

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ROOFR INC.,
Petitioner

v.

PICTOMETRY INTERNATIONAL CORP.,
Patent Owner

Case IPR2023-00436
U.S. Patent No. 9,183,538

**DECLARATION OF JUSTIN T. KESTNER, P.E.
IN SUPPORT OF PATENT OWNER'S RESPONSE**

Mail Stop "PATENT BOARD"
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Pictometry EX2031
Roofr v. Pictometry
IPR2023-00436

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	MY BACKGROUND AND QUALIFICATIONS	2
III.	MATERIALS CONSIDERED	5
IV.	LEGAL UNDERSTANDING	7
	A. My Understanding of Claim Construction	7
	B. My Understanding of Obviousness	8
	C. My Understanding of a Person Having Ordinary Skill in the Art	10
V.	THE '538 PATENT	11
	A. Overview	11
	B. Level of Ordinary Skill in the Art	12
	C. Claim Construction	13
VI.	INDEPENDENT CLAIMS 1, 13, AND 14.....	14
	A. Bailey does not disclose determining “an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof.”	14
	B. Bailey does not disclose determining a “predominant pitch of the roof by analyzing one or more image showing the roof.”	18
	C. Mr. Cummings has not demonstrated that the Pershing-789 reference teaches determining a roof’s footprint.	20
	D. Mr. Cummings has not demonstrated that the Kennedy reference teaches determining a roof’s footprint.	23
VII.	DEPENDENT CLAIMS 11 AND 18.....	25
	A. Bailey does not teach that its use of “predominant slope” means an average of individual pitch values or pitch factors.	25
	B. A POSITA would not have understood Bailey’s “predominant slope” to mean an average of individual pitch values or pitch factors.	29
	C. Bailey’s slope factor chart is used to calculate roofing area, not a “predominant pitch,” as required by claim 18.	38

VIII. ROOF ESTIMATION USING BLUEPRINTS IS DIFFERENT FROM ROOF ESTIMATION USING AERIAL IMAGES.....	39
IX. CONCLUSION.....	41

I, Justin T. Kestner, hereby declare as follows.

I. INTRODUCTION

1. I have been retained as an expert witness on behalf of Pictometry International Corp. for the above-captioned *inter partes* review (IPR). My hourly rates for my time in connection with this IPR are \$665 for deposition testimony and \$595 per hour for all other work. My compensation is not contingent in any way on the content of my analysis or the outcome of this proceeding.

2. I understand that this Declaration accompanies Patent Owner's Response filed in this IPR involving U.S. Patent No. 9,183,538 ("the '538 patent") (EX1001), which resulted from U.S. Patent Application No. 13/424,054 ("the '054 application"), filed on March 19, 2012. I understand that the '538 patent alleges a priority date of March 19, 2012. I refer to this date throughout this declaration.

3. In preparing this Declaration, I have reviewed the '538 patent and each of the documents cited herein, in light of general knowledge in the art before March 19, 2012. In formulating my opinions, I have relied upon my experience, education, and knowledge in the relevant art. In formulating my opinions, I have also considered the viewpoint of a person of ordinary skill in the art ("POSITA") (as discussed further below in Section V.B) prior to March 19, 2012.

II. MY BACKGROUND AND QUALIFICATIONS

4. I am the CEO of Haag Global, Inc., (“Haag”) and the president of, and a principal engineer with, Haag Engineering Co. Haag was established in 1924 and is the oldest firm in the U.S. that has continuously focused on failure and damage analysis. Haag has been an industry leader for over 60 years in evaluating damage to roofing.

5. I am a professional engineer licensed in 18 states, as well as Puerto Rico. I received a Bachelor of Science in Civil & Environmental Engineering from Villanova University, a Master of Science in Civil Engineering from Lehigh University, and a Master of Business Administration from Villanova University. I have 28 years of engineering experience since earning my bachelor’s degree.

6. Much of my work at Haag has focused on the performance of roofing in general. I have inspected thousands of roofs in at least 21 states and Puerto Rico. My roofing expertise includes, but is not limited to, evaluating roofing performance, determining leak causation, assessing damage from wind, hail, fire, and tree impact, evaluating expected remaining roof service life, assessing quality of installation and materials, field and laboratory testing, and assessing the viability of repairs or need for replacement. The latter two often involve preparing or reviewing cost estimates for such roofing work.

7. Inherent in roofing work is the need to measure and diagram the involved roof(s). I have measured hundreds of roofs by hand using the direct measurement method (i.e., measuring dimensions of individual facets on the roof and determining their areas along with a combined total roof area). I have also used the slope factor method of measuring the footprint of a roof, determining the involved slope(s), and computing the total roof area by using slope factors. As technology evolved, I have also utilized various third-party providers of roof diagrams that include dimensions and areas to evaluate thousands of roofs. These technologies have utilized photogrammetry taken by planes, UAVs (drones), and even smartphones.

8. Haag as a company (including me individually) was an early adopter of roof diagram and area reports by third-party providers who used aerial measurements. Haag began utilizing these reports by various providers in late 2008 or early 2009. Initially, Haag staff (including me) continued to measure the dimensions and areas of different roof facets and compared these with those reported by third-party providers to validate the provider-reported dimensions and areas were reasonably accurate. After comparing dimensions and areas across hundreds of roofs, Haag determined that reported dimensions and areas were reasonably accurate, and Haag ceased this practice.

9. I more formally have studied the measurement and area accuracy of third-party providers of roof diagrams and areas. Haag was engaged to do so by Kespry, an early provider of drone-based roof inspections. This study involved measuring roofs in the field and comparing these results with those of Kespry and two providers of aerial-based roof measurement reports. I led this evaluation and co-authored a proprietary study for Kespry.

10. I also co-authored a similar study that Haag performed on roof measurement accuracy for Hover, whose software is utilized via a smartphone app. Users of Hover take several photographs of a building along its perimeter, and Hover computes the measurements and area of the roof.

11. I co-developed Haag's Certified Inspector Courses for residential and commercial roofs. EX2043. These courses included, among other topics, training on roof area calculations. EX2043. Over 22,500 people (including roofing contractors, insurance adjusters, engineers, architects, and roofing consultants) have completed these courses in the U.S. and Canada. In addition to teaching these 20-hour certification courses, I have taught several seminars on roofing that have been approved for continuous education credit by various state agencies including the Florida Board of Professional Engineers.

12. Additionally, I have performed testing on roofing products in Haag's laboratory, which is accredited by the International Accreditation Service (IAS) for

various test procedures. IAS accreditation signifies that a company has been evaluated for its technical competence and quality of service, and that the company has proven that it meets recognized standards.

13. A copy of my *curriculum vitae* is provided as EX2033, which contains further details on my experience, technical expertise, and other qualifications.

III. MATERIALS CONSIDERED

14. In formulating my opinions, I have relied upon my training, knowledge, and experience relevant to the '538 patent. Furthermore, I have considered the following documents listed below in addition to any other documents cited in this declaration. To the best of my knowledge, these documents are true and accurate copies of what they purport to be. An expert in the field would reasonably rely on them to formulate opinions such as those set forth in this declaration.

Exhibit No.	Description
Paper 1	Petition
Paper 14	Institution Decision
1001	U.S. Patent No. 9,183,538
1003	Declaration of Anthony Cummings
1004	U.S. Pat. Pub. No. 2008/0262789 A1 (“Pershing-789”)
1009	U.S. Pat. Pub. No. 2009/0304227 A1 (“Kennedy”)

Exhibit No.	Description
1010	Roofer: Steep Roofing Inventory Procedures And Inspection And Distress Manual For Asphalt Shingle Roofs, David M. Bailey, U.S. Army Corps of Engineers, CERL Tech. Rept. (December 1999) (“Bailey”)
1013	RSMeans Illustrated Construction Dictionary, RSMeans 4th Ed. (2010) (“RSMeans”) (excerpt)
2032	Deposition Transcript of Tony L. Cummings (November 17, 2023)
2033	<i>Curriculum Vitae</i> of Justin T. Kestner, P.E.
2034	RSMeans Illustrated Construction Dictionary, 4 th Edition, 2010
2035	“Residential Asphalt Roofing Manual,” Asphalt Roofing Manufacturers Association (ARMA), 1997
2036	Excerpts from “Residential Asphalt Roofing Manual: Design and Application Methods,” Asphalt Roofing Manufacturers Association (ARMA), 2014
2037	Excerpt from “The NRCA Roofing Manual: Architectural Metal Flashing, Condensation Control and Reroofing,” National Roofing Contractors Association (NCRA), 2010
2038	Excerpts from “The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing,” National Roofing Contractors Association (NCRA), 2014
2039	Excerpt from “The NRCA Roofing and Waterproofing Manual,” National Roofing Contractors Association (NCRA), 2006
2040	Merriam-Webster Online Dictionary search for “predominant pitch” definition, accessible online at https://www.merriam-webster.com/dictionary/predominant%20pitch (last accessed November 25, 2023)

Exhibit No.	Description
2041	Merriam-Webster Online Dictionary search for “predominant slope” definition, accessible online at https://www.merriam-webster.com/dictionary/predominant%20slope (last accessed November 25, 2023)
2042	Merriam-Webster Online Dictionary definition of “predominant,” accessible online at https://www.merriam-webster.com/dictionary/predominant (last accessed November 25, 2023)
2043	“About Haag Certified Inspector Program,” Haag Global, Inc., accessible online at https://haageducation.com/s/about-HCI (last accessed November 25, 2023)
2044	“NRCA Market Survey 2015-2016,” National Roofing Contractors Association (NCRA), 2016

IV. LEGAL UNDERSTANDING

A. My Understanding of Claim Construction

15. I understand that during an *inter partes* review proceeding, claims are to be construed in light of the specification as would be read by a person of ordinary skill in the relevant art at the time the application was filed. I understand that claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the relevant art in the context of the entire disclosure. A claim term, however, will not receive its ordinary meaning if the patentee acted as his or her own lexicographer and clearly set forth a definition

of the claim term in the specification. In this case, the claim term will receive the definition set forth in the patent.

B. My Understanding of Obviousness

16. I understand that a patent claim is invalid if the claimed invention would have been obvious to a person of ordinary skill in the art at the time the application was filed. I understand that this means that even if all of the requirements of the claim cannot be found in a single prior-art reference that would anticipate the claim, the claim can still be invalid.

17. To obtain a patent, a claimed invention must have been, as of its priority date, nonobvious in view of the prior art in the field. I understand that a patent claim is obvious when the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art.

18. I understand that to prove that prior art or a combination of prior art renders a patent claim obvious, it is necessary to: (1) identify the particular references that, singly or in combination, render the patent claim obvious; (2) specifically identify which elements of the patent claim appear in each of the asserted references; and (3) explain how the prior-art references could have been combined in order to create the inventions claimed in the patent claim.

19. I also understand that when considering the obviousness of a patent claim, one should consider whether a teaching, suggestion, or motivation to combine the references exists so as to avoid impermissibly applying hindsight when considering the prior art. I understand this test should not be rigidly applied, but that the test can be important to avoiding such hindsight.

20. I understand that certain objective indicia can be important evidence as to whether a patent is obvious or nonobvious. Such indicia include: (1) commercial success of products covered by the patent claims; (2) a long-felt need for the invention; (3) failed attempts by others to make the invention; (4) copying of the invention by others in the field; (5) unexpected results achieved by the invention as compared to the closest prior art; (6) praise of the invention by the infringer or others in the field; (7) the taking of licenses under the patent by others; (8) expressions of surprise by experts and those skilled in the art at the making of the invention; and (9) the patentee proceeded contrary to the accepted wisdom of the prior art. At this point, I am not aware of any objective indicia of non-obviousness. But I reserve the right to review and opine on any evidence of objective indicia of non-obviousness that may be presented during this proceeding.

21. I also understand that “obviousness” is a legal conclusion based on the underlying factual issues of the scope and content of the prior art, the differences between the claimed invention and the prior art, the level of ordinary skill in the

pertinent art, and any objective indicia of non-obviousness. For that reason, I am not rendering a legal opinion on the ultimate legal question of obviousness. Rather, my testimony addresses the underlying facts and factual analysis that would support a legal conclusion of obviousness or non-obviousness, and when I use the term obvious, I am referring to the perspective of one of ordinary skill at the time of invention.

C. My Understanding of a Person Having Ordinary Skill in the Art

22. I understand that a person of ordinary skill in the relevant art (herein “POSITA”) is presumed to be aware of all pertinent art, thinks along conventional wisdom in the art, and is a person of ordinary creativity.

23. I have been asked to consider the level of ordinary skill in the field that someone would have had at the time the claimed invention was made. In deciding the level of ordinary skill, I considered the following:

- the levels of education and experience of persons working in the field;
- the types of problems encountered in the field; and
- the sophistication of the technology.

24. My opinion below explains how a POSITA would have understood the technology described in the references I have identified herein around the timeframe of March 19, 2012.

25. Regardless if I use “I” or a “POSITA” during my technical analysis below, all of my statements and opinions are always to be understood to be based on how a POSITA would have understood or read a document at the time of the invention.

V. THE ’538 PATENT

A. Overview

26. From my review of the ’538 patent, the ’538 patent is generally directed to computer-implemented systems and methods for estimating roof measurements based on image analysis. *See* EX1001, 1:10-25, 3:21-23. The technology disclosed in the ’538 patent improves upon and overcomes limitations and inefficiencies with conventional approaches, typically performed by contractors, for performing roof and material estimates and generating handwritten reports. EX1001, 1:10-34. The ’538 patent describes the process in which “property owners approaching a major roofing project may... contact one or more contractors for a site visit... in order to make a determination on material needs” and prepare an estimate for the project. EX1001, 1:10-16. With this approach, the “time and energy for providing such an estimate becomes laborious.” EX1001, 1:16-18. Several factors, including the availability of personnel of the roofing contractors, size of the roof, weather and traffic conditions, and the distance

between the roofing contractor and the site of the estimate, affect the ability of contractors to provide timely estimates. EX1001, 1:16-18.

27. Of importance in this case, the '538 patent generally describes a practical application of computer-based image analysis that includes determining an estimated roofing area based on the predominant pitch and the footprint of the roof, and generating a roof report for determination of the amount of materials needed for a construction project. EX1001, Abstract; *see also* EX1001: 3:21-23, 9:1-7, FIG. 8. The technology described and claimed in the '538 patent increases the “speed at which an estimate can be prepared,” “reduce[s] labor and fuel costs associated with on-site visits,” and enhances safety by avoiding the need for manual measurements on the top of a roof. *See* EX1001, 1:31-34.

B. Level of Ordinary Skill in the Art

28. Based on the disclosure of the '538 patent, it is my opinion that a POSITA would have had a Bachelor's Degree in an academic area emphasizing construction, architecture, and/or engineering, or similar discipline, and at least two years of experience with roofing measurement, aerial imagery use in roofing estimation, and roofing measurement software. I do not agree that the level of ordinary skill in the art found by the Board in the Institution Decision is appropriate. Specifically, the definition does not appear to require that a POSITA have had any experience with roof measurement. Given that the focus of the '538

patent is on roof measurement, I believe that a POSITA must have had experience in this area to understand and appreciate the '538 patent subject matter. Roofing measurement is a complex task that must consider many variables including varying slopes on different roof sections, discontinuities in roofs, specialized terminology (e.g., rake factors, slope factors, footprints), assessment of the quality of measurements, and what assumptions are reasonable and what are not from a practical perspective to provide commercially useful measurements. Finally, although, a person of ordinary skill could potentially have no educational degree but more industry experience, a higher level of education cannot replace the requirement for actual experience with roofing measurement and aerial imagery use in roofing. Because the focus of the '538 patent is roofing measurement using aerial imagery, as stated above a person of ordinary skill would necessarily have had experience in the area of roofing measurement and the use of aerial imagery used in roofing estimation.

C. Claim Construction

29. Based on my review of the challenged claims, it is my opinion that none of the claim terms requires explicit construction. Accordingly, it is my opinion that all claim terms should receive their ordinary and customary meaning, in the context of the '538 patent specification, which I understand is sometimes referred to as the *Phillips* standard.

VI. INDEPENDENT CLAIMS 1, 13, AND 14

A. Bailey does not disclose determining “an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof.”

30. I understand that independent claim 1 of the '538 patent requires determining “an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof.” EX1001, Independent Claim 1. Independent claims 13 and 14 recite almost identical language. EX1001, Independent Claims 13, 14. For all alleged grounds of unpatentability set forth in his declaration, Mr. Cummings relies on the Bailey reference for the “predominant pitch” limitations. With respect to the Pershing-789 grounds, Mr. Cummings states:

Ground 1 relies on the teachings of Pershing-789’s computer-implemented roof estimation system which covers nearly every element of claims 1-5 and 8-13. *Ground 1 further relies on the teachings of Bailey which discloses the “predominant pitch” limitation (through its teaching of “predominant slope”) that the examiner believed was missing from the prior art during prosecution.*

EX1003, ¶42 (emphasis added). For the Kennedy grounds, Mr. Cummings similarly states: “Ground 3 relies on the teachings of Kennedy, which disclose almost every claim element recited in the '538 patent, in combination with *Bailey’s teachings of generating a roof report and determining the ‘predominant pitch’ of a roof.*” EX1003, ¶128 (emphasis added).

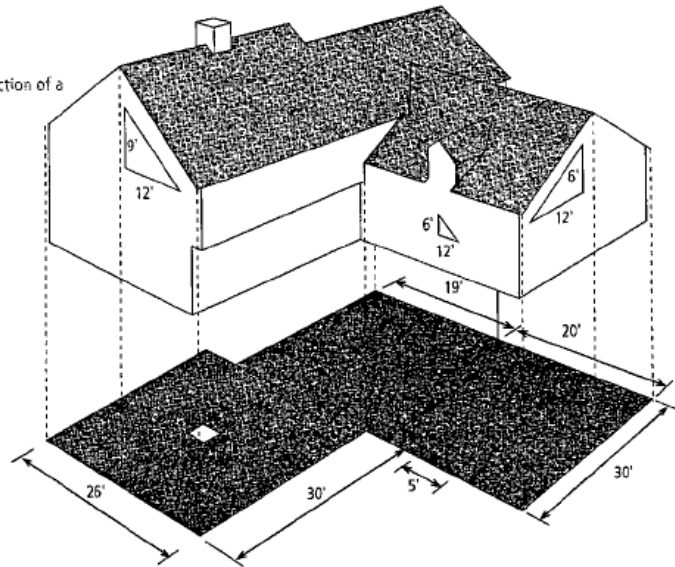
31. Mr. Cummings then asserts, without any explanation, that in Bailey “a roof’s area is calculated based on the footprint of a roof and its pitch.” EX1003, ¶64 (citing EX1010, 134-36). Mr. Cummings further asserts, without any citation to Bailey, that “Bailey teaches the [] ‘predominant slope [*i.e.*, pitch]’ may be used for an entire roof.” EX1003, ¶64. But Bailey does not disclose using a “predominant slope” value to determine the area of an entire roof—Bailey actually teaches the opposite.

32. In particular, Bailey explains that “[roof] sections are generally delineated by: ... different roof slopes or levels,” EX1010, 11. In the portion of Bailey cited by Mr. Cummings, Bailey provides an “estimation procedure ... reprinted courtesy of the Asphalt Roofing Manufacturers Association,” which describes calculating the area of a complex roof using pitch values and the horizontal projection of the roof. EX1010, 133-36. Bailey instructs, “[b]ecause the actual area is a function of the slope, *calculations must be grouped in terms of roof slope and those of different slopes are not combined until the true roof areas have been determined.*” EX1010, 135 (emphasis added). This process is illustrated on the next page, showing areas for different roof sections (having different slopes) being calculated separately. EX1010, 136.

Estimating Area (Complex Roofs)

(continued)

Figure 17
Horizontal projection of a
complex roof



- ① Calculate the horizontal area under the 9" slope roof.
- ② From this gross figure, deductions must be made for the area of the chimney and for the triangular area of the ell roof that overlaps and is sloped differently from the main roof:
- ③ Calculate the net projected area of the main roof.
- ④ Calculate the horizontal area under the 6" slope roof:

EX1010, 136 (excerpted and annotated).

33. Nowhere does Bailey teach using a single predominant or primary slope for estimating the area of an entire roof. Instead, Baily uses actual slopes of each different roof section to estimate the area of individual roof sections, and then Bailey simply combines areas at the end of its process. EX1010, 134-36; *see also* EX1010, 22 (Bailey disclosing using individual roof slopes for calculating “roof section area”: “The roof section area used in the condition rating procedure is the actual exposed area — not the projected horizontal area. The latter area can be determined from a roof section plan having horizontal dimensions and then can be

converted to the actual area by adjusting for roof slope (see Appendix B).”). Thus, Bailey’s estimation process operates differently than the claimed process, which requires determining “an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof,” EX1001, Claim 1—that is, the estimated roofing area of the entire roof is determined based on a single predominant pitch of the entire roof.

34. As further evidence of Bailey not using a single “predominant slope” to determine roofing area, Bailey teaches that “Slopes (inches of rise per foot of horizontal distance) *should be measured for each exposure*,” referring again to the process outlined in Appendix B. EX1010, 21 (emphasis added). Bailey, in fact, provides an example worksheet for roof sections (not an entire roof) that calls for a “SLOPE (primary)” of that individual section. EX1010, 14-15.

ROOF SECTION IDENTIFICATION WORKSHEET			AGENCY/INST.: <i>Example</i>	
DATE: <i>JUN/ 1999</i>	BLDG. NO.: <i>1253</i>	SECTION ID: <i>A</i>	AREA: <i>2813</i> SF	
OCCUPANCY:		YEAR ORIG. CONST.: _____	YEAR LAST REPLACED: _____	

33	SLOPE (primary): <i>4</i>	IN 12
----	---------------------------	-------

EX1010, 14-15 (excerpted and annotated).

35. Nothing in Bailey teaches that the “predominant slope” included on the worksheet is used to calculate the area for an entire roof. Bailey’s Roof Section Identification Worksheet, where the “predominant slope” is recorded, is merely

described as part of “data collection” of the “information needed to successfully manage a roof network”; the worksheet “simplifies the task of collecting the inventory data for a roof section and ensures uniformity in reporting terminology.” EX1010, 11-12, 17. But, as explained above, Bailey explains that “those [roof areas] of different slopes are not combined until the true roof areas have been determined,” and “the results can be added to obtain the total area of [the] roof.” EX1010, 135, 137. Therefore, the express teachings of Bailey would have dissuaded a POSITA from using a single, predominant slope when estimating roof area.

36. And neither Pershing-789 nor Kennedy discloses what is missing from Bailey—neither discloses or suggests using a *predominant* pitch of the roof to determine an estimated roof area, and Mr. Cummings does not allege otherwise.

B. Bailey does not disclose determining a “predominant pitch of the roof by analyzing one or more image showing the roof.”

37. I understand that each challenged claim of the ’538 patent requires determining a “predominant pitch ... of the roof *by analyzing one or more image showing the roof.*” EX1001, Independent Claims 1, 13, 14 (emphasis added). As noted above, Mr. Cummings relies on Bailey’s disclosure for its alleged teaching of determining a “predominant pitch of the roof,” as recited in the independent claims. EX1003, ¶¶42, 128. Regardless of whether Bailey’s “predominant slope” (EX1010, 17) meets the claimed “predominant pitch of the roof,” Bailey does not

teach (nor does Mr. Cummings allege) that its predominant slope is determined “*by analyzing one or more image showing the roof.*” EX1001, Claims 1, 13, 14 (emphasis added).

38. Instead, Bailey teaches that either (a) “[t]he roof plan” or “section drawings may indicate the slope,” which I understand Mr. Cummings explained refers to individual “roof pitches” for those surfaces visible in the drawings (EX2032, 59:8-19); or (b) “[i]f such information is not available, *field measurement will be required* (use the method in Appendix B).” EX1010, 17 (emphasis added). Bailey does not specify what a predominant slope is, nor does it disclose or suggest any details of how to determine or calculate the “predominant slope” described on page 17 of EX1010, let alone disclose or suggest analyzing roof images to do so. And, as noted above, Bailey’s Appendix B discloses measuring the slope of each roof surface separately and provides no guidance on determining a “predominant slope.” EX1010, 133-137.

39. Nowhere does Bailey disclose that a “predominant slope”—let alone any slope—is determined by analyzing images of the roof, nor does Bailey explain how such analysis would be performed. And neither Pershing-789 nor Kennedy discloses what is missing from Bailey—neither discloses determining a “*predominant pitch of the roof by analyzing one or more image showing the roof,*”

EX1001, Claim 1, and Mr. Cummings does not allege otherwise. *See* EX1003, ¶¶56-57, 138-39.

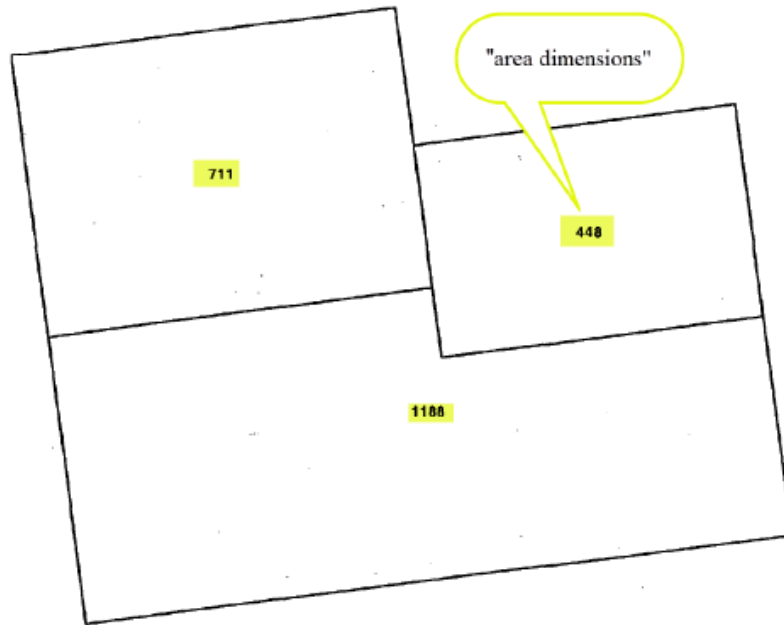
C. Mr. Cummings has not demonstrated that the Pershing-789 reference teaches determining a roof's footprint.

40. Each of independent claims 1, 13, and 14 recite “determin[ing] a *footprint* ... of the roof by analyzing one or more image showing the roof.”

EX1001, Claims 1, 13, 14 (emphasis added). Mr. Cummings asserts that “Pershing-789 teaches determining the claimed ‘*footprint*’ of the roof by drawing two-dimensional boundaries/outlines of roof sections, e.g., to compute area.” EX1003, ¶54 (emphasis in original). But Mr. Cummings incorrectly equates the concepts of footprint and area, which are not the same from a roofing standpoint.

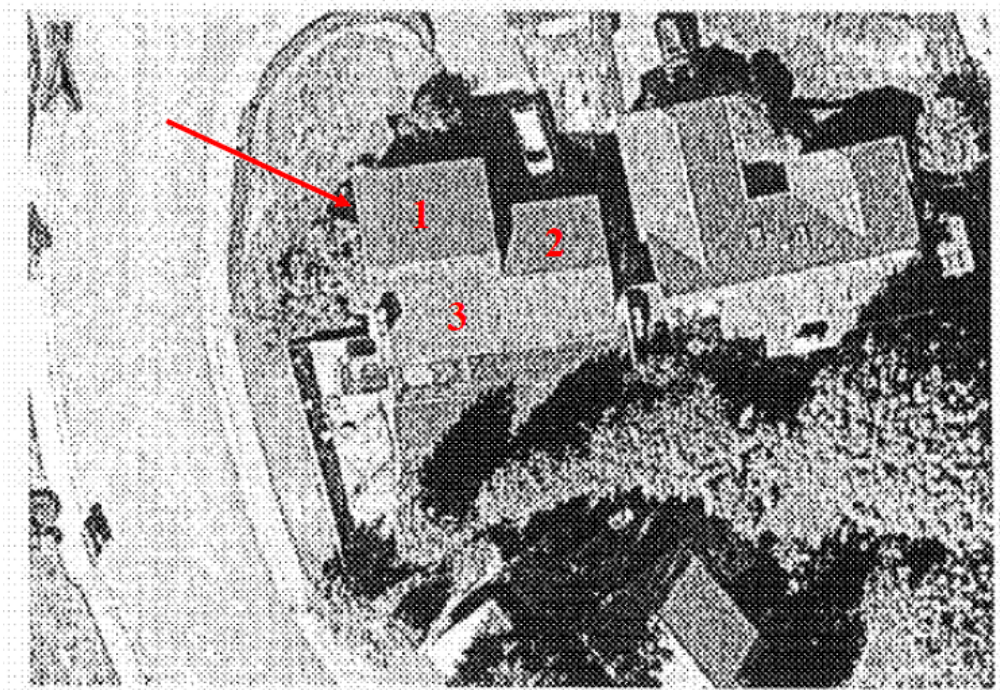
41. The '538 patent explains that “[t]he footprint may provide a two-dimensional boundary and/or outline of the roof.” EX1001, 12:8-9. This description is consistent with the definition of “footprint” provided in the RSMean Illustrated Construction Dictionary, which defines “footprint” as “[t]he area that falls directly beneath and shares the same perimeter as a structure.” EX2034, 219. A POSITA would therefore have understood that the footprint of a pitched roof is not the same as the roofing area.

42. Mr. Cummings points to and annotates Figure 5E of Pershing-789 for this element, as reproduced below.



EX1003, ¶55 (annotating EX1004, FIG. 5E).

43. Mr. Cummings, however, misinterprets Figure 5E of Pershing-789. Specifically, Pershing-789 discloses that “FIG. 5E is an illustration of the fifth page” of an example roofing report shown in Figures 5A-5F. EX1004, ¶28. An aerial image of the roof is shown in Figure 5A, which illustrates a pitched roof having three sections, as annotated below.



EX1004, FIG. 5A (excerpted and annotated).

44. The areas depicted in Figure 5E of Pershing-789 refer to the “square footage of each roof section,” which a POSITA would have understood to be the *surface area* of the roof. EX1004, ¶28. Because the roof is pitched, however, the *area* of the roof is not the same as the *footprint* of the roof—the area would be greater than the footprint. *See, e.g.*, EX1013, 462 (defining “roof pitch” and explaining that “[m]ore roofing material is required to cover the increased roof area when the slope or pitch is great”). A POSITA would not have understood roofing area (e.g., the “square footage of each roof section” as described by Pershing-789) to be the same as the footprint of the roof.

45. Mr. Cummings clarified during his deposition that in testifying “the ‘footprint’ of the roof includes at least its area,” EX1003, ¶54, he meant that the footprint must include at least an annotation of the footprint’s area, EX2032, 69:13-70:12, and that it may also include other annotations.

46. Mr. Cummings also confirmed that he considered the area numbers indicated on Figure 5E of Pershing-789 to be the horizontal projection areas of the roof. EX2032, 69:5-12. I disagree that a POSITA would understand Pershing-789 in this way. Pershing-789’s report is used “to prepare a cost estimate for the repair or replacement of the roof or installation of roof equipment.” EX1004, Abstract. A POSITA would have understood the information included in Figure 5E of the report to be the actual area of the surface of the roof (rather than of the horizontal projection thereof), because this would provide the information necessary to provide these cost estimates. And, regardless, under Petitioner’s theory, Pershing-789’s Figure 5E cannot disclose *both* the footprint of a pitched roof *and* the total square footage (or surface area) of the surface of pitched roof because Pershing-789’s Figure 5E only discloses one set of area information.

D. Mr. Cummings has not demonstrated that the Kennedy reference teaches determining a roof’s footprint.

47. Each of independent claims 1, 13, and 14 recite “determin[ing] a *footprint* ... of the roof by analyzing one or more image showing the roof.” EX1001, Claims 1, 13, 14 (emphasis added).

48. For determining the footprint, Mr. Cummings asserts “Kennedy expressly discloses a ‘sizing tool’ that is superimposed on an aerial image to determine ‘surface dimensions’ of a roof.” EX1003, ¶136. Mr. Cummings continues: “Kennedy discloses ‘generating length and width *measurements* for a generally rectangular planar installation surface such as a side of a roof.’” EX1003, ¶137.

49. As with Pershing-789, Mr. Cummings has confused a roof’s *footprint* with the *surface area* of the roof. Kennedy describes: “The term ‘sizing’ as used herein refers to obtaining or generating length and width measurements for a generally rectangular planar installation surface such as a side of a roof. An installation surface is a surface area of a roof, for example a roof side contemplated for installation of energy system components.” EX1009, ¶82. A POSITA would understand the “roof side contemplated for installation of energy system components” to be the roof’s surface. Thus, a POSITA would understand measurements of Kennedy’s “planar installation surface” to be measuring the surface area of the roof, and not the roof’s footprint.

50. Regardless, the claims further recite determining an estimated roofing area of the roof based on, in part, the footprint. Here, Mr. Cummings also points to measuring an “installation surface area.” EX1003, ¶140. Kennedy’s “installation surface area” cannot be both the claimed footprint and the claimed roofing area.

VII. DEPENDENT CLAIMS 11 AND 18

51. Dependent claims 11 and 18 each require determining the “predominant pitch” of the roof based on multiple “pitch values” or “pitch factors.” EX1001, Claim 10 (“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”), Claim 11 (“wherein each pitch value is associated with an estimated percentage of roof area to provide an average pitch value”), Claim 18 (“wherein the predominant pitch is based on a weighted average of individual pitch factors for two or more portions of the roof”).

52. As discussed below, Bailey does not disclose combining multiple pitch values in any manner, nor would a POSITA have understood Bailey’s “predominant slope” to mean an average of multiple pitch values or pitch factors. Instead, Bailey discloses calculating areas separately for different roof sections and simply combining the calculated areas at the end of its process.

A. Bailey does not teach that its use of “predominant slope” means an average of individual pitch values or pitch factors.

53. Mr. Cummings states that “Bailey expressly teaches calculating the ‘*predominant slope*’ of the roof,” EX1003, ¶57, pointing to the following portion of Bailey:

Section 33 - Slope. The predominant slope of the roof section. The roof plan will generally indicate the slope (e.g., 4 in. in 12). If the slope is not noted on the roof plan, the section drawings may indicate the slope. If such information is not available, field measurement will be required (use the method in Appendix B).

EX1010, 17.

54. Mr. Cummings then asserts that “the ‘predominant slope’ disclosed in Bail[e]y is an express disclosure of the claimed ‘predominant pitch.’” EX1003, ¶63. At the outset, I agree with Mr. Cummings that the terms “pitch” and “slope” are often used interchangeably in the roofing industry. EX1003, ¶61. Bailey, however, does not disclose how its “predominant slope” would be determined, or that Bailey uses a combination of multiple slope values for its calculations.

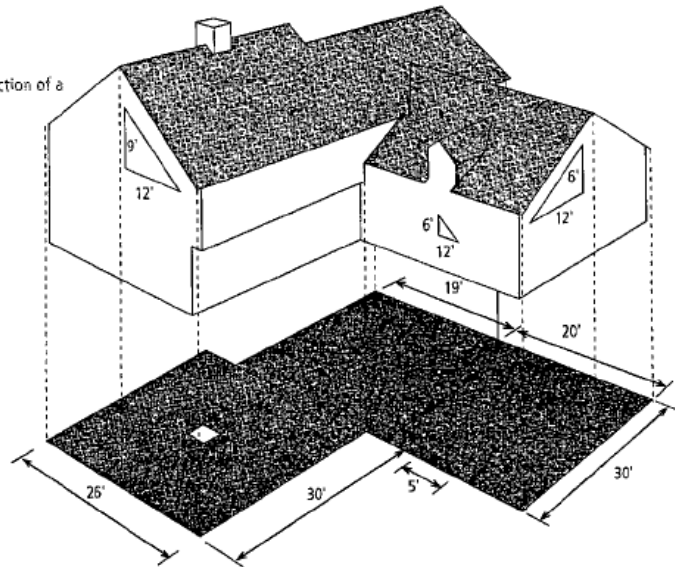
55. In particular, in its explanation of “predominant slope” cited by Mr. Cummings, Bailey refers to “Appendix B” for a method of taking “field measurement.” In this appendix, however, Bailey instructs to use individual slopes for each roof section to estimate roofing area for that section, rather than combining the slopes from different sections. Bailey provides the below example that calculates the area of a roof section-by-section. EX1010, 136. Even though multiple different slopes are present on the roof, Bailey does not disclose combining these slopes in any way to determine a “predominant slope,” as I understand Mr. Cummings conceded during deposition. *See* EX1010, 136;

EX2032, 64:3-14 (referring to EX1010, 134-36: “Q So in this example, he does not use predominant slope as part of his calculation? A No, he does not.”).

Estimating Area (Complex Roofs)

(continued)

Figure 97
Horizontal projection of a
complex roof



- ① Calculate the horizontal area under the 9" slope roof.
- ② From this gross figure, deductions must be made for the area of the chimney and for the triangular area of the ell roof that overlaps and is sloped differently from the main roof:
- ③ Calculate the net projected area of the main roof.
- ④ Calculate the horizontal area under the 6" slope roof:

EX1010, 136 (excerpted and annotated).

56. Specifically, rather than determine an average of different slopes present on the roof, or even on a roof section, Bailey instructs to make deductions for areas that are “sloped differently from the main roof.” EX1010, 136. Bailey further explains that “calculations must be grouped in terms of roof slope and those [roof areas] of different slopes are not combined until the true roof areas have been determined.” EX1010, 135. Therefore, in contrast to the ’538 patent, Bailey’s

method does not teach or suggest determining any average of different pitch values or pitch factors.

57. The sample roof inspection sheets provided in Bailey also support the understanding that Bailey uses separate slopes for each roof section to estimate roofing area, rather combining slopes into a single “predominant slope” for the entire roof. For example, Bailey’s roof section identification worksheet provides an entry for a “primary” slope of each roof section, as shown below. EX1010, 14-15, 142.

ROOF SECTION IDENTIFICATION WORKSHEET			AGENCY/INST.: <i>Example</i>	
DATE: <i>Jul/ 1999</i>	BLDG. NO.: <i>1253</i>	SECTION ID: <i>A</i>	AREA: <i>2813</i> SF	
OCCUPANCY:	YEAR ORIG. CONST.: _____		YEAR LAST REPLACED: _____	

32 ATTACHMENT SURFACE (if applicable):		
☐ WOOD FIBER	☐ WOOD BOARDS	☐ METAL PURLINS
☐ PLYWOOD	☐ WOOD BATTENS	☐ OTHER
		☐ UNKNOWN
33 SLOPE (primary): <i>4</i> IN 12		

EX1010, 14-15 (excerpted and annotated).

58. Again, Bailey avoids combining multiple slopes present on roof (e.g., taking an average) in favor of calculating areas for each section, which are then combined at the end. EX1010, 135.

B. A POSITA would not have understood Bailey’s “predominant slope” to mean an average of individual pitch values or pitch factors.

59. Aside from Bailey’s express teachings, I also disagree with Mr. Cummings that “calculating a predominant pitch, which is merely the computation of a weighted average of pitch values of a roof, has been used in the art *for decades*.” EX1003, ¶46; *see also* EX1003, ¶96 (“A POSITA would understand that Bailey’s disclosure of a single ‘predominant’ or ‘primary’ pitch value is a weighted average pitch value that accounts for the amount of surface area taken up by roof facets.”). As numerous documents show, the term “predominant pitch” is not a term of art in the roofing industry, nor was it standard practice in the industry to use a weighted average of pitch values of a roof.

60. First, Appendix B of Bailey, which provides details on Bailey’s “Field Measurement Method,” is a reproduction of the 1997 edition of the “Residential Asphalt Roofing Manual” published by the Asphalt Roofing Manufacturers Association (ARMA). EX1010, 133. A copy of the complete manual is attached as EX2035, which includes the portion reproduced in Bailey. *See* EX2035, 29-33. Notably, nowhere does this manual mention or define “predominant pitch” or “predominant slope,” including in the provided glossary. EX2035, 95-101.

Overhang: That portion of the roof structure that extends beyond the exterior walls of a building.

Pallets: Wooden platforms used for storing and shipping bundles of shingles.

Pitch: The degree of roof incline expressed as the ratio of the rise, in feet, to the span, in feet.

Ply: A layer of roofing (i.e., one-ply, two-ply).

Quick-Setting Cement: An asphalt-based cement used to adhere tabs of strip shingles to the course below. Also used to adhere roll roofing laps applied by the concealed nail method.

Racking: Roofing application method in which shingle courses are applied vertically up the roof rather than across and up. Not a recommended procedure.

EX2035, 99.

The 2014 version of the ARMA's Residential Asphalt Roofing Manual similarly does not define "predominant pitch" or "predominant slope." *See* EX2036, 107-113.

61. ARMA is a well-established trade association that represents the majority of the asphalt roofing industry's manufacturers and their raw material suppliers. ARMA has published a number of technical bulletins on various topics involving residential roofing, modified bitumen roofing, and built-up roofing, among other types. Further, ARMA has published books in print and electronic format, including their Residential Asphalt Roofing Manual. Various employees of my company, Haag Engineering, have had membership in ARMA over the decades including committee positions. Its publications would have been known to a POSITA and relied upon as authoritative sources in the industry. If "predominant

pitch” or “predominant slope” were specific terms of art, they would very likely be present in ARMA’s Residential Asphalt Roofing Manual.

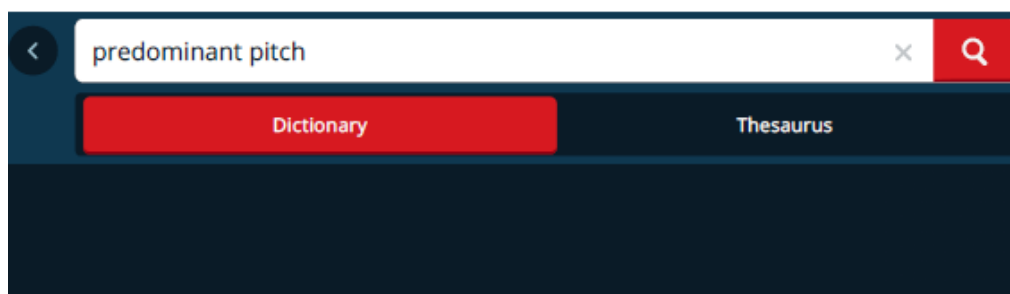
62. Another authoritative source in the roofing industry is the National Roofing Contractors Association (NRCA). The NRCA was founded in 1886 and is a leading organization in the roofing industry. Its members include contractors, manufacturers, distributors, engineers, architects, roof consultants, building owners, and government officials. NRCA hosts various industry events including the annual International Roofing Expo and various committee meetings. NRCA publishes various technical resources including roofing manuals. NRCA also provides various training courses including on roof installations. Various employees of my company, Haag Engineering, have had membership in NRCA for decades, including committee positions. Its publications again would have been known to a POSITA and relied upon as authoritative sources in the industry.

63. I understand that both the 2010 and 2014 editions of “The NRCA Roofing Manual: Architectural Metal Flashing, Condensation Control and Reroofing” have been provided as EX2037 and EX2038, respectively. Like the ARMA Residential Asphalt Roofing Manual, neither of these NRCA manuals define the terms “predominant pitch” or “predominant slope” in their glossaries. EX2037, 270-304; EX2038, 347-352. I also understand that the 2006 edition of “The NRCA Manual: Roofing and Waterproofing” has been provided as EX2039,

which similarly does not define the terms “predominant pitch” or “predominant slope” in its glossary.

64. Mr. Cummings further relies on the RSMeans Illustrated Construction Dictionary for its definition of “weighted average.” EX1003, ¶97 (citing EX1013, 605). But that definition mentions nothing regarding roof pitch or slope, let alone predominant pitch or predominant slope. EX1013, 605. I understand that the complete RSMeans Illustrated Construction Dictionary has been provided as EX2034. Although Mr. Cummings stated that the RSMeans Illustrated Construction Dictionary is “frequently referred to by those of ordinary skill in the art as a ‘complete source of construction terms and concepts,’” EX1003, ¶97, it again includes *no definition* for the terms “predominant pitch” or “predominant slope,” EX2034, 404-405, 418, 504.

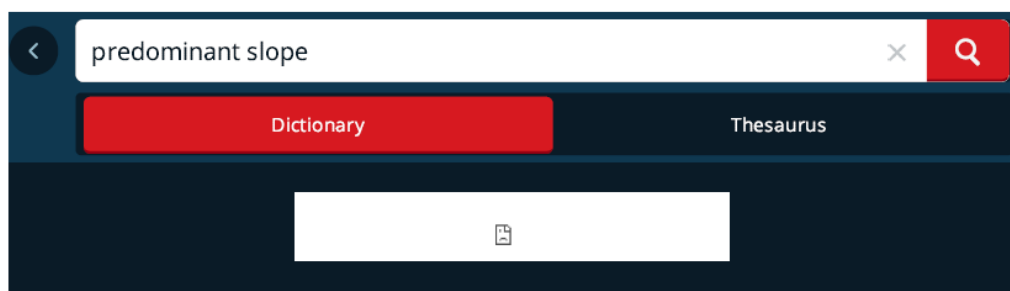
65. Additionally, “predominant pitch” and “predominant slope” are not terms that appear in traditional dictionaries. For example, I performed a search of Merriam-Webster’s online dictionary and found no entries for either term.



“predominant pitch”

The word you've entered isn't in the dictionary. Click on a spelling suggestion below or try again using the search bar above.

EX2040, 1.



“predominant slope”

The word you've entered isn't in the dictionary. Click on a spelling suggestion below or try again using the search bar above.

EX2041, 1.

66. The terms “predominant pitch” and “predominant slope” are therefore not terms of art in the roofing industry and certainly would not have been understood by a POSITA to mean an average of pitch values of a roof. Indeed, I understand that Mr. Cummings conceded during deposition that Bailey does not

disclose taking an average of multiple slope values. EX2032, 54:17-55:4 (“Q And do you have the understanding of how [Bailey] determined the primary slope? ... To answer, no, he doesn’t say it.”), 57:21-58:3 (“Q But I thought we said, earlier, that [Bailey] doesn’t tell us how [the predominant slope is] determined? ... A There’s no calculation.”).

67. Nor would a POSITA have sought to use an average of pitch values for estimating roofing area. To the extent a POSITA desired to use a single “predominant slope” for the entire roof, a POSITA would have been motivated to use the slope that covered the majority of the roof, rather than an average of multiple slopes. This is consistent with the ordinary meaning of the terms “predominant” and “pitch”: “Predominant” meaning “being most frequent or common”; “pitch” meaning “[t]he angle or inclination of a plane such as a roof, which varies according to climate, design, and materials used, and is expressed as a ratio of rise per run”; and “slope” meaning “[t]he slope of a roof, ramp, or paving expressed as one unit of rise to one unit of run. *See also* pitch.” EX2042; EX2034 (RSMMeans Dictionary), 404, 504.

68. In my experience, roofing estimators (whether roofing contractors or insurance adjusters) often prioritize the speed of estimating for steep-slope roof projects, the majority of which are highly competitive reroofing projects. The reroofing market is historically three times the size of the new construction market

for steep-slope roofing, *see* EX2044, so efficiency is often prioritized over accuracy. Using a primary slope that covers the majority of a roof section increases the speed of estimation and requires fewer field measurements. I note that Mr. Cummings appears to agree with me on this point, explaining that using a “single pitch value” would “simplify the calculations used by Pershing-789 related to roof repair or replacement.” EX1003, ¶46. Therefore, to the extent a single slope for the entire roof was desired, a POSITA would not have been motivated to use an average of multiple slopes that requires additional measurements and calculations.

69. This understanding of “predominant pitch” as “primary pitch” is also consistent with the disclosure of Bailey, which uses “predominant” and “primary” interchangeably. For example, in reference to Bailey’s “Roof Section Identification Worksheet,” *see* EX1010, 12-18, FIG. 4, Bailey describes Section 33 as: “Section 33 - Slope. The predominant slope of the roof section.” EX1010, 17. On the worksheet itself, Section 33 is listed as “SLOPE (primary)”:

32 ATTACHMENT SURFACE (if applicable):		
☐ WOOD FIBER	☐ WOOD BOARDS	☐ METAL PURLINS
☐ PLYWOOD	☐ WOOD BATTENS	☐ OTHER
		☐ UNKNOWN
33 SLOPE (primary): <u>4</u> IN 12		
34 DRAINAGE (check all):		
☐ INTERIOR DRAINS	☐ SCUPPERS	☐ OVERFLOW SCUPPERS
☐ INTERIOR GUTTERS	☐ ADJACENT ROOF SECTIONS	☐ ROOF EDGE
☒ GUTTERS & DOWNSPOUTS	☐ SCUPPERS W/LEADER & DOWNSPOUTS	☐ OTHER

EX1010, 15, FIG. 4 (excerpted and annotated); *see also* EX1010, 142 (Appendix C – “Samples of Roof Inspection Sheets” showing the same). For a similar “Roof Section Identification Sheet,” EX1010, 18-19, FIG. 5, Bailey also lists Section 33 as simply “SLOPE” with a single entry space available.

ROOF SECTION IDENTIFICATION		AGENCY/INST.: <i>Example</i>	
DATE: <i>JUN/ 1999</i>	BLDG NO: <i>1253</i>	SECTION ID: <i>A</i>	AREA: <i>2813</i> SF
OCCUPANCY: <i>Housing</i>	YEAR ORIG. CONST.: <i>1991</i>	YEAR LAST REPLACED: <i>—</i>	
10 GENERAL			
11 TYPE: <i>Gable, Hip</i>			
12 PERIMETER:			
PARAPET	LF	FIREWALL	LF
ROOF EDGE	<i>234</i> LF	HIP	<i>116</i> LF
ADJACENT WALL	LF	VALLEY	<i>70</i> LF
		RIDGE	<i>69</i> LF
		OTHER	LF
13 ACCESS: <i>External Ladder: Temporary</i>			
20 STRUCTURAL FRAME			
21 TYPE: <i>Wood Trusses</i>			
30 ROOF DECK			
31 STRUCTURAL DECK: <i>Plywood</i>			
32 ATTACHMENT SURFACE:	33 SLOPE:		34 DRAINAGE:
<i>—</i>	<i>4</i> IN 12		<i>Gutters & Downspouts</i>
40 UNDERLAYMENT			
<i>Asphalt Saturated Sheet</i>			

EX1010, 19, FIG. 5 (excerpted and annotated); *see also* EX1010, 140 (Appendix C – “Samples of Roof Inspection Sheets” showing the same).

70. Further, as Bailey discloses, a fairly accurate measurement of roofing area can be performed without calculating an average of pitches or pitch values; instead, areas for different roof sections can be estimated and simply added together at the end. *See* EX1010, 136-37. This, in fact, is the method suggested by ARMA in its Residential Asphalt Roofing Manual, as noted above. EX2035, 32-38.

C. Bailey’s slope factor chart is used to calculate roofing area, not a “predominant pitch,” as required by claim 18.

71. Claim 18 specifically requires that “*the predominant pitch is based on a weighted average of individual pitch factors* for two or more portions of the roof.” EX1001, Claim 18 (emphasis added). In his declaration, Mr. Cummings asserts, “Bailey also expressly teaches using the same ‘pitch factors’ shown in Figure 7 of the ’538 patent to calculate *area*.” EX1003, ¶127. Mr. Cummings then incorrectly concludes: “Thus, Bailey also renders obvious ‘wherein the *predominant pitch* is based on a weighted average of individual pitch factors for two or more portions of the roof.’” EX1003, ¶127 (emphasis added) (citing EX1010, 137 (Table 3)).

72. As Mr. Cummings admits, Table 3 of Bailey is used to convert horizontal areas to actual roofing areas: “Now that the total projected horizontal areas for each roof slope have been calculated, the results can be converted to actual areas with the aid of Table 3. (To calculate the Actual Area, multiply the Horizontal Area by the Area/Rake Factor.)” EX1010, 137; EX2032, 66:10-22 (“[Y]ou’re using this table [3] to calculate the actual surface area of the roof, correct? A That’s correct”; Mr. Cummings explaining that “this table [3] doesn’t determine pitch.”). Claim 18 of the ’538 patent, on the other hand, requires the use of pitch factors to determine “the predominant pitch,” not a roofing area. EX1001,

Claim 18. Nowhere does Bailey disclose that its “Area/Rake Factor[s]” are used to determine a pitch or slope of any kind.

VIII. ROOF ESTIMATION USING BLUEPRINTS IS DIFFERENT FROM ROOF ESTIMATION USING AERIAL IMAGES.

73. Mr. Cummings asserted that the process of preparing roof estimates including takeoff (quantities) and calculations was the same whether using blueprints or aerial images. EX2032, 41:7-10 (“Q. So is it your view that whether you’re using a blueprint or an aerial image to make roof estimations is the same? A. Yes. The process is.”). Mr. Cummings based his assertion on his experience working with blueprints. EX2032, 43:1-4 (“Q. And you have a lot of experience doing that in the context of working with blueprints, correct? A. That’s correct.”). However, Mr. Cummings later clarified that in the past 33 years he has prepared only 15 to 20 roof estimates, none of which involved using aerial measurements. EX2032, 78:18-79:1 (“Q. You indicated you did a significant number of roof estimates from 1990 onward. A. Yes. Q. Can you quantify what “significant” is? A. Let’s see, probably in the neighborhood of, I’d say, 15 to 20.”).

74. I disagree with Mr. Cummings’s assertion that the process of preparing roof estimates including takeoff (quantities) and calculations was the same whether using blueprints or aerial images. Above all, this is an assertion he clearly lacks the experience to credibly make. Mr. Cummings ignores the fact that blueprints are typically not available for contractors, insurance adjusters, and other

professionals (such as myself) to use for estimating roof areas/quantities of existing buildings. In my experience, blueprints for existing buildings have been provided to me or my team approximately 5 percent or less of the time. This is because the building owner either does not have a copy of the blueprints (the norm for residential construction), cannot locate the blueprints, does not want to take the time to attempt to locate them, or does not choose to provide them. Thus, some roof measurement methodology must be used—direct measurement by walking the roof, pitch factor by measuring the footprint and determining the pitch, or use of a third-party provider of roof measurements.

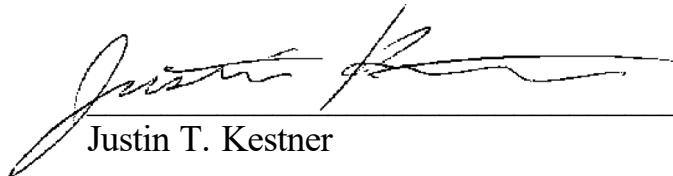
75. Further, blueprints are two-dimensional representations of an *as-designed* structure. The actual *as-built* condition of the structure typically has variations from the as-designed blueprints. Also, various roof appurtenances such as flues, plumbing stacks, attic vents, and others typically are not shown on the plans. For these reasons, many professionals will measure a roof to verify its actual dimensions and to ascertain the number and locations of appurtenances.

IX. CONCLUSION

76. In signing this declaration, I recognize that the declaration will be filed as evidence in an *inter partes* review before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required, I will appear for cross-examination within the United States during the time allotted.

77. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on this 27th day of November, 2023, in Flower Mound, TX.



Justin T. Kestner