about 42 percent graphite and about 58 percent E-glass.

6. A deck according to claim 2, wherein an interior layer of said alternating layers adjacent to said outer layer is formed of a graphite and vinylester.

7. A deck according to claim 1, wherein said polygonal shape is selected from the group consisting of trapezoidal shapes, quadrilateral shapes, parallelogram shapes, and pentagonal shapes.

8. A deck according to claim 7, wherein the polygonal shape is a trapezoid.

9. A deck according to claim 1, wherein at least two of said plurality of core members are positioned to abut one another and configured in at least two alternating polygonal shapes.

10. A deck according to claim 1, wherein at least one of said plurality of core members comprises at least one interior wall that is substantially parallel to said upper sheet and said lower sheet.

11. A deck according to claim 10, wherein said at least one of said plurality of core members defines at least two polygonal shapes.

12. A deck according to claim 1, wherein said plurality of core members when viewed in cross-section are

configured in a pattern alternating between a single polygonal shape and at least two polygonal shapes.

13. A deck according to claim 1, wherein at least one of said plurality of core members includes an upper wall and a lower wall extending beyond said polygonal shape to define a receiving opening.

14. A deck according to claim 1, wherein at least two of said plurality of core members abut one another.

15. A deck according to claim 1, wherein said upper sheet is a laminate material.

16. A deck according to claim 1, wherein said lower sheet is a laminate material.

17. A deck according to claim 1, wherein said at least one sandwich panel comprises a plurality of interconnected sandwich panels.

18. A deck according to claim 1, wherein said at least one sandwich panel is an integrally formed, unitary pultruded sandwich panel comprising pultruded face-sheets and at least one pultruded core member.

19. A deck according to claim 1, further comprising a wear surface overlaying an upper surface of said deck for withstanding foot and vehicular traffic.

20. A deck according to claim 1, wherein said sandwich panel is formed of a polymer matrix composite material comprising reinforcing fibers and a polymer resin and said fibers and said resin are selected such that said support structure will have a positive margin of safely under a predetermined required lane load and a predetermined safety factor using a first-ply failure as failure criteria.

21. A load bearing deck structure according to claim 1 wherein said polymer matrix fiber reinforced composite material is a pultruded polymer composite.

22. A load bearing deck structure according to claim 1 wherein said polymer matrix composite material comprises reinforcing fibers contained at a thermosetting polymeric resin.

none further limit "oblique angle."

The question then becomes whether "oblique angle" has a "customary" meaning, *i.e.*, whether one of ordinary skill in the art would have some understanding of what that term meant. The term, of course, has the "common" dictionary meaning that Martin Marietta relies on. As a technical term of art, "oblique angle" has been defined as "[a]n angle that is neither a right angle nor a multiple of a right angle." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 1374. That comports with the "ordinary" meaning of the term, *i.e.*, "an acute or obtuse angle." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999) at 802.FN31

FN31. The specification of the '118 patent describes "oblique angle" a in terms of one of the included angles as illustrated in Fig. 3:

Claim 1, however, recites that "wherein at least one of the side walls is disposed at an oblique angle *to one of the upper and lower facesheets* such that the side walls and facesheets define a polygonal shape when viewed in cross-section." [Emphasis added.] An "oblique angle" is not limited to an "acute angle," *i.e.*, [a]n

angle of less than 90 (deg.)," MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 31, nor an "obtuse angle," *i.e.,* "[a]n angle of more than 90 (deg.) and less than 180 (deg.)." Id. at 1376. As illustrated, the side wall is disposed at an acute angle *vis-a-vis* the "upper" facesheet and at an obtuse angle *vis-a-vis* the "lower" facesheet. Because "oblique angle" simply means "[a]n angle that is neither a right angle nor a multiple of a right angle," that includes both "acute" and "obtuse" angles. The term simply excludes angles of 90 (deg.) or multiples of the same, *i.e.,* 180 (deg.), 270 (deg.) *etc.* At this stage of the analysis, therefore, "wherein at least one of the side walls is *disposed at an oblique angle* to one of the upper and lower facesheets" simply means, based on the claim language alone, "disposed at an angle that is neither a right angle nor a multiple of a right angle."

The next step is to consult the specification to determine whether the patentees "defined" or otherwise gave a meaning to "oblique angle" that differs from the "customary" meaning of the term, or, more broadly, described their invention in terms that would impose limitations on "oblique angle," *e.g.,* an angle between 30 (deg.) and 45 (deg.) as the defendants propose.

The '118 patent uses "oblique angle" in the beginning of the specification, where an invention is typically described in broad terms, in a general sense, *see* C.R. Bard, 388 F.3d at 864 ("[a]lthough a statement's location is not 'determinative,' the location can signal the likelihood that the statement will support a limiting definition of a claim term. Statements that describe the invention as a whole, rather than statements that describe only preferred embodiments, are more likely to support a limiting definition of a claim term. * * * Statements that describe the invention as a whole are more likely to be found in certain sections of the specification, such as the Summary of the Invention. * * * Accordingly, other things being equal, certain sections of the specification are more likely to contain statements that support a limiting definition of a claim term than other sections, although what import to give language from the specification must, of course, be determined on a case-by-case basis.") [internal citations omitted], for example in the abstract:

Each facesheet is formed integrally with the side walls of the core members and at least one of the side walls is disposed *at an oblique angle* to one of the upper and lower facesheets so that the side walls and facesheets define a polygonal shape when viewed in cross section. [Emphasis added.]

and, under the heading "Summary of the Invention":

The load bearing deck of the modular structural section also includes at least one sandwich panel including an upper surface, a lower surface and a core. The core includes a plurality of substantially hollow, elongated core members positioned between the upper surface and the lower surface. Each of the elongate core members includes a pair of side walls. *The side walls can be formed and disposed in a variety of shapes angles with respect to the upper and lower walls*. Each core member has side walls positioned generally adjacent to a side wall of an adjacent core member. The upper and lower surfaces of the sandwich panel are preferably an upper facesheet and lower facesheet formed of a polymer matrix composite material. In one embodiment, the upper and lower facesheets are formed of polymer matrix composite arranged in a hybrid of alternating layers including carbon and E-glass fibers in vinylester or polyester resin. [Emphasis added.]

'118 patent, col. 5, lines 18-33. None of the foregoing uses impose any limitation on "oblique angle," and none indicates an intent to limit the "customary" meaning of the term.

The next appearance of "oblique angle," or a discussion of the relative relationship of the "side walls" to the

"upper and lower walls," in the '118 patent is in the following context:

The core members 46 are shown as hollow tubes of trapezoidal cross-section (FIGS. 2, 3 and 7). Each of the trapezoidal tubes 46 includes a pair of side walls 48, 49. *One of the side walls 48 is disposed at an oblique angle a to one of the upper and lower facesheets 35, 40* such that the side walls 48, 49 and the upper wall 64 and lower wall 65, when viewed in cross-section, define a polygonal shape such as a trapezoidal cross-section (FIG.3). *The oblique angle a of the side wall 48 with respect to the upper wall 64 is preferably about 45 (deg.), but angles between about 30 (deg.) and 45 (deg.) can be provided in alternative embodiments.* Each tube 46 has a side wall 48 positioned generally adjacent to a side wall 48' of an adjacent tube 46' (FIG.3). Alternatively, the tubes 46 could be aligned in other configurations such as having a space between adjacent side walls. [Emphasis added.]

'118 patent, col. 9, line 65-col. 10, line 12. This portion of the specification is, of course, referencing the preferred embodiment as illustrated in Fig. 3 of the '118 patent:

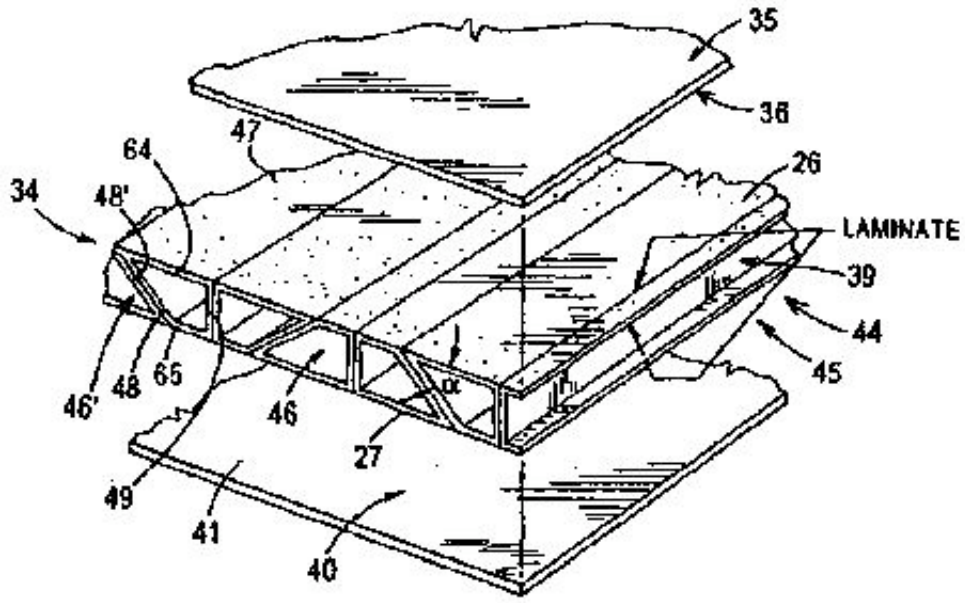


FIG. 3

Although patent drawings are not to scale unless otherwise indicated, *see* Nystrom, 374 F.3d at 1117 ("The district court erred in not properly applying the principles set forth in our prior precedents that arguments based on drawings not explicitly made to scale in issued patents are unavailing."), Fig. 3 appears to illustrate an angle a within the range referenced in the specification of about 30 (deg.) and 45 (deg.). The foregoing excerpt from the specification also refers to a 45 (deg.) angle as the "preferred" angle. The foregoing except further clearly explains that "angles between about 30 (deg.) and 45 (deg.) can be provided in alternative embodiments," thus strongly suggesting that the "oblique angle" should be between about 30 (deg.) and 45 (deg.).

The specification of the '118 patent has other descriptions of that "oblique angle" as well that suggest "oblique angle" perhaps should be an angle between about 30 (deg.) and 45 (deg.):

The side walls 48, 48' disposed at an oblique angle a provide transverse shear stiffness for the deck core 45. This increases the transverse bending stiffness of the overall deck 32. *The sidewall 48 shown at the preferred 45 (deg.) angle a provides the highest bending stiffness*. The trapezoidal tubes 46 also preferably have a vertical side wall 49 positioned between adjacent diagonal side walls 48, 48'. The vertical sidewall 49 provides structural support for localized loads subjected on the deck 32 to prevent excessive deflection of the top facesheet 35 along the span between the intersection of the diagonal walls 48, 48' and the upper face-sheet 35.FN32 [Emphasis added.]

FN32. This portion of the '118 patent appears to contain printing errors. For example, the printed version of the patent refers to "oblique angle a" rather than "oblique angle (alpha)," and to "the preferred 450 angle a" rather than "the preferred 45 (deg.) angle (alpha)." The foregoing reproduces the text as it appears in the original application. MM's Opening Brief, Exhibit B(1) at 19 [hand numbered page 20].

'118 patent, col. 10, lines 13-23.

Thus, the shape including the angled side wall 48 of the trapezoidal tube 46 provides stiffness across the cross-section of the tube 46. An adjacent tube 46' includes a side wall 48' angled in an opposite orientation between the upper and lower walls 64, 65 from the adjacent angled side wall 48. Providing side walls 48, 49 at varying orientations preserves the mathematical symmetry of the cross-section of the tubes 46. *When normalized by weight, the trapezoidal tube 46 with at least a 45 (deg.) angle between the sidewall 48 and the upper wall 64 and the lower wall 65 has a transverse shear stiffness 2.6 times that of a tube with a square cross-section. Alternatively, for a tube with an oblique angle of about 30 (deg.), the transverse shear stiffness is 2.2 times that of a tube with a square shaped cross-section*. [Emphasis added.]

'118 patent, col. 10, lines 24-37. Those portions of the specification reinforce the impression from the outset that the range for the "oblique angle" should be about 30 (deg.) and 45 (deg.). The problem comes in the next step, namely deciding whether the *claims* of the '118 patent should be so limited, when the claim language itself simply refers to an "oblique angle."

In this instance, the prosecution history of the '118 patent does not shed any light on that issue. The parties have not pointed to anything in the prosecution history that is decisive (or even instructive), and none has been found on independent review. *See* Nystrom, 374 F.3d at 1116 ("The prosecution history did not redefine or disclaim 'convex top surface' in claim 1 to be limited to a particular radius of curvature ratio. Accordingly, we hold that the correct construction of the expression 'convex top surface' as used in claim 1 is the ordinary and customary meaning of an upper surface that curves or bulges outward, as the exterior of a sphere.").

There are, however, other guideposts to a proper construction. First, the defendants' contention that col. 10, lines 5-8 of the '118 patent:

The oblique angle a of the side wall 48 with respect to the upper wall 64 is preferably about 45 (deg.), but angles between about 30 (deg.) and 45 (deg.) can be provided in alternative embodiments.

"defines" the "oblique angle," is misplaced based on the language of the specification. That portion of the specification does not "define" "oblique angle" *per se,* and is clearly referring to a preferred embodiment of the invention. The defendants further reliance on col. 10, lines 13-14 and 17, of the '118 patent, is also unavailing. Defendants' Response at 27-28. Those portions of the specification may reflect "preferred" forms of the invention, but those portions do not reflect, as disclosed, essential or fundamental features or characteristics of "the invention" as either disclosed or claimed.

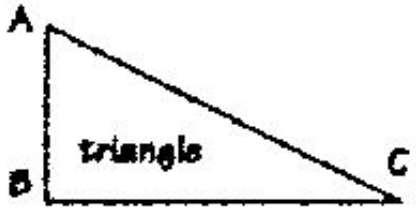
However, claim 1 of the '118 patent *does* require, *inter alia,* that:

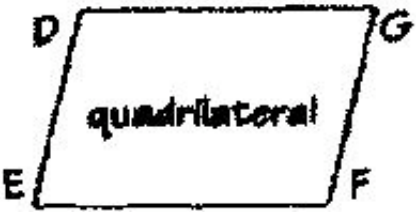
wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets *such that the side walls and facesheets define a polygonal shape when viewed in cross-section*. [Emphasis added.]

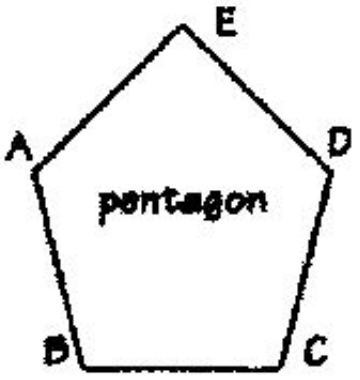
As discussed above, a polygon by definition requires at least three points and line segments. *See* MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 1542 (defining "polygon" as "[a] figure in the plane given by points $p_1, p_2, \ldots\ldots, p_n$, and line segments $p_1 p_2$, $p_2p_3, \ldots\ldots, p_{n-1}p_n, p_np_1$."). Also, a "polygon" by definition is "closed." Id. *See also* MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999) at 903 (defining "polygon" as "a closed plane figure bounded by straight lines.").

Polygons include, for example, triangles (3-sided); quadrilaterals (4-sided); pentagons (5-sided); hexagons (6-sided); heptagons (7-sided); octagons (8-sided), *etc.:* FN33

FN33. These figures were taken from the website for www.math.com. It should be noted, however, that neither the specification nor the claims of the '118 patent limit the polygonal shape to equiangular or equilateral polygons, or to "regular" polygons, *i.e.,* polygons that are both equiangular and equilateral.



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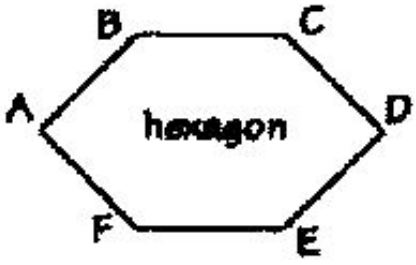
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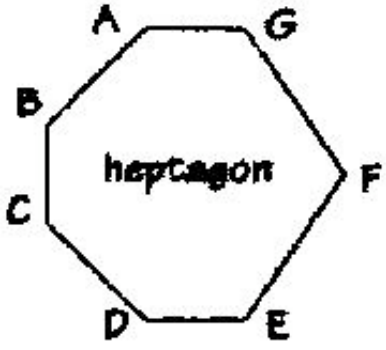
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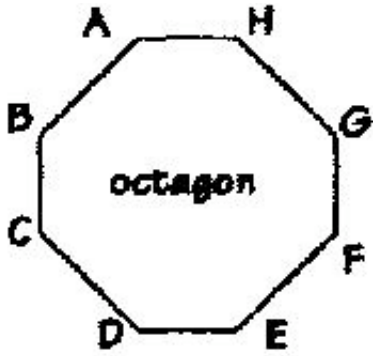
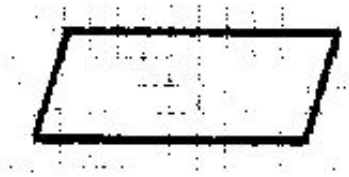
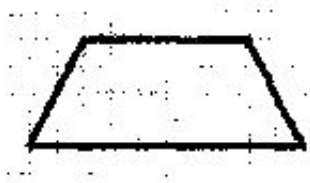


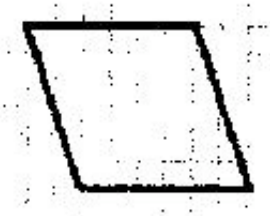
"Quadrilaterals" include "parallelograms," *i.e.*, a quadrilateral with opposite sides parallel, and "trapezoids," *i.e.*, a quadrilateral that has exactly two sides parallel, and a "rhombus," *i.e.*, a parallelogram with four equal sides, as well as squares and rectangles which, by definition, require four 90 (deg.) corners.:



parallelogram



trapezoid



rhombus

The specification of the '118 patent discloses that the preferred embodiment of such "polygonal shape" is a trapezoid: "The core members 46 are shown as hollow tubes of trapezoidal cross-section (FIGS. 2, 3 and 7)." '118 patent, col. 9, lines 65-66. The specification also, however, discloses that "[v]arious other polygonal cross-sectional shapes can also be employed such as quadrilaterals, parallelograms, other trapezoids, pentagons, and the like. Alternative embodiments to the tubes 46 can be seen in the related Alternative Modular Composite Support Structure applications referenced previously," *i.e.,* U.S. Patent Nos. 6,081,955 and 5,794,402.FN34

FN34. "Modular Composite Support Structure Applications" is a defined term. '118 patent, col. 8, lines 51-59. According to the specification, the disclosures of those applications were incorporated by reference into the '118 patent. *See* Advanced Display Sys., Inc. v. Kent State Univ., 212 F.3d 1272 (Fed.Cir.2000).

Fig. 3 of the '955 patent illustrates the following:

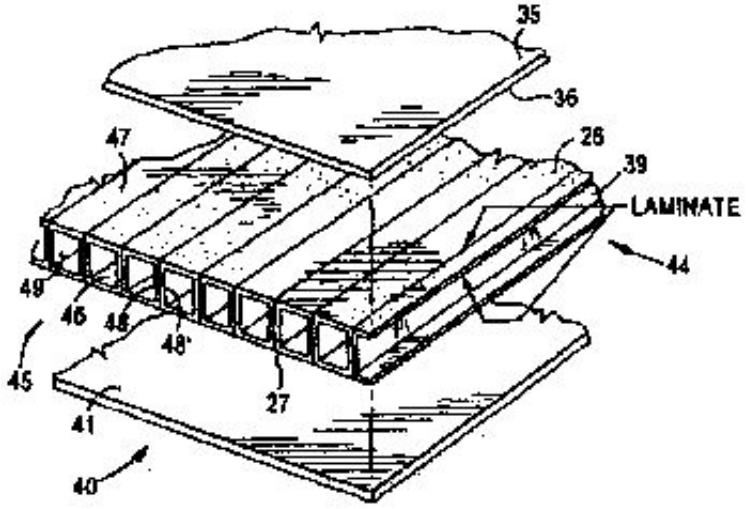


FIG. 3

Tubes 46 are illustrated as squares or rectangles, although the specification of the '955 patent says that "[a]lternatively, the core members can be provided in other shapes, cross-sections and configurations. * * * Further, tubes of different cross-sections can be laid in different directions as seen in the related Modular Composite Support Structure applications referenced previously." '955 patent, col. 8, lines 5-23. The '955 patent further discloses: "The tubes can be configured in various shapes and configurations including polygonal shapes such as trapezoids and squares, circles FN35 and other shapes. An alternative trapezoidal core deck can be seen in the commonly assigned related Modular Composite Support Structure applications referenced previously." The "Modular Composite Support Structure applications" referenced in the ' 955 patent are application Nos. 08/723,098 and 08/723,109. Application No. 08/723,098 issued as U.S. Patent No. 6,023,806, *i.e.,* the grandparent of the '118 patent. Application No. 08/723,109 issued as U.S. Patent No. 5,794,402, *i.e.,* the grand-parent of the ' 378 patent.

FN35. "Circles," of course, are not polygons.

The foregoing broad disclosure suggests that the cross-sectional shape of the core members was not viewed as critical or essential for the structural panels described in these applications and patents. However, the specification of the '118 patent explains that there is an advantage to disposing at least one of the side walls at an oblique angle, namely that the function served by disposing the side walls at an oblique angle is to "provide transverse shear stiffness for the deck cover 45," which "increases the transverse bending stiffness of the overall deck 32." '118 patent, col. 10, lines 14-17.

Claim 1 of the '118 patent once again provides: "wherein [1] at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets [2] such that the side walls and facesheets define a polygonal shape when viewed in cross-section." That limitation has two requirements, *i.e.,* (1) the oblique angle requirement, and (2) the polygonal shape requirement.

If the limitation had only the second requirement, *i.e.,* called for "wherein the side walls and facesheets define a polygonal shape when viewed in cross-section," the claim would clearly require only that the side walls and facesheets define one of the several polygonal shapes discussed above. The first "oblique angle" requirement, however, eliminates squares and rectangles, although both are polygons. Doing so, according to the specification, serves to "provide transverse shear stiffness for the deck cover 45," which "increases the transverse bending stiffness of the overall deck 32," *vis-a-vis* that of a deck having tubes with a square cross-section.

It may be that not all polygonal shapes would serve to provide such transverse shear stiffness. After all, the term "polygon" is not limited *per se* to any number of sides. The foregoing are simply examples of common polygons. But the present record does not contain any evidence limiting the potential polygonal shapes that may be used to realize the merits of the invention.

Nor does the record contain any evidence that angles outside the disclosed preferred range of 30 (deg.) to 45 (deg.) would not (or could not) serve to provide the transverse shear stiffness associated with using an oblique angle. The interior sum angle "S" of a polygon having *n* sides is S =(*n* 2) 180 (deg.). Thus, the interior sum angle of, for example, a quadrilateral (4-sides), is S = (4-2) 180 (deg.) or 360 (deg.).FN36 The oblique angle limitation eliminates 90 (deg.) for at least one of the side walls. All other angles, however, would be included. There has been no showing, for example, that either of the following crudely drawn trapezoidal shapes (which are intended to illustrate angles outside the preferred range of 30 (deg.) to 45 (deg.)) would not serve to provide greater transverse shear stiffness than that of tubes or core members having a square cross-section: FN37

FN36. For some polygons, that may mean that the "oblique angle" would be outside the range of 30 (deg.) and 45 (deg.) at least in some configurations. For example, the interior sum angle of a hexagon is S = (6-2) 180 (deg.) or 720 (deg.). Assuming for the sake of simplicity that the polygon is equiangular, each interior angle would be 720 (deg.)/6 or 120 (deg.). If the facesheets are on the BD, FE sides of the hexagon, the "oblique angle" would be 60 (deg.).

FN37. The same is true if the polygon is of some other shape, for example a triangle:

Although perhaps not evident from the crudeness, the drawing on the left is intended to illustrate core members in a triangular shape having an oblique angle of greater than 45 (deg.). The figure on the right is intended to illustrate core members in a triangular shape having an oblique angle of less than 30 (deg.). The point is, there has been no showing on the present record that either of those designs would not realize the merits of the invention, *i.e.,* increased transverse shear stiffness *vis-a-vis* a deck having core members of a square cross-section.

It may well be that as the angles of the side walls approach the vertical, as shown on the left, or the horizontal, as shown on the right, that the degree of transverse shear stiffness offered by the design is reduced-and perhaps even markedly so-as compared to tubes or core members having a square cross-section. And perhaps that is implicit in the comparison drawn in the specification to tubes or core members having an "oblique angle" as opposed to tubes or core members having a square cross-section, *i.e.,* as the "oblique angle" approaches that of a tube or core member having a square cross-section, the degree of transverse shear stiffness is reduced. And perhaps one of ordinary skill in the art would know or understand that there are practical limits on the usefulness or effectiveness of the oblique angle as a result. But none of that is of record here.

In terms of the intrinsic record, as noted above, in the context of explaining the oblique angle, the '118 patent teaches that disposing the side walls at an oblique angle to the face sheets provides transverse shear stiffness for the deck core which increases the transverse bending stiffness of the overall deck as compared to using core members having a square cross-section. In that context, the '118 patent further discloses that "[t]he sidewall 48 shown at the *preferred* 45 (deg.) angle a provides the *highest* bending stiffness." '118 patent, col. 10, lines 16-17. The language the patentees use (*e.g.,* "preferred," "highest") connotes preference or explanation, not limitation. When the patentees further disclose that "at least a 45 (deg.) angle" results in "a transverse shear stiffness 2.6 times that of a tube with a square cross-section," and an angle of "about 30 (deg.)" results in a "transverse shear stiffness" of "2.2 times that of a tube with a square shaped cross-section," '118 patent, col. 10, lines 32-37, that informs one that the transverse shear stiffness decreases when the oblique angle is decreased from 45 (deg.) to 30 (deg.), but does not suggest that angles below 30 (deg.) would not provide at least some transverse shear stiffness beyond that of a tube with a square shaped cross-section, or that angles below 30 (deg.) are outside the scope of the invention. Nor does that suggest that angles above 45 (deg.) would not provide at least some transverse shear stiffness beyond that of a tube with a square shaped cross-section, or that angles above 45 (deg.) are outside the scope of the invention.

Thus, there is nothing in the language of claim 1 *per se* that would limit "oblique angle" to angles within the range of 30 (deg.) to 45 (deg.), and neither the "ordinary" nor the "customary" meaning of the term would

impose such a limitation. There is likewise nothing in the prosecution history that would impose such a limitation, and, indeed, neither party has relied on any portion of the prosecution history in advocating their respective proposed constructions. The "customary" meaning of an "oblique angle" is "[a]n angle that is neither a right angle nor a multiple of a right angle." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 1374, and that comports with the "ordinary" meaning of the term, *i.e.,* "an acute or obtuse angle." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (10th ed.1999) at 802. In general terms, the specification discloses that disposing the side walls at an "oblique angle" to the face sheets, *i.e.,* at an angle other than 90 (deg.) in which the tubes or core members would be square (or rectangular) in cross-section, increases the transverse shear stiffness of the resulting structure. The specification discloses that a range of 45 (deg.) to 30 (deg.) is preferred, but does not limit the "oblique angle" to that range by, for example, (1) defining "oblique angle" as one within that range, or (2) defining "the invention" as being limited to an "oblique angle" within that range. Rather, the foregoing suggests that the patentees used "oblique angle" in accordance with both the "ordinary" and "customary" meaning of the term, *i.e.,* to distinguish an angle of 90 (deg.).

4. The Defendants' Comments

As noted above, the defendants proposed that "disposed at an oblique angle" meant "connected to form an oblique angle." The draft report-and this final report-note that "disposed at an oblique angle" says nothing about parts or components being "connected." That proposed construction was viewed as part of the defendants' underlying theme that the facesheets and core components are "distinct" and thus must be "connected" together.

In their comments to the draft report, the defendants say that was not their intent. Rather, the defendants say that their argument "had to do with the basic requirements of any angle-two lines coming together at a point. If two lines never intersect, they do not form an angle." Defendants' Comments at 8. The defendants urge that "[i]f the word 'connected' carries too much baggage, Defendants submit that the word 'intersect' can be used in its place to the same effect." Id. The defendants, *inter alia,* note that the draft report acknowledges that a polygon is a "closed plane figure bounded by straight lines," and urge that "[c]losed figures cannot be formed if the walls never intersect." Id. at 9. "From this, Defendants submit that the claim, when its limitations are read as a whole, requires that at least one of the sidewalls intersects with one of the upper or lower face-sheets." Id. at 9-10.

Martin Marietta responds that "[t]he claim does not say that the sidewall and upper or lower face sheet *form* an angle. The claim simply states, and merely requires, that at least one of the side-walls be *disposed-i.e.,* oriented-at an oblique angle with respect to one of the upper and lower face sheets. It is not a requirement of the claim that the at least one sidewall be physically connected to, intersect, or in any other way 'touch' the upper or lower face sheet." [Emphasis in original.] MM's Resp. Comments at 4. Martin Marietta also urges although that claim requires that the combination of the sidewalls and face sheets define a polygonal shape, "the claim does not require that the *at least one* of the sidewalls that is disposed, or located, at an oblique angle to one of the upper and lower face sheets *actually contact, intersect, or be connected to* the upper and lower face sheets." [Emphasis in original.] Id. at 5.

Once again, in context, the disputed limitation is "wherein at least one of the side walls is **disposed at an oblique angle** to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section." The defendants' comments do not go to the "oblique angle" issue, but rather to "disposed." The draft report and this final report reject the contention that "disposed at

an oblique angle" means "connected to form an oblique angle." The draft report and this final report note that the defendants simply try to read too much into the phrase "disposed at an oblique angle" by urging that phrase implies "connected," and the same holds true for "intersect."

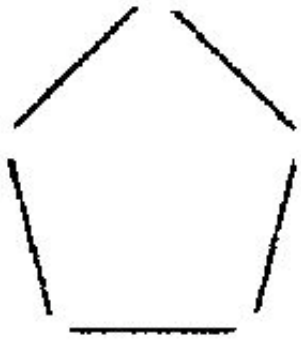
It is appreciated, of course, that parties (whether the patentee or the defendant) may urge one construction or another with an eye on how that construction impacts infringement *vel non*. Claim construction under *Markman,* however, must be performed with a blind eye to the second step of the infringement analysis, *i.e.,* whether the claim as properly construed covers the accused device or process, either literally or through equivalents.

Secondly, as the Federal Circuit has repeatedly emphasized, the courts are not at liberty to rewrite the claims. *See, e.g.,* Becton Dickinson, 922 F.2d at 799 n. 6 ("Nothing in any precedent permits judicial redrafting of claims."). Even where the claims on their face indicate that the claims are inoperable or invalid. *See* Chef America, 358 F.3d at 1373.

Here, the patentees have chosen to define their invention using the phrase "disposed at an oblique angle." There is no actual dispute over what "disposed" means. The word "disposed" does not carry the same meaning or connotation as "intersects." The patentees could have drafted the claim to read "wherein at least one of the side walls **intersects** one of the upper and lower face-sheets **at an oblique angle** such that the side walls and facesheets define a polygonal shape when viewed in cross-section," if that was their invention, but they did not. Rather, the patentees chose to claim their invention as "wherein at least one of the side walls is **disposed at an oblique angle** to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section."

Yes, it is true, that an angle is a "geometric figure, arithmetic quantity, or algebraic signed quantity determined by two rays emanating from a common point or by two planes emanating from a common line," MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th ed.1994) at 93. And the defendants are thus correct that if two lines never intersect, they do not form an angle. And the defendants are further correct that a "closed figure" cannot be formed if the walls do not intersect. But that is not what the actual language of the claim requires.

The claim requires that "at least one of the side walls is *disposed* at an oblique angle to one of the upper and lower facesheets," *i.e.,* that at least one of the side walls is "located" or "situated" or "placed" or "positioned" or one of the other synonyms for "disposed," *see* ROGET'S INTERNATIONAL THESAURUS (5th ed.1992) at 124, at an oblique angle to one of the upper and lower facesheets. The claim language does not require that at least one of the side walls and one of the upper and lower facesheets *form* an oblique angle. Similarly, the claim says: "such that the side walls and facesheets *define* a polygonal shape when viewed in cross-section." Again, the claim language does not *per se* require that the side walls and the facesheets *form* a polygonal shape, only that they "define" a polygonal shape. The following may be reasonably said to "define" a "polygonal shape," *i.e.,* one that identifies the essential qualities of a polygonal shape:



even though the lines do not intersect and the figure is not, therefore, a polygon *per se,* although it is a polygonal *shape*.

The point is, the claim construction analyses required by the *Markman* decisions do not open the door to rewriting claims to, for example, replace "disposed" with "intersect" or other words carrying a different connotation from "disposed," and then later urging that the claims as so rewritten are not infringed. Here, there is no serious dispute over the meaning of "disposed." In the context of the claim, it does not mean-and is not synonymous with-"connected" or "intersects."

Further, insofar as *Phillips* places an increased emphasis on the specification, the "invention" of the '118 patent-in-suit, as set out in the written description, is discussed at length above. On the present record-which, of course, was prepared prior to the decision in *Phillips*-there is simply no justification for restricting the scope of the actual language used in the claim. That is, there has been no persuasive showing that one of ordinary skill in the art reading the claim as part of the patent as a whole would accord the claim language a meaning different from the plain language of the claim. Nor has there been any persuasive showing that the patentees "disavowed" or "disclaimed" any scope inhering in the language that the patentees chose to use in the claims.

5. Recommended Construction

Accordingly, the special master recommends that the Court adopt the following construction:

In claim 1 of the '118 patent, "an oblique angle" in the limitation "wherein at least one of the side walls is disposed at an oblique angle to one of the upper and lower facesheets such that the side walls and facesheets define a polygonal shape when viewed in cross-section," means an angle that is neither a right angle nor a multiple of a right angle.

VI.

Final Report and Recommendation

This is the master's *final* report and recommendation. Under Rule 53(g)(2), FED. R. CIV. P.:

(2) *Time To Object or Move*. A party may file objections to-or a motion to adopt or modify-the master's order, report, or recommendation no later than 20 days from the time the master's order, report, or recommendation are served, *unless the court sets a different time*. [Emphasis added.]

Accordingly, the parties are encouraged to determine whether an order from the Court modifies the foregoing. Also, the parties are encouraged to review Rule 53(g)(3), (4), FED. R. CIV. P., relating to the Court's *de novo* review of findings of fact and conclusions of law.

Although this is the master's final report and recommendation for purposes of filing objections, or motions to adopt or modify, the parties may, of course, seek further comment or clarification through motions directed to the Court.

SIGNED at San Antonio, Texas on August *2nd,* 2005.

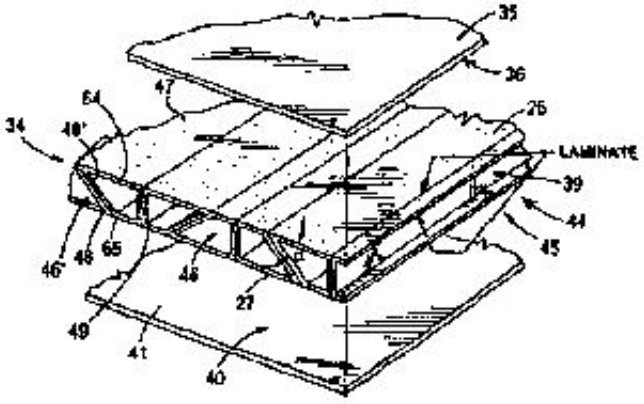
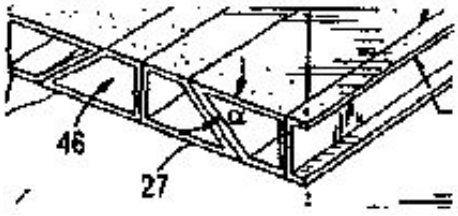
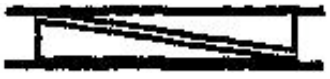


FIG. 3





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