# Roofr Inc.
# v.
# Pictometry International Corp.

**IPR2023-00436**

**U.S. Patent No. 9,183,538**

## Patent Owner's Demonstratives

April 23, 2024

Sterne Kessler
STERNE KESSLER GOLDSTEIN & FOX



Pictometry EX2045
Roofr v. Pictometry
IPR2023-00436

# Instituted Grounds

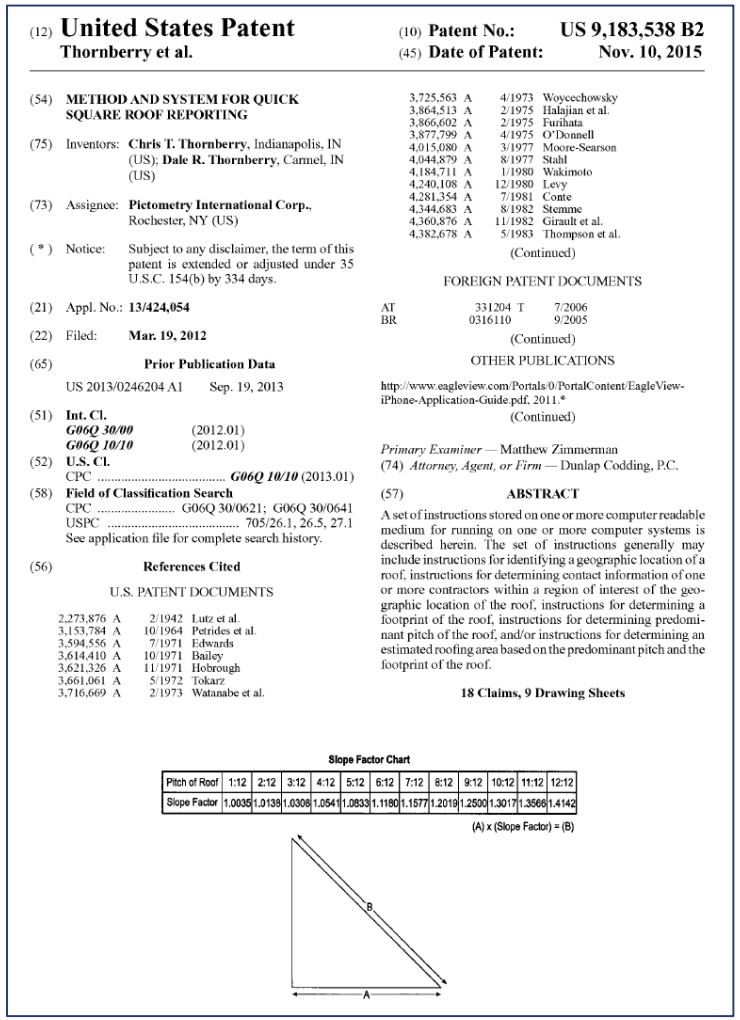
| IPR2023-00436 ('538 Patent) | | |
|---|---|---|
| **Claims Challenged** | **Basis** | **Applied References** |
| 1–5, 8–13 | 35 U.S.C. § 103(a) | Pershing-789, Bailey |
| 6, 7, 14–18 | 35 U.S.C. § 103(a) | Pershing-789, Bailey, Abhyanker |
| 1–5, 8–13 | 35 U.S.C. § 103(a) | Kennedy, Bailey |
| 6, 7, 14–18 | 35 U.S.C. § 103(a) | Kennedy, Bailey, Abhyanker |

Inst. Dec., 4, 16.

# Agenda

- **The ’538 Patent and Level of Ordinary Skill in the Art**
- The “predominant pitch” Limitations
  - Independent Claims 1, 13, and 14
  - Dependent Claims 11 and 18
- The “footprint of the roof” Limitations - Independent Claims 1, 13, and 14
- The Board Should Accord Little to No Weight to Mr. Cummings’s Testimony

# The ’538 Patent



(12) **United States Patent**
**Thornberry et al.**

(10) **Patent No.: US 9,183,538 B2**
(45) **Date of Patent: Nov. 10, 2015**

(54) **METHOD AND SYSTEM FOR QUICK SQUARE ROOF REPORTING**

(75) Inventors: **Chris T. Thornberry**, Indianapolis, IN (US); **Dale R. Thornberry**, Carmel, IN (US)

(73) Assignee: **Pictometry International Corp.**, Rochester, NY (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 334 days.

(21) Appl. No.: **13/424,054**

(22) Filed: **Mar. 19, 2012**

(65) **Prior Publication Data**

US 2013/0246204 A1 Sep. 19, 2013

(51) **Int. Cl.**
***G06Q 30/00*** (2012.01)
***G06Q 10/10*** (2012.01)

(52) **U.S. Cl.**
CPC ..... ***G06Q 10/10*** (2013.01)

(58) **Field of Classification Search**
CPC ..... G06Q 30/0621; G06Q 30/0641
USPC ..... 705/26.1, 26.5, 27.1
See application file for complete search history.

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*Primary Examiner* — Matthew Zimmerman
(74) *Attorney, Agent, or Firm* — Dunlap Codding, P.C.

(57) **ABSTRACT**

A set of instructions stored on one or more computer readable medium for running on one or more computer systems is described herein. The set of instructions generally may include instructions for identifying a geographic location of a roof, instructions for determining contact information of one or more contractors within a region of interest of the geographic location of the roof, instructions for determining a footprint of the roof, instructions for determining predominant pitch of the roof, and/or instructions for determining an estimated roofing area based on the predominant pitch and the footprint of the roof.

**18 Claims, 9 Drawing Sheets**

**Slope Factor Chart**

| Pitch of Roof | 1:12 | 2:12 | 3:12 | 4:12 | 5:12 | 6:12 | 7:12 | 8:12 | 9:12 | 10:12 | 11:12 | 12:12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Slope Factor | 1.0035 | 1.0138 | 1.0308 | 1.0541 | 1.0833 | 1.1180 | 1.1577 | 1.2019 | 1.2500 | 1.3017 | 1.3566 | 1.4142 |

(A) x (Slope Factor) = (B)



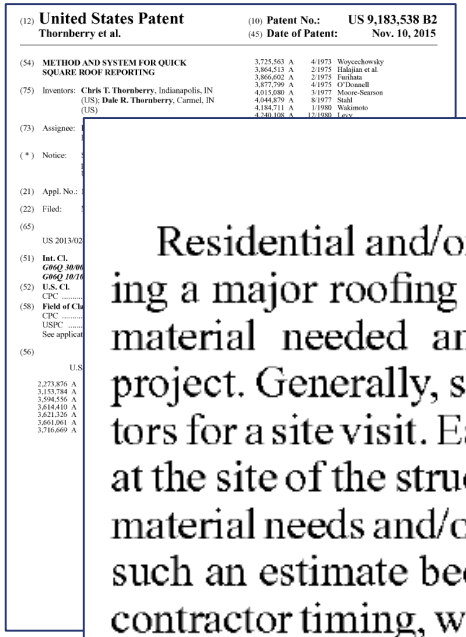

(57) **ABSTRACT**

A set of instructions stored on one or more computer readable medium for running on one or more computer systems is described herein. The set of instructions generally may include instructions for identifying a geographic location of a roof, instructions for determining contact information of one or more contractors within a region of interest of the geographic location of the roof, instructions for determining a footprint of the roof, instructions for determining predominant pitch of the roof, and/or instructions for determining an estimated roofing area based on the predominant pitch and the footprint of the roof.

EX1001, Abstract.

POR, 2-3.

# The ’538 Patent


(12) **United States Patent**
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(10) **Patent No.: US 9,183,538 B2**
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(54) **METHOD AND SYSTEM FOR QUICK SQUARE ROOF REPORTING**

(75) Inventors: **Chris T. Thornberry**, Indianapolis, IN (US); **Dale R. Thornberry**, Carmel, IN (US)

(73) Assignee:

( * ) Notice:

(21) Appl. No.:

(22) Filed:

(65)

US 2013/02

(51) **Int. Cl.**
*G06Q 30/06*
*G06Q 10/10*

(52) **U.S. Cl.**
CPC

(58) **Field of Cla**
CPC
USPC
See applicat

(56)

U.S

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4,240,108 A 12/1980 Levy

## BACKGROUND

Residential and/or commercial property owners approaching a major roofing project may be unsure of the amount of material needed and/or the next step in completing the project. Generally, such owners contact one or more contractors for a site visit. Each contractor must physically be present at the site of the structure in order to make a determination on material needs and/or time. The time and energy for providing such an estimate becomes laborious and may be affected by contractor timing, weather, contractor education, and the like. Estimates may be varied even between contractors in determination of estimated square footage causing variance in supply ordering as well. Additionally, measuring an actual roof may be costly and potentially hazardous—especially with steeply pitched roofs. Completion of a proposed roofing project may depend on ease in obtaining a simplified roofing estimate and/or obtaining reputable contractors for the roofing project.

EX1001, 1:10-25.

Images are currently being used to measure objects and structures within the images, as well as to be able to determine geographic locations of points within the image when preparing estimates for a variety of construction projects, such as roadwork, concrete work, and roofing. Estimating construction projects using software may increase speed at which an estimate can be prepared, and may reduce labor and fuel costs associated with on-site visits.

EX1001, 1:26-33.

POR, 2-3.

# The ’538 Patent

The one or more memories **110** may include the image database **138**. The image database **138** may store geo-referenced imagery. Such imagery may be represented by a single pixel map, and/or by a series of tiled pixel maps that when aggregated recreate the image pixel map. Imagery may include nadir, ortho-rectified and/or oblique geo-referenced images. The one or more processors **108** may provide the images via the image database **138** to customers at the one or more user terminals **104**. Customers, using the user terminals

EX1001, 8:19-27.

The one or more memories **130** of the second host system **126** may also include a second image database **141**. The second image database **141** may provide additional nadir, ortho-rectified, and/or oblique geo-referenced and/or non-geo-referenced images for use in providing a roofing report as described in detail herein. Alternatively, the image database **138** and the image database **141** may be the same database.

EX1001, 9:8-13.

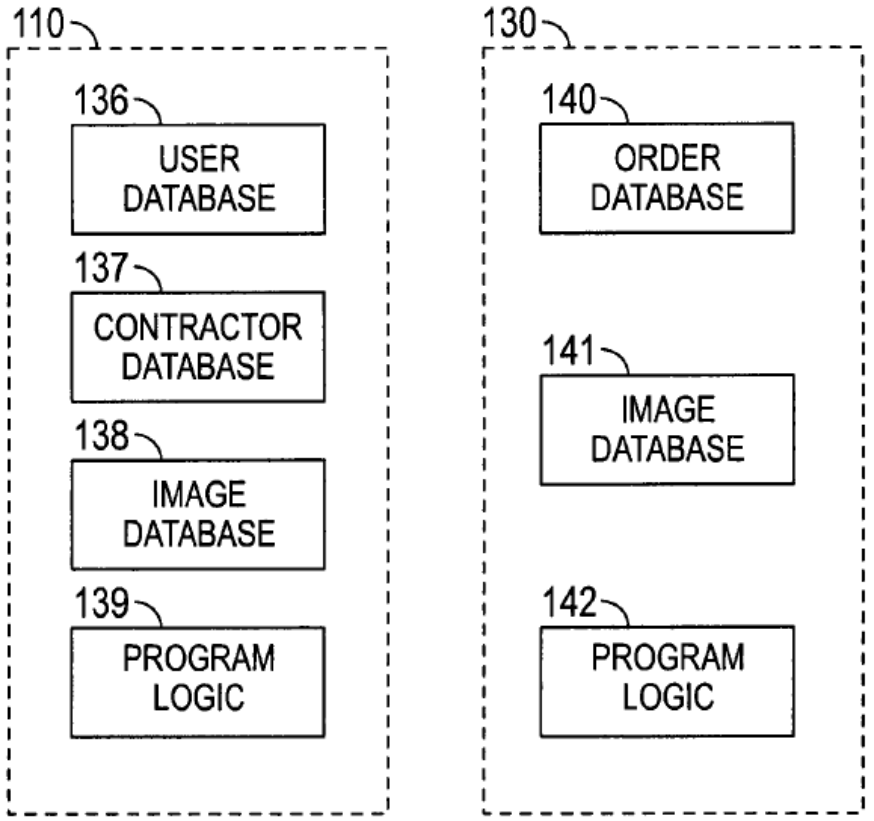



**FIG. 2**

EX1001, FIG. 2.

POR, 2-3.

# Petitioner's Proposed Level of Ordinary Skill

## Petition

**II. LEVEL OF SKILL IN THE ART**

A person of ordinary skill in the art at the time of the alleged invention would have bachelor's degree in architecture or an equivalent with at least five years of experience performing roof estimation. This level of skill is approximate, and more experience would compensate for less formal education, and vice versa. Ex. 1003 at ¶¶ 1-7.

Pet., 2.

Pet., 2.

# Institution Decision – Level of Ordinary Skill

## Institution Decision

On this record, we disagree with Petitioner's definition because it does not reflect that one skilled in the art would also have computer-related experience, even though the challenged patent and the asserted prior art deal extensively with computer modeling. Instead, we find that one skilled in the art would have a Bachelor's Degree in an academic area emphasizing the design of electrical, computer, or software technologies, or a similar discipline, and at least two years of experience related to computerized image analysis and three-dimensional modeling. In addition, experience may compensate for formal education, and vice versa.[6]

Inst. Dec., 6-7.

# Patent Owner's Proposed Level of Ordinary Skill

## Patent Owner Response

**B. Person of Ordinary Skill in the Art (POSITA)**

A person of ordinary skill in the art ("POSITA" or "skilled artisan") of the '538 patent 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 and estimation, aerial imagery use in roofing estimation, and roofing measurement software. EX2031, Kestner Declaration, ¶28. The Board's preliminary definition of a POSITA in the Institution Decision recognized that the claims relate to image analysis, but the Board's definition was inappropriately devoid of any mention of roofing measurement experience. DI, 6-7. The parties are in agreement that a POSITA must have experience in performing roof estimation. EX2031, ¶28; Pet., 2; EX1003, ¶7.

POR, 4.

## PO's Expert Kestner

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.

EX2031, ¶28.

POR, 4-5.

# Patent Owner's Proposed Level of Ordinary Skill

The focus of the '538 patent is on roof measurement using aerial imagery

## '538 Patent

The footprint may provide a two-dimensional boundary and/or outline of the roof. In a step **194**, a predominant pitch value for the roof may be determined. In some embodiments, a predominant pitch value may be determined using the footprint as a boundary of the roof. The predominant pitch may be a weighted average of individual pitch factors for two or more portions of the roof. FIG. **7** illustrates an exemplary slope factor chart for determining pitch factors. For example, a first portion of the roof (e.g., 60% of the roof) may be at a 6:12 pitch. The 6:12 pitch corresponds to 1.1180 as the pitch factor). A second portion of the roof (e.g. 40% of the roof) may be at a 4:12 pitch. The 4:12 pitch corresponds to 1.0541 as the pitch factor. Thus, the weighted value of the first portion of the roof having 6:12 pitch is:

(Pitch Factor)*(Percentage of roof)=First Weighted Value

1.1180*0.6=0.6708 EQ. 1

The weighted value of the second portion of the roof having 4:12 pitch is:

EX1001, 12:8-25.

The weighted value of the second portion of the roof having 4:12 pitch is:

(Pitch Factor)*(Percentage of roof)=Second Weighted Value

1.0541*0.4=0.42164 EQ. 2

The sum of 0.6708 and 0.42164 is 1.09244 as the total weighted pitch value. A total weighted pitch value of 1.09244 is closest to a pitch factor of 1.0833 in the table in FIG. **7**. This pitch factor corresponds to a 5:12 pitch. As such, the predominant pitch in this scenario would be 5:12. Using the predominant pitch and outer dimensions provided by the footprint, an estimated area of the roof may be determined, in a step **196**.

EX1001, 12:26-39.

POR, 4-5, 29-30.

# The ’538 Patent: Independent Claim 1

1. 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: identify a geographic location of a roof; determine a footprint and predominant pitch of the roof by analyzing one or more image showing the roof; determine an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof; 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.

EX1001, Claim 1.

POR, 10.

# The ’538 Patent: Independent Claims 13 and 14

**13**. A system, comprising:
two or more host systems, each host system having one or more non-transitory computer readable medium;
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:
identify a geographic location of a roof;
determine contact information of at least one contractor within a region of interest about the geographic location of the roof;
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:
determine a footprint and predominant pitch of the roof by analyzing one or more image showing the roof;
determine an estimated roofing area based on the predominant pitch and the footprint of the roof; and,
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.

EX1001, Claim 13.

**14**. 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;
providing to the user, with the computer processor, imagery of the roof based on the geographic location of the roof;
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
generating, with the computer processor, 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.

EX1001, Claim 14.

POR, 10.

# Agenda

- The ’538 Patent and Level of Ordinary Skill in the Art
- **The “predominant pitch” Limitations**
  - **Independent Claims 1, 13, and 14**
  - Dependent Claims 11 and 18
- Independent Claims 1, 13, and 14: The “footprint of the roof” Limitations
- The Board Should Accord Little to No Weight to Mr. Cummings’s Testimony

# The "predominant pitch" Limitations

1. 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: identify a geographic location of a roof; determine a footprint and predominant pitch of the roof by analyzing one or more image showing the roof; determine an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof; 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.

EX1001, Claim 1.

POR, 10.

# The Petition's Proposed Combinations Rely on Bailey for Use of a "predominant pitch"

## Petition

**4. Claim 1d determine an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof;**

As discussed above, Pershing-789 uses a "footprint" of the roof and its pitch to calculate an estimate of its area. Ex. 1004 at [0013]-[0015], [0028]. As taught by Bailey, a roof's area is calculated based on the footprint of a roof and its pitch. Ex. 1010 at 134-36. Further, Bailey teaches the a "predominant slope [*i.e.*, pitch]" may be used for an entire roof. Accordingly, Pershing-789 and bailey render obvious determining an "estimated roofing area" based on the "predominant pitch and the footprint" of the roof. Ex. 1003 at ¶ 65.

Pet., 34.

## Pershing-789

**[0013]** In another embodiment, the roof estimate software program and image file database are both stored on one or more a remote computers and accessed by the roof company via a wide area network. The roof company uses an assigned user name and password to log onto the website and accessed the computer. After logging on, the roof company logs then submits the new customer's address, other relevant job related information, and a request for a report from the roof estimation service. An estimation service associated with the website uses the address information to obtain the images of the roof sections on the building(s) and uses the roof estimation software program and calibration module to determine the relevant geometry, pitch angles, dimensions, and surface areas of the building's roof. The service then produces and sends a report to the roof company. The company then uses the report to prepare a final estimate that is then delivered to the potential customer.

EX1004, ¶13.

Pet., 34; POR, 10.

# The Petition's Proposed Combinations Rely on Bailey for Use of a "predominant pitch"

## Petition

**4. Claim 1d**

Kennedy teaches measuring the area dimension of a roof: "Referring now to FIG. 6, in order to ***measure an installation surface area***, such as a ***roof 640 area*** of house 600 in FIG. 6, user 507 ***positions measuring tool 1150 over an image of roof 600*** in alignment with a side of the image of roof 600." Ex. 1009 at [0106] (emphasis added). Kennedy further calculates the pitch of a roof as part of its estimation as discussed above.

As discussed above, a POSITA would have been motivated to use Bailey's teaching of calculating the predominant pitch for use as Kennedy's "pitch" value. As taught by Bailey, the pitch is used in conjunction with the footprint of a roof to compute area. Ex. 1010 at 134-36; Ex. 1003 at ¶¶ 141-42.

Pet., 66-67.

## Kennedy

**[0107]** The position of interactive measuring tool **1150** within viewport **1100** is adjustable by user interaction with tool **1150** via a mouse, keyboard, trackball or other input/output device. In addition, length of sides **1187** and **1177** are user adjustable. Referring now to FIG. **6**, in order to measure an installation surface area, such as a roof **640** area of house **600** in FIG. **6**, user **507** positions measuring tool **1150** over an image of roof **600** in alignment with a side of the image of roof **600**. User **507** adjusts the length of a tool side, for example side **1187**, of measuring tool **1150** to correspond in length to the length of a side of the image of roof **600**. Another side **1187** of measuring tool **1150** is aligned with a third side of the image of roof **600** and likewise adjusted in length to correspond to the length of corresponding side in the image.

EX1009, ¶107.

Pet., 66-67; POR, 10.

# Bailey Mentions "predominant slope" for Reporting Purposes

## Bailey

***Roof Section Identification Worksheet***

The three-page Roof Section Identification Worksheet (Figure 4) simplifies the task of collecting the inventory data for a roof section and ensures uniformity in reporting terminology. Most of the items are self-explanatory and the collection process uses standard checklists to identify the various system components. Data can be obtained from specifications, drawings, and visual inspection.

Descriptions of the collected inventory data follow:

EX1010, 12.

*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.

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

. . .

| 33 SLOPE (primary): 4 IN 12 |
|---|

EX1010, 14-15.

Bailey's predominant slope is simply part of standard data collection

POR, 14-15; PO Sur-reply, 4-6.

# Bailey Estimates Roofing Area Without Use of a "predominant slope"

## Bailey

***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).

EX1010, 22.

## Petition

Bailey would have also motivated a POSITA to use its teachings in Pershing-789's system at least because it is a technical report from the US Army Corps of Engineers which provides instructions for evaluating roofs. Ex. 1010 at 1. A POSITA would have been highly motivated to consider the teachings of such a well-respected guide. Ex. 1003 at ¶ 47.

Pet., 24.

## Bailey

**Appendix B: Field Measurement Method**

This estimation procedure is reprinted courtesy of the Asphalt Roofing Manufacturers Association.

**Estimating How Much Roofing is Required**

Various types of asphalt roofing materials and accessories are required to complete a typical roofing job, including shingles or roll roofing, underlayment, starter strips, drip edges, valley flashings and hip and ridge shingles. Before the job begins, estimates of the required quantities of each material, based on calculations derived from the dimensions of the roof, must be made.

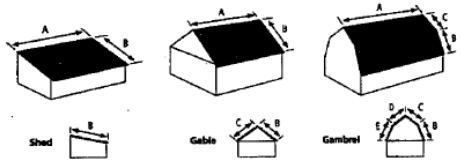
Fairly simple calculations are all that are required. Certain measurement and calculation methods also may be used that simplify the process even further. These are described in the following sections along with suggestions on how to take measurements without getting onto the roof.

**Estimating Area (Simple Roofs)**

Roofs come in a variety of shapes and styles but virtually every kind of roof is comprised of plane surfaces that can be subdivided into simple geometric shapes — squares, rectangles, trapezoids and triangles. Thus, roofing area calculations simplify to area calculations for these basic shapes.

The simplest type of roof is one without any projecting dormers or intersecting wings. Each of the illustrated roofs is comprised of one or more rectangles. (See Figure 13.) The area of the entire roof in each case is the sum of the areas of each rectangle.

Figure 13
Examples of simple roofs




For the shed roof which has only one rectangle, the area is found by simply multiplying the rake line by the eaves line, or B x A. The gable roof is comprised of two rectangular planes and its area is found by multiplying the sum of the rake lines by the eaves line,

chapter V
Estimating How Much Roofing is Required

1997 Edition
Residential Asphalt Roofing Manual
29

EX1010, 133.

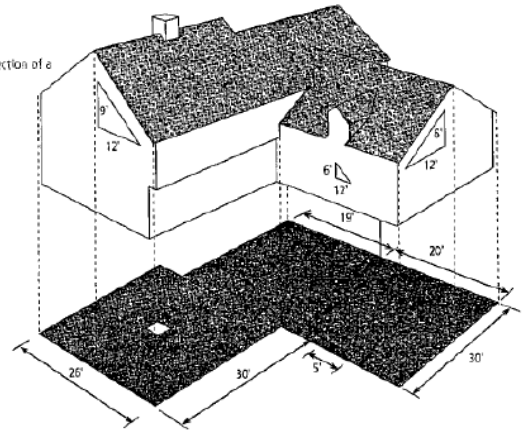
Pet., 24, 34; POR, 5-7, 15-16; PO Sur-reply, 5-6.

# Both Experts Agree that Bailey's Appendix B Does Not Use a Predominant Slope to Estimate Roofing Area

## PO's Expert Kestner

**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).

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*

EX2031, ¶¶32-33.

## Petitioner's Expert Cummings

Q Do you see a diagram on page 136?
A I do.
Q The title, if you will, is "Estimating Area Complex Roofs."
A Yes.

EX2032, 61:3-7.

Q Okay. So, in the calculations that Bailey uses to estimate the area of complex roofs, does he use the predominant slope in any way?
MR. HAGIZ: Objection to form.
A When you estimate the individual areas, like this, that's not a predominant slope calculation. That's a couple -- you're trying to find the slopes of all the various areas of the roof, and the square footage.
Q So in this example, he does not use predominant slope as part of his calculation?
A No, he does not.

EX2032, 64:3-14.

POR, 12-13; PO Sur-reply, 6.

# Both Experts Agree that Bailey's Appendix B Does Not Use a Predominant Slope to Estimate Roofing Area

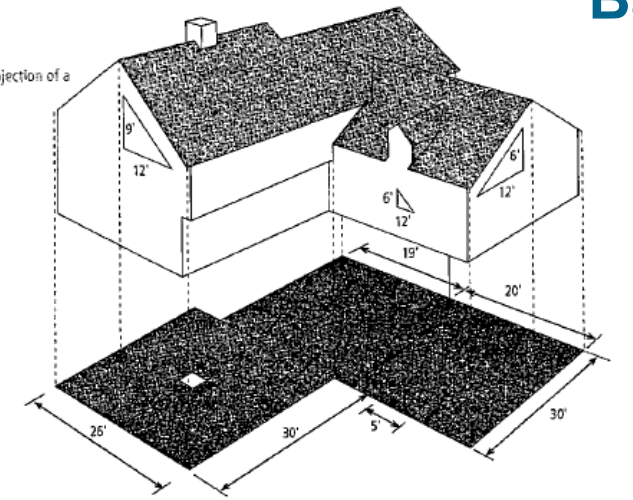
## Bailey's Area Estimation Process

EX1010, 136-137.

**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:

① **Calculation for Horizontal Area Under a 9" Slope Roof**

| | |
|---|---|
| (26 x 30) | = 780 |
| + (19 x 30) | = 570 |
| **Total** | = 1350 ft.² |

② **Calculation for Deduction of Differently Sloped Areas**

| | |
|---|---|
| 4 x 4 | = 16 ® |
| + (16 x 5) ÷ 2 | = 40 ® |
| **Total** | = 56 ft.² |

® Chimney Area
® Ell roof (triangular area)

③ **Calculation for Net Projected Area of Main Roof**

1,350 ft.² – 56 ft.² = 1,294 ft.²

④ **Calculation for Horizontal Area Under 6" Slope Roof**

| | |
|---|---|
| 20 x 30 | = 600 |
| + (16 x 5) ÷ 2 | = 40 |
| **Total** | = 640 ft.² |

### © Duplications

Portions of higher roof surfaces often project over roof surfaces below them but the horizontal projections do not show the overlap. Such duplicated areas should be added to the total horizontal area. Thus, one final correction must be made to account for these overlapped or duplicated areas before the total projected horizontal area is obtained.

In the example, there is an overlap: ① on the 6" slope roof where the dormer eaves overhang the ell roof; ② on the 9" slope roof where the main roof eaves overhang the ell section; and ③ where the main roof eaves overhang the smaller section of the main roof in the rear of the building. In each case, if the eaves extend 4" beyond the structure, the duplication calculations are:

① Two eaves overhangs:
2(5 x ⅓) = 3⅓ ft.²

② Two eaves overhangs:
2(7 x ⅓) = 4⅔ ft.²

③ Overhang covers only half of the 19' wide section:
9.5 x ⅓ = 3 1/16 ft.²

Item ① should be added to the area of the 6" slope roof and items ② and ③ to the 9" slope roof. Thus, for the 6" slope roof, the adjusted total is 640 + 3 = 643 ft.² and for the 9" slope roof, 1,294 + 8 = 1,302 ft.² (fractions are rounded off to the nearest foot).

### Ⓓ Conversion to Actual Area

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.)

① For the *9" slope* roof:
1,302 ft.² x 1.250 = 1,627.5 ft.²

② For the *6" slope* roof:
643 ft.² x 1.118 = 718.8 ft.²

After the horizontal areas have been converted to actual areas, the results can be added to obtain the total area of roof to be covered:

1,628 ft.² + 719 ft.² = 2,347 ft.²

**Table 3: Area/Rake Conversion***

| Slope (inches per foot) | Area/Rake Factor |
|---|---|
| 4 | 1.054 |
| 5 | 1.083 |
| 6 | 1.118 |
| 7 | 1.157 |
| 8 | 1.202 |
| 9 | 1.250 |
| 10 | 1.302 |
| 11 | 1.356 |
| 12 | 1.414 |

*To use the table, simply multiply the projected horizontal area by the conversion factor for the appropriate roof slope. The result is the actual area of the roof.

POR, 12-14; PO Sur-reply, 6.

# Petitioner's Motivation to Combine is Conclusory and Unrelated to its Proposed Combination

## Petitioner's Expert Cummings

**A. Motivation To Combine Pershing-789 and Bailey**

43. A POSITA would have been motivated to combine the teachings of Pershing-789 and Bailey. As discussed in more detail below, Pershing-789's teachings broadly disclose calculating the pitch of a roof: "It should be understood that the system and method described herein may be used to any individual or company that would find the calculation of the size, geometry, ***pitch*** and orientation of the roof of a building from aerial images of the building useful." Ex. 1004 at [0016] (emphasis added). A POSITA would understand that this broad reference to a pitch calculation would include pitch weighted averages typically used in estimation. Using an average pitch value for a roof is useful because it simplifies area calculations. A POSITA would understand that using a weighted average that gives greater weight to roof facets with larger surface area is desirable because it enhances accuracy in the area estimation process. Accordingly, a POSITA considering Pershing-789 would be motivated to use a weighted average to compute pitch.

EX1003, ¶43.

Neither Petitioner nor its expert explain how use of Bailey's predominant slope would simplify calculations or increase accuracy compared with Bailey's already-disclosed estimation procedure in Appendix B.

## Petitioner's Reply

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.*,

Pet. Reply, 7-8.

Pet., 20-21; Pet. Reply, 7-8; POR, 44-45; PO Sur-reply, 7-8.

# Agenda

- The ’538 Patent and Level of Ordinary Skill in the Art
- **The “predominant pitch” Limitations**
  - Independent Claims 1, 13, and 14
  - **Dependent Claims 11 and 18**
- Independent Claims 1, 13, and 14: The “footprint of the roof” Limitations
- The Board Should Accord Little to No Weight to Mr. Cummings’s Testimony

# Dependent Claims 11 and 18

**10**. 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.

**11**. 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.

EX1001, Claims 10, 11.

**18**. 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.

EX1001, Claim 18.

POR, 19-20.

# The Petition Contends that Bailey's Predominant Slope is a Weighted Average Pitch Value

## Petition

As discussed with respect to claim 1, below, Bailey expressly teaches finding the "predominant slope [*i.e.*, pitch]"—which Mr. Cummings explains is a weighted average of roof pitches. Bailey teaches calculating the

Pet., 21.

## Petition

As confirmed by Mr. Cummings, 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 discussed with respect to claim 10. Ex. 1003 at ¶

Pet., 51.

## Petitioner's Expert Cummings

44. As discussed with respect to claim 1, below, Bailey expressly teaches finding the "predominant slope [*i.e.*, pitch]"—which is a weighted average of roof pitches. Bailey teaches calculating the predominant slope of

EX1003, ¶44.

## Petitioner's Expert Cummings

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 discussed with respect to claim 10. This is because Bailey teaches using its estimates

EX1003, ¶96.

Pet., 21, 51; POR, 22; PO Sur-reply, 12.

# Petitioner and its Expert Concede that Bailey Does Not Describe How its Predominant Slope is Determined

## Petitioner's Reply

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

Pet. Reply, 14.

(Discussing Bailey)

## Petitioner's Expert Cummings

Q And do you have the understanding of how he determined the primary slope?

MR. HAGIZ: Objection to form.

A He talks about a predominant pitch and taking -- he really doesn't give you an exact formula or anything of that nature on how to calculate it. Predominant pitch, during this frame and during my time frame, was a very common approach. But you basically -- I'm getting off track. To answer, no, he does not say it.

EX2032, 54:17-55:4.

Pet. Reply, 14; POR, 22; PO Sur-reply, 12.

# A POSITA Would Not Have Understood Bailey's Predominant Slope as a Weighted Average

## PO's Expert Kestner

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.

EX2031, ¶59.

## Bailey's Cited "Residential Asphalt Roofing Manual" (No Definition of Predominant Slope)

**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.

EX2031, ¶60 (citing EX2035, 99).

POR, 24-28; PO Sur-reply, 12-13.

# A POSITA Would Not Have Understood Bailey's Predominant Slope as a Weighted Average

A POSITA would have understood Bailey's predominant slope to simply mean the single pitch that covers the majority of the area of the roof (or roof section)

## PO's Expert Kestner

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 (RSMeans Dictionary), 404, 504.

EX2031, ¶67.

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.

EX2031, ¶68.

POR, 24-28; PO Sur-reply, 12-13.

# Mr. Cummings Provides No Evidence that it was Well Known to Use a Weighted Average for Estimating Roofing Area

## Petitioner's Expert Cummings

> 46. In addition, 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***. Indeed, there are only a finite number of ways to measure

EX1003, ¶46.

"This court's opinions have repeatedly recognized that conclusory expert testimony is inadequate to support an obviousness determination…"

*TQ Delta, LLC v. Cisco Systems, Inc.*, 942 F.3d 1352, 1359 (Fed. Cir. 2019).

POR, 45; PO Sur-reply, 13-14.

# Bailey Already Teaches an Accurate Procedure for Calculating Roofing Area Without Calculating an Average of Pitch Values or Pitch Factors

## PO's Expert Kestner

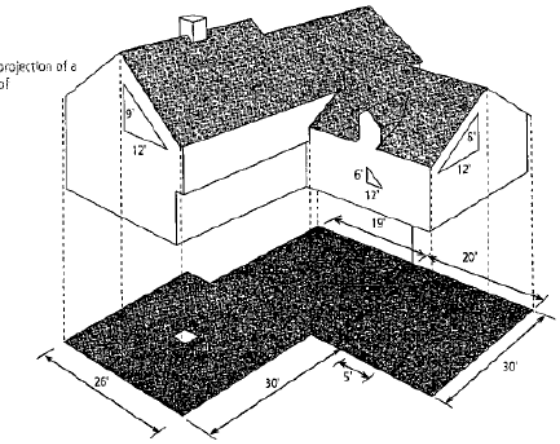
70. Further, as Bailey discloses, a fairly accurate measurement of roofing area can be performed without calculating an average of pitches or pitch values; instead, areas for different roof sections can be estimated and simply added together at the end. *See* EX1010, 136-37. This, in fact, is the method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

EX2031, ¶70.

**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).

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*

EX2031, ¶¶32-33.

POR, 12-13, 28; PO Sur-reply, 14-15.

# Claim 18: Bailey's Area/Rake Conversion Table is Used to Calculate Roofing Area—Not a "predominant pitch"

## Petition

**H. Claim 18**

Bailey also expressly teaches using the same "pitch factors" shown in Figure 7 of the '538 patent to calculate area (as shown below). Ex. 1010 at 137. 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." *See also* claims 10, 11; Ex. 1003 at ¶ 128.

Pet., 60.

## Bailey

**D Conversion to Actual Area**

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.)

① For the *9" slope* roof:
1,302 ft.² x 1.250 = 1,627.5 ft.²

② For the *6" slope* roof:
643 ft.² x 1.118 = 718.8 ft.²

After the horizontal areas have been converted to actual areas, the results can be added to obtain the total area of roof to be covered:

1,628 ft.² + 719 ft.² = 2,347 ft.²

**Table 3: Area/Rake Conversion***

| Slope (inches per foot) | Area/Rake Factor |
|---|---|
| 4 | 1.054 |
| 5 | 1.083 |
| 6 | 1.118 |
| 7 | 1.157 |
| 8 | 1.202 |
| 9 | 1.250 |
| 10 | 1.302 |
| 11 | 1.356 |
| 12 | 1.414 |

*To use the table, simply multiply the projected horizontal area by the conversion factor for the appropriate roof slope. The result is the actual area of the roof.

EX1010, 137.

Pet., 60; POR, 29-31; PO Sur-reply, 16-17.

# Claim 18: Bailey's Area/Rake Conversion Table is Used to Calculate Roofing Area—Not a "predominant pitch"

## Petitioner's Expert Cummings

Q And so, this table in Bailey, in general, doesn't disclose that this table is used to calculate the pitch, that's, essentially, inherent in the figure -- or in the table?

MR. HAGIZ: Objection to form.

A The pitch has to be -- this table doesn't determine pitch. Once you determine the pitch in the field, or off the drawings or whatever, then you can apply this factor to wherever the pitch had been determined.

EX2032, 66:16-67:3.

## Bailey

**D Conversion to Actual Area**

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.)

① For the *9" slope* roof:
1,302 ft.² x 1.250 = 1,627.5 ft.²

② For the *6" slope* roof:
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After the horizontal areas have been converted to actual areas, the results can be added to obtain the total area of roof to be covered:

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**Table 3: Area/Rake Conversion***

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| 7 | 1.157 |
| 8 | 1.202 |
| 9 | 1.250 |
| 10 | 1.302 |
| 11 | 1.356 |
| 12 | 1.414 |

*To use the table, simply multiply the projected horizontal area by the conversion factor for the appropriate roof slope. The result is the actual area of the roof.

EX1010, 137.

POR, 29-31; PO Sur-reply, 16-17.

# Agenda

- The ’538 Patent and Level of Ordinary Skill in the Art
- The “predominant pitch” Limitations
  - Independent Claims 1, 13, and 14
  - Dependent Claims 11 and 18
- **Independent Claims 1, 13, and 14: The “footprint of the roof” Limitations**
- The Board Should Accord Little to No Weight to Mr. Cummings’s Testimony

# The “footprint of the roof” Limitations

1. 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: identify a geographic location of a roof; determine a footprint and predominant pitch of the roof by analyzing one or more image showing the roof; determine an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof; 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.

EX1001, Claim 1.

POR, 32.

# The Petition's Pershing-789 Contentions Conflate Footprint and Surface Area

## Petition

Pershing-789 teaches "determine[ing] a footprint" of the roof. The '538 patent teaches that the "footprint may provide a two-dimensional boundary and/or outline of the roof." Ex. 1001 at 12:8-9. Thus, the "footprint" of the roof includes at least its area. Pershing-789 teaches determining the claimed "***footprint***" of the roof by drawing two-dimensional boundaries/outlines of roof sections, *e.g.*, to compute area. This is shown, for example, in Figure 5E:

Pet., 28.

Ex. 1004 at Fig. 5E (annotated). Pershing-789 explains that, "FIG. 5E is an illustration of the fifth page 107 of the report showing the ***square footage of each roof section*** along with the total square foot ***area*** value." *Id.* at [0028] (emphasis added). A closeup of Fig. 5E shows the area of different roof

Pet., 29.

A POSITA would have understood that a roof's footprint and surface area are not the same.

## PO's Expert Kestner

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.

EX2031, ¶44.

Pet., 28-29; POR, 32-36; PO Sur-reply, 17-21.

# The Petition's Pershing-789 Contentions Conflate Footprint and Surface Area

Figure 5E of Pershing-789 illustrates the *surface area*—not the footprint—of the roof

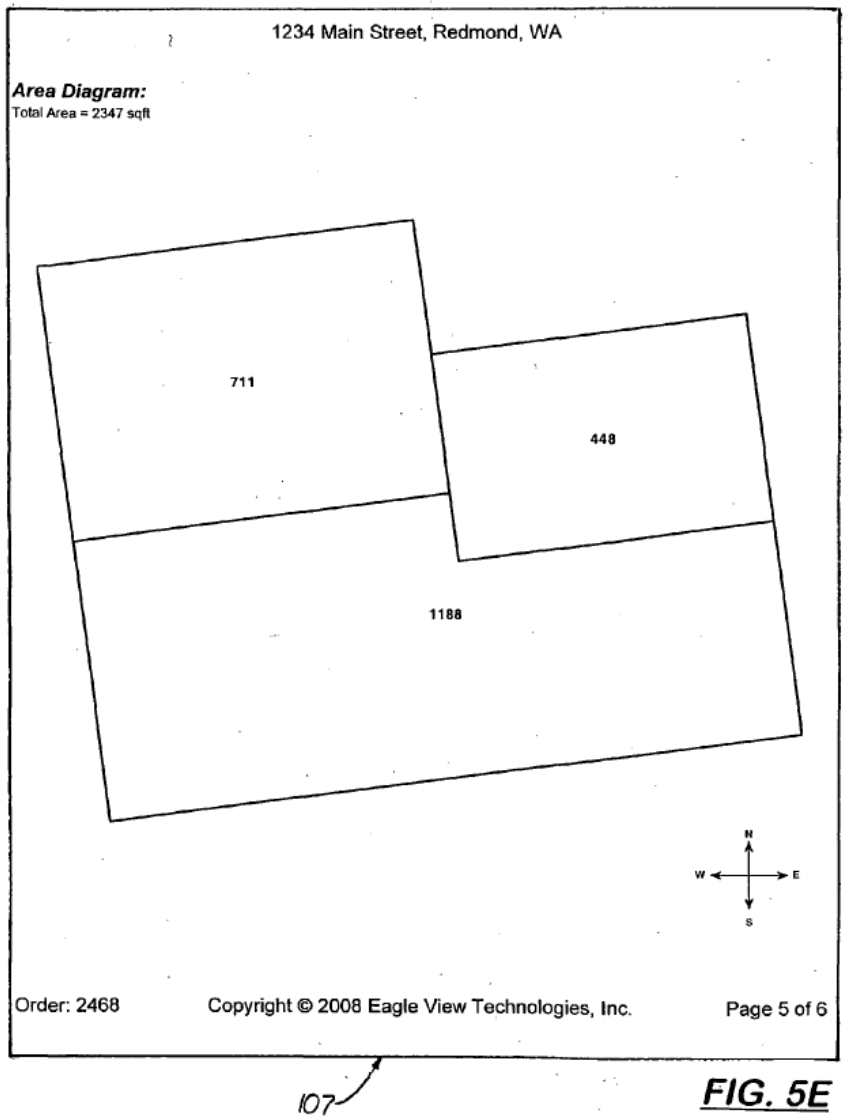
## Pershing-789

FIG. **5**E is an illustration of the fifth page **107** of the report showing the square footage of each roof section along with the total square foot area value. FIG. **5**F is an illustration of a

EX1004, ¶28.

tion service. An estimation service associated with the web-site uses the address information to obtain the images of the roof sections on the building(s) and uses the roof estimation software program and calibration module to determine the relevant geometry, pitch angles, dimensions, and surface areas of the building's roof. The service then produces and sends a report to the roof company. The company then uses

EX1004, ¶13.




EX1004, FIG. 5E.

Pet., 27-30; POR, 32-36; PO Sur-reply, 17-21.

# The Board Should Ignore Petitioner's Revised Reply Arguments

No explanation of using "outline drawing of the roof" for "calculating an estimate of its area"

## Petition

Pershing-789 teaches "determine[ing] a footprint" of the roof. The '538 patent teaches that the "footprint may provide a two-dimensional boundary and/or outline of the roof." Ex. 1001 at 12:8-9. Thus, the "footprint" of the roof includes at least its area. Pershing-789 teaches determining the claimed "***footprint***" of the roof by drawing two-dimensional boundaries/outlines of roof sections, *e.g.*, to compute area. This is shown, for example, in Figure 5E:

Pet., 28.

**4. Claim 1d determine an estimated roofing area of the roof based on the predominant pitch and the footprint of the roof;**

As discussed above, Pershing-789 uses a "footprint" of the roof and its pitch to calculate an estimate of its area. Ex. 1004 at [0013]-[0015], [0028].

Pet., 34.

## Petitioner's Reply

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).[4] Figs. 5C and 5D of Pershing-789 similarly show the footprint

Pet. Reply, 20.

Pet. Reply, 17-21; PO Sur-reply, 17-21.

# The Petition's Kennedy Contentions Conflate Footprint and Surface Area

## Petition

Kennedy expressly discloses a "sizing tool" that is superimposed on an aerial image to determine "surface dimensions" of a roof:

> In one embodiment of the invention, a graphical user interface (best illustrated in FIGS. 8-9) cooperates with sizing subsystem 500 of system 100 to implement a sizing tool enabling user 107 to determine surface dimensions and pitch of a surface, for example a roof 191 of a house appearing in the retrieved image 153. Thus there is no need to physically visit the installation site to make measurements and perform sizing calculations.

Id. at [0058]; *see also id.* at [0110] ("***To size surface 1215 user 507 superimposes sizing tool***, in this example tool 1117 (illustrated in Fig. 11) of at least a portion of image 1215…in some embodiments, information defining an orientation of shape 1215 with respect to a reference axis 1211 is generated by comparing orientation of adjusted tool 1107 to reference axis 1211.") (emphasis added). Kennedy discloses "***generating length and width measurements*** for a generally rectangular planar installation surface such as a side of a roof." *Id.* at [0082] (emphasis added); *see also* [0109], Fig. 12.

Pet., 64-65.

A POSITA would have understood Kennedy's teachings refer to the surface area and not the footprint of the roof.

## PO's Expert Kestner

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.

EX2031, ¶49.

Pet., 64-65; POR, 37-38; PO Sur-reply, 17-21.

# Agenda

- The ’538 Patent and Level of Ordinary Skill in the Art
- The “predominant pitch” Limitations
  - Independent Claims 1, 13, and 14
  - Dependent Claims 11 and 18
- Independent Claims 1, 13, and 14: The “footprint of the roof” Limitations
- **The Board Should Accord Little to No Weight to Mr. Cummings’s Testimony**

# A POSITA Necessarily Would Have Experience in the Area of Roofing Measurement

## Patent Owner Response

Given that the focus of the '538 patent is roofing measurement using aerial imagery, a POSITA would necessarily need to have experience in the area of roofing measurement and the use of aerial imagery used in roofing estimation. EX2031, ¶28.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 estimation. *Id.*

POR, 4.

## PO's Expert Kestner

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,

EX2031, ¶28.

POR, 4; PO Sur-reply, 22.

# Mr. Cummings Has Not Regularly Prepared Roof Estimates Since the 1980s

## Petitioner's Expert Cummings

Q And then after 1988, did you do any work in the roof estimation area?

A I did not. Let me back up for a second.

I have prepared, over the course, from basically 1994, I've been on projects where I've acted as an expert in providing cost estimates in litigation cases.

EX2032, 22:8-15.

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.

Q And did any of those involve aerial imagery?

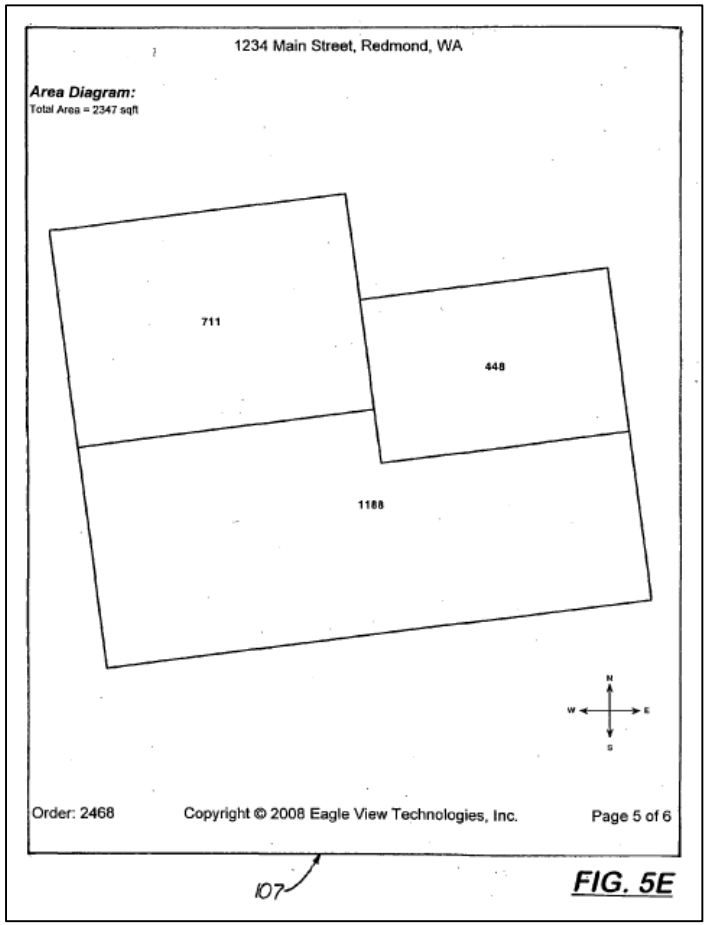
A They did not.

EX2032, 78:18-79:4.

POR, 39-43; PO Sur-reply, 23.

# Mr. Cummings was Confused by Basic Roofing Terminology, Repeatedly Conflating Surface Area and Footprint

## Pershing-789




EX1004, FIG. 5E.

## Petitioner's Expert Cummings

Q Okay. And what is the area you're referring to?

A The area, according to 5E, is the two dimensional -- based on this, what's supposed to be an aerial image, it's the horizontal area of the roof.

Q Okay. So is it your view that the areas indicated in that figure are areas of the horizontal projection of the roof?

A That's how I'm reading it.

EX2032, 69:5-12.

## Petitioner's Reply

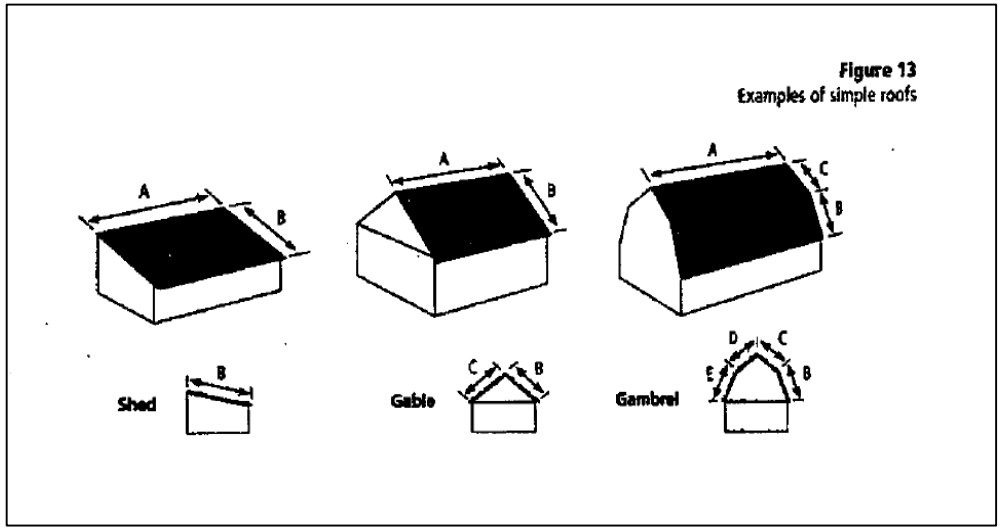
of a roof—*i.e.*, the two-dimensional boundary or outline of the roof. Figure 5E of Pershing-789 illustrates *both* the footprint of the roof (the outline drawing of the roof) *and* the surface area of the roof (indicated by the numeric annotations).[4] Figs. 5C and 5D of Pershing-789 similarly show the footprint

Reply, 20.

POR, 33-36; PO Sur-reply, 24-25.

# Mr. Cummings was Confused by Basic Roofing Terminology, Repeatedly Conflating Surface Area and Footprint

## Bailey




EX1010, 133.

## PO's Expert Kestner

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.

EX2031, ¶40.

## Petitioner's Expert Cummings

Q Okay. So then, switching gears, staying with that same figure, if we're now looking at the area of the footprint of the roof --

A Yes.

Q -- is that a calculation you can do in your head?

MR. HAGIZ: Objection to form.

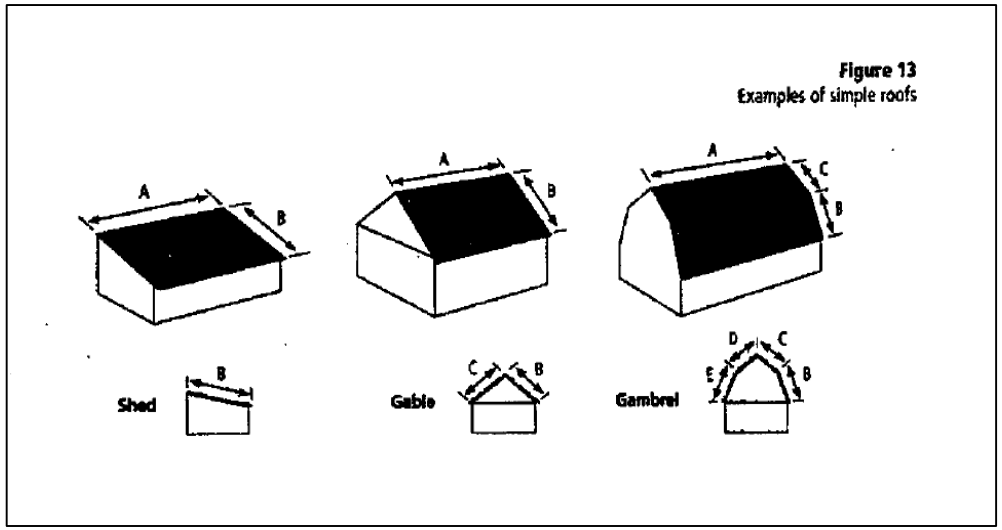
A If it is a simple -- if it's a simple one like that. Again, it's A times B. If it's a rectangular house.

EX2032, 74:13-75:1.

POR, 46; PO Sur-reply, 23-24.

# Mr. Cummings Could Not Calculate the Footprint of a Simple Roof

## Bailey




EX1010, 133.

## Petitioner's Expert Cummings

Q And now, what I'm looking for is how you would determine the footprint of that roof, what is the area of the footprint of that roof?

Is that going to be A times B or something different?

MR. HAGIZ: Objection to form.

A It would be -- there's -- there's probably a way. I don't -- off the top of my head, I've never calculated a roof that direction. So there would have to be a way to get to, basically, forming a triangle. I don't -- I don't know that -- off the top of my head, I don't know how you'd calculate that.

EX2032, 75:6-18.

POR, 46; PO Sur-reply, 23-24.

# Mr. Cummings's Testimony for Key Claim Limitations is Conclusory and Unsupported

## Petitioner's Expert Cummings

building useful." Ex. 1004 at [0016] (emphasis added). A POSITA would understand that this broad reference to a pitch calculation would include pitch weighted averages typically used in estimation. Using an average pitch value for a roof is useful because it simplifies area calculations. A POSITA would understand that using a weighted average that gives greater weight to roof facets with larger surface area is desirable because it enhances accuracy in the area estimation process. Accordingly, a POSITA considering Pershing-789 would be motivated to use a weighted average to compute pitch.

EX1003, ¶43.

46. In addition, 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*. Indeed, there are only a finite number of ways to measure roof pitch, including calculating precise pitch values for every roof facet or creating a single pitch estimate for an entire roof (or roof section). A POSITA

EX1003, ¶46.

## Patent Owner Response

Petitioner simply has not shown that a POSITA would have considered the term "predominant pitch"/"predominant slope," without more, to refer to a weighted average of pitch values of a roof. EX2031, ¶¶59-70.

POR, 28.

not have a meaning known in the art). Petitioner cannot rely solely on conclusory unsupported testimony to supply a claim limitation missing from the prior art.

POR, 45.

## PO's Expert Kestner

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.

EX2031, ¶59; *see also id.*, ¶¶60-66.

POR, 22-28, 45; PO Sur-reply, 13-14.

# Thank You