

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of

**CERTAIN PHOTOVOLTAIC TRUNK
BUS CABLE ASSEMBLIES AND
COMPONENTS THEREOF**

Inv. No. 337-TA-1438

ORDER NO. 20: CONSTRUING CLAIM TERMS

(July 23, 2025)

This order addresses the constructions of certain claim terms in U.S. Patent Nos. 12,015,375 and 12,015,376, the patents asserted in this investigation.

BACKGROUND

The Commission instituted this investigation to determine whether certain photovoltaic trunk bus cable assemblies infringe claims 1–12 and 15–24 of the '375 patent and claims 1–6, 8–10, 12–16, 19, and 20 of the '376 patent, which remain the asserted claims. 90 Fed. Reg. 9730–31 (EDIS Doc. ID 843816). Shoals Technologies Group, LLC is the complainant. *Id.* Voltage, LLC and Ningbo Voltage Smart Production Co. are the respondents. *Id.*

The parties filed a chart of disputed claim constructions. Chart of Disputed Constructions (Corrected) (EDIS Doc. ID 849729). The parties did not agree on any constructions. The parties also filed opening, responsive, and supplemental claim construction briefs. Shoals Br. (EDIS Doc. ID 850653); Voltage Br. (EDIS Doc. ID 850646); Shoals Reply (EDIS Doc. ID 851678); Voltage Reply (EDIS Doc. ID 851684); Shoals Supp. (EDIS Doc. ID 853253); and Voltage Supp. (EDIS Doc. ID 852770); *see also* Order No. 10 (EDIS Doc. ID 852756) (granting leave to file supplemental briefs). Shoals filed expert declarations with its opening and reply briefs, and Voltage deposed Shoals's expert. Glancey Opening Decl. (Shoals Br., Ex. 3); Glancey Responsive

Decl. (Shoals Reply, Ex. 8); and Glancey Tr. (Shoals Supp., Ex. 10). There was a claim construction hearing. 6/11/2025 Tr. (EDIS Doc. ID 853547 and 853548).

The parties refer to materials from *Certain Photovoltaic Connectors and Components Thereof*, Investigation No. 337-TA-1365. There, Shoals accused Voltage of infringing U.S. Patent Nos. 10,992,254 and 11,689,153—from which the '375 and '376 patents issued as continuations—and a third patent from a different family. *See* Inv. No. 337-TA-1365, Comm'n Op. at 2–3 (Jan. 14, 2025) (EDIS Doc. ID 842550). The ALJ construed several terms in the '254 and '153 patents and ultimately found a violation of section 337 based on the '153 patent. *Id.* at 3–5; Inv. No. 337-TA-1365, Order No. 16 (Feb. 20, 2024) (EDIS Doc. ID 814515); and Inv. No. 337-TA-1365, Initial Determination at 53–77 (Aug. 30, 2024) (EDIS Doc. ID 832409). In its review of the initial determination, the Commission adopted a different construction of certain “aperture” terms in the '153 patent and found no violation under its construction. 1365 Comm'n Op. at 24–54. Shoals has appealed. *See Shoals Techs. Grp., LLC v. Int'l Trade Comm'n*, Fed. Cir. No. 25-1439 (docketed Feb. 13, 2025).

LEGAL STANDARDS

It is a bedrock principle of patent law that a patent's claims define the invention for which a patentee is granted the right to exclude. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). “[T]here is no magic formula or catechism for conducting claim construction.” *Id.* at 1324. Instead, courts attach weight to appropriate sources “in light of the statutes and policies that inform patent law.” *Id.*

A claim term typically receives its ordinary and customary meaning, which is the meaning the term would have to one of ordinary skill in the art at the time of invention after reading the entire patent. *Id.* at 1312–13 and 1321. A patent's 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.* at 1315 (internal citation and quotation omitted).

Courts “also consider the patent’s prosecution history, if it is in evidence.” *Id.* at 1317 (cleaned up). The prosecution history, which is intrinsic evidence, is “the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent.” *Id.* “[T]he 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.” *Id.* “[B]ecause 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.” *Id.*

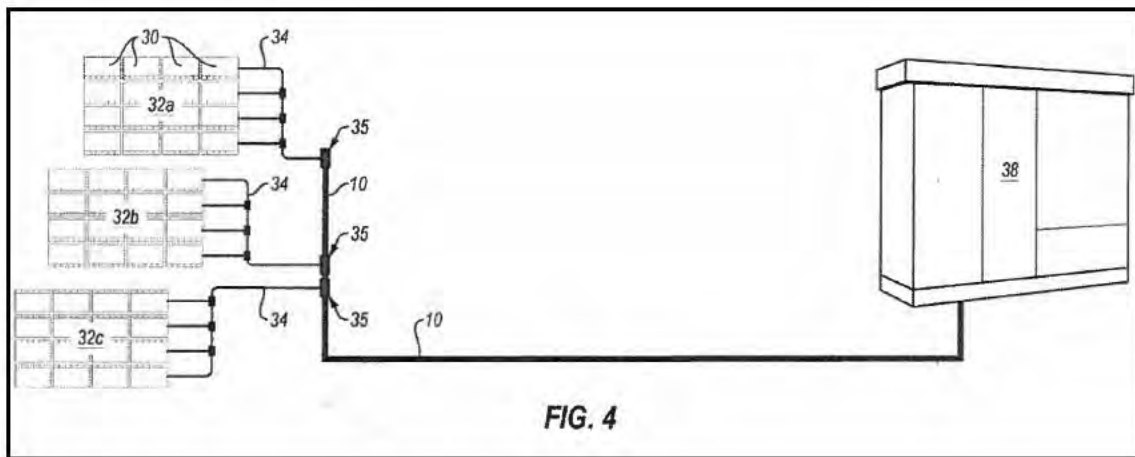
For some terms, a court “will need to look beyond the patent’s intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period.” *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 331 (2015). Extrinsic evidence is “all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.” *Phillips*, 415 F.3d at 1317 (internal citations and quotations omitted).

While expert testimony can be useful “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,” such 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.” *Id.* at 1318. For at least that reason, extrinsic evidence “is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context

of intrinsic evidence.” *Id.* at 1319. Where the intrinsic record unambiguously describes the scope of the patented invention, reliance on extrinsic evidence is improper. *See id.* at 1324.

DISCUSSION

The '375 and '376 patents share a specification and are both titled “Lead Assembly for Connecting Solar Panel Arrays to an Inverter.” *See* '375 patent at title. Fig. 4 depicts “a system of the present invention” with solar panels 30 arranged in solar arrays 32a–c that are connected by wire harnesses 34 and wire harness connectors 35 to lead assembly 10, which connects to inverter 38.



Id. at 2:35–36, 4:10–33, and Fig. 4.

In the 1365 investigation, the Commission discussed the related '153 patent and quoted from it, stating that “a conventional solar power configuration” is shown in Fig. 1, which includes “a plurality of solar panels 30 each connected to a central combiner box 36, and a plurality of combiner boxes (not shown) connected to an inverter.” 1365 Comm’n Op. at 13. The “inverter ‘converts the direct current (DC) generated by the solar panels into alternating power (AC), which goes in the “grid.” In this conventional configuration, combiner boxes are used to combine the energy coming from solar arrays prior to going into the inverter.” *Id.* at 13–14. However, “[c]ombiner boxes are problematic because they are clumsy, prone to damage and

malfunctioning, must be periodically maintained, and require extensive planning and skill for installation. ... Due to the many connections going into a combiner box, a combiner box cannot easily be moved without disconnecting and reconnecting all the connections and wiring, which requires considerable manpower, danger, and expense.” *Id.* at 14. The specification states that “there is a need for a device that is inexpensive, easy to use and that ‘renders a combiner box unnecessary.’” *Id.* 13–14 and *see* ’375 patent at 1:28–62.

I. Level of Ordinary Skill in the Art

The parties propose competing levels of ordinary skill. Shoals’s proposal matches that found in the 1365 investigation, while Voltage deletes the italicized portion from Shoals’s proposal and adds the underlined portions to its proposal:

Shoals Proposal	Voltage Proposal
at least a bachelor’s degree in mechanical or electrical engineering or a related scientific field and at least two years of experience with electrical wiring and connectors, <i>including significant experience with electrical wiring in photovoltaic systems</i> , in which more education could substitute for experience and that experience combined with training could substitute for formal education	at least a bachelor <u>of science</u> degree in electrical engineering, mechanical engineering, <u>chemistry, materials science and engineering</u> , or an equivalent, and two years of academic or professional experience involving electrical wiring and connectors, in which lack of professional experience could be substituted by additional education, and vice versa

Shoals Br. at 10; Voltage Br. at 3–4; and 1365 ID at 51.

At the claim construction hearing, Voltage did not dispute that chemistry and materials science added to its proposal are “not particularly pertinent to th[ese] patent[s]” or that “some experience” with electrical wiring in photovoltaic systems is “required.” 6/11/2025 Tr. at 74:18–76:9 and 137:4–9. Instead, Voltage disputed only whether “significant” experience is necessary, without explaining why it believed one of skill need not have “significant” experience with photovoltaic systems, or how any differences between the parties’ proposals matter for purposes

of claim construction. *Id.* at 137:4–9; *cf. Genzyme Therapeutic Prods. Ltd. P’ship v. Biomarin Pharm. Inc.*, 825 F.3d 1360, 1372 (Fed. Cir. 2016) (finding no reversible error where challenger “ha[d] not shown that there are any meaningful differences between its proposed definition of a person of ordinary skill and [an opponent]’s, or that the outcome of th[e] case would have been different based on which definition the court used”).

Voltage has not demonstrated why the level of skill determined in the 1365 investigation is incorrect. I therefore adopt Shoals’s proposal, which is that adopted in the 1365 investigation.

II. Construction of Disputed Claim Terms

The parties dispute the constructions of nine terms, discussed in turn.

A. Lead Assembly

The preamble of all asserted independent claims in both patents recites “[a] lead assembly.” Claim 1 of the ’375 patent and claims 1 and 14 of the ’376 patent recite, “A lead assembly for electrically coupling one or more drop lines to a feeder cable, the lead assembly comprising.” Claim 15 and 20 of the ’375 patent recite, “A lead assembly comprising.” The parties dispute whether the preamble term “lead assembly” limits the claims and, if so, its construction. The parties propose:

Shoals Proposal	Voltage Proposal
Preamble: “lead assembly” is limiting Construction: “an assembly for coupling a plurality of solar panel array wire harnesses to an inverter”	Preamble: “lead assembly” is not limiting, otherwise: Construction: plain and ordinary meaning
’375 patent: all claims ’376 patent: all claims	

Chart of Disputed Constructions at 2.

According to Voltage, “lead assembly” is not limiting because “the body of each of the Asserted Claims disclose[s] structurally complete inventions.” Voltage Br. at 19. Although “[n]o litmus test defines when a preamble limits claim scope,” several “guideposts [that] have emerged from various cases” support that “lead assembly” is limiting. *Catalina Mktg. Int’l, Inc. v. Collsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002). Beginning with the claim language itself, in at least independent claim 14 of the ’376 patent “the applicant[] specifically included this language”—*i.e.*, “lead assembly”—“in the claim not once, but twice,” “in both the preamble and body,” indicating that “this phrase limits” the claim. *Id.* at 810–811.

The “lead assembly” language in the preamble also “provides antecedent basis for and [is] necessary to understand positive limitations in the bod[ies]” of additional claims. *Pacing Techs., LLC v. Garmin Int’l, Inc.*, 778 F.3d 1021, 1024 (Fed. Cir. 2015). For example, dependent claim 19 of the ’375 patent recites “[t]he lead assembly of claim 15, wherein the lead assembly has a voltage rating of at least 1000 VDC.” Voltage agrees that “in that instance [lead assembly] is actually being used” as a “limitation.” 6/11/2025 Tr. at 121:8–13. Voltage agrees that the same is true as to ’376 patent independent claim 14, which recites that “the lead assembly has a voltage rating of 600 VDC, 1000 VDC, or 1500 VDC.” *Id.* at 121:14–15. These uses of “lead assembly” as an antecedent basis distinguishes the claims from those in *American Medical Systems, Inc. v. Biolitec, Inc.*, which Voltage cites, where the preamble did “not provide a necessary antecedent basis for [a] term ... in the bodies of [other] claims.” 618 F.3d 1354, 1359 (Fed. Cir. 2010). “While antecedent basis alone is not determinative of whether a preamble is limiting, use of preamble terms to define positive limitations in the body of the claims,” as here, “can evince an inventor’s intent that the preamble limit the scope of the claim.” *Shoes by Firebug LLC v. Stride Rite Children’s Grp., LLC*, 962 F.3d 1362, 1368 (Fed. Cir. 2020).

Voltage seemed to suggest at the hearing that “lead assembly” should be limiting in some claims, but not others. *See* 6/11/2025 Tr. at 121:14–18 (“when the applicant, again, wanted to use ‘lead assembly’ in the body of the claims, the applicant did use it as a limitation in the body of the claims”). The law is clear, however, that “a claim term should be construed consistently with its appearance in other places in the same claim or in other claims of the same patent.” *Vascular Solutions LLC v. Medtronic, Inc.*, 114 F.4th 1361, 1370 (Fed. Cir. 2024) (citations omitted).

In addition, “[t]he specification is replete with references to the invention as” a “lead assembly,” reinforcing that “the inventor considered that the [‘lead assembly’] preamble language represented an important characteristic of the claimed invention.” *Poly-Am., L.P. v. GSE Lining Tech., Inc.*, 383 F.3d 1303, 1310 (Fed. Cir. 2004); *see also Lemoine v. Mossberg Corp.*, No. 2020-2140, 2021 WL 4199934 at *2 (Fed. Cir. Sept. 15, 2021) (“the specification repeatedly discloses that the claimed invention is a retrofit kit for existing conventional shotguns”) and *Applied Materials, Inc. v. Advanced Semiconductor Materials Am., Inc.*, 98 F.3d 1536, 1573 (Fed. Cir. 1996) (“The [limiting preamble] term ‘cold purge’ has its roots in the specification.”).

The asserted patents are both titled “Lead Assembly for Connecting Solar Panel Arrays to Inverter.” The abstract summarizes the invention as “[a] lead assembly.” All “[d]isclosed embodiments are directed to a lead assembly.” ’375 patent at 1:66–2:1. And all but four of the sixty-one figures label or depict a “lead assembly” or the components of a “lead assembly.” *See id.* at 2:25–4:12 and Figs. 3–6 and 9–61. That is a far cry from *Shoes by Firebug*, which Voltage cites, where the specification’s description of “textile material” as optional undermined the significance of “textile footwear” in the preamble. 962 F.3d at 1367–68. And it is even further from *Vaupel Textilmaschinen KG v. Meccanica Euro Italia S.P.A.*, where the features allegedly required by the preamble were “not illustrated in any of the figures of the [asserted] patent or

otherwise described in the specification.” 944 F.2d 870, 880 (Fed. Cir. 1991). Here, by contrast, “[t]he applicant rel[ie]d on [‘lead assembly’] to define its invention.” *Catalina*, 289 F.3d at 810.

Voltage counters that “lead assembly” is merely “a handle for referring to the claimed invention” that the applicant did not “clear[ly] rel[y] on ... as a patentably significant limitation.” Voltage Br. at 18–20. The specification, however, indicates otherwise. It observes that “in known solar power installations,” “a combiner box is still a necessary component ... because the energy coming from solar arrays must be combined prior to going into [an] inverter,” which is “[u]nfortunate[.]” because “[c]ombiner boxes ... are clumsy, prone to damage and malfunctioning, must be periodically maintained,” “require extensive planning and skill for installation,” and “cannot easily be moved without disconnecting and reconnecting all the connections and wiring, which requires considerable manpower, danger, and expense.” ’375 patent at 1:47–57. By contrast, the specification explains, “[i]t is a very important feature that a system of the present invention doesn’t require a combiner box,” as “lead assemblies 10 effectively ‘combine’ the power from solar arrays 32 and deliver it to inverter 38.” *Id.* at 6:12–15. Indeed, that “lead assembly” “recit[es] additional structure ... underscored as important by the specification” reinforces why “the preamble may operate as a claim limitation” here. *Catalina*, 289 F.3d at 808.

Voltage contends that during prosecution of the asserted patents and their parents, the applicant left unrebutted the Examiner’s statements that the preamble phrases “for electrically coupling one or more drop lines to a feeder cable” and “for use in a solar energy installation” did not limit the pending claims as “intended use[s].” See Voltage Br., Ex. 6 at 37659, 37669, and 37672; *id.*, Ex. 7 at 39390 and 41018; *id.*, Ex. 3 at 1011, 1024–25, 1079–80, 1113–14, 1149–50, and 1207; and *id.*, Ex. 8 at 1392, 1427–42 and 1598–609. In none of those instances, however, did the Examiner address the term “lead assembly” itself. Instead, the Examiner repeatedly noted that

the “claim is drawn to a lead assembly” and that the uses recited in the preambles of the claims were just that, intended uses. *See* Voltage Br., Ex. 3 (’254 patent prosecution history) at 1024, 1079, 1113–1114, 1149–1150, and 1207; *see also* Ex. 6 (’375 patent prosecution history) at 7669 and 7672 and Ex. 7 (’376 patent prosecution history) at 1018.

During prosecution of the ’153 patent, the Examiner stated with respect to application claim 1, which recited “[a] lead assembly for use in a solar energy installation,” that “[a]s the body of the claim recites a structurally complete invention, the limitation that the lead assembly is for use in a solar energy installation is not given patentable weight.” Voltage Br., Ex. 8 at 1427; *see also id.* at 1598 (Examiner also stating that where the “preamble merely states, for example, the purpose or intended use of the invention,” “the preamble is not considered a limitation.”).

After that, claim 1 was amended to recite:

1. (Currently Amended) A lead assembly for use in a solar energy installation including: a drop line <u>terminating at a drop line connector, the drop line connector configured to connect with a central trunk of a wire harness, the central trunk of the wire harness having a plurality of branches that each electrically connect to a separate solar panel contained in an array of a plurality solar panels;</u>

Id. at 1473. In rejecting the claims, the Examiner stated that, “[c]laim 1 recites that the drop line connector is configured to connect with a central trunk of a wire harness, the central trunk of the wire harness having a plurality of branches that each connect to a separate solar panel contained in an array of a plurality of solar panels. The language that the drop line connector is configured to provide a function or have a property implies an intended use. Intended use limitations are given weight to the extent that the prior art structure is capable of performing the intended use.” *Id.* at 1607. The Examiner clarified, however, that “[t]he claim is drawn to a lead assembly. The claim is drawn to a lead assembly and its structure; the broadest reasonable interpretation of the claim

does not require a wire harness as part of this structure, only the capability of the drop line connector to connect to a wire harness.” *Id.* As with the previously cited portions of the prosecution history, the Examiner specifically recognized that the claim was directed to a “lead assembly.” The prosecution histories do not support that the “lead assembly” preamble language is not limiting.

Voltage also argues that Shoals’s expert “was unable to identify what more the preamble provided that was not already described by the body of Claim 1.” Voltage Supp. at 6. Dr. Glancey testified, however, that “lead assembly” contributes “the overall structure” of the invention, “namely, a structure of the lead assembly to inform a POSITA of what type of lead assembly we’re talking about here in the context of photovoltaic systems.” Glancey Tr. at 241:16–21 and 245:2–20. That testimony is consistent with the claims reciting “lead assembly” in the preamble and body of at least one claim, as the admittedly structural antecedent basis for that and other claims, and as central to every disclosed embodiment and the specification’s explanation of how the invention improves on the prior art, as discussed above. The claim language, specification and prosecution history support that “lead assembly” in the preamble is limiting.

As for the meaning of “lead assembly,” at the claim construction hearing the parties agreed that, if limiting, it is “an assembly for electrically coupling a solar panel array” or “a plurality of solar panel arrays.” See 6/11/2025 Tr. at 88:14–17 (Shoals) and 106:23–107:3 and 127:19–128:4 (Voltage); see also *id.* at 132:3–7 (Shoals clarifying that its “position ... is not that the lead assembly includes either an inverter or a wire harness.”). The intrinsic evidence supports this construction. See ’375 patent at abstract (summarizing invention as “[a] lead assembly” in which “a plurality of solar arrays are electrically coupled together”), 1:66–2:6 (same), 4:45–47 (“As shown in FIG. 3, solar arrays 32a, 32b, and 32c are connected to a lead assembly 10.”), and Figs.

3, 4, 9, and 10 (depicting a lead assembly's coupling of solar arrays). The extrinsic evidence does not contradict this intrinsic evidence. *See, e.g., Voltage Br., Ex. 14* at 32285 and 32330 and *Glancey Tr.* at 233:8–234:3.

Yet this construction does not resolve the fundamental question of whether the claimed lead assembly excludes a combiner box. That exclusion, because of the claimed lead assembly, is supported by the specification. '375 patent at Abstract, 1:24–27, 1:58–59, 2:9–11, 2:32–34, and 6:13–16 (describing as a “very important feature of a system of the present invention” the exclusion of a combiner box). Shoals contends that “the recitation of the lead assembly necessarily excludes connection to a combiner box.” *Tr.* at 85:8–20 and *see Tr.* at 71:21–22, 78:15–79:18, 83:6–9, and 86:7–10. Voltage contends that “[p]art of the invention here is the system can work without a combiner box. ... The invention is without one. You know, it can work with one, but it can work without one.” *Tr.* at 106:5–13 and *see Tr.* at 105:11–14.

The record is incomplete on this issue because while the parties appear to agree that not having a combiner box is part of the invention, they do not adequately identify how that should be addressed by the construction of “lead assembly” or provide responses to the other party's position, namely Shoals's argument that a combiner box is necessarily excluded and Voltage's argument that the invention is without a combiner box but that one may also be included. Dr. Glancey's testimony was not entirely clear on this point, but he appeared to take the position that including a combiner box would require “modifying the invention, no longer making it the invention.” *Glancey Tr.* at 109:21–22 and *see for example* 91:18–92:4, 93:20–94:13, 96:1–4, 97:14–16, 98:6–21, 107:22–108:1, and 108:18–109:5.¹ In addition, dependent claim 5 of the '376 patent recites

¹ During this testimony, several inappropriate objections were made. *See* 86:2–7, 90:17–20, 92:9–13, 93:7–10, and 101:7–8 (instructing witness not to answer).

“without an intervening combiner box.” It is not clear how that recitation is squared with the parties’ apparent positions that the “invention is without” a combiner box for all claims. Finally, claim 16 of the ’375 patent recites that “the feeder cable is directly electrically connected to a component selected from the group consisting of” a “recombiner,” among other things. The record is unclear whether this is affirmatively reciting a connection to a combiner or to some other component and how, if at all, that impacts whether the claimed lead assembly excludes a combiner box. The parties are invited to address these issues in their pre-hearing briefs. Based on the above discussion, construction of “lead assembly” is deferred.

B. Drop Line

The term “drop line” is in every independent claim and several dependent claims of both patents. The parties’ proposed constructions, below, contrasted “line” with “portion of wire,” “electrically couples” with “connects,” and “solar array wire harness” with “solar array.”

Shoals Proposal	Voltage Proposal
line that electrically couples a solar array wire harness to a feeder cable	portion of wire that connects a solar array to a feeder cable
’375 patent: claims 1, 4–8, 11, 15, and 20–23 ’376 patent: claims 1–4, 6, 8, 9, 12–14, 15–17, 19, 20	

Chart of Disputed Constructions at 2.

At the hearing, the parties withdrew their proposals and accepted the following construction: “line that electrically couples a solar array to a feeder cable.” *See* 6/11/2025 Tr. 176:9–12 and 188:13–18 (Shoals) and 176:22–177:2 (Voltage); *see also id.* 183:9–10 (Voltage: “we’re not adverse to ‘line’” instead of “wire”), 178:17–18 and 185:2–3 (Voltage: “‘wire’ and ‘line’ are somewhat interchangeable”), 184:11–12 (Voltage: “you don’t need a portion”), 180:3–4 (Voltage: “portion of wire” includes “the entire portion, everything”), 177:11–12 (Voltage: “no

difference” between “electrically coupled and connect”), 175:3–19 (Shoals: “wire harness” not “necessary so long as the construction is not read as to prevent the connection being through the wire harness.”), and 171:5–8 (Shoals: “The drop line is a portion of the lead assembly that carries current from a solar panel array and is connected to the feeder cable at the joint.”).

The intrinsic evidence supports the now-agreed construction. For example, claim 1 of the ’375 patent recites that “a section of the feeder cable and a section of the one or more drop lines can be electrically coupled at a nexus” and that “each of the one or more drop lines are configured to be capable of receiving electrical power from a plurality of solar panels for combination at the nexus.” *See also, e.g.*, ’376 patent at claim 1 (similar). The specification states that the disclosed embodiments comprise “at least one drop line joined to a feeder cable at a nexus ... In use, the drop line is connected to solar arrays, and the feeder cable is connected to an inverter ... In this manner, a plurality of solar arrays are electrically coupled together, with a common feeder cable connecting them all to the inverter.” ’375 patent at 1:64–2:7; *see also id.* at Figs. 9 and 10 (labelling drop lines 12, solar arrays 32, and feeder cable 14).

Consistent with the claim language, specification, and as agreed by the parties, “drop line” is construed as a “line that electrically couples a solar array to a feeder cable.”

C. Feeder Cable

The term “feeder cable” is in every independent claim and several dependent claims of both patents. The parties propose:

Shoals Proposal	Voltage Proposal
a cable that electrically couples one or more drop lines with an inverter	plain and ordinary meaning
’375 patent: claims 1, 3, 9, 10, 12, 15, 16, 18, 20, 22, 23 ’376 patent: claims 1–6, 8, 10, 12–14, 15–17, 19, 20	

Chart of Disputed Constructions at 2.

At the hearing, Shoals clarified that its “definition doesn’t require the feeder cable be directly connected” to an inverter, and Voltage proposed “a cable that feeds electrical current” as its plain and ordinary meaning. *See* 6/11/2025 Tr. 143:19–144:19 (Shoals) and 150:14–15 (Voltage).

The claim language does not support construing “feeder cable” as a cable that electrically couples a drop line with an inverter. In the ’375 patent, for example, claim 1 does not recite an inverter, whereas dependent claim 10 recites “wherein the lead assembly is configured to combine electrical power received from the plurality of solar panels at the nexus and to deliver the combined electrical power to an inverter that is in electrical communication with the feeder cable.” If “feeder cable” in claim 1 already requires electrical coupling to an inverter, then claim 10’s recitation of “an inverter that is in electrical communication with the feeder cable” would be superfluous. *See Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1312 (Fed. Cir. 2011) (“Such a reading would render the dependent claims completely superfluous.”). So, too, with the same language in claim 8 of the ’376 patent, which depends from claim 1, and with dependent claims 9 and 18 of the ’375 patent, which recite “an inverter electrically connected to the feeder cable.”

Application of the doctrine of claim differentiation here is supported by the specification, which does not indicate that a feeder cable must electrically couple a drop line with an inverter. Shoals points to certain embodiments that comprise “at least one drop line joined to a feeder cable at a nexus” and in which “the drop line is connected to solar arrays, and the feeder cable is connected to an inverter.” ’375 patent at 1:66–2:11; *see also, e.g., id.* at abstract and Fig. 9 (labelling drop line 12, feeder cable 14, and inverter 38), and Fig. 10 (similar). The specification also states, however, that “[e]ach feeder cable 14 terminates in feeder cable connector 15, which

connects to trunk buss jumper 27 (FIG. 27), to inverter 38 (FIG. 3), or to connection unit, recombiner, or disconnect unit (not shown).” *Id.* at 5:24–27. This passage supports that the claimed feeder cable need not always couple a drop line to an inverter but can instead electrically couple to a different device, such as a connection unit, recombiner, or disconnect unit. *See also id.* at claim 16 (“wherein the feeder cable is directly electrically connected to a component selected from the group consisting of a trunk buss jumper, an inverter, a connection unit, a recombiner, and a disconnect unit”). Although Dr. Glancey opines that the feeder cable would still electrically couple with an inverter even in embodiments that terminate in a trunk buss jumper, connection unit, or disconnect unit, he does not cite any support for that opinion, nor does he specifically address the recombiner-terminating embodiments. *See Glancey Opening Decl.* at ¶ 50.

In addition, Dr. Glancey explained that “not all feeder cables will feed or be connected to an inverter” because, for instance, “some could be connected to a transformer,” including feeder cables that “also connect to drop lines.” *Glancey Tr.* at 116:9–118:7. And although he testified that the asserted patents distinguish their feeder cable from “the feeder cable, for example, that connects the electric power lines outside your house to your house ... for connecting the electric power supplied by ... a power company,” he acknowledged that “feeder cable” is a “broad term” that “generally means conveying electrical power from a source to a use ... that can take many different forms,” including “outside solar installations.” *Id.* at 115:19–116:11 and 118:10–119:18. Other extrinsic evidence, such as the 2014 National Electrical Code, likewise defines and discusses “feeder[s]” without closely associating them with an inverter, including when addressing “Solar Photovoltaic (PV) Systems.” *See Voltage Br., Ex. 13* at 30915, 30949–61, and 31508–23; *cf., id.*, *Ex. 14* at 32285 and 32230 (P. Dunlop, *Photovoltaic Systems* (3d ed. 2012)).

Shoals stresses the specification's statements that "[i]t is a very important feature that a system of the present invention doesn't require a combiner box" because the "lead assemblies 10 effectively 'combine' the power from solar arrays 32 and deliver it to inverter 38," and that, "[a]s shown in FIG. 3, the present invention also eliminates the need of DC feeders, which would carry power from the combiner box to the inverter in a conventional system." '375 patent at 6:12–18. But none of these statements mentions "feeder cables" or demands that every feeder cable electrically couple to an inverter, and, as noted above, the dependent claims and specification support that a feeder cable can electrically couple to a trunk buss jumper, a connection unit, a recombiner, or a disconnect unit. In addition, as detailed above, Shoals's arguments are more directed to the claimed lead assembly, which the specification describes as "very important," "doesn't require a combiner box," "renders a combiner box unnecessary," and avoids "an unnecessary combiner box." *Id.* at 6:13–16, 1:58–59, and 31–34.

Based on the claim language, the specification, and the parties' arguments, the term "feeder cable" is construed to have its plain and ordinary meaning, which is a "cable that feeds electrical current."

D. Nexus

The term "nexus" is in every independent and several dependent claims of the '375 patent. Claim 1 recites, "a joint where a section of the feeder cable and a section of the one or more drop lines can be electrically coupled at a *nexus*, the joint including the section of the feeder cable and the section of the one or more drop lines."

Claim 15 recites, "a joint where a section of a feeder cable and a section of each of two drop lines can be electrically coupled at a *nexus*, each of the two drop lines connected to a wire harness and configured to receive power from a plurality of solar panels."

Claim 20 recites, “a joint where a section of the feeder cable and a section of the drop line cable can be electrically coupled at a *nexus* to electrically couple each of the first drop line and the second drop line to the feeder cable at the nexus.” The parties propose:

Shoals Proposal	Voltage Proposal
plain and ordinary meaning	region of electrical interconnection of the drop line cable and feeder cable
'375 patent: claims 1, 2, 10, 15, 18, 20, and 22	

Chart of Disputed Constructions at 2.

According to Shoals, the plain and ordinary meaning of “nexus” is “the connection or link between the drop line(s) and the feeder cable.” Shoals Br. at 19. The parties’ dispute centers on two terms in Voltage’s proposal, “cable” (in “drop line *cable*”) and “electrical interconnection.”

The evidence does not support that “nexus” should be construed to refer to a “drop line *cable*.” Independent claims 1 and 15 and their dependent claims do not mention a “drop line cable” at all, but instead recite relationships between “drop lines”—*sans* “cable”—and a “nexus.” *See, e.g.*, ’375 patent at claim 1 (a section of a feeder cable and “a section of the one or more drop lines can be electrically coupled at a nexus”) and claim 15 (a section of a feeder cable and “a section of each of two drop lines can be electrically coupled at a nexus”). By contrast, independent claim 20 and its dependent claims recite “a drop line *cable* that includes a first drop line and a second drop line,” and that a section of a feeder cable and “a section of the drop line *cable* can be electrically coupled at a nexus to electrically couple each of the first drop line and the second drop line to the feeder cable at the nexus.” *See also* Voltage Reply, Exs. 33 and 34 (pending claims in continuation applications reciting “drop line cable”). I decline to construe “nexus” by reference to a “drop line *cable*” in every claim when some independent claims use that term, but others do not, as

“[d]ifferent claim terms are presumed to have different meanings.” *Bd. of Regents of the Univ. of Tex. Sys. v. BENQ Am. Corp.*, 533 F.3d 1362, 1371 (Fed. Cir. 2008).

Voltage has not rebutted that presumption here. To the contrary, Voltage acknowledges the distinction between a “drop line” and a “drop line cable,” as it interprets the latter to include, more broadly, “one or more drop lines, branches, or taps.” Voltage Br. at 16. Voltage also observes that “Shoals recognizes the distinction between the physical drop line cable that can include two ‘drop lines.’” Voltage Reply at 9. Voltage nonetheless asserts that including “‘drop line cable’ provides clarity regarding the bounds of the claimed nexus and avoids the ambiguity created by Shoals in the 1365 investigation.” *Id.* at 8–9. Voltage, however, does not clearly explain what that supposed ambiguity is.

The evidence also does not support including “electrical interconnection” in the construction of “nexus.” The ’375 patent’s claims do not mention “electrical *interconnection*” but instead consistently recite that feeder cable and drop line sections are “electrically *coupled* at a nexus.” *See* ’375 patent at claims 1, 15, and 20. The specification also does not use the term “electrical interconnection,” and the most closely related term—“interconnects”—is in a passage discussing structures different from a nexus. *Id.* at 2:12–14 (“The terminal end of each drop line includes a drop line connector for fast and easy connection to the wire harness that interconnects the solar panels of a solar array.”). That the claims of the ’376 patent recite “electrical interconnection” when the claims of the ’375 patent do not only further supports not importing the term into the latter’s claimed “nexus.” And in the parts of the ’294 patent prosecution history Voltage cites, the Examiner and applicant addressed whether a reference taught a “compression lug” that secured a nexus, not the meaning of “nexus” itself. *See* Voltage Br., Ex. 3 at 1044, 1045, 1083, 1117, and 1211. Dr. Glancey’s testimony that “nexus” is “the region of electrical

interconnect” does not overcome the intrinsic evidence, which describes a coupling, not an interconnection. *See* Glancey Tr. at 185:10–186:3, 187:5–14, 188:9–13, 202:2–20, and 204:7–9.

Voltage maintains that “[i]ncluding ‘region of electrical interconnection’ in the construction of ‘nexus’ clarifies the meaning and the geometric boundaries of the claimed ‘nexus’” but does not explain how “electrical *interconnection*” differs from “electrical *coupling*.” Voltage Reply at 8. Indeed, Voltage concedes that its construction means “essentially, where the cables are electrically *coupled* and the electrical power is combined.” Voltage Br. at 16.

That said, I agree with Voltage that Shoals’s proposed plain meaning—“the connection or link between the drop line(s) and the feeder cable”—sweeps too broadly and fails to distinguish the claimed “nexus” from, for example, the claimed “joint.” Claim 1 recites a “joint” that “includ[es] [a] section of the feeder cable and [a] section of the one or more drop lines,” and the specification depicts embodiments in which “drop line 12 [is] joined to feeder cable 14 at joint 17.” ’375 patent at claims 1, 15, and 20, 4:53–54, and Figs. 5–7. The claims and specification distinguish, however, the joint’s more generic connection/linking of a drop line and feeder cable from the nexus’s more specific “electrical[] coupl[ing]” of the two. *Id.* at claims 1, 15, and 20, 5:58–59 (“drop line 12 and feeder cable 14 *electrically couple* at nexus 19 of joint 17), and Fig. 37. That intrinsic evidence trumps the definition of “nexus” that Shoals cites from a general-purpose dictionary. *See* Shoals Br., Ex. 5 (Merriam-Webster). Indeed, Shoals agrees that the claims specify that “a section of feeder cable and a section of the drop line(s) are *electrically coupled*,” not merely “connected” or “linked.” Shoals Reply at 11.

In its supplemental brief and without expert testimony or other factual support, Voltage argues for the first time that under Dr. Glancey’s understanding of “nexus,” that term (and “region of electrical interconnection” in the ’376 patent) is indefinite. Voltage Supp. at 5–6, *citing* Glancey

Tr. at 174:5–12, 176:18–177:7, and 177:12–178:7. In its responsive supplemental brief, Shoals disputes Voltage’s argument. Shoals Supp. at 6, *citing* Glancey Tr. at 176:18–178:18. Based on the four pages of cited deposition testimony, Voltage has not shown by clear and convincing evidence that the term “nexus” is indefinite.

Based on the claim language, specification, and the parties’ arguments, the term “nexus” is construed as “region in which a drop line and a feeder cable are electrically coupled.”

E. Opposite Direction(s)

The terms “opposite direction(s)” are in independent and dependent claims of both patents, which use “opposite direction” or “opposite directions” to recite how different objects extend away from one another. One set of claims uses “opposite direction” to recite how two drop lines or a feeder cable extend out of and away from one or more mold structures:

- ’375, claim 21: “the first drop line extends out of and away from the mold structure in one direction and the second drop line extends out of and away from the mold structure in an *opposite direction*”
- ’376, claims [2] and 15: “the feeder cable extends out of and away from the [one or more] mold structure[s] in one direction and out of and away from the [one or more] mold structure[s] in an *opposite direction*”

Another set of claims uses “opposite directions” and also recites that two drop lines (or their pathways) extend along a longitudinal axis parallel to a longitudinal axis of a feeder cable (or its pathway).

- ’375, claims 15 and 20: “at least a portion of the first drop line pathway and at least a portion of the second drop line pathway extend in *opposite directions* along a longitudinal axis that is parallel to a longitudinal axis of the feeder pathway”
- ’376, claim 1: “the first drop line and the second drop line extend in *opposite directions* along a longitudinal axis that is parallel to a longitudinal axis of the feeder cable”

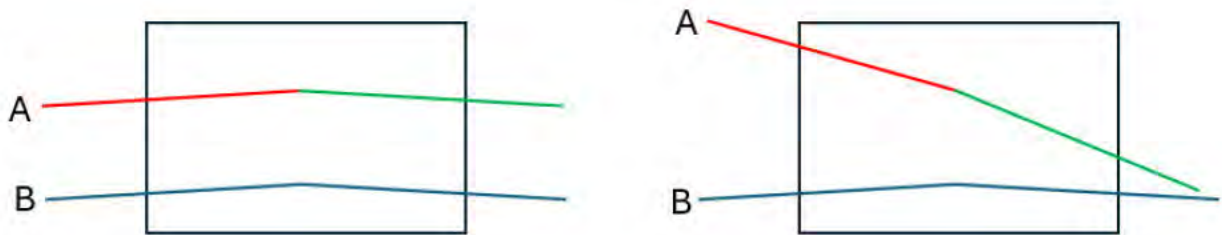
Neither party argues that the term “opposite direction(s)” should be construed differently for the different claims in which it appears. The parties propose:

Shoals Proposal	Voltage Proposal
plain and ordinary meaning	in [a] direction[s] 180 degrees apart or indefinite
'375 patent: claims 15, 20 , and 21 '376 patent: claims 1, 2 , and 15	

Chart of Disputed Constructions at 2–3.

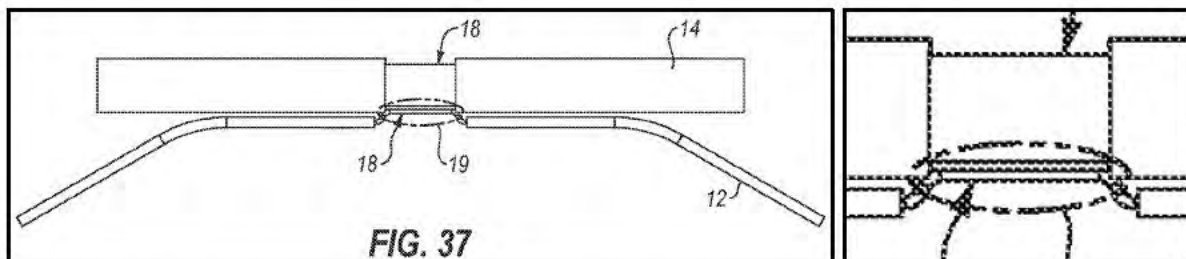
The claim language itself does not support that two objects extending in “opposite direction(s)” must be precisely 180 degrees apart, as Voltage proposes. In the first set of claims, for example, “opposite direction” most naturally conveys that a first drop line (or one end of a feeder cable) extends out of one side of a mold structure, whereas a second drop line (or the other end of the feeder cable) extends out of the opposing side of the mold structure—an arrangement that does not demand a 180-degree separation between the two drop lines (or ends of the feeder cable).

Voltage argues that, in the second set of claims, the “longitudinal axis that is parallel to a[nother] longitudinal axis” terms “would also geometrically limit ‘opposite direction(s)’ to 180 degrees.” Voltage Br. at 22 and 24. The longitudinal axis/parallel claim recitations, however, are additional requirements of the claims in which they appear. They orient the oppositely extending drop lines (or pathways) relative to a third object, namely, the feeder cable (or its pathway). In the images below, A and B are each lines with an approximately 179-degree bend. In both, the red and green sides of line A extend in opposite directions from each other outside the rectangle, but only in the left image could line A be considered parallel to line B.



As shown, the parallelism relationship can be met without the 180-degree separation Voltage proposes.

The specification also does not support that “opposite direction(s)” requires 180 degrees of separation. Indeed, outside of the claims, it does not use the words “opposite,” “direction,” or their variants, nor does it mention angles or degrees. The parties thus focus their specification-based arguments on the patents’ figures, but they do not support a 180-degree requirement either. In Fig. 37, the left side of item 12 is a first drop line, the right side of item 12 is second drop line, and item 14 is a feeder cable. *See* ’375 patent at 3:17–18, 4:10–33, and 5:58–6:9. Yet the portions of the drop lines as they emerge from opposite sides of nexus 19 are not 180 degrees apart.



Voltage also points to Figs. 7, 29, and 31–36, which appear to show 180-degree separations, and which the applicant cited during prosecution to support a new claim reciting “opposite direction.” *See* Voltage Br. at 23–24 and Voltage Reply at 15, *citing* Voltage Ex. 6 at 39203. But neither the specification nor the prosecution history requires numerically precise geometric relationships between the figures’ components. Instead, the specification explains that each figure is an “exemplary embodiment.” ’375 patent at 4:4–5. Voltage’s “attempt to import a

feature from [certain] embodiment[s] into the claims” is “flawed.” *Acumed LLC v. Stryker Corp.*, 483 F.3d 800, 805 (Fed. Cir. 2007).

Iridescent Networks, Inc. v. AT&T Mobility, LLC, which Voltage cites, does not suggest any different. 933 F.3d 1345 (Fed. Cir. 2019). There, the Federal Circuit construed “high quality of service connection” as “limited to the minimum connection parameter requirements disclosed in [a patent’s] Figure 3,” where the figure labelled certain applications as having “High QoS [Quality of Service]” in connection with numerical bandwidths in megabits per second, and the applicant numerically characterized the term to overcome an enablement rejection. *Id.* at 1347–54. Here, by contrast, the patents’ figures do not specify the angular separation between their components, and the applicant was not numerically specific during prosecution.

The claims are not indefinite, moreover, just because “opposite direction(s)” does not mean precisely 180 degrees apart. Voltage insists otherwise, asserting without expert or other factual support that absent a 180-degrees construction, a skilled artisan would lack “a rational basis by which to determine what is or is not sufficiently ‘opposite.’” Voltage Br. at 22, citing *Effective Exploration, LLC v. Bluestone Natural Resources II, LLC*, No. 2:16-cv-607, 2017 WL 3193322, at *22–23 (E.D. Tex. July 27, 2017). There, however, the court recognized that it was not clear where a measurement was taken and that measuring from different places could yield different results. *Id.* That is not true here. In the first set of claims, opposite direction is relative to the mold structure. In the second set of claims, opposite direction is relative to a pathway and a longitudinal axis. Because objective boundaries are provided, this term is not indefinite.

Based on the intrinsic evidence and the parties’ arguments, the term “opposite direction(s)” is construed to have its plain and ordinary meaning, which does not require precisely 180 degrees of separation.

F. Within/In

This dispute concerns phrases in the final clauses of certain independent claims in each patent:

- '375, claim 1: “wherein the one or more drop line pathways and the feeder pathway extend parallel to one another *within* the nexus”
- '376, claim 1: “wherein, *in* the region of electrical interconnection, the first drop line and the second drop line extend in opposite directions along a longitudinal axis that is parallel to a longitudinal axis of the feeder cable”
- '376, claim 14: “wherein the drop line and the feeder cable extend parallel to one another *within* the region of electrical interconnection”

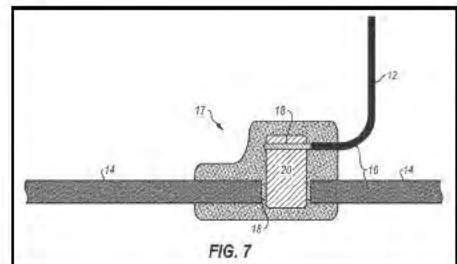
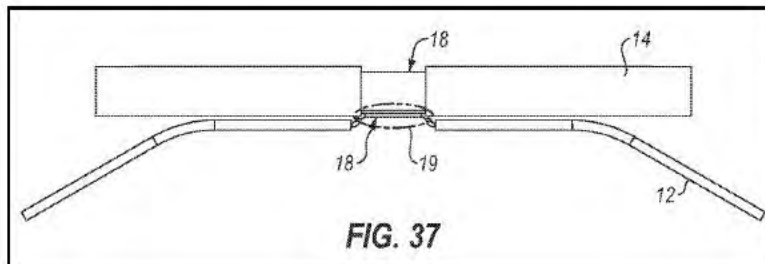
The parties propose:

Shoals Proposal	Voltage Proposal
plain and ordinary meaning	Indefinite, otherwise: wherein the one or more drop line pathways and the feeder pathway extend parallel to one another through the entire nexus wherein, through the entire region of electrical interconnection, the first drop line and the second drop line extend in opposite directions along a longitudinal axis that is parallel to a longitudinal axis of the feeder cable wherein the drop line and the feeder cable extend parallel to one another through the entire region of electrical interconnection
'375 patent: claim 1 '376 patent: claims 1 and 14	

Chart of Disputed Constructions at 3–4. Voltage’s proposal replaces “within the” (first and third terms) or “in the” (second term) with “through the entire.”

The claim language supports a construction akin to Voltage’s proposal. Each disputed term concerns the parallel extension of two separately identified pathways, lines, or cables. Each term identifies where that parallelism occurs: “within the nexus” for the first term, “in the region of electrical interconnection” for the second term, and “within the region of electrical interconnection” for the third term. And none of the terms qualifies the extent of the area of parallelism, *i.e.*, “the nexus” or “the region of electrical interconnection.” That lack of qualification distinguishes these terms from other parallelism-requiring terms in the patents’ claims, which, for example, recite that “at least a portion” of certain wires, pathways, lines, or cables be parallel. ’375 patent at claims 1, 15, 20, and 23 and ’376 patent at claims 6 and 16; *see also* ’375 patent at claims 1, 15, and 20 (reciting pathways and lines that “extend *at least partially* through” or “extend *partially* through” a mold structure).

The specification does not specify whether any items are “parallel,” but Figs. 37 and 7 are consistent with parallelism over a substantial extent of the nexus. The specification states that Fig. 37 shows “drop line 12 and feeder cable 14 electrically couple[d] at nexus 19 or joint 17,” and that Fig. 7 shows “a joint with a compression lug.” ’375 patent at 2:41–42 and 5:58–64. In Figure 37, exposed wires 18 of drop line 12 and feeder cable 14 extend in parallel within nearly all the circled nexus 19, and in Fig. 7 the same exposed wires 18 extend in parallel in joint 17.²



² The parties agree that their proposed constructions do not exclude the embodiment shown in in Fig. 37. *See* 6/11/2025 Tr. at 212:13–17 and 218:11–14.

Voltage also compares the disputed terms here to certain “aperture” terms that the 1365 ALJ construed in the parent ’254 patent. There, the parties disputed the construction of “second aperture ... parallel to said first aperture,” and specifically “what portion of the ... ‘second aperture’ [] is to be evaluated to determine whether the ‘first aperture’ and the ‘second aperture’ are parallel.” Voltage Br., Ex. 2 at 42. The ALJ construed the term “according to its plain and ordinary meaning, which requires that the second aperture, considered as a whole, is parallel to the first aperture, considered as a whole.” *Id.* at 47. As support for that construction, the ALJ observed that, like here, “[t]he claim language does not state that ‘any portion’ or part of the second aperture is parallel to the first aperture,” and that “the claim language shows that where the applicant sought to refer to ‘partial’ aspects, it knew how to do so” because other claim elements “refer[red] to the second aperture ‘only partially extending’ through the undermold.” *Id.* at 44–45. “Thus,” according to the ALJ, “the most natural reading of this language is that it refers to each aperture considered as a whole.” *Id.* at 45–46 (collecting cases). In so holding, the ALJ also declined to adopt Voltage’s and Commission Investigative Staff’s proposals that would have required considering the “entire length” of the second aperture. *Id.* at 42.

The 1365 ALJ’s reasoning—concerning a similar dispute over “parallel” claim terms in a parent patent with the same specification as the asserted patents—is persuasive. Shoals’s principal argument otherwise—that Voltage takes the 1365 ALJ’s reasoning “out of context” because “aperture” does not appear in the currently asserted claims—disregards the material resemblance between the issues and evidence. *See* Shoals Reply at 22. Shoals’s prosecution-based argument offers nothing meaningfully more, and if anything appears to bolster the 1365 ALJ’s reasoning. During prosecution, the applicant replaced “away from” the nexus or region of electrical interconnection with “within” those structures. Voltage Br., Ex. 6 at 39257–58 and Ex. 7 at 41118.

Although the applicant did not explain why it made those changes, the change from requiring parallelism “away from” the nexus or region of electrical interconnection to “within” the nexus or region reinforces the centrality of those areas to the claimed parallelism.

Voltage separately argues that these terms are indefinite because one of skill would lack reasonable certainty about the metes and bounds of the drop lines or pathways in the nexus or region of electrical interconnection. If reasonable certainty as to the starts and ends of the drop lines or pathways were necessary, Voltage’s argument could carry some force. During the 1365 evidentiary hearing, for example, when asked to draw where first and second drop lines ended in products accused of infringing the ’153 patent, Shoals’s technical expert drew the below red and blue lines that “become[] squiggly at the end” or “dotted” or “dashed,” and he disagreed that “there’s a specific point somewhere within the nexus that the first [or second] drop line ends”:



Voltage Br., Ex. 19 at 549:9–551:13 and 553:7–556:14 (Brooks), Ex. 21 (1365 RDX-13), and Ex. 22 (1365 RDX-14); *see also id.*, Ex. 19 at 551:14–17 (expert acknowledging that someone looking at the images “possibly [would] not” be able “to determine where [he] believe[d] the second or the first drop line ends.”). And here, another Shoals expert testified that a drop line includes only features that “reliabl[y] transfer ... electrons ... to the feeder cable,” without explaining what “threshold for that reliability [he was] relying on.” *See* Glancey Tr. 169:4–178:18.

On the current record, however, it remains unclear whether one of skill would need to identify the precise endpoints of the claimed drop lines or pathways to determine whether a device

satisfied the disputed limitations. Neither the testimony cited by Voltage nor the intrinsic evidence and testimony cited by Shoals adequately addresses this issue. *See* above and '375 patent at Figs. 35–37 and 43–45 and Glancey Responsive Decl. at ¶¶ 15–17. On the current record, Voltage has not demonstrated that these terms are indefinite.³

Consistent with the intrinsic evidence and the construction of similar terms in the 1365 investigation, the “within/in” terms are construed as:

- '375, claim 1: wherein the one or more drop line pathways and the feeder pathway extend parallel to one another within the nexus considered as a whole
- '376, claim 1: wherein, in the region of electrical interconnection considered as a whole, the first drop line and the second drop line extend in opposite directions along a longitudinal axis that is parallel to a longitudinal axis of the feeder cable
- '376, claim 14: wherein the drop line and the feeder cable extend parallel to one another within the region of electrical interconnection considered as a whole

G. At Least a Portion

The term “at least a portion” is in the last clause of independent claims 15 and 20 of the '375 patent: “wherein at least a portion of the first drop line pathway and at least a portion of the second drop line pathway extend in opposite directions.” The parties propose:

³ Voltage argues that any “indefiniteness of these claims is a problem of Shoals’ own making,” pointing to the applicant’s amendments substituting “within” for “away from” and “region of electrical interconnection” for “the one or more mold structures” during prosecution of the asserted patents. Voltage Br. at 33–34, *citing id.*, Ex. 11 at 35 and Ex. 12 at 38–39. But an applicant always chooses its claim language and the Examiner here did not identify any indefiniteness issues based on these terms.

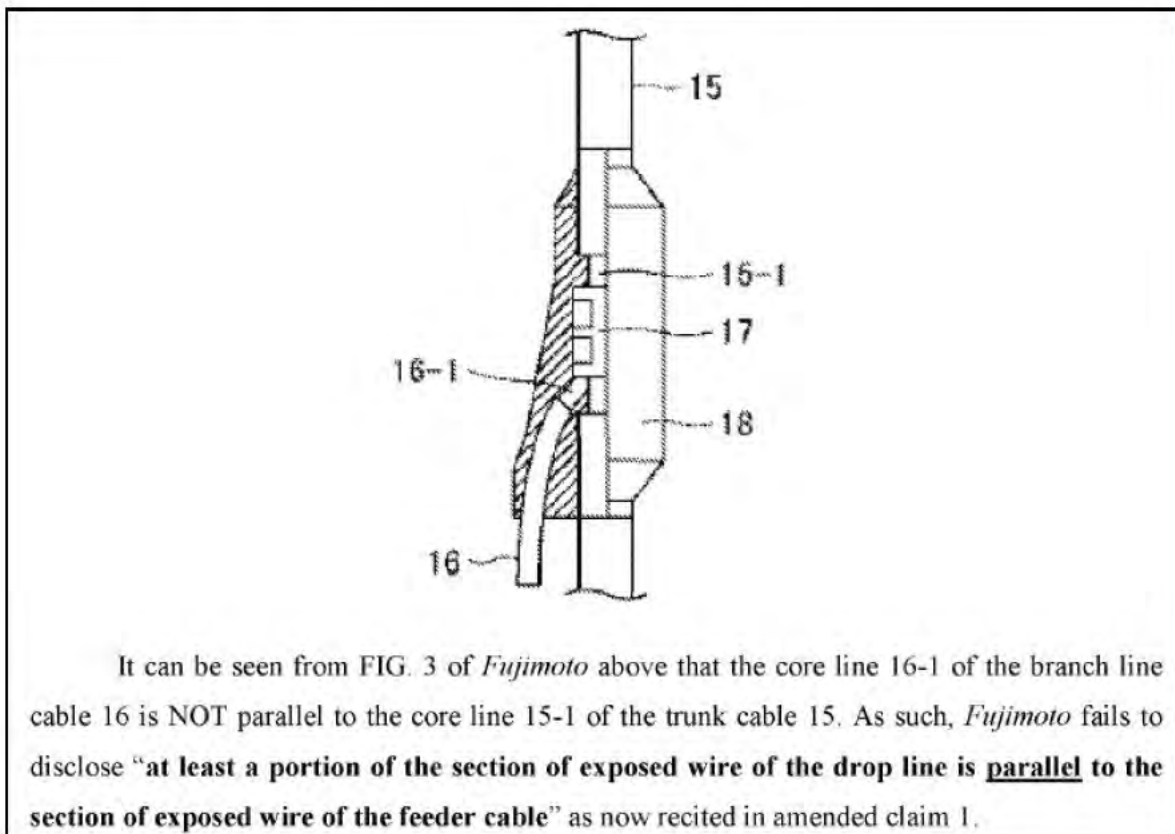
Shoals Proposal	Voltage Proposal
plain and ordinary meaning	Indefinite, otherwise: wherein the first drop line pathway, taken as a whole, and the second drop line pathway, taken as a whole, extend in opposite directions
'375 patent: claims 15 and 20	

Chart of Disputed Constructions at 3.

The claims and specification support construing this term according to its plain and ordinary meaning. On its face, “at least a portion” of a pathway includes “a portion” of the pathway through the entirety of the pathway, and neither claim 15 nor claim 20 purports to restrict or otherwise alter that scope. Neither does the specification, which discloses “*portions* of feeder cable” in an unrelated context and does not address a “pathway” at all. *See* ’375 patent at 5:27–30 (“Trunk buss jumper 27 is essentially an ‘extension cord’ which is economical to use in some configurations, for example where portions of feeder cable 14 are installed at different times.”).

Despite Voltage’s arguments otherwise, the prosecution history does not support departing from the plain and ordinary meaning of “at least a portion” either. The originally filed claims did not include these “at least a portion” terms, Voltage Br., Ex. 6 at 37455–57, and the applicant did not make any patentability arguments based on these terms, which were added after an office action and in response to the Examiner’s proposed amendments. *Id.* at 39214, 39218–39222, 39231, and 39257–60. Voltage nonetheless argues that the Examiner’s stated intent for the proposed amendments—“Figures 8 and 54 best represent the limitations I am attempting to capture”—supports its construction, but neither that statement nor Figs. 8 or 54 suggests that “at least a portion” carries other than its plain and ordinary meaning. *Id.* at 37491, 37507, and 39257.

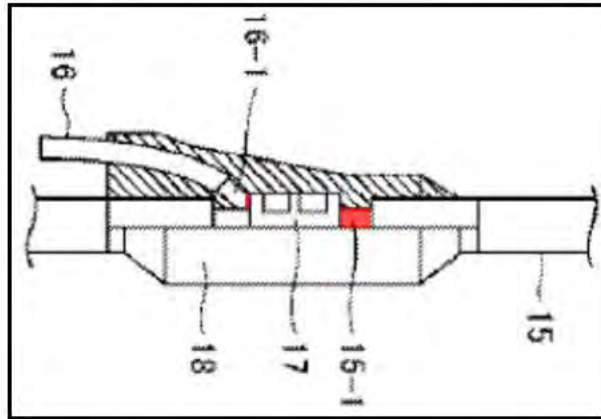
Voltage also highlights the prosecution of other claims reciting “at least a portion.” After the Examiner rejected the originally filed claims over JP Publication No. 2014/050227 to Fujimoto, the applicant (1) amended pending claim 1 to recite “at least a portion of the section of exposed wire of the drop line is parallel to at least a portion of the section of exposed wire of the feeder cable,” (2) amended pending claim 17 to recite “at least a portion of the first drop line pathway is parallel to at least a portion of the feeder pathway,” and (3) added a new claim 22, reciting “at least a portion of the drop line cable pathway is parallel to at least a portion of the feeder pathway.” *Id.* at 39192 and 39194–95. The applicant argued the amendments distinguished Fujimoto’s Figure 3:



Id. at 39199 (applicant’s argument for pending claim 1) and 39202 (applicant incorporating the same arguments for pending claims 17 and 22).

According to Voltage, by arguing that Fujimoto’s core line 16-1 and core line 15-1 do not teach “at least a portion of the section of exposed wire of the drop line is parallel to the section of

exposed wire of the feeder cable,” the applicant disclaimed from “at least a portion” lengths such as the red sliver of core line 16-1 in the Voltage-annotated version of Fujimoto’s Figure 3 below:



Voltage Reply at 21–22. In the unannotated version of Fujimoto’s Figure 3, however, much of core line 16-1 approaches feature 17 in a direction not parallel to core line 15-1, and Voltage’s red highlighting obscures, rather than clarifies, what is shown there. Nor has Voltage explained, backed by expert or other evidence, why core line 16-1 must enter feature 17 parallel to core line 15-1. The evidence does not support that the applicant “clear[ly] and unmistakabl[y] disclaime[d]” from “at least a portion” of a pathway everything except the pathway “taken as a whole.” *Avid Tech., Inc. v. Harmonic, Inc.*, 812 F.3d 1040, 1047 (Fed. Cir. 2016).

Voltage also argues that the 1365 claim construction order supports its “taken as a whole” proposal because the ALJ there construed a “second aperture ... parallel to said first aperture” in the ’254 patent “according to its plain and ordinary meaning, which required that the second aperture, considered as a whole, to be parallel to the first aperture, considered as a whole”—and rejected Shoals’s argument that “it is sufficient for any portion of the ‘second aperture’ to be parallel to the ‘first aperture.’” Voltage Br., Ex. 2 at 42–47. Unlike the ’375 patent claims, however, the ’254 patent claims did not recite “at least a portion” or even “portion.” Indeed, the 1365 ALJ noted exactly that: “The claim language [of the ’254 patent] does not state that ‘any

portion’ or part of the second aperture is parallel to the first aperture.” *Id.* at 44–45. The opposite is true here and does not support that “at least a portion” should be construed the same way that different claim language was construed in the 1365 investigation.

On indefiniteness, Voltage asks, “Does ‘at least a portion of’ mean ‘any portion of’? The majority of? How much of the first and second drop line pathways must extend in opposite directions along a longitudinal axis that is parallel to a longitudinal axis of the feeder pathway to satisfy the claim limitation, as amended by Shoals?” Voltage Br. at 29–30. This, however, is a question best left to experts in their infringement and domestic industry analyses.

Voltage also points to Dr. Glancey’s testimony that “first/second drop line pathways [that] extend in opposite directions along a longitudinal axis [that] is parallel to a longitudinal axis of the feeder pathway in only part of the nexus” would not satisfy the claim. Glancey Tr. at 231:21–232:7; *see also* Glancey Reply Decl. ¶ 20. Voltage Supp. at 12. Dr. Glancey’s testimony, however, cannot change what the claim recites. In addition, what Dr. Glancey stated in his declaration and confirmed at his deposition was that as shown in Fig. 37, parallelism exists “at least in the nexus, where the first and second drop lines are coupled to the feeder cable.” *Id.* Considered in that context, Dr. Glancey’s testimony is understood to explain that in the area of electrical coupling of the drop line and feeder cable in Fig. 37, the pertinent structures are parallel.

Voltage has not demonstrated by clear and convincing evidence that this term is indefinite. *Advanced Aerospace Techs., Inc. v. United States*, 124 Fed. Cl. 282, 293 (2015), which Voltage cites, does not change that. There, the court found “outboard portion” to be indefinite, but the dispute and analysis centered on “outboard,” and the court did not suggest “portion” alone is indefinite. *Id.* at 292–93.

Based on the intrinsic evidence and the parties' arguments, the phrase "at least a portion" is construed to have its plain and ordinary meaning, which does not require considering each pathway "taken as a whole."

H. Directly

This dispute implicates terms in several dependent claims of the '375 patent:

- "where in the feeder cable is configured to attach *directly* to an inverter" (claim 3)
- "wherein the combined electrical power received from the plurality of solar panels is conducted *directly* to an inverter electrically connected to the feeder cable" (claim 9)
- "wherein electrical power received from the plurality of solar panels is combined at the nexus and conducted *directly* to an inverter electrically connected to the feeder cable" (claim 18)
- "wherein the feeder cable is *directly* electrically connected to a component selected from the group consisting of a trunk buss jumper, an inverter, a connection unit, a recombiner, and a disconnect unit" (claim 16)

The parties propose:

Shoals Proposal	Voltage Proposal
attach directly to an inverter without a combiner box	plain and ordinary meaning (all terms)
conducted to an inverter electrically connected to the feeder cable without a combiner box	
electrically connected without a combiner box	
'375 patent: claims 3, 9, 16, and 18	

Chart of Disputed Constructions at 4.

The parties' proposals align in part, as "under either party's construction, these 'directly' terms exclude an intervening combiner box, consistent with a purported advantage of avoiding use of a combiner box." Voltage Reply at 25; *see* '375 patent at 1:24–27 ("Disclosed embodiments

relate ... specifically to assemblies for connecting solar panel arrays to an inverter, without the need of a combiner box.”) and 6:13–19 (“It is a very important feature that a system of the present invention doesn’t require a combiner box.”).

The parties’ proposals depart, however, concerning other potentially intervening components. According to Voltage, these terms’ plain and ordinary meanings “exclude[] all intervening components (including a combiner box).” Voltage Responsive Br. at 25. According to Shoals, however, “[i]n using the word ‘directly,’ the claims and specification ... do not impose a strict requirement that the connection be made without any intervening components,” and “to the extent Voltage’s interpretation excludes the implementation of a trunk buss jumper or a disconnect unit, for example, such an interpretation should be rejected, as it would exclude embodiments described in the specification that teach connecting the lead assembly to the inverter through a trunk buss jumper or through a disconnect box.” Shoals Br. at 29 and 31.

The claim language supports that “directly” excludes intervening components. Claims 3 and 9 depend from independent claim 1, and claims 16 and 18 depend from independent claim 15. Both independent claims recite solar panels whose electrical power passes through a drop line to a feeder cable, but neither recites a structure into which the power passes from the feeder cable. The dependent claims add at least one such structure, and each requires “direct[ness]”: in claim 3, “the feeder cable is configured to attached *directly* to an inverter”; in claims 9 and 18, the combined electrical power received from the solar panels is “conducted *directly* to an inverter electrically connected to the feeder cable”; and in claim 16, “the feeder cable is *directly* electrically connected to a component selected from the group consisting of a trunk buss jumper, an inverter, a connection unit, a recombiner, and a disconnect unit.” By using the adverb “directly,” the dependent claims presumably do not contemplate its opposite, namely, “indirectly.”

Other claims support that understanding. Claims 8, 15, and 20 of the '375 patent, for example, recite that certain objects (drop line connectors or wire harnesses) be configured to “connect” to other objects (wire harnesses or solar panels) without reciting “*directly* connect.” Because “connect,” standing alone, may support both direct and indirect connections, the patentee’s use of “directly” in the disputed terms supports exclusion of intermediate components.

Shoals relies on portions of the specification disclosing embodiments in which a component intervenes between a feeder cable and an inverter. *See, e.g.*, '375 patent at 2:2–9 (“the feeder cable is connected to an inverter, or to a buss trunk jumper, which connects to the inverter”), 5:24–36 (“Each feeder cable 14 terminates in feeder cable connector 15, which connects to trunk buss jumper 27 (Fig. 27), to inverter 38 (Fig. 3), or to a connection unit, recombiner, or disconnect unit (not shown).”), and Fig. 9 (labelling trunk buss jumper 27 between feeder cable connector 15 and inverter 38).⁴ But independent claims 1 and 15 cover such embodiments because they lack terms reciting the “direct[ness]” required by claims 3, 9, 16, and 18. That distinguishes the disputed terms here from those in *Nobel Biocare Services AG v. Intradent USA, Inc.*, 903 F.3d 1365, 1380–82 (Fed. Cir. 2018) and *Oatey Co. v. IPS Corp.*, 514 F.3d 1271, 1276–78 (Fed. Cir. 2008), which Shoals cites, where a proposed construction would have excluded embodiments from independent claims as well. (*Nobel Biocare* also construed the terms under a “broadest reasonable construction” standard that the Commission does not apply. 903 F.3d at 1380). In any event, “[i]t is not necessary that each claim read on every embodiment.” *Baran v. Med. Device Techs., Inc.*, 616 F.3d 1309, 1315 (Fed. Cir. 2010). And other figures in the specification show a feeder cable connected to an inverter without any intervening devices regardless. *See, e.g.*, '375 patent at Fig. 4.

⁴ “Trunk buss jumper 27 is essentially an ‘extension cord’ which is economical to use in some configurations, for example where portions of feeder cable 14 are installed at different times.” '375 patent at 5:27–30.

Based on the intrinsic evidence and the parties' arguments, "directly" is construed as having its plain and ordinary meaning, which means without intervening components.

I. Current Rating of 30 Amps

The term "current rating of 30 amps" is in independent claim 14 of the '376 patent, which recites: "a feeder cable comprising a conductive core and insulation, wherein the feeder cable has a first diameter through the conductive core and insulation of the feeder cable and a current rating of 30 amps." The parties propose:

Shoals Proposal	Voltage Proposal
wherein the feeder cable has a first diameter through the conductive core and insulation of the feeder cable and a current rating of at least 30 amps	plain and ordinary meaning
'376 patent: claim 14	

Chart of Disputed Constructions at 2.

The evidence refutes Shoals's proposal, which adds "at least" before "30 amps." To begin, other claims expressly recite "at least." Claims 4 and 16 of the '376 patent recite "using *at least* one of a compression lug, a solder portion, a splice, or a crimp," and claims 6 and 16 recite "*at least* a portion of" a drop line or feeder cable. By reciting "at least," those terms convey use of a minimum number of items or some minimum length. Claim 19 of the '375 patent also recites "a voltage rating of *at least* 1000 VDC," thus specifying a minimum voltage rating. By contrast and in view of those claims, the omission of "at least" from claim 14 of the '376 patent conveys that 30 amps, as claimed, is not a minimum current. Indeed, if the patentee intended every standalone number to convey a minimum, then claim 14's later recitation of "a voltage rating of 600 VDC, 1000 VDC, or 1500 VDC" would make little sense, as the 600 VDC term would already encompass the 1000 and 1500 VDC terms. *See Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 810 (Fed. Cir.

2021) (“It is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous.”) (internal quotation omitted).

Shoals relies on two passages from the specification. The first passage states that, “Feeder cable 14 is preferably constructed of 6 gauge to 1000 MCM wire” and highlights “aluminum or copper” wires. ’376 patent at 5:55–60; *see also id.* at dependent claim 17 (reciting that “the feeder cable includes a wire of between 250 MCM to 1000 MCM”). According to Shoals, one of skill would understand that aluminum or copper wires between those sizes would have current ratings above 30 amps. *See* Glancey Opening Decl. at ¶¶ 62–67. For support, Shoals points to a table of “Allowable Ampacities of Insulated Conductors Rated 0–2000 Volts” excerpted from the National Electrical Code. *See id.* at ¶¶ 63–66, *citing* Shoals Br., Ex. 7. Over the temperatures considered, that table reports that six-gauge insulated copper and aluminum wires have allowable ampacities of 55–75 and 40–60 amps, respectively, and that their 1000 MCM counterparts have allowable ampacities of 455–615 and 375–500 amps, respectively. Shoals Br., Ex. 7.

None of that contradicts the claim language because, as Shoals acknowledges, by “allowable ampacities” the National Electrical Code means “the *maximum* amount of current that can be carried by that conductor.” 6/11/2025 Tr. 163:17–25; *see also* Glancey Opening Decl. at ¶ 63 (“The current rating of a cable/wire is well understood in the art” and “would be understood in the art to refer to the amount of current that can be carried by a cable.”). Because Dr. Glancey uses “allowable ampacities” synonymously with “current rating,” *see* Glancey Opening Decl. at ¶ 68, the latter also refers to a maximum carriable current, not a minimum carriable current per Shoals’s proposed construction. Additional extrinsic evidence supports the same conclusion: “Current rating is the maximum current that a fuse will carry for an indefinite period without too much deterioration of the fuse element.” Voltage Br., Ex. 16 (Collins English Dictionary); *see also*

id., Ex. 17 at 32261 (J. Goergen, Rated vs. Nominal Current, IEEE (Jan. 22, 2018): “A stated operating limit of a machine expressible in ... characteristics such as voltage or current”); and *id.*, Ex. 18 at 32265 (Understanding Solar Cable Ratings: What You Need to Know: “The current rating defines the maximum current that a cable can carry without overheating”).

The second specification passage Shoals relies on states, “An embodiment of the present invention preferably has the following specifications: Voltage rating of 600 VDC/1000 VDC/1500 VDC; Maximum branch current of 30 amps per string; maximum trunk cable size of 750 MCM; and Maximum ambient operating temperature of 50° C.” ’376 patent at 6:27–32. Shoals contends that this supports its construction because (a) a skilled artisan would understand a “string” means a “drop line,” so a lead assembly having multiple drop lines must be able to carry at least 30 amps; and (b) a 750 MCM cable could carry more than 30 amps. *See* Glancey Opening Decl. at ¶ 68. Shoals’s first argument ignores that claim 14 recites a “lead assembly for electrically coupling *one* or more drop lines to a feeder cable,” which includes single-drop-line embodiments. Shoal’s second argument, that a 750 MCM cable *could* carry more than 30 amps, does not mean it has to.

In addition, during prosecution of the parent ’254 patent, the Examiner treated current ratings as maximums, not minimums. There, the applicant added “30 amp feeder cable” to the claims in response to a rejection, but the Examiner nonetheless rejected the 30-amp claims because the prior art taught an eight-gauge wire, and a “Wire Gauges – Current Ratings” table showed that “a skilled artisan would understand that wires with such diameters would be rated at 30 amps (see Table).” Voltage Br., Ex. 3 at 1135, 1137, 1141, and 1156. The cited table discloses that a “single core” eight-gauge wire has a “current load rating” of “75” amps up to 30° C. *Id.* at 1163. One of skill would understand that for the Examiner to find that that table entry disclosed a 30-amp wire, he must have understood current ratings to be maximums—such that a 75-amp wire could carry at

most a 75-amp current, including a 30-amp current—as opposed to minimums, because 30 amps is not “at least” 75 amps.

Based on the evidence and the parties’ arguments, “a current rating of 30 amps” is construed to have its plain and ordinary meaning, which means at most 30 amps, not at least 30 amps.

SO ORDERED.



Doris Johnson Hines
Administrative Law Judge