

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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ROOFR INC.,  
Petitioner

v.

PICTOMETRY INTERNATIONAL CORP.,  
Patent Owner

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IPR2023-00436  
Patent 9,183,538

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**PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE**

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### LIST OF EXHIBITS

| Exhibit  | Description                                                                                                                                                                                                 |
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| Ex. 1001 | U.S. Patent No. 9,183,538 (“’538 patent”)                                                                                                                                                                   |
| Ex. 1002 | File History of the ’538 patent                                                                                                                                                                             |
| Ex. 1003 | Expert Declaration of Anthony Cummings                                                                                                                                                                      |
| Ex. 1004 | U.S. Pat. Pub. No. 2008/0262789 A1 (“Pershing-789”)                                                                                                                                                         |
| Ex. 1005 | U.S. Pat. Pub. No. 2007/0220174 A1 (“Abhyanker”)                                                                                                                                                            |
| Ex. 1006 | <b>INTENTIONALLY OMITTED</b>                                                                                                                                                                                |
| Ex. 1007 | <b>INTENTIONALLY OMITTED</b>                                                                                                                                                                                |
| Ex. 1008 | <i>Pictometry: aerial photography on steroids</i> , LET Staff, Law Enforcement Technology (July 2002) (“Pictometry”)                                                                                        |
| Ex. 1009 | U.S. Pat. Pub. No. 2009/0304227 A1 (“Kennedy”)                                                                                                                                                              |
| Ex. 1010 | <i>Roofer: Steep Roofing Inventory Procedures And Inspection And Distress Manual For Asphalt Shingle Roofs</i> , David M. Bailey, U.S. Army Corps of Engineers, CERL Tech. Rept. (December 1999) (“Bailey”) |
| Ex. 1011 | Excerpted Drawings From File History of Pershing-789                                                                                                                                                        |
| Ex. 1012 | Declaration of Sylvia Hall-Ellis                                                                                                                                                                            |
| Ex. 1013 | <i>RSMeans Illustrated Construction Dictionary</i> , RSMeans 4 <sup>th</sup> Ed. (2010) (“RSMeans”)                                                                                                         |
| Ex. 1014 | Declaration of Ron Hagiz in Support of Petitioner’s Motion for <i>Pro Hac Vice</i> Application                                                                                                              |
| Ex. 1015 | Deposition Transcript of Justin T. Kestner                                                                                                                                                                  |
| Ex. 1016 | U.S. Patent Publication No. 2011/0187713                                                                                                                                                                    |

**GROUND OF CHALLENGE (37 C.F.R. § 42.204(b)(2))**

| <b>No.</b> | <b>Ground for Challenge</b>                                                               |
|------------|-------------------------------------------------------------------------------------------|
| 1          | Pershing-789 And Bailey Render Obvious Claims 1-5 And 8-13 Of The '538 Patent             |
| 2          | Pershing-789, Bailey And Abhyanker Render Obvious Claims 6-7 And 14-18 Of The '538 Patent |
| 3          | Kennedy And Bailey Render Obvious Claims 1-5 And 8-13 Of The '538 Patent                  |
| 4          | Kennedy, Bailey And Abhyanker Render Obvious Claims 6-7 And 14-18 Of The '538 Patent      |

### LIST OF CHALLENGED CLAIMS

| Claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Claim 1a:</b> One or more non-transitory computer readable medium storing a set of computer executable instructions for running on one or more computer systems that when executed cause the one or more computer systems to:                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Claim 1b:</b> identify a geographic location of a roof;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Claim 1c:</b> determine a footprint and predominant pitch of the roof by analyzing one or more image showing the roof;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Claim 1d:</b> determine an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Claim 1e:</b> and generate a roof report for determination of an amount of materials needed for a construction project, wherein the roof report includes at least one image showing the roof and the estimated roofing area of the roof.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Claim 2:</b> The one or more non-transitory computer readable medium storing a set of computer executable instructions for running on one or more computer systems of claim 1, that when executed further cause the one or more computer systems to determine contact information of one or more contractors within a region of interest of the geographic location of the roof, and to provide a roof report, wherein the roof report includes one or more ortho images of the roof one or more oblique images of the roof, the estimated roofing area and the contact information of one or more contractor within the region of interest of the geographic location of the roof. |
| <b>Claim 3:</b> The one or more non-transitory computer readable medium of claim 2, wherein the roof report includes contact information of the customer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Claim 4:</b> The one or more non-transitory computer readable medium of claim 1, wherein the one or more non-transitory computer readable medium comprises a first non-transitory computer readable medium of a first host system and a second non-transitory computer readable medium of a second host system.                                                                                                                                                                                                                                                                                                                                                                     |

| Claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Claim 5:</b> The one or more non-transitory computer readable medium of claim 1, wherein identifying the geographic location of the roof further comprises obtaining contact information of a customer.                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Claim 6:</b> The one or more non-transitory computer readable medium storing a set of computer executable instructions for running on one or more computer systems of claim 1, that when executed further cause the one or more computer systems to receive customer input to validate geographic location of the roof.                                                                                                                                                                                                                                                                                 |
| <b>Claim 7:</b> The one or more non-transitory computer readable medium of claim 6, wherein the geographic location includes coordinates and validation of the geographic location includes instructions for receiving customer input to alter one or more coordinates of the geographic location.                                                                                                                                                                                                                                                                                                         |
| <b>Claim 8:</b> The one or more non-transitory computer readable medium of claim 1, wherein identifying a geographic location of the roof includes identifying one or more edges of the roof in an image.                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Claim 9:</b> The one or more non-transitory computer readable medium storing a set of computer executable instructions for running on one or more computer systems of claim 1, that when executed further cause the one or more computer systems to identify edges of the roof; determine three-dimensional information of the edges including position, orientation and length using multiple oblique images from multiple cardinal directions; and, determine, automatically, one or more line segments forming a portion of a footprint of the roof utilizing position and orientation of the edges. |
| <b>Claim 10:</b> The one or more non-transitory computer readable medium of claim 1, wherein determining the predominant pitch includes determining a plurality of pitch values with each pitch value associated with a portion of the roof, the predominant pitch based on the plurality of pitch values.                                                                                                                                                                                                                                                                                                 |
| <b>Claim 11:</b> The one or more non-transitory computer readable medium of claim 10, wherein each pitch value is associated with an estimated percentage of roof area to provide an average pitch value.                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Claim 12:</b> The one or more non-transitory computer readable medium storing a set of computer executable instructions for running on one or more computer systems of claim 1, that when executed further cause the one or more computer systems to provide the roof report to one or more                                                                                                                                                                                                                                                                                                             |

| Claims                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| contractors, the contractor located within the region of interest of the geographic location of the roof.                                                                                                                                                                                                                                           |
| <b>Claim 13a:</b> A system, comprising: two or more host systems, each host system having one or more non-transitory computer readable medium;                                                                                                                                                                                                      |
| <b>Claim 13b:</b> the non-transitory computer readable medium of the first host system storing a set of computer executable instructions that when executed by one or more processors causes the one or more processors to:                                                                                                                         |
| <b>Claim 13c:</b> identify a geographic location of a roof;                                                                                                                                                                                                                                                                                         |
| <b>Claim 13d:</b> determine contact information of at least one contractor within a region of interest about the geographic location of the roof                                                                                                                                                                                                    |
| <b>Claim 13e:</b> the non-transitory computer readable medium of the second host system storing a set of computer executable instructions that when executed by one or more processors causes the one or more processors to:                                                                                                                        |
| <b>Claim 13f:</b> determine a footprint and predominant pitch of the roof by analyzing one or more image showing the roof                                                                                                                                                                                                                           |
| <b>Claim 13g:</b> determine an estimated roofing area based on the predominant pitch and the footprint of the roof; and,                                                                                                                                                                                                                            |
| <b>Claim 13h:</b> generate a roof report for determination of an amount of materials needed for a construction project, wherein the roof report includes one or more ortho images of the roof, one or more oblique images of the roof, the estimated roofing area and contact information of one or more contractors within the region of interest. |
| <b>Claim 14a:</b> A roofing estimate method, comprising: receiving, by at least one computer processor from a user via a user terminal, a geographic location of a roof                                                                                                                                                                             |
| <b>Claim 14b:</b> providing to the user, with the computer processor, imagery of the roof based on the geographic location of the roof                                                                                                                                                                                                              |
| <b>Claim 14c:</b> determining and providing, with the computer processor, an estimated roofing area based at least on a predominant pitch and a footprint of the roof by analyzing one or more image showing the roof, the footprint of the roof determined at least in part using at least one image of the roof, and                              |
| <b>Claim 14d:</b> generating, with the computer processor, a roof report for determination of an amount of materials needed for a construction project,                                                                                                                                                                                             |

| Claims                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| wherein the roof report includes at least one image showing the roof and the estimated roofing area of the roof.                                                                                                     |
| <b>Claim 15:</b> The roofing estimate method of claim 14, wherein the roof report further includes contact information of one or more contractor within a region of interest of the geographic location of the roof. |
| <b>Claim 16:</b> The roofing estimate method of claim 14, wherein the footprint of the roof is determined at least in part with oblique images of the roof.                                                          |
| <b>Claim 17:</b> The roofing estimate method of claim 14, wherein the predominant pitch value of the roof based at least in part on the footprint of the roof as a boundary of the roof.                             |
| <b>Claim 18:</b> The roofing estimate method of claim 14, wherein the predominant pitch is based on a weighted average of individual pitch factors for two or more portions of the roof.                             |

## I. INTRODUCTION

The Response filed by Patent Owner Pictometry International Corp. (“PO”) fails to raise any persuasive reason to preserve the validity of claims 1-18 (“the challenged claims”) of the ’538 patent.

PO only raises two substantive arguments in its Response. First, PO argues that Bailey teaches away from estimating the area of a roof based on a “predominant pitch” because Bailey discloses a field measurement technique for determining the area of a roof. But Bailey expressly teaches that the field measurement technique may be used when a predominant pitch *cannot be determined*. Bailey’s disclosure of a secondary measuring technique does not teach away from using predominant pitch. Second, PO argues that Pershing-789 and Kennedy do not disclose a “footprint” of a roof because they do not provide area measurements. But the claims and specification do not require a “footprint” to provide an area measurement. Even PO’s expert does not assert such a requirement. Accordingly, PO has not established that the patentability of any challenged claim should be upheld.

## **II. GROUNDS 1-4: BAILEY RENDERS OBVIOUS THE “PREDOMINANT PITCH” LIMITATIONS**

### **A. Independent Claims 1, 13, and 14**

Grounds 1-4 of the Petition rely on Bailey (Ex. 1010) in combination with either Pershing-789 (Ex. 1004, Grounds 1-2) or Kennedy (Ex. 1009, Grounds 3-4) to render obvious limitations in the challenged independent claims directed to estimating a roof area based on a predominant pitch. PO’s argument that Bailey does not disclose these limitations fails to address the obviousness theory presented by Petitioner and incorrectly focuses on whether Bailey independently teaches the limitations in a single disclosure. *See generally* POR 10-19. Petitioner relies on the teachings of Bailey as applied to Pershing-789 or Kennedy, and not a singular disclosure in Bailey alone. PO does not address—much less dispute—Petitioner’s proposed combination or motivation to combine.

#### **1. Bailey Discloses a Predominant Pitch for a Roof**

There is no dispute that Bailey expressly discloses a predominant pitch. As explained in the Petition, Bailey teaches determining a “predominant slope” of a roof section. Pet. 31; Ex. 1009, 17. PO admits that the terms “slope” and “pitch” are used interchangeably in the relevant art. POR 10 n.2; Ex. 2031 ¶ 54. Thus, Bailey’s “predominant slope” is a predominant pitch.

PO contends that Bailey's predominant slope is determined for a section of a roof, and not the entirety of the roof. POR 10-11. But Bailey expressly teaches a "roof section" may comprise the entire roof. Specifically, Bailey teaches that a building with roof size 10,000 square feet or less "should be managed as one section." Ex. 1010, 10. Thus, in one example, illustrated in Figure 2, "all exposed areas on the building ... would comprise one roof section."

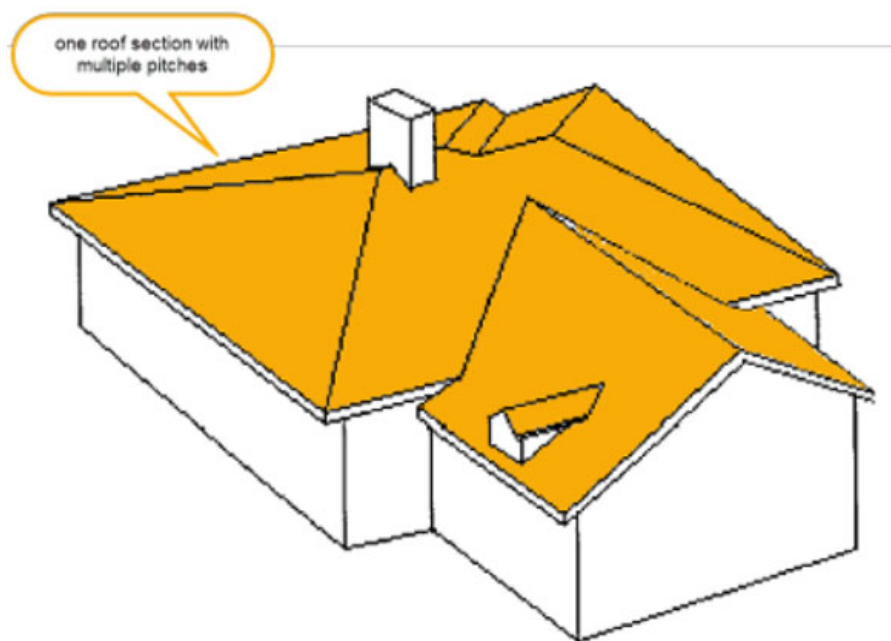


**Figure 2. Example of a building roof comprising a roof section.**

*Id.*, Fig. 2 (annotated); *see also* Pet. 13-14; Ex. 1015, 18:7-9 ("Q And in Bailey, a roof section could comprise an entire roof, correct? A Yes.").

Bailey also provides an example of a building with a roof comprising a single roof section and determines a single predominant slope for the roof. *See* Ex. 1010, 13 (example building with one roof section measuring 2,813 square feet), 14 (roof section identification worksheet for the same roof), 15 (determining a “SLOPE (primary)” value for the roof), 17 (explaining that the “SLOPE (primary)” field is “[t]he predominant slope”). PO’s expert agrees that in this example, the “roof section” comprises the entire roof. Ex. 1015, 18:10-19:5.

PO also argues that Bailey teaches to measure a slope for “each exposure.” PO 11 (quoting Ex. 1010, 21). But the fact that Bailey *also* describes measuring slopes for individual roof exposures does not negate the fact that Bailey separately teaches determining a predominant slope for an entire roof. Indeed, the ’538 patent itself teaches to determine “individual pitch factors for two or more portions of the roof,” and to compute the predominant pitch from the plurality of individual pitch factors. Ex. 1001, 12:12-14; *see also id.*, claims 10, 18.

## **2. Bailey Renders Obvious Estimating a Roof Area Based on “Predominant Pitch”**

The Petition relies on Pershing-789 (in Grounds 1-2) and Kennedy (in Grounds 3-4) for disclosure of a remote measurement system that determines

the pitches of different roof sections and estimates the area of the roof. *See* Pet. 28-31, 34 (Ground 1) (citing Ex. 1004, [0013]-[0016], [0028]); *id.* 64-67 (Ground 3) (citing Ex. 1009, [0058], [0106], [0116]). In the proposed combination, Pershing-789 and Kennedy are modified, based on Bailey’s teaching of a predominant slope corresponding to the entire roof, to use the predominant pitch to estimate the roof area, rather than individual pitches of different roof sections. Pet. 34. The Petition explains that a POSITA would be motivated to apply Bailey’s teachings to Pershing-789 and Kennedy because, *inter alia*, Bailey’s predominant slope simplifies the calculation of roof estimates, and allows for a more streamlined, yet accurate, estimation. Pet. 21-22; *see also* Ex. 1003, ¶¶43-45.

PO does not directly respond to this analysis in the petition. Instead, PO argues that Bailey does not specifically teach that its predominant slope is used to calculate the area of a roof. POR 12. But obviousness does not require the prior art to literally teach the proposed modification. *See Intex Recreation Corp. v. Team Worldwide Corp.*, 860 Fed. Appx. 717, 723 (Fed. Cir. 2021) (finding error where Board “fixated on whether the prior art literally disclosed” Petitioner’s proposed modification). And PO’s argument that

Bailey lacks this express teaching fails to credit the creativity of POSITA and common sense. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421-22 (2007).

Here, PO does not dispute that Pershing-789 and Kennedy disclose estimating the area of a roof based on pitch. Indeed, Bailey itself notes that the area of a roof section or roof can be determined from the “horizontal dimensions” of the roof “by adjusting for roof slope.” Ex. 1010, 22; *see also id.*, 136 (describing how to calculate the area of a portion of a roof based on its slope). And, as noted above, Bailey expressly teaches determining a predominant slope corresponding to an entire roof. In light of these teachings, only common sense and basic math are needed to estimate the roofing area using a single predominant slope corresponding to the entire roof—rather than separately computing the area corresponding to individual slopes of different portions of a roof. *See* Ex. 1003, ¶46.

PO alternatively argues that Bailey teaches away from using a predominant slope to estimate roofing area because Bailey separately describes how to compute an area for each slope. POR 12-13. As an initial matter, “mere disclosure of alternative designs does not teach away” absent “clear discouragement” of a particular implementation. *Univ. of Maryland Biotechnology v. Presens Precision Sensing GmbH*, 711 Fed. Appx. 1007,

1011 (Fed. Cir. 2017) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) and *In re Ethicon, Inc.*, 844 F.3d 1344, 1351 (Fed. Cir. 2017)). PO does not provide any analysis under the relevant law, and fails to identify any “clear discouragement” in Bailey from using a predominant slope to estimate roofing area.

In addition, PO’s purported teaching away is only provided in an appendix to Bailey describing how to perform *field measurements* of roofs (*i.e.*, measuring the physical roof structure rather than determining measurements from an image or diagram of the roof). Ex. 1010, 133-137. Bailey teaches that the field measurements described in the appendix are only required if the information necessary to determine a predominant slope is “not available.” *Id.*, 17. Thus, Bailey’s reference to field measurements in its appendix does not teach away from the use of predominant slope; it is merely an alternative for when the predominant slope is not known or otherwise available.

Bailey’s instruction to measure a slope “for each exposure” similarly does not teach away from using the predominant slope to estimate area, as PO contends. POR 15-16 (quoting Ex. 1010, 21). As noted above, measuring individual slopes is necessary even if the predominant pitch is used to estimate

the roof area because the predominant pitch is determined from the individual slopes of different portions of the roof. Ex. 1001, 12:12-14; *see also id.*, claims 10, 18. And the fact that Bailey cites to the field measurement appendix for instructions on how to measure individual slopes for each exposure does not represent a teaching away from using the predominant slope to estimate the roof area—particularly since, as discussed above, Bailey separately teaches to use field measurements only if the predominant slope cannot be determined. Ex. 1010, 17.

PO's argument that Bailey's predominant slope is only used for "data collection" and is "not related to calculating the area of a roof at all" ignores the full context of the reference. POR 14-15. Bailey is an inspection manual for a software program that is disclosed as being used to collect information for "performing *automated calculations*, data analyses, and *reporting*." Ex. 1010, 8 (emphases added). Indeed, Bailey expressly teaches that the "information about each building and roof section"—which includes the predominant pitch—"can be used to perform analyses and develop reports." *Id.*, 11. Thus, Bailey's collected information is ultimately used to automate calculations and generate reports relating to roofing projects.

PO nevertheless argues that the roof information is limited to “managing repair and replacement decisions,” and is thus unrelated to “calculating the area of a roof.” POR 15. Yet PO’s argument is belied by the fact that Bailey expressly teaches how to use the collected information—including the horizontal dimensions of the roof and the pitch—to calculate the roof area, applying a slope. Ex. 1010, 22. Indeed, Bailey refers to a table that provides the same slope-factor conversions that appear in the ’538 patent. *Compare* Ex. 1010, 137 (Table 3) *with* Ex. 1001, Fig. 7; *see also* Ex. 1003, ¶127. Further, the ’538 patent itself teaches that the measurements and estimations generated and provided in roof reports are used in connection with “major roofing project[s],” which would plainly include roof repair and replacement projects. Ex. 1001, 1:22-25; *see also* Ex. 1003, ¶47 (explaining that Bailey is in the same field of endeavor as the ’538 patent). Thus, PO cannot plausibly argue that repair and replacement decisions for roofs are unrelated to measurement and estimation of those roofs.

**3. The Combination of Bailey with Pershing-789 or Kennedy Renders Obvious Determining a**

**Predominant Pitch by “Analyzing One or More Images Showing the Roof”**

PO also argue that Bailey does not specifically disclose determining a predominant pitch “by analyzing one or more images showing the roof.”<sup>1</sup> POR 17. As explained above and in the Petition, however, Petitioner does not rely on Bailey for the disclosure of determining roof measurements from images of the roof. Instead, the Petition relies on Pershing-789 (in Grounds 1-2) and Kennedy (in Grounds 3-4) for their remote measurement systems that determine roof measurements (including pitch) from aerial images of roofs. *See* Pet. 28-31, 34 (Ground 1) (citing Ex. 1004, [0013]-[0016], [0028]); *id.* 64-67 (Ground 3) (citing Ex. 1009, [0058], [0106], [0116]). In the proposed combination, Bailey’s teaching of a predominant pitch corresponding to the entire roof is applied to Pershing-789 and Kennedy, which then determine the predominant pitch accordingly and use it to estimate the roof area. Pet. 34. Thus, Bailey need not separately disclose determining the predominant pitch by analyzing an image of a roof.

In addition, Bailey teaches that its predominant pitch may be determined using a roof plan or section drawings that indicate the slope of

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<sup>1</sup> Only independent claims 1 and 13 include this limitation; thus, this argument does not apply to independent claim 14.

different portions of the roof. For example, in describing the “predominant slope” field in the Roof Section Information Worksheet, Bailey explains that “[t]he roof plan will generally indicate the slope,” or “the section drawings may indicate the slope.”<sup>2</sup> Ex. 1010, 17. Bailey teaches that if this information is not available, then “field measurements will be required.” *Id.* Thus, Bailey makes clear that the slope information is used to determine the predominant slope. This is consistent with the ’538 patent, which teaches that predominant pitch may be determined from “individual pitch factors of two or more portions of the roof.” Ex. 1001, 12:12-14. Thus, predominant pitch need not be determined directly from the image of the roof.

In the proposed combinations, Pershing-789 and Kennedy already determine the slope or pitch for individual portions of a roof by analyzing an image of the roof. *See, e.g.*, Ex. 1004, [0011] (“An image analysis and calibration is then performed [on aerial images] ... that determines the geometry, the slopes, the pitch angles, and the outside dimensions of the roof sections.”); Ex. 1009, [0058] (describing a “sizing tool” that “determine[s] surface dimensions and pitch of a surface, for example a roof 191 of a house

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<sup>2</sup> As PO acknowledges, the roof plan and section drawings indicate “slope information” rather than the “predominant slope.” POR 17.

appearing in the retrieved image 153”). Applying Bailey’s teachings, the slope information determined from the aerial images would be used—instead of slope information from a roof plan—to compute the predominant pitch.

PO also argues that Bailey does not specify how to determine or calculate the predominant slope. POR 18. As discussed in the Petition, and addressed in more detail in Section VII *infra*, PO is incorrect—a POSITA would be familiar with a small number of known techniques to determine the predominant pitch based on individual slope or pitch values. *See, e.g.*, Pet. 51-53; Ex. 1003, ¶¶96-100. Indeed, even PO’s expert agrees that a POSITA would be familiar with at least one approach for determining a predominant pitch—which also involves analyzing the individual slopes of different portions of the roof. Ex. 2031, ¶¶67-68. Regardless, whether or not Bailey teaches a particular method of calculating predominant slope has no bearing on obviousness with respect to independent claims 1, 13, and 14, as those claims merely require the predominant pitch to be determined—without limitation to a particular technique or method. *See* Ex. 1001, cls. 1, 13, 14.

#### **B. Dependent Claims 11 and 18**

Claims 11 and 18 of the ’538 patent both, in effect, recite using a weighted average to determine predominant pitch. Claim 18 expressly recites

that the predominant pitch is “based on a weighted average of individual pitch factors.” Claim 11 recites determining an “average pitch value” where “each pitch value is associated with an estimated percentage of roof area”—*i.e.*, the “weight” of each pitch value in computing the average depends on the roof area associated with that pitch value.

PO first argues that Bailey provides “*no details* as to how its predominant slope is determined.” POR 21. PO is incorrect. Importantly, PO does not dispute that Bailey discloses the additional limitation of dependent claim 10, which requires the predominant pitch to be based on “a plurality of pitch values with each pitch value associated with a portion of the roof.” As the Petition explains, Bailey teaches that a predominant pitch corresponds to a roof section, which may comprise an entire roof. Pet. 48-49; Ex. 1003, ¶¶ 92-93; Ex. 1010, 10, 17. Bailey further explains that the predominant pitch is determined using slopes for different roof portions, as indicated in, *e.g.*, a roof plan or drawings, or measured using field measurements. Ex. 1010, 17; *see also id.*, 21 (explaining that the roof plan should include slope “for each exposure”).

PO next argues that Bailey teaches separately computing the area of roof portions associated with different slopes. POR 21-22. This argument

mirrors PO's erroneous argument regarding claims 1, 13, and 14, and depends on Bailey's Appendix B, describing how to perform field measurements. Ex. 1010, 133-137. As discussed in Section II.A.2, Bailey instructs readers to refer to Appendix B if the information necessary to determine a predominant slope is not available. *See id.*, 17. Thus, Appendix B is not instructive as to how Bailey's predominant slope would be determined.

PO next argues that a POSITA would not be motivated to use a weighted average to determine Bailey's predominant slope because the term "predominant pitch" (or "predominant slope") is not a term of art. POR 23-28. PO misapprehends Petitioner's proposed combination. Petitioner does not contend that the term "predominant pitch" is a term of art. Rather, Mr. Cummings explains that the type of measurement that the '538 patent refers to as a "predominant pitch" has been used for decades. Mr. Cummings further explains that a POSITA would have been familiar with the well-known technique of using weighted averages to determine a single value representative of a range, and would have been motivated to use the known weighted average technique to compute Bailey's predominant pitch because weighted averages are known to generate a more representative result.

Specifically, Mr. Cummings explains that roof pitch may either be computed separately for every roof facet, or as a single value used to the estimate a pitch for the entire roof. Ex. 1003, ¶46. PO's expert admits that he has also determined pitch in this manner in his professional experience. Ex. 1015, 9:9-10:6 (describing examples using a single pitch value for a roof, where "there may be smaller, very minor areas of the roof ... that might be a different pitch. But they're pretty insignificant, so we ignore that they have a different pitch and we would just go with the pitch that covers the majority of the roof area."). Indeed, PO agrees that, at a minimum, POSITA would have understood that a "predominant pitch" may be determined by selecting a single slope value that "covered the majority of the roof." Ex. 2031, ¶ 67.

Mr. Cummings further explains that a POSITA would have been familiar with the use of weighted averages generally to determine an average representative of a range of values. Ex. 1003, ¶97. PO does not dispute this point. Indeed, the term appears in construction dictionaries, which explains that a weighted average is "more representative of the true mean than that obtained by straight averaging." Ex. 1013, 605. Accordingly, a POSITA would have known that using a weighted average to determine a value representative of a range of source values leads to a more accurate result. Ex.

1003, ¶97. Thus, at a minimum, using a weighted average to determine Bailey's predominant slope would have been nothing more than the application of a known technique to yield a predictable result. However, Mr. Cummings further explains that a POSITA would have been motivated to use a weighted average—as opposed to merely using the slope that appears most frequently—because the resulting pitch value (and any area estimations based on that pitch value) would be more accurate, based on the true pitch and area of the roof. *Id.* PO's arguments do not address this reasoning, presented by Mr. Cummings and the Petition.

PO also argues that Bailey's table of pitch factors (Table 3) does not disclose determining a weighted average. POR 29-31. PO again misunderstands how the Petition relies on Bailey's pitch factor table. Bailey explains that a slope is typically represented as “the ratio of rise in inches to horizontal run in feet.” Ex. 1010, 134. However, when using the slope to determine the surface area of a roof, the slope is converted to a slope factor or pitch factor, which is multiplied by the horizontal area of the roof to compute the surface area. *Id.*, 1010. Mr. Cummings relies on Bailey's conversion table (which is the same as the “slope factor chart” provided in Figure 7 of the '538 patent) to disclose the use of slope factors to represent the slope (including the

predominant slope), as specifically required by claim 18. *See* Ex. 1003, ¶127. Mr. Cummings otherwise relies on the same analysis summarized above in concluding that Bailey renders obvious determining a predominant pitch using a weighted average calculation.

### **III. GROUNDS 1-2: PERSHING-789 DISCLOSES DETERMINING A ROOF'S FOOTPRINT**

PO's argument that Pershing-789 does not disclose determining a footprint of a roof relies on an erroneous construction of "footprint" as requiring the display of a horizontal area measurement.

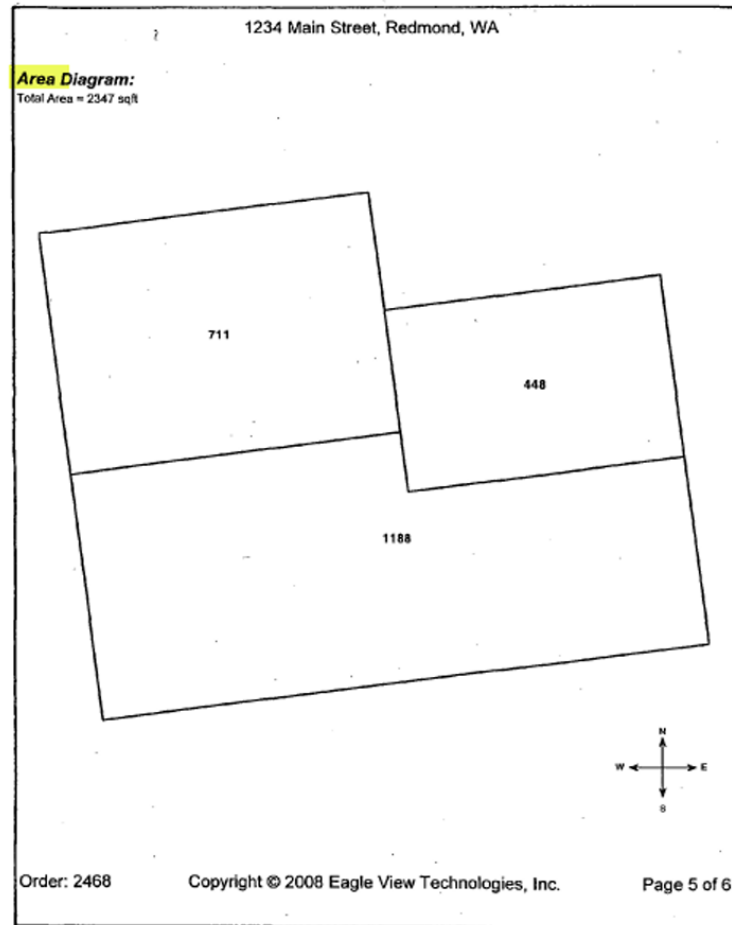
The '538 patent expressly teaches that a "footprint" of a roof may be "a two-dimensional boundary and/or outline of the roof." Ex. 1001, 12:8-9; *see also id.*, 12:37-39 (referring to "outer dimensions provided by the footprint"). Both PO and PO's expert cite to the same disclosure in the '538 patent as describing what a footprint is. POR 32; Ex. 2031, ¶ 41.<sup>3</sup> The patent's description is consistent with related references. For example, the '538 patent incorporates by reference U.S. Patent Publication No. 2011/0187713, which purportedly describes systems and methods for determining the footprint of a roof. *Id.*, 11:55-63. The cited patent publication describes a method for

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<sup>3</sup> PO also cites to a dictionary definition that similarly defines a footprint as an area that "shares the same perimeter as a structure." Ex. 2034, 219.

generating a wireframe model that includes the step of “[p]reserving the footprint (*e.g., perimeter*) of the original wireframe.” Ex. 1016, [0099].

There is no meaningful dispute that Pershing-789 discloses a two-dimensional outline or boundary of a roof. As the Petition explains, Pershing-789 teaches that aerial images of a roof may be analyzed to generate a report, which includes a two-dimensional outline of the roof and various measurements or calculations associated with the roof. Pet. 27-30; Ex. 1001, [0022], [0028]. For example, Figure 5E of Pershing-789 shows a page of a roof report that displays the footprint of the roof, along with area calculations:



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**FIG. 5E**

*Id.*, Fig. 5E, [0028]. Pershing-789's roof report may also include other pages that display the outline of the roof with other measurements, such as perimeter measurements and pitch measurements. *See id.*, Figs. 5C, 5D.

Instead, PO argues that because Figure 5E of Pershing-789 indicates the surface areas of different portions of the roof, Figure 5E does not teach a footprint of a roof. POR 32-34. In essence, Petitioner argues that the surface area of a roof is distinct from the area defined by the footprint of the roof. But

this distinction has no bearing on whether Pershing-789 discloses a **footprint** of a roof—*i.e.*, the two-dimensional boundary or outline of the roof. Figure 5E of Pershing-789 illustrates **both** the footprint of the roof (the outline drawing of the roof) **and** the surface area of the roof (indicated by the numeric annotations).<sup>4</sup> Figs. 5C and 5D of Pershing-789 similarly show the footprint of the roof along with other measurement annotations. PO does not explain why Pershing-789’s outline of the roof cannot be a footprint, merely because it contains measurement information in addition to the footprint. Indeed, the Board considered and rejected the same argument in its Institution Decision. *See* Institution Decision 11 (“Although the roof’s surface area and its footprint are distinct, that does not mean that Figure 5E is not a footprint simply because it includes corresponding surface area values.”).

To the extent PO now contends that a footprint of a roof **must** include a calculation of the two-dimensional area corresponding to the footprint, PO offers no support for that interpretation. As PO acknowledges, the ’538 patent only requires a footprint to provide “a two-dimensional boundary and/or

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<sup>4</sup> The Petition highlights the surface area in Figure 5E of Pershing-789 because it is relevant to a related limitation, *i.e.*, that the footprint and predominant pitch are used to determine an estimated roofing area. As PO’s expert acknowledges, the roofing area to the surface area of the roof, accounting for its pitch. *See* Ex. 2031, ¶ 44.

outline of the roof”—not an area calculation. Ex. 1001, 12:8-9; POR 32. PO’s expert similarly only opines that a footprint is distinct from surface area—not that a footprint must include a calculation of a two-dimensional area. *See* Ex. 2031, ¶¶44-46. The Petition similarly does not assert that a footprint must include a calculation of two-dimensional area; it simply states, consistent with the description of a “footprint” in the ’538 patent, that Pershing-789 “teaches determining the claimed ‘*footprint*’ of the roof by drawing two-dimensional boundaries/outlines of roof sections.” Pet. 28. The footprint may be *used* “to compute area” (*id.*) but the area calculation is not a necessary part of a “footprint.”

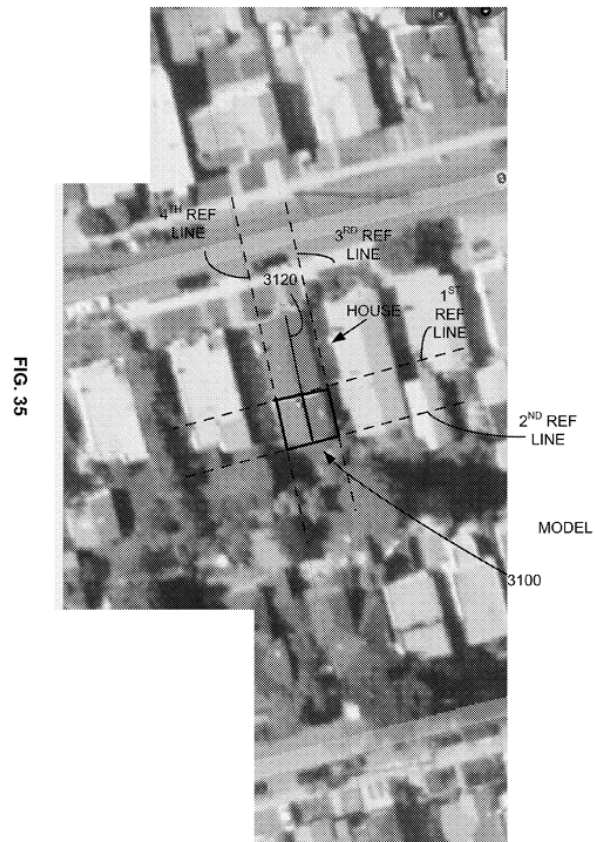
PO’s only apparent basis for importing an “area calculation” requirement into the claimed footprint is purported testimony from Petitioner’s expert, Mr. Cummings, that “the footprint requires an indication of the area thereof.” POR 32. However, the deposition testimony that PO excerpts involved questions relating to Mr. Cummings’ opinions regarding Figure 5E—which illustrates *both* the footprint of the roof *and* surface area information. Mr. Cummings then clarified that “[t]he footprint is, based on this drawing, is the *outer boundary lines*.” That is consistent with the

opinions offered in his declaration. *See, e.g.*, Ex. 1003, ¶126 (“[T]he footprint of the roof may be represented by the roof’s boundary lines.”).

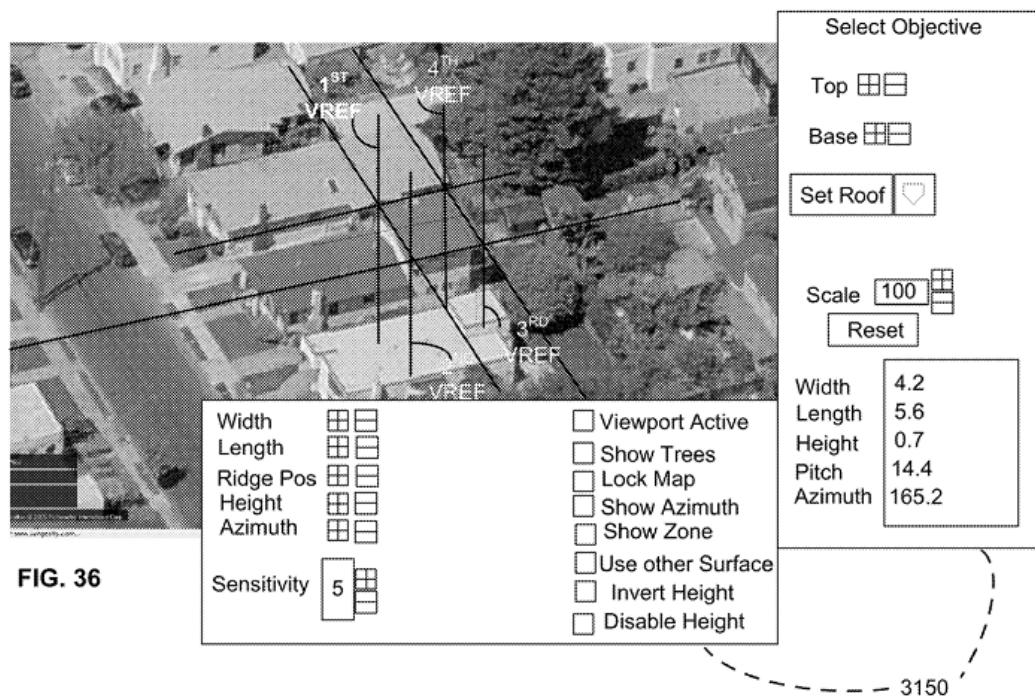
#### **IV. GROUNDS 3-4: KENNEDY DISCLOSES DETERMINING A ROOF’S FOOTPRINT**

PO repeats its erroneous interpretation of “footprint” as requiring the display of an area calculation in its arguments relating to Kennedy.

As explained in the Petition, Kennedy discloses a “sizing tool” that may be superimposed on an aerial image to determine the footprint of a roof. *See* Pet. 64-66; Ex. 1009, [0058], [0110]. As shown in several figures, including Figures 35 and 36, Kennedy’s sizing tool is displayed as an outline of the roof structure to be measured, thus providing the boundary or outline of the roof.



*Id.*, Fig. 35, [0188].



*Id.*, Fig. 36, [0189]; *see also*, e.g., Figs. 10-12 (additional examples showing the sizing tool determining an outline or boundary of a roof).

PO does not argue that Kennedy fails to disclose an outline or boundary of a roof. Instead, relying again on the same mischaracterized excerpts of Mr. Cummings' deposition testimony, PO asserts that Kennedy's sizing tool does not determine a footprint because it does not identify "the *area* of the footprint." POR 37. As discussed above, PO's assertion that a footprint must provide a numerical area calculation is contradicted by the intrinsic evidence of the '538 patent and lacks any other support.

PO argues that the Petition refers to Kennedy's determination of "surface dimensions" of a "planar installation surface." POR 38 (citing Pet. 15-17, 64-66). However, as with Pershing-789, the Petition notes Kennedy's use of the footprint to determine a surface area of a roof because that is required by other limitations, such as limitation 1d, which requires determining "an *estimated roofing area* of the roof based on the predominant pitch and *the footprint of the roof*." See, e.g., Pet. 66-67 (explaining how Kennedy's measurement of an "installation surface area" using the sizing tool satisfies limitation 1d). Petitioner does not contend that a footprint of a roof must display an area measurement.

**V. MR. KESTNER'S OPINIONS ARE NOT ENTITLED TO MORE WEIGHT THAN MR. CUMMINGS' OPINIONS**

**A. Mr. Cummings' Opinions Are Not Conclusory**

PO argues that Mr. Cummings' opinions should be given no weight because his opinions are replicated in the Petition. POR 43-44. However, the authority PO cites on this point merely holds that *conclusory* assertions cannot support an obviousness determination. For example, in *Xerox Corp. v. Bytemark, Inc.*, the Board gave "little weight" to an expert declaration asserting a missing limitation would be obvious where the expert merely asserted the obviousness of the limitation, but did not "cite to additional

supporting evidence or provide any technical reasoning to support his statement.” *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9, 15-16 (P.T.A.B. August 24, 2022). The Board did not disregard the expert’s opinion merely because it was repeated in the petition, as PO suggests. Indeed, no authority cited by PO sets forth such a rule, and the Board’s Institution Decision in this proceeding already noted that the mere fact that “the Petition repeats Mr. Cummings’s testimony” is not “problematic” and “does not undermine the testimony’s persuasiveness ..., nor does it mean Petitioner’s arguments are conclusory.” Institution Decision 7.

Nowhere in his declaration does Mr. Cummings provide the type of conclusory assertion that the Board rejected in *Xerox*—*i.e.*, by simply asserting that a limitation is disclosed or obvious, without supporting evidence or reasoning. For example, Mr. Cummings’ opinion that Bailey discloses and renders obvious the predominant pitch limitations is supported by citations to Bailey and explanation of Bailey’s relevant disclosures, technical reasoning as to how a POSITA would understand those disclosures, and detailed explanation regarding how and why a POSITA would apply Bailey’s teachings to Pershing-789 and Kennedy. *See, e.g.*, Ex. 1003, ¶¶ 43-47, 56-63, 91-99, 127, 129-131. Similarly, Mr. Cummings’ opinions on the “footprint”

limitations rely on the '538 patent's definition of a "footprint," and cite to and describe specific disclosures in Pershing-789 and Kennedy that teach the limitation. *See, e.g., id.*, ¶¶ 51-55, 136-138. PO and PO's expert do not even challenge many of these opinions—notably, Mr. Cummings' opinions on motivation to combine.

Mr. Cummings' opinion that it would be obvious to determine a predominant pitch as a weighted average is similarly supported by evidence and technical reasoning. For example, Mr. Cummings explains how Bailey's predominant pitch is based on multiple pitch values for a single roof, explains that weighted average calculations are common and well known in construction (citing to supporting evidence in a construction dictionary), and explains that POSITA would be motivated to use a weighted average to determine a single value (*e.g.*, a predominant pitch) representative of multiple individual values (*e.g.*, individual pitches or slopes) because the result is a "more representative" of the plurality of individual values. Ex. 1003, ¶¶ 43, 92-94, 96-99.

PO also argues that Mr. Cummings may not have written his declaration. POR 45-46. In fact, Mr. Cummings affirmatively testified that he *did* write his declaration, in collaboration with the attorneys. Ex. 2032,

9:10-10:7. The fact that he did not select the references relied upon in the first instance has no bearing on the opinions he formed based on review of those references. Nor are his opinions undermined by the fact that he did not immediately recognize Bailey's Appendix B, when introduced by PO for the first time as a standalone document. PO's argument is not supported by any of the remaining cited deposition testimony, which merely shows that (1) Mr. Cummings was momentarily confused by a typographical error in exhibit numbering; (2) Mr. Cummings could not answer detailed questions about the prosecution history when the document was not provided to him at the deposition; (3) Mr. Cummings was not prepared to explain aspects of the prior art references that he did not rely on in forming his opinions (such as why Bailey uses 10,000 square feet as the size of a roof section, or how Bailey's Roof Section Identification Worksheet is ultimately used within Bailey's larger system).

**B. Mr. Cummings Has Relevant Experience**

PO separately argues that Mr. Cummings' opinions should be given less weight than Mr. Kestner's because he has less relevant experience in measuring roofing area using images of a roof. POR 39-43. PO is incorrect for several reasons.

First, PO does not address the level of skill in the art adopted by the Board in its Institution Decision, which determined that a POSITA would have experience “related to computerized image analysis and three-dimensional modeling.” Institution Decision 7. PO does not argue that Mr. Cummings lacks the relevant experience under the Board’s standard, and indeed, Mr. Cummings has extensive experience with “software related to construction modeling and estimation,” CAD software, and construction estimating software, including experience developing such software. Ex. 1003, ¶ 6.

Second, PO’s argument is based on Mr. Kestner’s purported experience using aerial images of roofs for roof estimation, specifically. But PO and Mr. Kestner do not credibly explain why Mr. Cummings’ experience using blueprints for roof estimation, and with roof estimation more generally, render his opinions less credible here. Mr. Kestner asserts that roof estimation using blueprints is different from roof estimation using aerial images because (1) blueprints may not be available, and (2) blueprints may not perfectly represent the as-built structure. Ex. 2031, ¶¶ 74-75. But neither PO nor Mr. Kestner explain why the unavailability or inaccuracy of blueprints would render Mr.

Cummings incapable of opining on the types of measurements used in roofing estimation—such as the pitch, footprint, and area of a roof.

In addition, Mr. Kestner admitted that his experience is limited to using images of roofs where the relevant measurements are already provided—or manually determined through field measurement. Ex. 1014, 11:9-16, 13:12-14:5. Thus, Mr. Kestner does not have any experience in determining measurements of roofs using aerial images—he merely uses the measurements provided with those images, much like Mr. Cummings may use measurements provided in a blueprint. PO does not explain why this distinction is meaningful or would render Mr. Cummings’ opinions less credible.

Third, PO argues that Mr. Kestner has “significantly more experience” than Mr. Cummings, asserting that Mr. Cummings “has estimated the roof area of *only 15 to 20 roofs* in the past *thirty years*.” POR 41. Yet PO selectively ignores the fact that Mr. Cummings has estimation experience dating back to the 1980s, during which time he worked on projects involving “approximately 2,000 housing units.” Ex. 1003, ¶5. PO offers no reason why Mr. Cummings’ experience during this time frame should be discounted.

Further, PO cites no authority to support its argument that the Board should credit the testimony of the expert with more quantifiable experience. An expert's experience goes to the threshold question of whether he is qualified to provide opinions on technical subject matter. The Board may then evaluate the credibility and substance of each expert's opinions and weigh them accordingly. Mr. Kestner's opinions are not entitled to more weight, regardless of his experience relative to Mr. Cummings.

Date: February 16, 2024

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**CERTIFICATE OF LENGTH (37 C.F.R. §§ 42.24(D))**

The undersigned hereby certifies that, according to the word-processing system used to prepare the foregoing document, this document has 5,595 words and thus complies with the applicable word limit.

Date: February 16, 2024

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**CERTIFICATE OF SERVICE (37 C.F.R. §§ 42.6(E), 42.105(A))**

The undersigned hereby certifies that on February 16, 2024 a copy of this reply and supporting exhibits were served upon the following lead and backup counsel for Patent Owner via electronic mail at

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