

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NEARMAP US, INC.,
Petitioner

v.

EAGLE VIEW TECHNOLOGIES, INC.,
Patent Owner

IPR2022-00734
U.S. Patent 9,135,737

**DECLARATION OF CHANDRAJIT BAJAJ, PH.D.
IN SUPPORT OF PATENT OWNER'S RESPONSE**

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I, Chandrajit Bajaj, do hereby declare as follows:

I. INTRODUCTION

1. I am making this declaration at the request of patent owner Eagle View Technologies, Inc. (“Eagle View” or “Patent Owner”) in the pending *Inter Partes* Review of U.S. Patent No. 9,135,737 (“the ’737 Patent”) filed by Nearmap US, Inc. (“Nearmap” or “Petitioner”).

2. I am being compensated for my work in this matter at my standard hourly rate. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the specifics of my testimony.

3. I have been asked to provide my opinions regarding whether claims 1, 6, 7, 9, 10, 16, 17, 25, 26, and 34 (“the challenged claims”) of the ’737 Patent are patentable as they would have been non-obvious to a person having ordinary skill in the art (“POSITA”) at the time of the invention, in light of the prior art. It is my opinion that the challenged claims would have been non-obvious to a POSITA.

4. In the preparation of this declaration, I have studied:

- a. The ’737 Patent, EX1001;
- b. File History for the ’737 Patent, EX1002;
- c. Declaration of Dr. David A. Forsyth in IPR2022-00734, EX1003;

d. Heller et al., *The Site-Model Construction Component of the RADIUS Testbed System*, Proceedings: ARPA Image Understanding Workshop (1997) (“Heller”), EX1004;

e. Quam et al., *The Radius Common Development Environment*, RADIUS: Image Understanding for Imagery Intelligence, O. Firschein and T. Strat, eds. (1997) (“Quam”), EX1005;

f. U.S. Patent Pub. No. 2006/0235611 to Deaton et al. (“Deaton”), EX1006;

g. *Xactware Solutions, Inc. v. Eagle View Technologies, Inc.*, IPR2016-00592, Paper 50 (PTAB August 25, 2017) (Final Written Decision) (“’592 IPR Final Written Decision”), EX1010;

h. *Xactware Solutions, Inc. v. Eagle View Technologies, Inc.*, IPR2016-00592, Paper 1 (PTAB August 25, 2017) (Petition), EX1011;

i. *Xactware Solutions, Inc. v. Eagle View Technologies, Inc.*, IPR2016-00592, Paper 32 (PTAB Nov. 16, 2016) (Patent Owner's Response (redacted)), EX1012;

j. *Xactware Solutions, Inc. v. Eagle View Technologies, Inc.*, Nos. 2018-1053, 2018-1055, 2018-1056, 2018-1110 (Fed. Cir. 2019) (non-precedential), EX1016;

- k. Petition for *Inter Partes* Review in IPR2022-00734 (“Petition”);
- l. Transcript of Deposition of Dr. David A. Forsyth, Ph.D., January 24, 2023, EX2006;
- m. Reference Guide: Twister 10/15/2008 (EX2007 in IPR2016-00592) (filed under seal), EX2007;
- n. Comparison of claims 1 and 16 of the ’737 Patent (redline comparison), and comparison of claims 1 and 26 of the ’737 Patent (redline comparison), EX2016.
- o. Plaintiff’s Opening Markman Brief, *Eagle View Technologies Inc. et al. v. Nearmap US, Inc.*, No. 2:21-cv-00283-TS-DAO, ECF No. 245 (D. Utah Jan. 27, 2023) (Stewart), EX2010;
- p. Defendant’s Motion for Claim Construction, *Eagle View Technologies Inc. et al. v. Nearmap US, Inc.*, No. 2:21-cv-00283-TS-DAO, ECF No. 244 (D. Utah Jan. 27, 2023) (Stewart), EX2011;
- q. Reference Guide: For Measuring Technicians, 10/15/2008 (EX2030 in IPR2016-00592) (filed under seal) (Render House), EX2030; and
- r. Declaration of Dr. Chandrajit L. Bajaj in IPR2016-00592 (filed under seal), November 16, 2016, EX2031.

In forming the opinions expressed below, I have considered:

- i. the documents listed above;
- ii. the relevant legal standards, including the standard for obviousness, and any additional authoritative documents as cited in the body of this declaration; and
- iii. my own knowledge and experience based upon my work in the field of computer science as described below, as well as the following materials.

5. Unless otherwise noted, all emphasis in any quoted material has been added.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

6. My complete qualifications and professional experience are described in my *Curriculum Vitae*, a copy of which can be found in the attached Exhibit. EX2006. The following is a brief summary of my relevant qualifications and professional experience.

7. I am currently employed as a Professor of Computer Science at the University of Texas at Austin ("UT Austin"). I currently hold the Computational Applied Mathematics endowed Chair in Visualization. I am also the Director of the Computational Visualization Center at UT Austin, which has been funded by the National Institutes of Health, the National Science Foundation, the Department

of Energy, and the Department of Defense. The center personnel include fifteen researchers, scientists, post-graduate students, and staff.

8. I have a Bachelor of Technology degree in Electrical Engineering, which I obtained from the Indian Institute of Technology in Delhi (IITD) in 1980. I also have a Master of Science degree and a Doctorate in Computer Science from Cornell University in 1983 and 1984 respectively.

9. Prior to my employment at the University of Texas, I was an assistant professor, then associate professor, and finally professor of Computer Sciences at Purdue University (Purdue) from 1984 until I resigned in 1997 and transferred to UT Austin. During this time, I was also the Director of Image Analysis and Visualization Center at Purdue University. I was a visiting associate professor of Computer Science at Cornell University from 1990–1991. I have also been invited for collaborative visits by several academic institutions, and have presented numerous keynote presentations worldwide. I have been an editorial member of the SIAM Journal on Imaging Sciences, and the ACM Transactions on Graphics, and continue my editorial role for ACM Computing Surveys and the International Journal of Computational Geometry and Applications.

10. I have spent the better part of my career, both at Purdue and UT Austin, researching, designing, teaching and using computer systems to model,

simulate, and visualize natural and synthetic objects combining computational image and geometric processing. I am knowledgeable about and have much experience in both hardware and software, including algorithms, used for capturing, analyzing and displaying interactive imagery.

11. In the 1970s, while majoring in Electrical Engineering at Indian Institute of Technology with a minor in Computer Sciences, I was intimately involved in the design and fabrication of microprocessor-controlled circuits as well as the development of microprocessor controller software. In the 1980s, while at Cornell University, my past experiences led to research in computational geometry, image processing, and optimization. In the early 1990s, I created three-dimensional (3D) interactive and collaborative multimedia software environments which were fully navigable for multi-person computer gaming and simulation (e.g. “The GATI Client-Server Animation Toolkit” and “The VAIDAK Medical Image Model Reconstruction Toolkit”). In 1994, I co-authored a technical paper entitled “Shastra: Multimedia Collaborative Design Environment.” The need for increasing computer graphics display realism without sacrificing interactivity led me also to explore image processing and geometric modeling techniques such as segmentation and surface reconstruction from imaging scans, point clouds, and texture mapping with data compression, such as described in some exemplary

publications "Arbitrary Topology Shape Reconstruction from Planar Cross Sections", *Graphical Models and Image Processing*, 58(6):524-543 (1996); "Making 3D Textures Practical", *Proceedings of Pacific Graphics*, 259-268 (1999); "3D RGB Image Compression for Interactive Applications," *ACM Transactions on Graphics*, 20,1, 10-38 (2001); "Anisotropic Vector Diffusion in Image Smoothing", *Proceeding of the 9th IEEE International Conference on Image Processing*, 828-831 (2002); "Image Segmentation Using Gradient Vector Diffusion and Region Merging", *Proceedings of the 16th International Conference on Pattern Recognition*, 941-944 (2002); "A Fast and Adaptive Algorithm for Image Contrast Enhancement", *Proceedings of IEEE International Conference on Image Processing*, 1001-1004 (2004).

12. In the mid-2000s, I began to create spatially-realistic 3D graphical environments with a combination of different types of acquired and reconstructed imagery within which a user may explore, query, and learn. My publication titled "From Voxel Maps to Models" that appeared in an Oxford University Press book called "Imaging Life: Biological Systems from Atoms to Tissues", is an example of my research in computational imaging. Over the course of my career, I have participated in the design and use of several computer systems including handhelds, laptops, graphics workstations to PC/Linux clusters, as well as very

large memory supercomputers for capturing, modeling and displaying virtual and scientific phenomena. My experience with computer modeling and displaying computer graphics imagery encompasses many fields, such as interactive games, molecular, biomedical and industrial diagnostics, oil and gas exploration, geology, cosmology, and military industries.

13. During my time at UT Austin, I also designed and implemented scalable solutions for inverse problems in microscopy, spectroscopy, biomedical imaging; constructing spatially realistic and hierarchical 3D models; development of search/scoring engines for predicting energetically favorable multi-molecular and cellular complexes; and statistical analysis and interrogative visualization of neuronal form-function. Additionally, I have courtesy appointments with, and supervise M.S. and Ph.D. students from several UT departments, including, biomedical and electrical engineering, neurobiology, and mathematics. I currently serve on the editorial boards for the International Journal of Computational Geometry and Applications, and the ACM Computing Surveys. Much of my work involves issues relating to interactive image processing, 3D modeling, bio-informatics, computer graphics, and computational visualization. Examples of my publications, including peer-reviewed publications, are listed in my CV.

14. As set forth in my CV, I have authored approximately 170 peer-

reviewed journal articles, 34 book chapters (which were also peer reviewed), and 157 peer-reviewed conference publications.

15. I have written and edited four books, on topics ranging from image processing, geometric modeling and visualization techniques, to algebraic geometry and its applications. I have given 220 invited speaker and keynote presentations. I am a Fellow of the American Association for the Advancement of Science (AAAS), a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), a Fellow of the Society of Industrial and Applied Mathematics (SIAM), and also a Fellow of the Association of Computing Machinery (also known as ACM), which is the world's largest education and scientific computing society. The ACM Fellow is ACM's most prestigious member grade and recognizes the top 1% of ACM members for their outstanding accomplishments in computing and information technology and/or outstanding service to ACM and the larger computing community.

III. LEVEL OF ORDINARY SKILL IN THE ART

16. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the levels of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field;

and (4) the prior art solutions to those problems.

17. A person of ordinary skill in the art (“POSITA”) in the field of the ‘737 Patent, as of its earliest possible priority date of October 31, 2008, would have been someone with a bachelor’s degree or higher in computer science, computer engineering, computer vision or visualization, physics, or an equivalent educational background, or someone having at least 5 years of industry experience in software development.

18. I determined the level of skill of a person of ordinary skill in the art by reviewing the ‘737 Patent and considering the type of problems encountered in the art, such as image and geometry processing. Solutions to these problems involve algorithm design and software development. These topics are routinely covered in multiple undergraduate curriculum courses in computer science, computer vision, visualization, and computer engineering. Problem solving application expertise is gained through projects and courses and industrial experience in real-time computer vision, visualization, interactive computer graphics, image processing and pattern recognition, data analysis and visualization. In the particular case of the ‘737 Patent, the problem of generating highly detailed roof estimate reports based on features of a roof in multiple aerial images and line drawings representing those features of a roof and overlaid on the aerial images.

See, e.g., EX1001 at 6:28-59, 8:10-9:8, 12:7-14:35, and Figures 3A-3F, 5A-5D, and 6A-6C.

19. For purposes of this Declaration, in general, and unless otherwise noted, my statements and opinions, such as those regarding my experience and the understanding of a POSITA generally (and specifically related to the references I consulted herein), reflect the knowledge that existed in the field as of the priority date of the '737 Patent. Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with the level of a POSITA prior to the earliest possible priority date of the '737 Patent of October 31, 2008.

IV. RELEVANT LEGAL STANDARDS

20. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '737 Patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

21. I understand that prior art to the '737 Patent includes patents and printed publications in the relevant art that predate the priority date of the invention recited in the claims of the '737 Patent. For purposes of this Declaration, I am applying October 31, 2008 as the priority date of the '737 Patent.

22. I have been informed that a claimed invention is unpatentable under

35 U.S.C. § 103 if the differences between the invention 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 to which the subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter. I have been informed that is impermissible within the framework of determining whether a claim is obvious to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.

23. I have further been informed that obviousness concerns whether a POSITA not only could have made but would have been motivated to make the proposed combinations or modifications of prior art to arrive at the claimed invention. I have been informed by counsel that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to

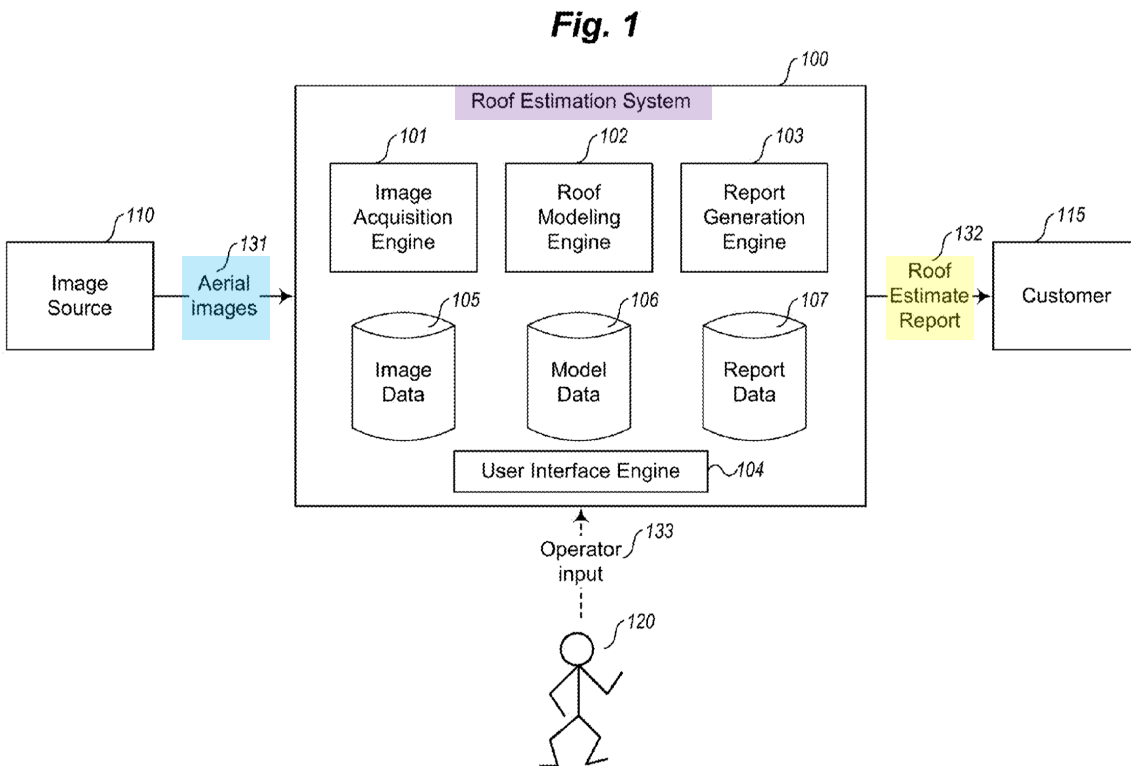
obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

24. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the patented invention, praise of the invention by those having ordinary skill in the art, skepticism of those having ordinary skill in the art at the time of invention, unexpected results of the invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, and copying of the alleged invention by others in the field. I understand that there must be a nexus—a connection—between any such secondary considerations and the claimed invention. I also understand that contemporaneous and independent invention by others is a secondary consideration tending to show obviousness.

V. OVERVIEW OF THE '737 PATENT**A. Summary of the '737 Patent**

25. The '737 Patent is titled "Concurrent Display Systems and Methods for Aerial Roof Estimation." EX1001, Title. The '737 Patent "relates to systems and methods for estimating construction projects, and more particularly, to such systems and methods for determining roof measurement information based on one or more aerial images of a roof a building." EX1001, 1:7-11. The '737 Patent provides embodiments that "include a roof estimation system that provides a user interface configured to facilitate roof model generation based on one or more aerial images of a building roof." EX1001, Abstract.

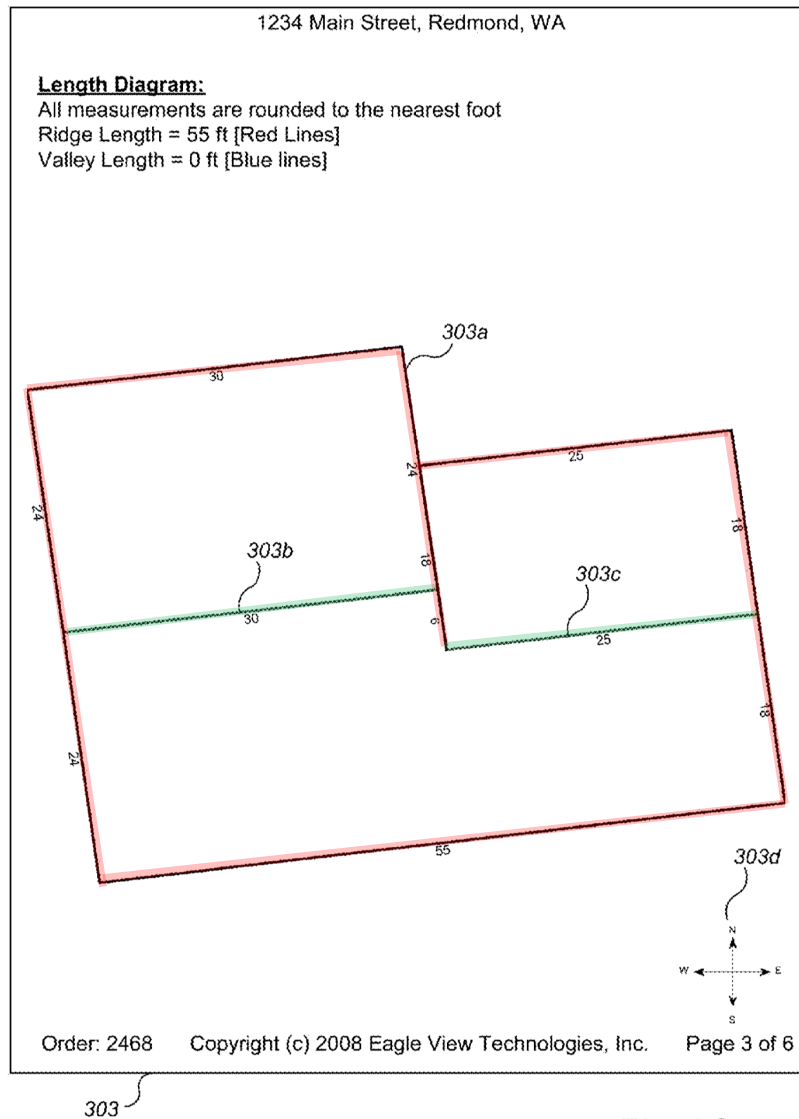
26. Figure 1 of the '737 Patent below provides an example embodiment of a roof estimation system (RES) 100 with which an operator 120 interacts to generate and output a roof estimate report 132. EX1001, 3:40-51. For instance, the '737 Patent explains that the RES 100 "generate[s] a roof estimate report 132 for a specified building, based on aerial images 131 of the building received from the image source 110." EX1001, 3:52-55.



EX1001, Fig. 1 (annotated)

27. The '737 Patent describes that the roof report 132 is generated for a specified building based on aerial images of the building. EX1001, 3:52-55. The '737 Patent explains that the roof report 132 is created based on a three-dimensional (3D) model and/or a two-dimensional (e.g., top-down roof plan) created by the roof modeling engine 102 of the RES 100. EX1001, 4:19-40. The generated roof report may include roof measurement information such as "one or more plan (top-down) views of the model, annotated with numerical values for the slope, area, and/or lengths of the edges of at least some of the plurality of planar

roof sections of the model of the roof.” EX1001, 6:31-34. In addition, the generated roof report may include “include information about total area of the roof, identification and measurement of ridges and/or valleys of the roof, and/or different elevation views rendered from the 3D model (top, side, front, etc[.]).” EX1001, 6:34-38. An example roof report is shown in Figure 3C below, which identifies a **line drawing** 303a of the roof structure, **ridge lines** 303b, 303c, and dimensions (in feet) of the different roof sections (e.g., 30 feet for **ridge line** 303b, and 25 feet for **ridge line** 303c). EX1001, 8:32-42.

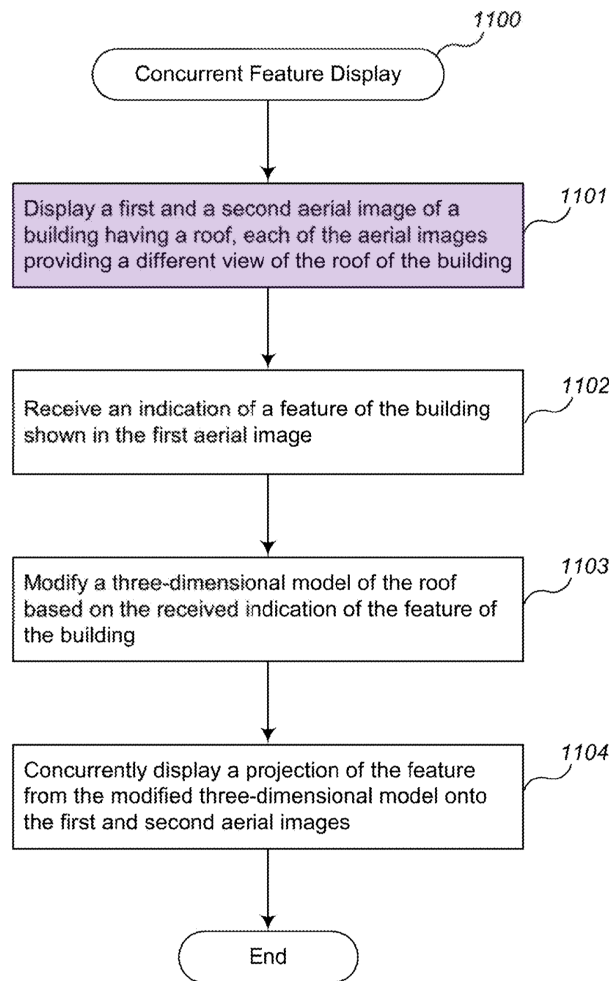
**Fig. 3C**

EX1001, Fig. 3C (annotated)

28. Exemplary embodiments of the '737 Patent thus provide useful advancements in a variety of roof estimation report contexts, whether it be for a roof contractor to repair or replace a roof, or to install solar energy panels, for example. EX1001, 1:28-37, 1:56-62. For example, the accuracy of the 3D model

that is created and in turn the resulting roof report that is generated are important considerations in evaluating the ultimate usefulness of a roof estimation procedure that relies on aerial images instead of in-person physical measurements of the roof.

29. To that end, the '737 Patent uses first and second aerial images of a building to construct a 3D model, through co-registration of the images onto a 3D reference grid. The '737 Patent includes displaying a first aerial image and a second aerial image of a roof during the process of generating a roof estimate report, as shown in Figure 11 below (step 1101). EX1001, 22:17-29, 22:39-44, Fig. 11.

**Fig. 11**

EX1001, Fig. 11 (annotated)

30. For example, as shown in Figure 4A below, five **images 402-406** of a **building roof 407** are shown on a user interface screen 400 next to a control panel 401 having user-selectable controls for various roof modeling tasks, such as setting reference points for the images, setting the vertical (Z) axis for the images, etc.

[illegible]

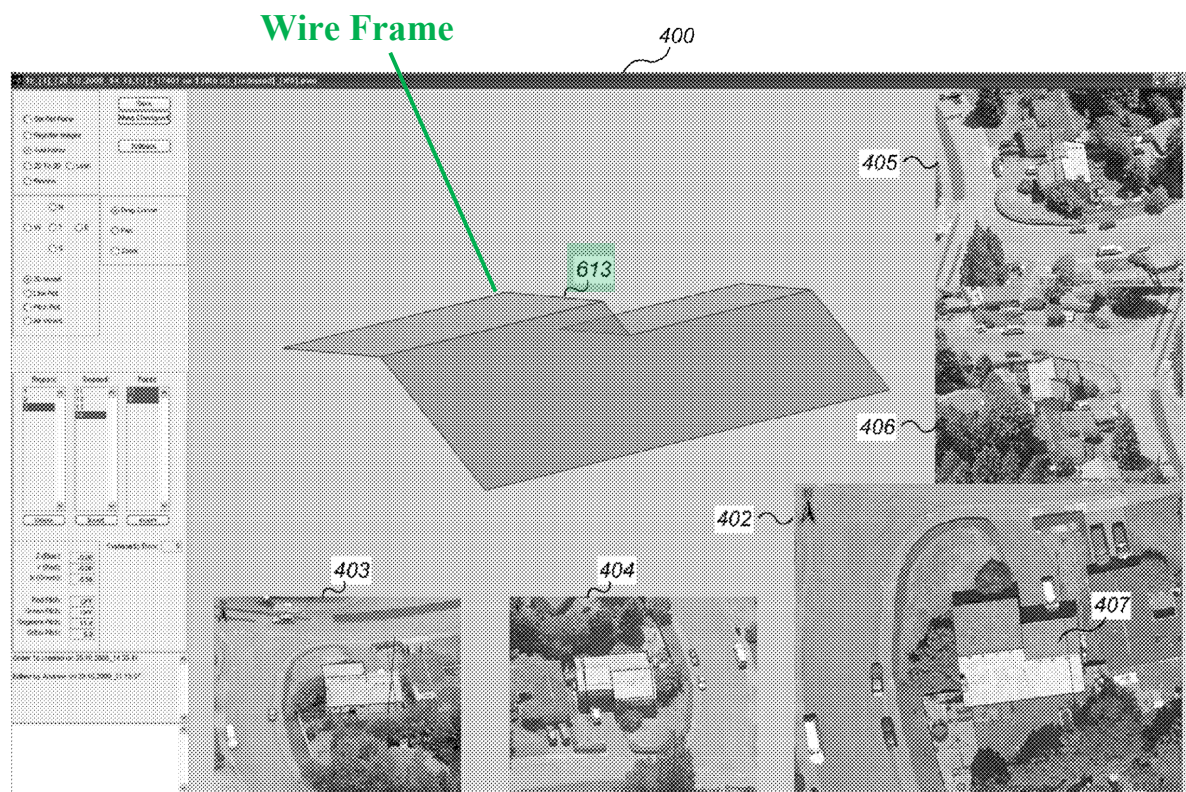
EX1001, Fig. 4A (annotated)

23

model of the building roof 407. EX1001, 14:51-52. In the example of Figure 6D,

the user interface 400 includes a shaded **wire frame 613** representation of the 3D model constructed as described above. In this view, the operator can review the **wire frame 613** in isolation from any images to determine whether the **wire frame 613** accurately represents the **building roof 407**. The **wire frame 613** is an interactive user interface component, in that it can be directly manipulated (e.g., moved, rotated, resized, etc.). In some embodiments, manipulating the **wire frame 613**, such as by changing its shape, results in corresponding changes in the underlying 3D model.

EX1001, 14:51-62.

**Fig. 6D**

EX1001, Fig. 6D (annotated)

32. One advantage of projecting the indicated features onto the first and second aerial images (step 1101 in Fig. 11) is that it provides to the user “feedback regarding the accuracy of the roof model, the image registration, etc.” EX1001, 3:28-33. For example, if a tree is blocking part of a roof in one view, it may not be possible to add certain features or verify the correctness of the model from that perspective. EX1001, 15:51-56. In another example, the alignment of the wire frame to the roof may be apparent in one image, but not apparent in another.

EX1001, 11:35-39, 19:46-57, 20:28-33.

33. With this in mind, the claimed invention permits “the operator [to] switch between various images of the building of the roof 407, making refinements to the 3D model by adjusting the wire frame in whichever image is more convenient and/or provides a more suitable perspective/view of the model.”

EX1001, 14:47-50; *see also* EX1001, 15:38-46. These changes are then propagated to the other view(s) of the roof, so that the user can continue to make changes or verify the accuracy of the model. For example, the '737 Patent explains with reference to step 1103 in Figure 11:

In step 1103, the *routine modifies a three-dimensional model of the roof based on the received indication of the feature of the building. Modifying the 3D model may include adding or updating the indicated feature to a wire frame model of the roof.* For example, if the indicated feature is a roof section corner point, the corner point will be added to the 3D model, along with the location (e.g., the X, Y, and Z position of the point) of the point. The location of the point is automatically determined based on a translation of the position of the point in the image to a point in the uniform reference grid associated with the image. If the indicated feature is a roof section edge, the edge will be added to the 3D model, such as by associating the edge with two points corresponding to the end points of the edge. Higher-level features can also be indicated. For example, a planar roof section may be indicated by “closing” a sequence of two or more connected line segments, to create a

closed polygon that represents the outline or perimeter of the planar roof section.

EX1001, 22:42-59.

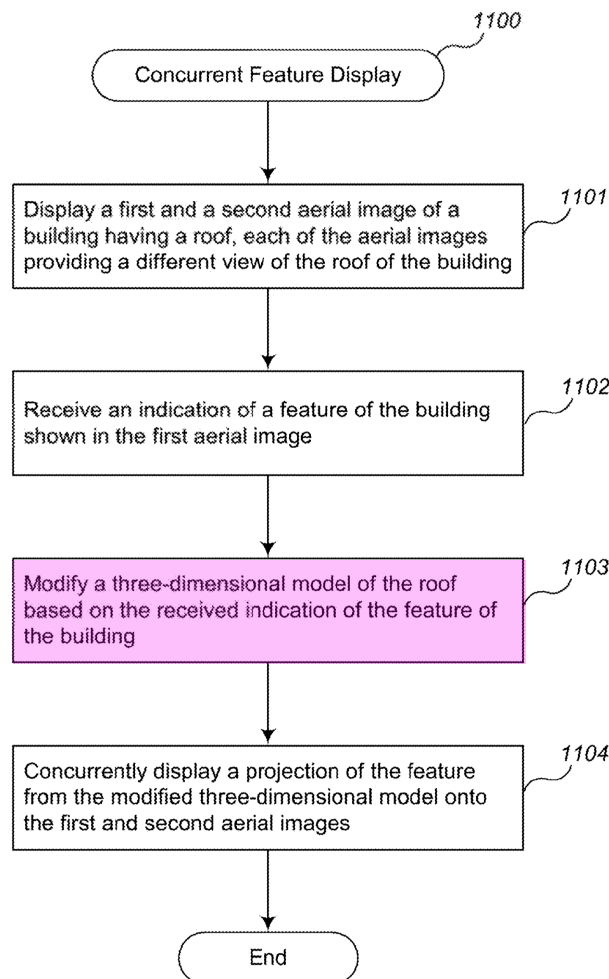


Fig. 11

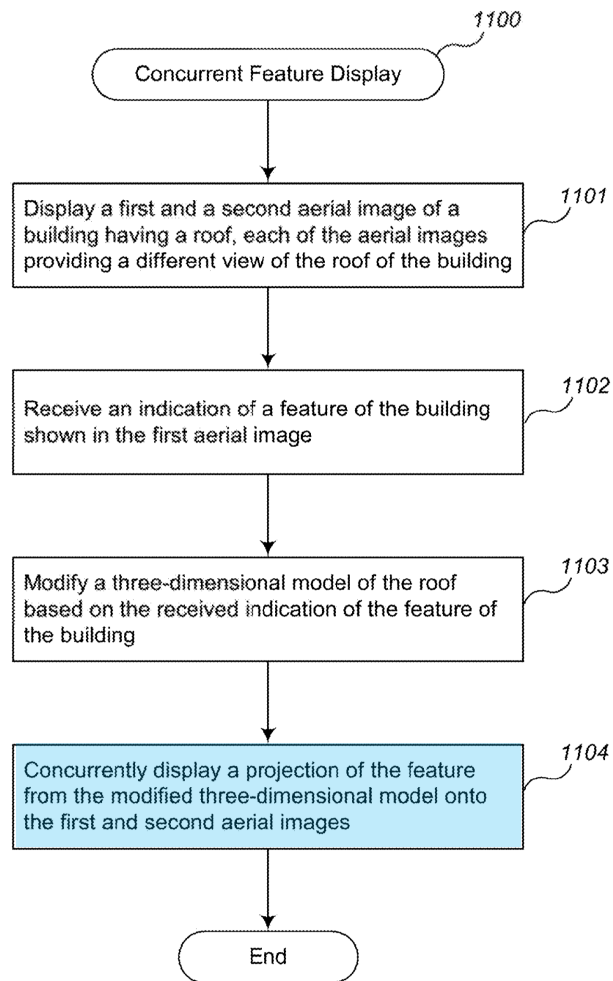
EX1001, Fig. 11 (annotated)

34. Further, the '737 Patent explains that the projection of the feature is displayed concurrently on the first and second aerial images, as explained with

respect to step 1104 of Figure 11:

In step 1104, *the routine concurrently displays a projection of the feature from the modified three-dimensional model onto the first and second aerial images*. In one embodiment, displaying the feature from the modified three-dimensional model includes projecting the three-dimensional model onto both the first and second aerial images. For example, if the first image (for which the indicated feature was received) provides a west view of the building, and the second image provides an east view of the building, the routine will concurrently display a projection of the indicated feature from the 3D model onto both the first and second images. The projection of the indicated feature into the second image is based at least in part on a translation from the position of the feature in the reference grid to a position in the second image. In addition, *the concurrent display onto two or more images occurs at substantially the same time* (within a short time interval, at times that are substantially coincident) as the indication of the feature of the building in step 1102, giving the operator the illusion that as they are indicating a feature in the first image, the feature is being simultaneously projected into the second image.

EX1001, 22:60-23:13.

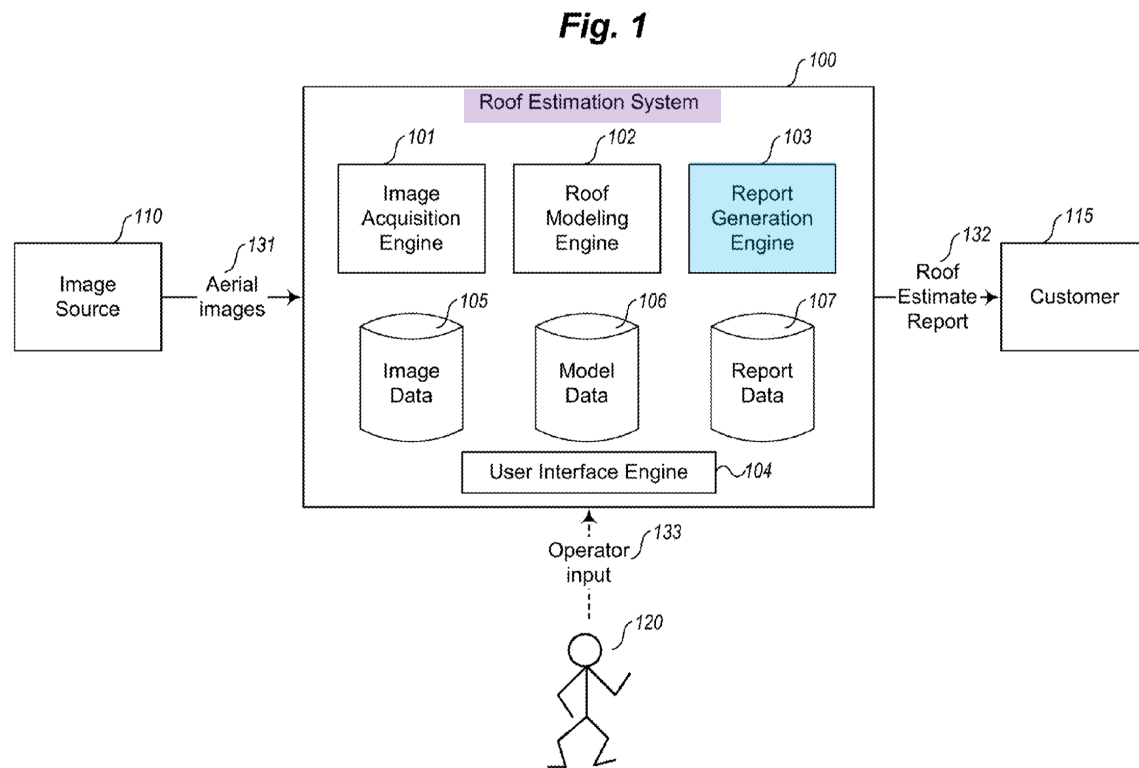
**Fig. 11**

EX1001, Fig. 11 (annotated)

35. The '737 Patent explains that the roof estimate report system (e.g., RES 100 in Figure 1 below) includes a report generation engine (e.g., report

generation engine in Figure 1)¹ that generates and outputs a roof estimate report.

EX1001, 3:40-46, 6:28-39, 1:55-64.



EX1001, Fig. 1 (annotated)

36. The '737 Patent explains that:

The report generation engine 103 generates a final roof estimate report based

¹ Figure 8 of the '737 Patent illustrates an exemplary embodiment of a computing system 800 that includes a roof estimation system 810 having, in part, a roof modeling engine 812 and a report generation engine 813. EX1001, 15:57-16:36, Fig. 8.

on a model stored as model data 106, and then stores the generated report as report data 107. **Such a report typically includes one or more plan (top-down) views of the model, annotated with numerical values for the slope, area, and/or lengths of the edges of at least some of the plurality of planar roof sections of the model of the roof. The report may also include information about total area of the roof, identification and measurement of ridges and/or valleys of the roof, and/or different elevation views rendered from the 3D model (top, side, front, etc[.]).**

EX1001, 6:28-39.

37. Independent claims 1, 16, and 26 are representative of the inventions disclosed in the '737 Patent. I have reproduced claims 1, 16, and 26 below with the limitation numbers added by Petitioner and its expert, Dr. Forsyth (EX1003).

38. Claim 1:

[1.0] A computer-implemented method in a roof estimate report system including at least one processor and a memory coupled to the at least one processor, the method comprising:

[1.1] displaying, by the at least one processor of the roof estimate report system, a plurality of aerial images of a roof at the same time, each of the aerial images providing a different view, taken from a different angle of the same roof;

[1.2] displaying, by the at least one processor of the roof estimate report system, respective line drawings representing features of the roof, the respective line drawings overlying a first and a second aerial image of the plurality of aerial images of the roof, the line drawing overlying the first

aerial image of the roof having features in common with the line drawing overlying the second aerial image of the roof;

[1.3] in response to user input, changing, by the at least one processor of the roof estimate report system, the line drawing representing a feature of the roof that overlies the first aerial image of the roof;

[1.4] in response to the changing, making corresponding changes, by the at least one processor of the roof estimate report system, to the line drawing overlying the second aerial image; and

[1.5] generating and outputting a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

EX1001, 23:55-24:19.

39. Claim 16

[16.0] A non-transitory computer-readable storage medium, having computer executable instructions stored thereon that, when executed by at least one computer processor, cause the at least one processor to enable a computing system to generate a roof estimate report for a building having a roof, by performing a method comprising:

[16.1] overlaying a line drawing on corresponding locations of a roof feature of the roof on first and second aerial images of the roof, wherein the first aerial image provides a first view of the roof of the building and the second aerial image provides a second view of the roof of the building;

[16.2] in response to changes in the line drawing overlaid on the first aerial image, displaying corresponding changes to the line drawing overlaid on the second aerial image; and

[16.3] generate and output a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

EX1001, 25:38-26:7.

40. Claim 26

[26.0] A computer-implemented method in a roof estimate report system including a computer system and a memory coupled to the computer system, the method comprising:

[26.1] changing, by the computer system of the roof estimate report system, a line in a first line drawing representing a feature of a roof that overlies a first aerial image of the roof;

[26.2] changing, by the computer system of the roof estimate report system, a line in a second line drawing that corresponds to the same feature in the first line drawing that was changed, the change in the second line drawing being made by the computer system in response to the change that was made in the first line drawing; and

[26.3] generating and outputting a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a

plurality of planar roof sections of the roof, wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

EX1001, 26:44-63.

B. Prosecution History of the '737 Patent

41. The '737 Patent was filed as Application No. 14/450,108 ("the '108 Application") on August 1, 2014, and is a continuation of Application No. 13/474,504, filed on May 17, 2012, now US Patent No. 8,825,454, and Application No. 12/467,250, filed on May 15, 2009, now US Patent No. 8,209,152. EX1001, cover, field (63). The '737 Patent claims priority to US Provisional Application No. 61/197,904, filed on October 31, 2008. EX1001, cover, field (60).

42. I understand that the Examiner issued one Office Action during prosecution of the '108 Application. EX1002, 213-228. During an Examiner interview, the Examiner and Patent Owner "agreed that including in the claims allowable subject matter from the parent application (U.S. Patent Application No. 13/474,504, now U.S. Patent No. 8,825,454; ...) regarding generating and outputting a roof estimate report...would put the application in condition for allowance." EX1002, 188. Patent Owner then amended prosecution claims 1, 16, and 26 (corresponding to issued claims 1, 16, and 26, respectively) to add this allowable subject matter, as shown below.

- a. Excerpt of amendment to prosecution claim 1 (corresponding to limitation [1.5] of issued claim 1).

generating and outputting a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof.

EX1002, 179.

- b. Excerpt of amendment to prosecution claim 12 (corresponding to limitation [16.3] of issued claim 16).

generate and output a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof.

EX1002, 182.

- c. Excerpt of amendment to prosecution claim 26 (corresponding to limitation [26.3] of issued claim 26).

generating and outputting a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof.

EX1002, 185.

43. In addition to the above amendments, Patent Owner submitted a Terminal Disclaimer over parent US Patent No. 8,825,454. EX1002, 170-174.

44. The Examiner then issued a Notice of Allowance in the '108 Application. EX1002, 146-158. In the Notice of Allowance, the Examiner made additional amendments to prosecution claims 1, 16, and 26 corresponding to limitations [1.5], [16.3], and [26.3] of issued claims 1, 16, and 26, as shown below.

- a. Examiner's Amendment to prosecution claim 1 (corresponding to limitation [1.5] of issued claim 1).

generating and outputting a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is used to provide for repair and/or constructing the roof structure of the building.

EX1002, 153.

- b. Examiner's Amendment to prosecution claim 16 (corresponding to limitation [16.3] of issued claim 16).

generate and output a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is used to provide for repair and/or constructing the roof structure of the building.

EX1002, 154.

- c. Examiner's Amendment to prosecution claim 26 (corresponding to limitation [26.3] of issued claim 26).

generate and output a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at

least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is used to provide for repair and/or constructing the roof structure of the building.

EX1002, 154-155.

45. In allowing the '108 Application, the Examiner indicated that the prosecution prior art did not did not disclose “a computer-implemented method in a roof estimate report system, that includes a step of generating and outputting a roof estimate report using a report generation engine, wherein the roof estimate report includes one or more top plan views of a model of the roof annotated with numerical values for corresponding slope, area, lengths of the edges of at least some of the plurality of planar roof sections of the model of the roof, wherein the generated roof estimate report is used to provide for repair and/or constructing the roof structure of the building.” EX1002, 156.

46. Thus, in allowing the application, the Examiner specifically identified limitation [1.5] of claim 1, limitation [16.3] of claim 16, and limitation [26.3] of claim 26 as being what the prior art did not disclose. I note that the Petition and Dr. Forsyth do not identify or discuss the Examiner's reasons for allowance.

VI. CLAIM CONSTRUCTION

47. It is my understanding that in order to properly evaluate the '737 Patent, the terms of the claims must first be interpreted. It is my understanding that for the purposes of this *inter partes* review, the claims are to be construed under the so-called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the art (POSITA) in light of the specification and prosecution history, unless the inventor and/or patent owner has set forth a special meaning for a term.

48. Additionally, claim terms are normally not interpreted in such a way that embodiments disclosed in the specification are excluded, except in cases of clear disclaimer in the specification or prosecution history. I have been further informed that claim terms only need to be construed to the extent necessary to resolve the obviousness inquiry.

49. All terms of the challenged claims should be construed according to their ordinary and customary meaning as would be understood by a POSITA in light of the specification and prosecution history of the '737 Patent.

50. I understand that Petitioner and Dr. Forsyth have construed two terms in the challenged claims, as identified below. I disagree with Petitioner and Dr. Forsyth's proposed constructions.

**A. “Generating and outputting a roof estimate report...”
(independent claims 1, 16, and 26).²**

51. Petitioner and Dr. Forsyth argue that limitations [1.5], [16.3], and [26.3] should not be entitled to any patentable weight. I disagree with Petitioner and Dr. Forsyth. As an initial matter, Petitioner and Dr. Forsyth have misinterpreted the Final Written Decision in the Xactware IPR (“the ’592 IPR Final Written Decision”) (EX1010) as suggesting that the entirety of limitations [1.5], [16.3], and [26.3] are not entitled to patentable weight under the printed matter doctrine. This is simply not what the ’592 IPR Final Written Decision states. Petitioner and Dr. Forsyth’s interpretation is based on an unreasonable reading of the ’592 IPR Final Written Decision, as I discuss below.

52. Limitation [1.5] recites:

[1.5] generating and outputting a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is provided for repair and/or constructing the roof structure

² Petitioner and Dr. Forsyth also identify claim 12 at the beginning of their claim construction analysis, but claim 12 is not otherwise addressed in the Petition or Dr. Forsyth’s declaration. Petition, 6; EX1003, p. 11.

of the building.

Limitation [26.3] is identical to limitation [1.5]. See EX2016, 4 (comparison of claims 1 and 26 of the '737 Patent). Limitation [16.3] recites substantially the same features as limitations [1.5] and [26.3], except that limitation [16.3] recites “generate and output ...,” whereas limitations [1.5] and [26.3] recite “generating and outputting ...,” i.e., the gerund form of the verbs generate and output. I discuss limitation [1.5] below as representative of limitations [16.3] and [26.3]. See EX2016, 2 (comparison of claims 1 and 16 of the '737 Patent).

53. After reproducing the entirety of limitation [1.5], Petitioner and Dr. Forsyth argue that:

These limitations are directed to generating printed matter that has no function or structural relation to the substrate on which it is printed or displayed. Thus, these limitations are entitled to no patentable weight. Petition, 6 (emphasis original); EX1003, ¶19 (similar).

54. Petitioner appears to be arguing that the entirety of limitation [1.5] (and limitations [16.3] and [26.3]) should not be entitled to any patentable weight based on its use of the term “[t]hese limitations” after the reproduction of limitation [1.5]. I understand that during his deposition, Dr. Forsyth confirmed that his use of the term “[t]hese limitations” in EX1003, ¶19 means that he is referring to the entirety of limitation [1.5] as well as the entirety of limitations [16.3] and

[26.3].

Q. So what are you referring to when you say "these limitations" in paragraph 19?

A. The limitations in Claims 1, 12, which isn't relevant, 16 and 26, which recite a form of the material we referred to as 1.5.

Q. So just to be clear here, when you say "these limitations," you're referring to Limitation 1.5, 16.3, and 26.3; correct?

A. I believe that's correct. Yes.

Q. And are you referring to the entirety of those limitations?

A. I'm referring -- syntax tells me that I'm referring to the limitations of those claims that are of the form recited in [paragraph] 18.

Q. And the form recited in [paragraph] 18 is Limitation 1.5 in its entirety; correct?

A. It's 1.5 in its entirety, correct.

Q. So when you say "these limitations," you're referring to Limitation 1.5 in its entirety, Limitation 16.3 in its entirety, and Limitation 26.3 in its entirety; correct?

A. I believe that to be correct.

EX2006, 68:16-69:12.

55. I understand that during his deposition, Dr. Forsyth explained that he interpreted the entirety of limitations [1.5], [16.3], and [26.3] as lacking patentable weight "because the [B]oard told me that these limitations are not entitled to patentable weight." EX2006, 72:15-17, 73:7-8 ("My understanding is that the [B]oard told me the whole limitation should not be given patentable weight.").

56. Petitioner and Dr. Forsyth's interpretation that the entirety of limitations [1.5], [16.3], [26.3] are not entitled to patentable weight is based on a misunderstanding of the Board's determination in the '592 IPR. In the '592 IPR Final Written Decision (EX1010), the Board explained that "the *claimed content of the information* is not entitled to weight in the patentability analysis." EX1010, 18. Similarly, the Board explained that "*the detailed requirements as to the contents of the roof estimate report* are not entitled to patentable weight." EX1010, 18. There is no basis in the Board's analysis of limitation [1.5] on pages 15-18 of the '592 IPR Final Written Decision to support Petitioner and Dr. Forsyth's argument that the *entirety* of limitations [1.5], [16.3], and [26.3] should not be entitled to weight under the printed matter doctrine. Rather, the Board clearly explained that only "the claimed content of the information" in the roof estimate report is not entitled to patentable weight. EX1010, 18.

57. At no point did the Board find or even suggest that the entirety of limitations [1.5], [16.3], and [26.3] should not be entitled to patentable weight. Accordingly, to the extent the Board determines that any portion of limitations [1.5], [16.3], and [26.3] may not be entitled to patentable weight under the printed matter doctrine, it is my opinion that only the portions of limitation [1.5] (and corresponding portions in limitations [16.3] and [26.3]) reciting "wherein the roof

estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof” could possibly be considered “the claimed content of the information,” and “the detailed requirements as to the contents of the roof estimate report.” EX1010, 18.

58. As a result, at least the portions of limitation [1.5] (and corresponding portions in limitations [16.3] and [26.3]) reciting “generating and outputting a roof estimate report using a report generation engine, ... wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building” are entitled to patentable weight. In this regard, a POSITA would understand that these portions of limitation [1.5] are not directed to “the claimed content of the information” or “the detailed requirements as to the contents of the roof estimate report.” This understanding is consistent with the ’592 IPR Final Written Decision because at no point in the ’592 IPR Final Written Decision did the Board find or suggest that these portions of limitation [1.5] (and corresponding portions in limitations [16.3] and [26.3]) are directed to “the claimed content of the information” or “the detailed requirements as to the contents of the roof estimate report.” EX1010, 18; EX1010, 15-18.

59. My opinion that the above-identified portions of limitation [1.5] (and corresponding limitations [16.3] and [26.3]) reciting “generating and outputting a

roof estimate report using a report generation engine, ... wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building” should be entitled to patentable weight is further supported because, as discussed above, the Examiner identified limitations [1.5], [16.3], and [26.3] as the allowable features of these claims, and specifically added the clause “wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building” in an Examiner’s Amendment when allowing the ’108 Application. As I also noted above, Petitioner and Dr. Forsyth did not discuss the Examiner’s identification of allowable subject matter, or the Examiner’s Amendment to limitations [1.5], [16.3], and [26.3] when the ’108 Application was allowed.

60. Petitioner and Dr. Forsyth’s argument that the entirety of limitations [1.5], [16.3], and [26.3] should not be entitled to patentable weight appears to be based on an attempt to read these limitations out of the claims because, as I discuss in greater detail below, their analysis of the prior art in Grounds 1 and 2 does not specifically address, and cannot meet, the requirements of limitation [1.5] (or corresponding requirements of limitations [16.3] and [26.3]) reciting “generating and outputting a roof estimate report using a report generation engine, ... wherein the generated roof estimate report is provided for repair and/or constructing the

roof structure of the building.”

61. I have been informed that Patent Owner and Petitioner are in a parallel district court litigation involving the '737 Patent. I understand that both Patent Owner and Petitioner have proposed constructions of various terms in the '737 Patent. EX2010 (Patent Owner's claim constructions); EX2011 (Petitioner's claim constructions). I understand that Petitioner and Dr. Forsyth's construction that the entirety of limitation [1.5] (and corresponding limitations [16.3] and [26.3]) should not be entitled to patentable weight conflicts with Petitioner's construction of the term “roof estimate report” as recited in limitations [1.5], [16.3], and [26.3] of the '737 Patent. I understand that Petitioner construed “roof estimate report” in limitations [1.5], [16.3], and [26.3] as “an electronic file or paper document transformed from a roof model and/or determined roof measurements that graphically shows a representation of the roof model **and/or determined roof measurements**.” EX2011, 4-7; EX2010, 7.

62. I note also that in the '592 IPR Final Written Decision the Board did not provide an express construction for limitations [1.5], [16.3], and [26.3]. EX1010, 6 (“We conclude no express claim constructions are necessary to resolve whether Petitioner has shown by a preponderance of the evidence that [the challenged] claims [] are unpatentable.”). Rather, the Board found that the “the

claimed content of the information,” and “the detailed requirements as to the contents of the roof estimate report” (EX1010, 18) should not be entitled to patentable weight when the Board analyzed limitations [1.6], [16.3], and [26.3] in view of the prior art at issue in the Xactware IPR, which is not at issue in this IPR proceeding. EX1010, 15-18 (analyzing limitations [1.5], [16.3], and [26.3] with respect to the “Avrahami” reference).

63. Accordingly, at a minimum, a POSITA would construe limitation [1.5] as positively reciting at least “generating and outputting a roof estimate report using a report generation engine, ... wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building,” and that the above-quoted phrases have patentable weight. A POSITA would similarly construe the corresponding features of limitations [16.3] and [26.3] as having patentable weight.

B. “transmitting roof measurement information” (claim 9).

64. Claim 9 recites “[t]he method of claim 1 further comprising: transmitting roof measurement information based at least in part on the change of the line drawing representing a feature of the roof that overlies the first aerial image of the roof.” EX1001, 24:52-56.

65. Petitioner and Dr. Forsyth argue that claim 9 “should be interpreted

broadly enough to encompass transmitting roof measurement information between components of the same computer system, consistent with the Board's interpretation of the term in the prior IPR challenge to the '737 patent." Petition, 11 (citing EX1010, 18-20); EX1003, ¶11 (identical argument and citation to EX1010, 18-20). Petitioner and Dr. Forsyth argue that "this claim term does not specify any particular source or destination for the transmission, thereby indicating that transmission within the same computer system is contemplated." Petition, 11 (citing EX1010, 18-20); EX1003, ¶11 (identical argument and citation to EX1010, 18-20). Further, Petitioner and Dr. Forsyth argue that "the '737 patent's specification contemplates this type of transmission," by referring to Figure 8, and EX1001, 16:15-17, which describe that "some portion of the contents, some of, or all of the components of the RES 810 may be stored on and/or transmitted over the other computer-readable media 805."

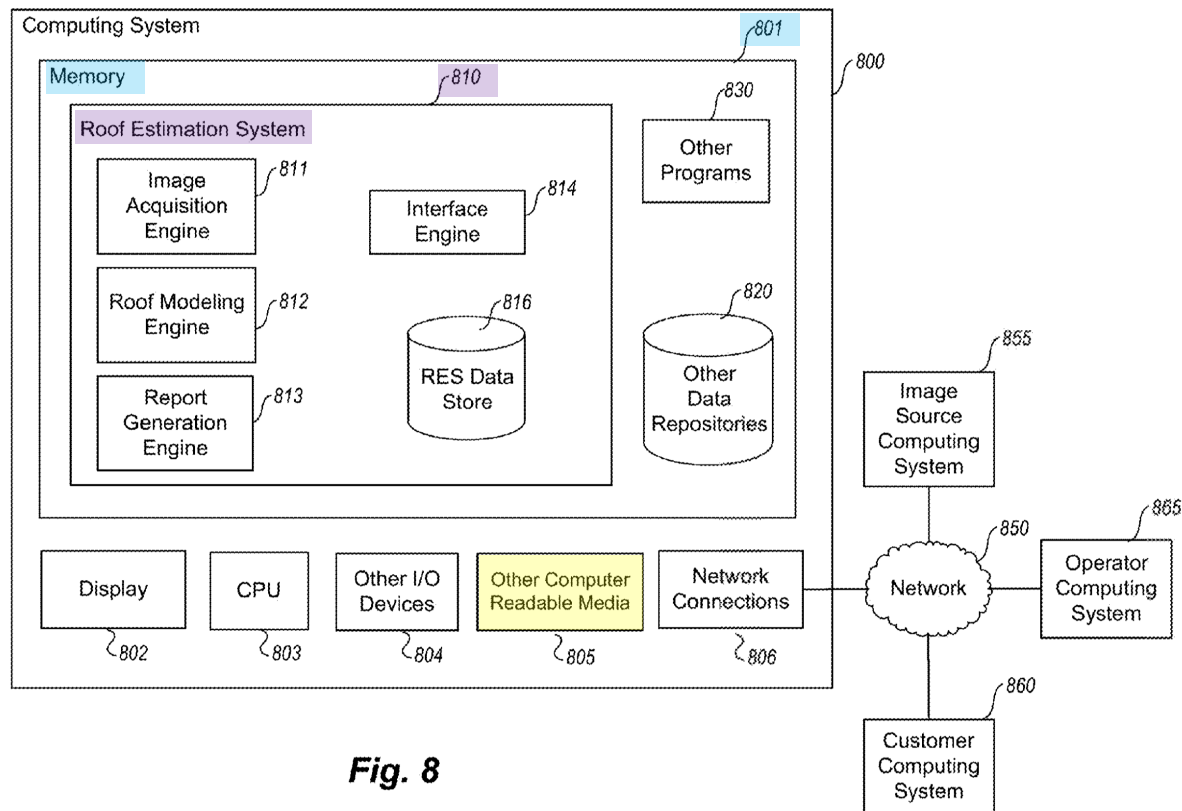
66. I disagree with Petitioner and Dr. Forsyth's proposed construction of claim 9. First, Petitioner and Dr. Forsyth's construction interprets 16:15-17 of the '737 Patent out of context. Petitioner and Dr. Forsyth left out the preceding sentence (EX1001, 16:13-14), which is important because that preceding sentence provides context to the meaning of 16:15-17 of the '737 Patent, and its description of the Roof Estimation System (RES) illustrated in Figure 8. EX1001, 15:58-61

(“FIG. 8 is an example block diagram of a computing system for practicing embodiments of a roof estimation system. FIG. 8 shows a computing system 800 that may be utilized to implement a Roof Estimation System (“RES”) 810.”). With reference to Figure 8, the ’737 Patent explains that:

The RES 810 is shown residing in memory 801. In other embodiments, some portion of the contents, some of, or all of the components of the RES 810 may be stored on and/or transmitted over the other computer-readable media 805.

EX1001, 16:13-17.

Accordingly, the ’737 Patent provides that in at least one embodiment, the Roof Estimation System (RES) 810 resides in memory 801, and that “[i]n other embodiments,” some or all the portions or components (e.g., image acquisition engine 811, roof modeling engine 812, report generation engine 813) may alternatively be stored on and/or transmitted over the other computer-readable media 805. This portion of the specification thus provides that different components of the *roof estimation system (RES) 810* may be stored on the memory 801 or the other computer-readable media 805.

**Fig. 8**

EX1001, Fig. 8

67. Notably absent from the above-quoted portion in 16:13-17 of the '737 Patent is any discussion of *the roof measurement information* being transmitted to the other computer-readable medium 805. On the other hand, 16:13-17 of the '737 Patent (as reproduced above) provides that some or all the portions or components of the *roof estimation system (RES) 810* may be stored on the memory 801 or the other computer-readable media 805. Therefore, Petitioner and Dr. Forsyth have construed 16:15-17 of the '737 Patent as allegedly supporting

something that is not described in the cited portion of the '737 Patent, namely that *the roof measurement information* is transmitted to the other computer-readable media 805. Claim 9 specifically recites that “***roof measurement information***” is transmitted, not that components of the roof estimation system (RES) are transmitted.

68. Second, a POSITA would construe claim 9 based on the embodiment of the '737 Patent that describes transmitting the roof measurement information, as that is what is recited in claim 9. In particular, column 17, lines 12-20 describe roof measurement information as being transmitted to third-party systems that generate roof estimate reports:

In some embodiments, the report generation engine 813 facilitates transmission of roof measurement information that may or may not be incorporated into a roof estimate report. For example, the roof generation engine 813 may transmit roof measurement information based on, or derived from, models stored in the RES data repository 816. ***Such roof measurement information may be provided to, for example, third-party systems that generate roof estimate reports based on the provided information.***

EX1001, 17:12-20.

69. Accordingly, based on the description of how the report generation engine 813 transmits the roof measurement information to an external third-party

system outside the RES, a POSITA would construe claim 9 as transmitting the roof measurement information outside the roof estimate report system (e.g., RES in Figure 8), such as to “third-party systems that generate roof estimate reports based on the provided information.” EX1001, 17:12-20. A POSITA would not reasonably construe claim 9 as transmitting the roof measurement information to another computer-readable medium (e.g., media 805 in Figure 8) within the roof estimate report system (e.g., RES in Figure 8), because that is inconsistent with what a POSITA would understand from the specification of the '737 Patent.

70. I understand that Patent Owner and Petitioner have not construed claim 9, or the “roof measurement information” in claim 9, in the parallel litigation between Patent Owner and Petitioner.

VII. PETITIONER'S GROUND 1 FAILS BECAUSE PETITIONER DOES NOT SHOW THE PRIOR ART RENDERS THE CLAIMS OBVIOUS

A. Ground 1 Does Not Render Obvious All the Limitations of Claim 1.

71. In Ground 1, Petitioner and Dr. Forsyth argue that claim 1 is rendered obvious by the combination of Heller (EX1004) and Quam (EX1005). Petition, 2, 19-35; EX1003, ¶¶34-62. Petitioner and Dr. Forsyth's Ground 1 fails because the Heller-Quam combination fails to render obvious at least limitation [1.5] of claim 1.

1. Overview of Heller.

72. Heller is titled “[t]he Site-Model Construction Components of the RADIUS Testbed System,” and is authored by A. Heller et al. EX1004, 1. Heller explains that the “central component” of the RADIUS system is “the creation of a 3-dimensional model that captures the basic geometry of the site under examination.” EX1004, Abstract; *see also* EX1004, 1 (Introduction). Heller describes that “[t]he construction and use of 3-D models of military and industrial sites” will allow advances in “the speed, confidence, and range of analytical techniques with which an image analyst develops and reports intelligence information.” EX1004, 1 (Introduction).

73. Figure 1 of Heller below “shows a typical RADIUS site model,” where “[t]he majority of features modeled fall under three broad categories:”

- (1) buildings and other structures (e.g., petroleum and water storage tanks)
 - (2) lines of communication (e.g., roads, railroad tracks, rivers, streams)
 - (3) functional areas (e.g., parking lots, site perimeters, forested areas, etc.).
- EX1004, 1 (Introduction).

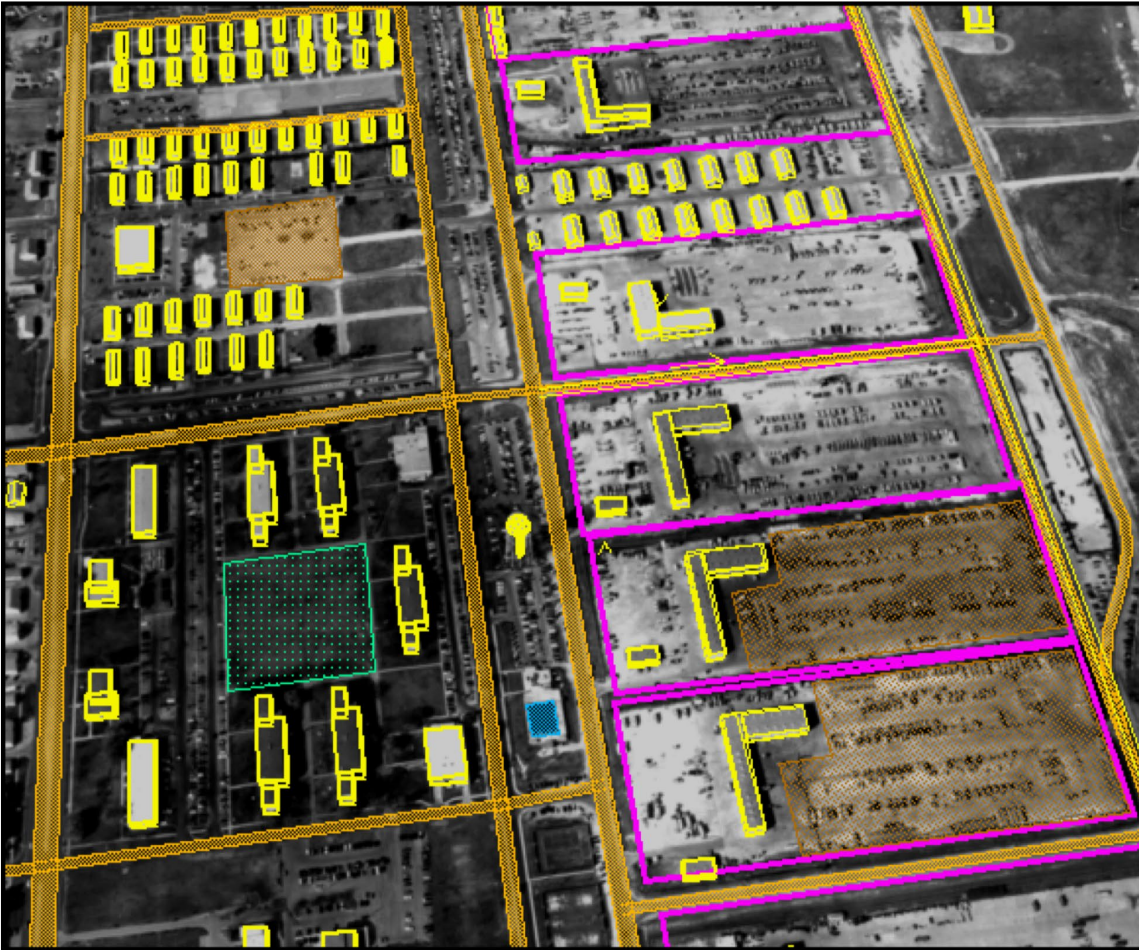


Figure 1: A typical RADIUS site model, projected onto an image of the site. The site model mainly consists of buildings, linear and area features.

EX1004, Fig. 1

74. Heller describes that “[m]ost buildings are modeled using the following primitives” or line drawings:

- (1) Boxes, which are simple rectangular solids;
- (2) Houses, which are boxes with sloped roofs (gable, shed, or hip);
- (3) Quonset huts, which are box with a half cylinder roof; and

(4) Extrusions, which are a curve that typically defines the (flat) roof line which is extended to the ground to form the sides of the building.

EX1004, 3.

75. Figure 4 of Heller below shows box primitives (line drawings) being manually added to the top of a roof structure. EX1004, 6.

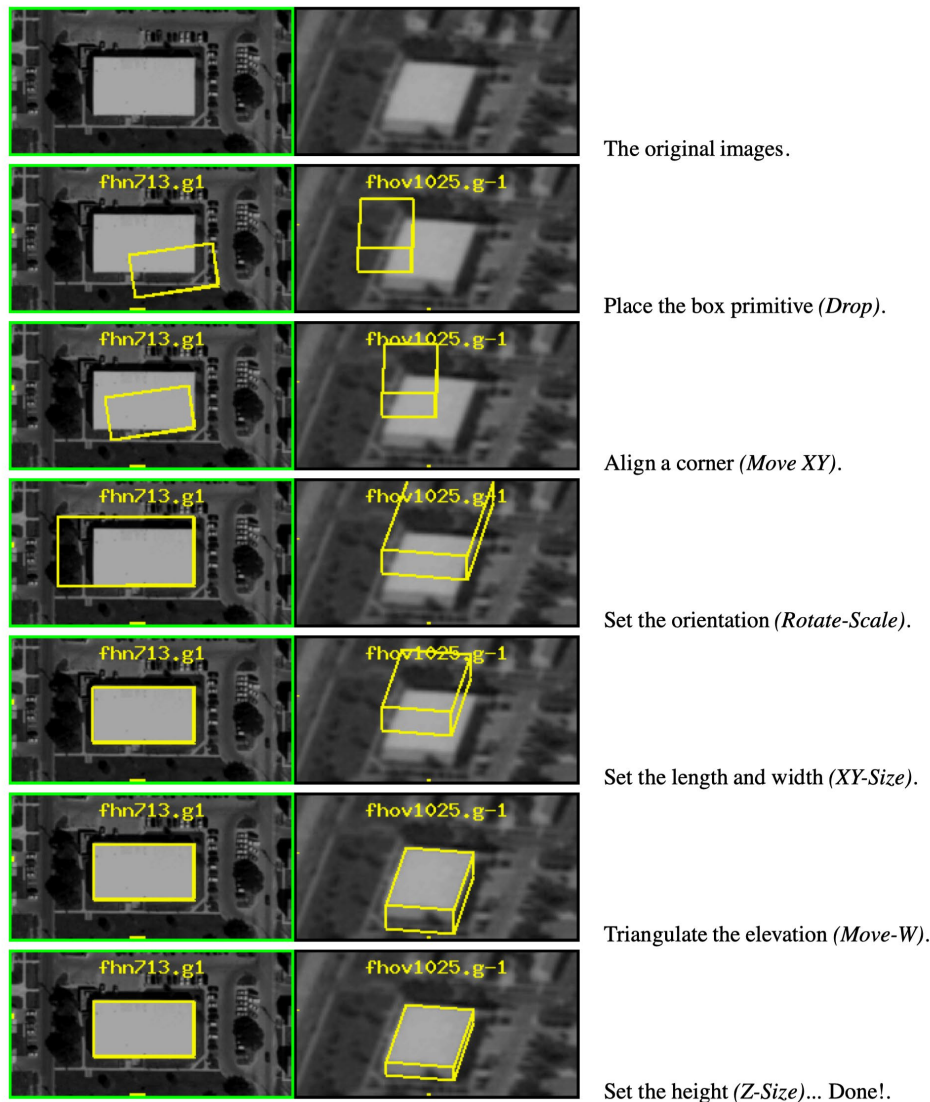


Figure 4: The sequence of adjustments used to manually model a building.

EX1001, Fig. 4

2. Overview of Quam.

76. Quam is titled “[t]he RADIUS Common Development Engine,” and is authored by A. Heller and L. Quam. EX1005, 1. Quam explains that the “main goal” of the RADIUS Common Development Engine (RCDE) “is to provide a

system to carry out interactive cartographic modeling of three-dimensional scenes from multiple images,” and to “provide[] the foundation for the RADIUS Testbed System.” EX1005, Abstract. Quam describes that “[t]he cartographic features and data that can be entered [into RCDE] include multiple images, camera models, digital terrain elevation data, point, line, and area cartographic features, and a wide assortment of 3-D objects.” EX1005, 1.

77. Quam explains that “[a] key realization...is that every entity represented in the RCDE has an associated local coordinate system,” where “coordinate transformations... allow[] each type of data to be represented, manipulated, and displayed in the most convenient form, without sacrificing functionality or generality, in addition to enabling the fusion of different geometric data.” EX1005, 1.

78. Quam discloses that “[t]he RCDE supports a variety of primitive shapes for modeling cultural features, such as a:

Contour Map This object displays a set of contours of constant elevation computed from a digital terrain model. The elevation spacing can be set to any convenient quantity.

Map Grid This object displays lines of constant latitude and longitude or UTM coordinates.

Text displays a string of text at a 3-D location in a site.

EX1005, 5, 8.

79. Quam also discloses that the RCDE includes a functionality of “display[ing] both the image coordinates and apparent 3-D coordinates of [a] selected point.”

Project-to-world is somewhat more complicated. It first computes the ray or curve¹² in space that is defined by the locus of points that project to the given point in the image plane, and then computes the intersection of that ray or curve with a surface, such as a terrain model or a plane of constant elevation. If this intersection fails, the function returns `nil`; otherwise, it returns the point of intersection. This functionality can be exercised by using the mouse to click on an image being displayed by the RCDE. In response, the RCDE displays both the image coordinates and apparent 3-D coordinates of the selected point.

EX1005, 11.

3. The Heller-Quam Combination Does Not Render Obvious Limitation [1.5].

80. As described above, at least the following portions of limitation [1.5] are entitled to patentable weight, because these portions of limitation [1.5] are not directed to the “the claimed content of the information” of the roof estimate report, or “the detailed requirements as to the contents of the roof estimate report.”

EX1010, 18.

[1.5] generating and outputting a roof estimate report using a report generation engine, ... wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

81. Other than reproducing the entirety of limitation [1.5] in a heading before their analysis of limitation [1.5], Petitioner and Dr. Forsyth nowhere mention, address, or show where either Heller or Quam disclose the following two features (a)-(b) of limitation [1.5].

(a) generating and outputting a roof estimate report using a report generation engine, and

(b) wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

Petition, 33-35; EX1003, ¶¶57-62.

82. Rather, based on their incorrect construction that the entirety of limitation [1.5] should not be entitled to any patentable weight, Petitioner and Dr.

Forsyth allege that “a showing of ‘generating and displaying *any graphical or textual information*’ is sufficient to meet [limitation [1.5]].” Petition, 34 (citing EX1010, 18); EX1003, ¶58 (identical argument and citation to EX1010, 18). This argument is wrong. To show that limitation [1.5] is taught by the prior art, Petitioner and Dr. Forsyth must show that the Heller-Quam combination teaches the following features (a)-(b) of limitation [1.5]:

- (a) generating and outputting a roof estimate report using a report generation engine, and
- (b) wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

83. Petitioner and Dr. Forsyth have not shown that Heller or Quam teaches either feature (a) or feature (b) of limitation [1.5]. Petitioner and Dr. Forsyth's analysis of limitation [1.5] does not even address feature (a) or feature (b) of limitation [1.5], much less show how Heller or Quam allegedly teach these features (a)-(b). I have reproduced below the four paragraphs of the Petition that supposedly address limitation [1.5], and I have noted the paragraphs in Dr. Forsyth's declaration which contain the identical arguments.

84. First paragraph in analysis of limitation [1.5]:

In the combination, Quam describes that “every entity represented in the RCDE has an associated local coordinate system” and are “tied together through a flexible and efficient network of coordinate transformations.” NEARMAP-1005, 1. “***This allows each type of data to be*** represented, manipulated, and ***displayed*** in the most convenient and precise form, without sacrificing functionality or generality, in addition to enabling the fusion of different types of geometric data.” *Id.*; NEARMAP-1003, [59].

Petition, 34; *see also* EX1003, ¶59 (identical argument and citations).

This paragraph, however, does not show that either Quam or Heller teaches feature (a) or feature (b) of limitation [1.5].

85. Second paragraph in analysis of limitation [1.5].

Quam also teaches that “functionality can be exercised by using the mouse to click on an image being displayed by the RCDE,” which, in response, “***displays both the image coordinates and apparent 3-D coordinates of the selected point.***” NEARMAP-1005, 11.

Petition, 34; *see also* EX1003, ¶60 (identical argument and citation).

This paragraph, however, does not show that either Quam or Heller teaches feature (a) or feature (b) of limitation [1.5].

86. Third paragraph in analysis of limitation [1.5].

Quam further describes a “ContourMap” object that “displays a set of contours of constant elevation computed from a digital terrain model,” a “Map Grid” object that “displays lines of constant latitude and longitude or UTM coordinates,” and a “Text” object that “displays a string of text at a 3-D location in a site.” *Id.*, 8.

Petition, 34-35; *see also* EX1003, ¶61 (identical argument and citation). This paragraph, however, does not show that either Quam or Heller teaches feature (a) or feature (b) of limitation [1.5].

87. Fourth paragraph in analysis of limitation [1.5].

Any of these or the many other teachings in Quam and Heller of displaying data is sufficient to address the limitation in question. *See* NEARMAP-1010, 18; NEARMAP-1003, [62]. Accordingly, The Heller-Quam combination renders this limitation obvious.

Petition, 35; *see also* EX1003, ¶62 (identical argument and citation to EX1010, 18). This paragraph, however, does not show that either Quam or Heller teaches feature (a) or feature (b) of limitation [1.5].

88. Petitioner and Dr. Forsyth have thus failed to show that Quam, Heller, or the “Heller-Quam combination” disclose either of the following features (a)-(b) of limitation [1.5].

- (a) generating and outputting a roof estimate report using a report generation engine, and
- (b) wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

89. To be clear, neither Heller nor Quam disclose “generating and outputting a roof estimate report using a report generation engine.” There is no teaching in Heller or Quam that corresponds to “generating and outputting a roof estimate report.” Heller and Quam each fail to disclose the feature of a “roof estimate report,” let alone generating and outputting such a report using a report generation engine. Second, there is no disclosure whatsoever in either Heller or Quam of such as generated roof estimate report being “provided for repair and/or constructing the roof structure of the building.” On the contrary, Heller and Quam are merely directed to creating a 3D model of the basic geometry of the site under examination. EX1004, Abstract, 1 (Introduction); EX1005, 1 (Introduction). There is no disclosure in either Heller or Quam of providing a report “for repair and/or constructing the roof structure of the building,” as required by limitation [1.5].

90. Accordingly, the Heller-Quam combination does not disclose, suggest or render obvious limitation [1.5]. Claim 1 is therefore patentable over the Heller-Quam combination presented in Ground 1, because the Heller-Quam combination

does not render obvious all the limitations of claim 1.

91. As noted above, limitation [1.5] also recites “wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof.” To the extent the Board gives patentable weight to this phrase, Petitioner and Dr. Forsyth have not shown that the Heller-Quam combination teaches a “roof estimate report” that “includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof,” as recited in limitation [1.5]. I note that Petitioner and Dr. Forsyth do not address this feature of limitation [1.5] in their analysis of limitation [1.5] in Ground 1, other than to reproduce the text of limitation [1.5]. Petition, 33-35; EX1003, ¶¶57-62.

B. Ground 1 Does Not Render Obvious Claims 16 and 26

92. Limitation [1.5] is not taught by the Heller-Quam combination for the reasons presented above. As discussed above, limitation [16.3] is substantially identical to limitation [1.5] (i.e., limitation [16.3] recites “generate and output” rather than “generating and outputting”), and limitation [26.3] is identical to limitation [1.5]. EX2016, 2 (comparison of limitations [1.5] and [16.3]), 4 (comparison of limitations [1.5] and [26.3]).

93. For claim 16 in Ground 1, Petitioner and Dr. Forsyth rely exclusively

on their analysis of claim 1. Petition, 44; EX1003, ¶¶78-81; EX2006, 182:13-183:15 (Dr. Forsyth confirming in his deposition that his analysis of claim 16 relied on his analysis for claim 1). For example, for limitation [16.3] of claim 16, Petitioner and Dr. Forsyth rely exclusively on their analysis of limitation [1.5] in Ground 1. Petition, 44; EX1003, ¶81. As described above, Petitioner and Dr. Forsyth have not shown that the Heller-Quam combination renders obvious limitation [1.5]. Therefore, Petitioner and Dr. Forsyth have also failed to show that the Heller-Quam combination renders obvious limitation [16.3] since Petitioner and Dr. Forsyth's analysis of limitation [16.3] refers only to the erroneous and unsupportable analysis of limitation [1.5] in Ground 1. Petition, 44; EX1003, ¶81. Consequently, claim 16 is patentable over the Heller-Quam combination because Heller and Quam fail to teach at least limitation [16.3].

94. For claim 26 in Ground 1, Petitioner and Dr. Forsyth rely exclusively on their analysis of claim 1. Petition, 48-49; EX1003, ¶¶87-90; EX2006, 183:13-25 (Dr. Forsyth confirming in his deposition that his analysis of claim 26 relied on his analysis for claim 1). For example, for limitation [26.3] of claim 16, Petitioner and Dr. Forsyth rely exclusively on their analysis of limitation [1.5] in Ground 1. Petition, 49; EX1003, ¶90. As described above, Petitioner and Dr. Forsyth have not shown that the Heller-Quam combination renders obvious limitation [1.5].

Therefore, Petitioner and Dr. Forsyth have also failed to show that the Heller-Quam combination renders obvious limitation [26.3] since Petitioner and Dr. Forsyth's analysis of limitation [26.3] refers only to the erroneous and unsupportable analysis of limitation [1.5] in Ground 1. Petition, 49; EX1003, ¶90. Consequently, claim 26 is patentable over the Heller-Quam combination because Heller and Quam fail to teach at least limitation [26.3].

C. Petitioner Fails to Demonstrate the Heller-Quam Combination Teaches Additional Claim Elements of Independent Claim 16

95. I understand that to prevail in a patentability challenge in an *inter partes* review, a petitioner must show with particularity where each of the elements of a challenged claim is taught in the prior art.

96. As noted above, Petitioner and Dr. Forsyth rely exclusively on their analysis of claim 1 in addressing the limitations of claim 16. Petition, 44; EX1003, ¶¶78-81; EX2006, 182:13-183:15 (Dr. Forsyth confirming that his analysis of claim 16 relied on his analysis for claim 1). Petitioner and Dr. Forsyth's analysis of claim 1, however, fails to address specific limitations of claim 16 that are unique to claim 16.

97. In alleging that claim 16 is unpatentable, Petitioner relies entirely on the mapping of claim 1, as shown below.

Claim 16 Limitation	Claim 1 Limitation
[16.0]	[1.0]
[16.1]	[1.1], [1.2]
[16.2]	[1.3], [1.4]
[16.3]	[1.5]

Petition, 44; EX1003, ¶¶78-81; EX2006, 182:13-183:15.

98. Limitation [16.0] recites:

- a. A non-transitory computer-readable storage medium,**
- b. having computer executable instructions stored thereon that,**
- c. when executed by at least one computer processor,**
- d. cause the at least one processor to enable a computing system**
- e. to generate a roof estimate report for a building having a roof, by performing a method comprising:”**

99. Accordingly, limitation [16.0] recites a non-transitory computer-readable storage medium that stores computer executable instructions, which cause at least one processor of a computing system to generate a roof estimate report for a building having a roof. Petitioner and Dr. Forsyth have not shown that limitation [16.0] is taught by the Heller-Quam combination.

100. I have been informed that when the limitations in the body of the claim rely upon or derive antecedent basis from the preamble of the claim, then the

preamble of the claim is limiting. I understand that the preamble of claim 16 is limiting because the body of claim 16 (limitations [16.1]-[16.3]) derives antecedent basis from the preamble. For example, the preamble of claim 16 recites “a building having a roof,” which provides antecedent basis for the “roof of *the building*” in limitations [16.1] and [16.3]. Thus, the preamble of claim 16 (limitation [16.0]) is limiting.

101. As noted above, Petitioner and Dr. Forsyth rely exclusively on their analysis of limitation [1.0] when addressing limitation [16.0]. However, Petitioner and Dr. Forsyth's analysis of limitation [1.0] do not show that Heller or Quam discloses a non-transitory computer-readable storage medium that stores computer executable instructions, which cause at least one processor of a computing system to generate a roof estimate report for a building having a roof, as required by limitation [16.0].

102. The term “non-transitory computer-readable storage medium” appears in Petitioner and Dr. Forsyth's reproduction of the text of limitation [16.0], but there is no analysis of this feature in Petitioner and Dr. Forsyth's analysis of limitation [1.0]. In particular, there is no showing in Petitioner and Dr. Forsyth's analysis of limitation [1.0] of how Heller or Quam teaches the claimed “non-transitory computer-readable storage medium,” as recited in limitation [16.0a]). I

base my interpretation below on Petitioner and Dr. Forsyth's analysis of limitation [1.0] since that is the only analysis that Petitioner and Dr. Forsyth provided for limitation [16.0]. Petition, 44 (relying exclusively on the analysis of limitation [1.0] for limitation [16.0]); EX1003, ¶78 (same); EX2006, 182:13-183:15.

103. Petitioner and Dr. Forsyth argue that Heller's RADIUS Testbed System (RTS) is "a software program," and that "Quam's RADIUS Common Development Engine (RCDE)...provides the foundation for [Heller's] RADIUS Testbed System." Petition, 20, 16 (explaining that in the Heller-Quam combination, Heller's RTS "create[s] three-dimensional models of buildings and other structures through the analysis of one or more images of the structures," and Quam's RCDE "provides the foundation for the RADIUS Testbed System."); EX1003, ¶¶35, 29 (same arguments). Thus, Petitioner and Dr. Forsyth appear to allege that Heller's RTS implemented on Quam's RCDE corresponds to the claimed "computer-implemented method" as recited in [1.0], even though they do not make that correspondence explicit. Petition, 20-21; EX1003, ¶35.

104. Petitioner and Dr. Forsyth have not shown that Heller's RTS implemented on Quam's RCDE corresponds to the claimed "computer executable instructions" in limitation [16.0b]. There is no analysis of "computer executable instructions" in limitation [16.0b]. Even if Heller's RTS implemented on Quam's

RCDE is interpreted to correspond to the claimed “computer executable instructions” in limitation [16.0b], despite Petitioner and Dr. Forsyth not explaining that it does, Petitioner and Dr. Forsyth have not shown that Heller’s RTS is stored on a “non-transitory computer-readable storage medium” as required by [16.0a]. Petitioner alleges that “Quam...makes clear that the RADIUS system utilizes ‘*memory*’ when performing computations, such as using a ‘[t]iled memory layout for image storage.’” Petition, 20 (emphasis original); EX1003, ¶35 (same). At best, this sentence shows that a “memory” is used to “perform[] computations,” such as “tiled memory layout for image storage.” Petitioner and Dr. Forsyth have not, however, shown that Heller’s RTS is stored on this “memory,” if this “memory” is alleged to correspond to the claimed “non-transitory computer-readable storage medium” that stores the claimed “computer executable instructions,” as required by [16.0a]-[16.0b]. Petitioner and Dr. Forsyth make no showing of what components of Heller or Quam correspond to the features of [16.0] other than to refer to Petitioner’s mapping of [1.0], which does not address the claimed “non-transitory computer-readable storage medium” that stores the claimed “computer executable instructions,” as required by [16.0a]-[16.0b].

105. Petitioner and Dr. Forsyth’s reference to “[t]iled memory layout for image storage” on page 17 of Quam is not tied to any “memory.” Petition, 20;

EX1003, ¶35. Petitioner and Dr. Forsyth also generically cite to pages 4-5, 8, 16 of Quam (Petition, 20; EX1003, ¶35) without explanation. Petition, 20; EX1003, ¶35. In any event, the discussion of a “memory” on pages 4-5, 8, 16 of Quam refers to storing images, not to storing “computer executable instructions” as in [16.0b] that are executed to cause at least one processor to enable a computing system to generate a roof estimate report, as required by [16.0a]-[16.0e].

106. Similarly, Petitioner and Dr. Forsyth's analysis of limitation of [1.0] does not address what elements of Heller or Quam allegedly correspond to the claimed “computing system.” The term “computing system” appears only once when Petitioner and Dr. Forsyth reproduce the text of limitation [16.0]. Petition, 44; EX1003, ¶78. The term “computing system” is recited in the preamble of claim 16 (i.e., limitation [16.0]), which is limiting for the reasons I discussed above.

107. Thus, Petitioner and Dr. Forsyth have not shown that the Heller-Quam combination in their analysis of limitation [1.0] teaches “a non-transitory computer-readable storage medium that stores computer executable instructions, which cause at least one processor of a computing system to generate a roof estimate report for a building having a roof,” as recited in limitation [16.0].

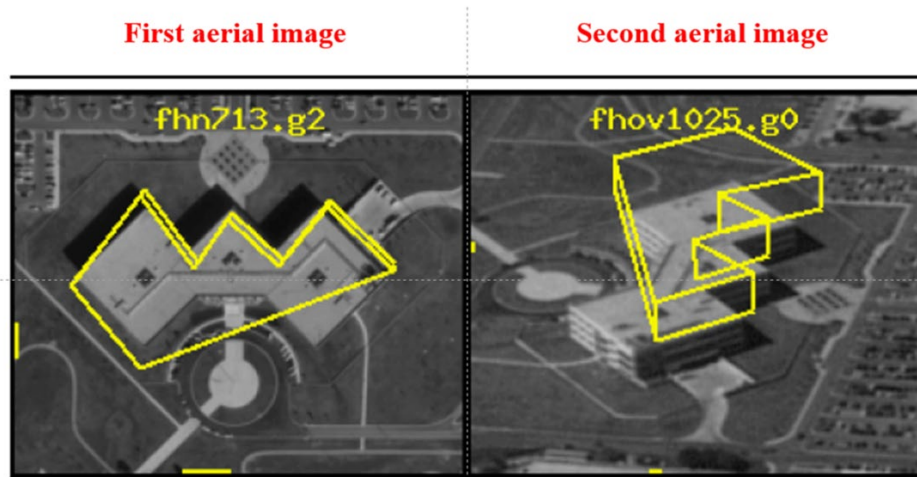
108. In addition, Petitioner and Dr. Forsyth's analysis of limitation [16.1] does not show that the Heller-Quam combination teaches all the features of

limitation [16.1]. Petitioner and Dr. Forsyth's analysis of limitation [16.1] refers exclusively to their analysis of limitations [1.1] and [1.2]. Petition, 44; EX1003, ¶79; EX2006, 182:13-183:15. Petitioner and Dr. Forsyth's analysis of limitations [1.1] and [1.2] does not, however, show how "a line drawing *on corresponding locations of a roof feature of the roof*," as recited in limitation [16.1], is met by the Heller-Quam combination. The phrase "corresponding locations of a roof feature of the roof" appears only when Petitioner and Dr. Forsyth reproduce the text of limitation [16.1]. Petition, 44; EX1003, ¶79.

109. Petitioner and Dr. Forsyth's analysis of limitation [1.1] and [1.2] nowhere shows how Heller or Quam specifically teach "*overlaying a line drawing on corresponding locations of a roof feature of the roof*," as recited in limitation [16.1]. For example, Petitioner and Dr. Forsyth's analysis of limitation [1.2] does not address nor show how a line drawing is overlaid on the same "locations of a roof feature of the roof" in both the first and second aerial images. I refer to Petitioner and Dr. Forsyth's analysis of limitation [1.2] below because their analysis of limitation [1.2] addresses the feature of "displaying...line drawings overlaying a first and second aerial image," as recited in limitation [1.2]. Other than a vague reference to "[t]he Heller-Quam combination" at the beginning of their analysis of limitation [1.2], Petitioner and Dr. Forsyth cite only to Heller's

teachings in their analysis of limitation [1.2]. Petition, 25-27; EX1003, ¶¶44-47.

110. In their analysis of limitation [1.2], Petitioner and Dr. Forsyth first provide the following annotation of Heller's Figure 5 and allege that "Heller depicts a first and second aerial image of the roof, each overlaid with a yellow wireframe (i.e., a 'line drawing')." Petition, 25 (citing EX1004, 3); EX1003, ¶44 (identical argument and citation).

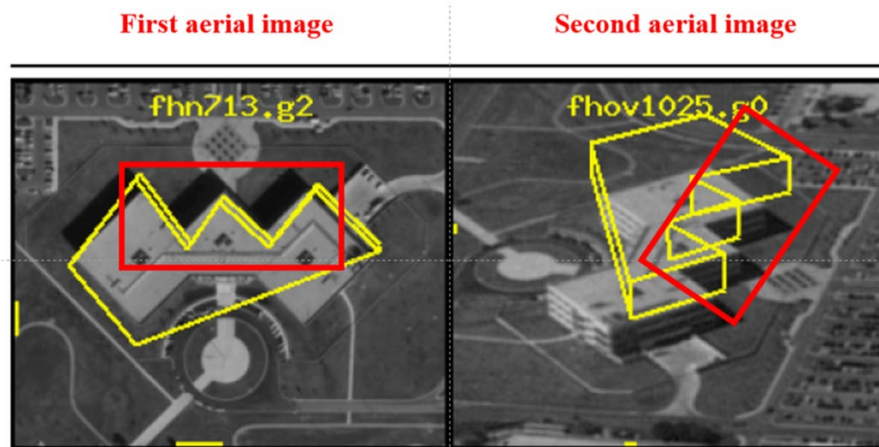


NEARMAP-1004, Detail of FIG. 5 (annotations in original)

Petition, 25; EX1003, ¶ 44.

Petitioner and Dr. Forsyth then argue that "the yellow line drawings overlaying the first and second images have 'features in common' as the claim [i.e., claim 1] requires." Petition, 26; EX1003, ¶45 (identical argument). Petitioner and Dr. Forsyth then refer to the following second annotation of Heller's Figure 5 and allege that the "features in common" are shown by "the 'W' shape of the roof

contour at the top of the first image [being] present in the yellow line drawings in both the first and second images.” Petition, 26; EX1003, ¶45.



NEARMAP-1004, Detail of FIG. 5 (annotated)

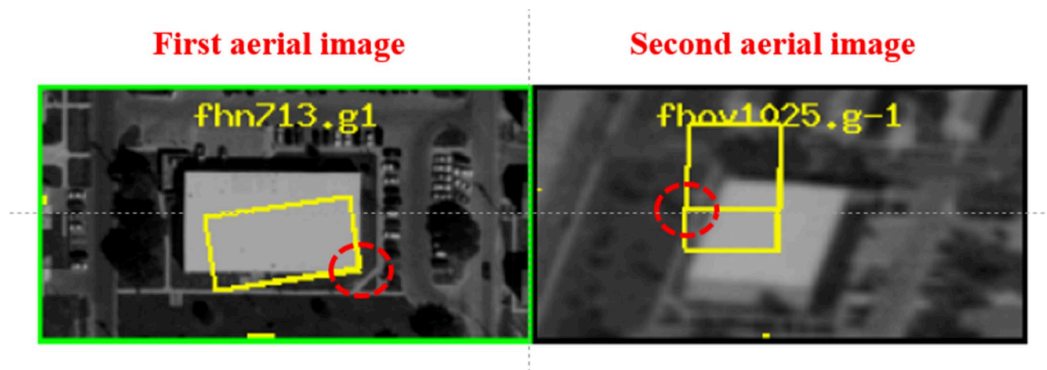
Petition, 26; EX1003, ¶ 45.

111. Petitioner and Dr. Forsyth’s above-identified analysis of the features of limitation [1.2] do not, however, show that Heller teaches “*overlaying a line drawing on corresponding locations of a roof feature of the roof*,” as recited in limitation [16.1]. In this regard, even if the “yellow wireframe” in the above pairs of first and second aerial images in Heller’s Figure 5 correspond to a “line drawing,” Petitioner and Dr. Forsyth have not explained or shown how either one of those wireframes (which one?) is overlaid on corresponding locations of a roof feature of the roof on first and second aerial images of the roof. For instance, Petitioner has not shown that the line drawings for the first and second images are

the same such that “a line drawing” is overlaid “on corresponding locations of a roof feature of the roof on first and second aerial images of the roof,” as required by limitation [16.1]. The wireframe in the “Second aerial image” of Heller’s Figure 5 does not intersect the roof and therefore cannot be a corresponding location of the roof feature. Petitioner and Dr. Forsyth’s allegation that the yellow wireframes “have ‘features in common’ as the claim [i.e., claim 1] requires” is insufficient to establish that these yellow wireframes are overlaid on *corresponding locations* of the same roof feature of the roof.

112. To further illustrate this deficiency in Petitioner and Dr. Forsyth’s reliance on their analysis of limitation [1.2] for limitation [16.1], Petitioner refers to the “simple ‘box’ example from FIG. 4 of Heller [below as] similarly depict[ing] a first second aerial image of the building roof, each overlaid with a yellow wireframe (i.e., a ‘line drawing’).” Petition, 26 (citing EX1004, Fig. 4); EX1003, ¶46 (identical argument and citation). Petitioner and Dr. Forsyth allege that “the first and second aerial images of FIG. 4 also have ‘features in common,’ such as the aligned corner denoted in red in both images below.” Petition, 26-27; EX1003, ¶46. However, as is plainly visible from the first and second aerial images shown in the annotated version of Heller’s Figure 4 below, the corner denoted in red in the “First aerial image” does not correspond to the same feature

of a roof in the “Second aerial image,” because the corner in red in the “Second aerial image” is not part of a line drawing that is “*overlay[ed]...on corresponding locations of a roof feature of the roof*,” as recited in limitation [16.1]. On the contrary, the corner in red in the “Second aerial image” is not overlaid on a roof, let alone on corresponding locations of a roof feature of the roof. Instead, as shown, the corner in red in the “Second aerial image” is offset from the roof.



NEARMAP-1004, Detail of FIG. 4 (annotated)

Petition, 27; EX1003, ¶47.

113. Having line drawings with “features in common” (e.g., red box in Petitioner’s second annotation of Heller’s Figure 5 or red circle in Petitioner’s annotation of Heller’s Figure 4) as Petitioner and Dr. Forsyth allege for limitation [1.2] (Petition, 25-26; EX1003, ¶45), does not show that “a line drawing” is overlaid “on corresponding locations of a roof feature of the roof on first and second aerial images of the roof,” as required by limitation [16.1]. Petitioner’s

mapping for limitation [1.2] simply does not show that “a line drawing” is overlaid on “corresponding locations” of the same roof feature (“a roof feature”) in both first and second aerial images of that roof.

114. Accordingly, Petitioner and Dr. Forsyth's analysis in the Petition and EX1003 do not show that the Heller-Quam combination discloses, suggests, or renders obvious limitations [16.0] and [16.1]. Claim 16 is therefore patentable over the Heller-Quam combination presented in Ground 1, because the Heller-Quam combination does not render obvious all the limitations of claim 16.

D. Petitioner Fails to Demonstrate the Heller-Quam Combination Teaches Additional Claim Elements of Independent Claim 26.

115. As indicated above, I understand that to prevail in a patentability challenge in an *inter partes* review, a petitioner must show with particularity where each element of a challenged claim is taught in the prior art.

116. As also noted above, Petitioner and Dr. Forsyth rely exclusively on their analysis of claim 1 in addressing the limitations of claim 26. Petition, 48-49 (claim 26); EX1003, ¶¶87-90 (claim 26); EX2006, 183:13-25 (Dr. Forsyth confirming in his deposition that his analysis of claim 26 relied on his analysis for claim 1). Petitioner and Dr. Forsyth's analysis of claim 1, however, fails to address specific limitations of claim 26 that are unique to claim 26.

117. In alleging that claim 26 is unpatentable, Petitioner relies entirely on

the mapping of claim 1, as shown below.

Claim 16 Limitation	Claim 1 Limitation
[26.0]	[1.0]
[26.1]	[1.1], [1.2], [1.3]
[26.2]	[1.4]
[26.3]	[1.5]

Petition, 48-49; EX1003, ¶¶87-90; EX2006, 183:13-25.

118. I have been informed that when the limitations in the body of the claim rely upon or derive antecedent basis from the preamble of the claim, then the preamble of the claim is limiting. I understand that the preamble of claim 26 (i.e., limitation [26.0]) is limiting because the body of claim 26 derives antecedent basis from the preamble. For example, the preamble of claim 26 recites “a computer system,” which provides antecedent basis for the term “the computer system” in limitations [26.1] and [26.2]. Therefore, the preamble of claim 26 (limitation [26.0]) is a limiting feature of claim 26.

119. Limitation [26.0] recites “a computer system,” which is not recited in [1.0]. EX2016, 3 (comparison of limitations [1.0] and [26.0]). Limitation [26.0] recites “[a] computer-implemented method in a roof estimate report system including a computer system and a memory coupled to the computer system, the method comprising.” Thus, limitation [26.0] recites **both** “a roof estimate report system” and a “computer system.” Limitation [1.0] does not recite “a computer

system,” but Petitioner and Dr. Forsyth rely exclusively on their analysis of limitation [1.0] for limitation [26.0]. Petition, 48; EX1003, ¶87; EX2006, 183:16-25.

120. While Petitioner and Dr. Forsyth's analysis of limitation [1.0] appears to allege that Heller's RADIUS Testbed System (RTS) implemented on Quam's RADIUS Common Development Engine (RCDE) corresponds to computer-implemented method” (Petition, 19-20; EX1003, ¶¶34-35), Petitioner and Dr. Forsyth do not establish what features of Heller or Quam correspond to the “computer system” as recited in limitation [26.0]. Petitioner and Dr. Forsyth's analysis for limitation [1.0] alleges that Quam describes that Heller's RADIUS “runs on both Sun [] Microsystems and Silicon Graphics RISC-based workstations.” Petition, 20; EX1003, ¶35. If these “workstations” are alleged to correspond to the claimed “roof estimate report system,” then Petitioner and Dr. Forsyth have not shown any feature of Heller or Quam that corresponds to the claimed “computer system” in limitation [26.0]. To the extent Petitioner and Dr. Forsyth are alleging that Quam's “workstations” include a “computer system and a memory coupled to the computer system,” as recited in limitation [26.0], Quam's “workstations” cannot also correspond to the claimed “roof estimate report system” as recited in limitation [26.0], because neither Heller nor Quam generate

or output roof estimate reports, as I established above with respect to limitation [1.5].

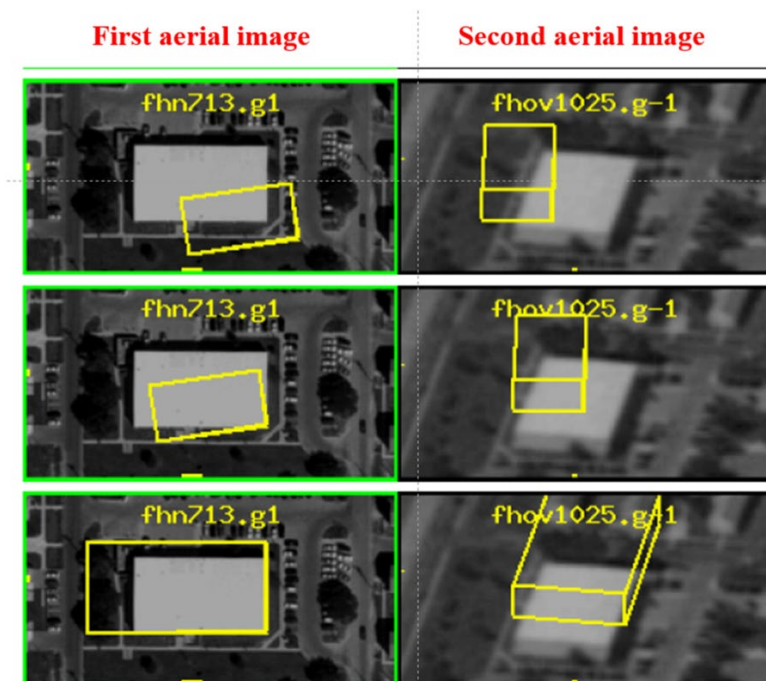
121. The simple fact is that Petitioner and Dr. Forsyth's analysis of limitation [1.0] does not show that the Heller-Quam combination teaches ***both*** "a roof estimate report system" ***and*** a "computer system," as recited in limitation [26.0].

122. Petitioner and Dr. Forsyth have also not shown that the Heller-Quam combination teaches limitation [26.2]. As indicated above, Petitioner and Dr. Forsyth rely exclusively on their mapping of limitation [1.4] for limitation [26.2]. Petition, 49; EX1003, ¶89; EX2006, 183:13-25. Petitioner and Dr. Forsyth's analysis of limitation [1.4] does not show that the Heller-Quam combination teaches all the features of limitation [26.2].

123. Despite a generic reference to "[i]n the combination" at the beginning of their analysis of limitation [1.4], Petitioner and Dr. Forsyth cite only to the teachings of Heller in their analysis of limitation [1.4]. Petition, 30-33; EX1003, ¶¶52-56.

124. Petitioner and Dr. Forsyth's analysis of limitation [1.4] does not show where Heller teaches "changing...a line in a second line drawing that ***corresponds to the same feature in the first line drawing*** that was changed," as recited in

limitation [26.2]. Petition, 30-33; EX1003, ¶¶52-55. Petitioner and Dr. Forsyth's analysis of limitation [1.4] does not show that the changed line in the second line drawing "corresponds to *the same feature* in the first line drawing that was changed, as recited in limitation [26.2]. With reference to the annotated version of Heller's Figure 4 below, Petitioner and Dr. Forsyth allege that "Heller teaches that the line drawing overlying the second aerial image is updated in response to changes to the line drawing overlaying the first aerial image." Petition, 30-31 (citing EX1004, 2, 3, Fig. 4, Fig. 5); EX1003, ¶52 (identical argument and citations).



NEARMAP-1004, Detail of FIG. 4

Petition, 31; EX1003, ¶52.

125. Importantly, neither Petitioner nor Dr. Forsyth quote or summarize any actual teachings in pages 2 and 3 of Heller to support their contention that “Heller teaches that the line drawing overlying the second aerial image is updated in response to changes to the line drawing overlaying the first aerial image.” Petition, 30-31 (citing EX1004, 2, 3, Fig. 4, Fig. 5); EX1003, ¶52 (identical argument and citations). Sections 2, 2.1, and 2.3 on pages 2-3 of Heller contain no discussion of displaying a plurality of aerial images of a roof at the same time, let alone making corresponding adjustments to the overlying line drawings of roof features on a different aerial image of a roof, in response to the changes made in the line drawing representing a feature of the roof that overlies a first aerial image. The only portion on page 3 of Heller that refers to more than one image is the following paragraph in section 2.2.

Finally, a road that has been initially modeled either fully manually or with the road tracker or ziplock snakes can be simultaneously optimized in two or more images with the MBO system, resulting in a highly accurate, full 3-D model of the road. Figure 3 shows the pre- and post- optimization versions of a road.

EX1004, 3 (annotated)

As shown in the above-reproduced portion of Section 2.2 on page 3 of Heller,

however, this portion relates to optimizing an input sketch of a line drawing representing a road (Heller's Figure 3, left and shown below), entered manually or using tools such as "Road Tracker" or "Ziplock Snakes", and then using a Model Based Optimization (MBO) of [Fua, 95].³ The results after optimization which better represents the road intensities, and are shown on the same image (Heller's Figure 3 right and shown below). Curiously, Petitioner and Dr. Forsyth do not rely on or cite to the road-optimization technique illustrated in Heller's Figure 3 in their analysis of limitation [1.4]. Petition, 30-33; EX1003, ¶¶52-56. Moreover, the above-reproduced portion of Section 2.2—the only portion of Heller's pages 2 and 3 that discuss more than one image—does not support Petitioner and Dr. Forsyth's contention that "Heller teaches that the line drawing overlying the second aerial image is updated in response to changes to the line drawing overlaying the first aerial image." Petition, 30-31 (citing EX1004, 2, 3, Fig. 4, Fig. 5); EX1003, ¶52 (identical argument and citations).

³ [Fua, 1995] P. Fua. Parametric Models are Versatile: The Case of Model Based Optimization. In *ISPRS WG III/2 Joint Workshop*, Stockholm, Sweden, September 1995. (Cited in "References" of Heller, EX1004, 11.)



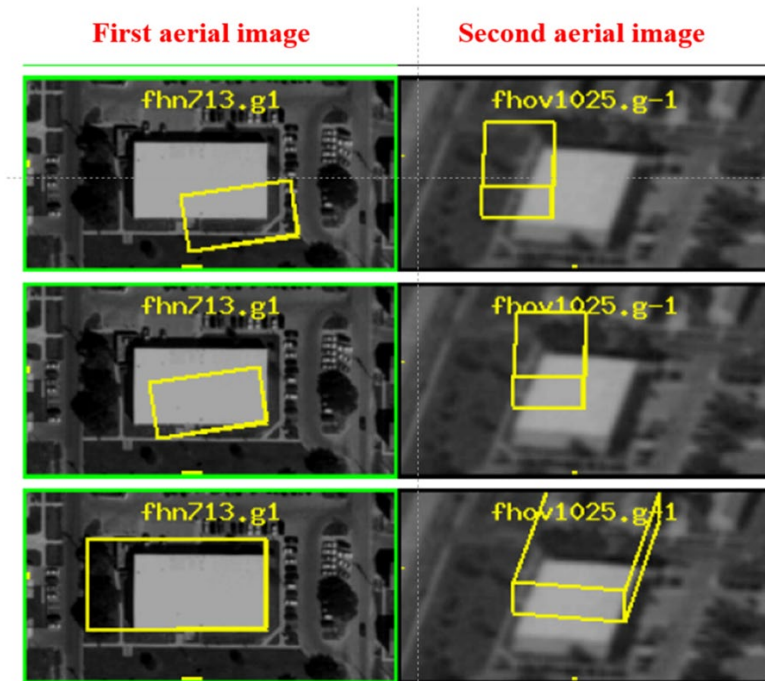
Figure 3: A road model, before and after optimization.

EX1004, Fig. 3

126. Further, Petitioner and Dr. Forsyth's analysis of limitation [1.4] with respect to their annotations of Heller's Figures 4 and 5 does not show that Heller teaches "changing...a line in a second line drawing that *corresponds to the same feature in the first line drawing [representing a feature of the roof]* that was changed," as recited in limitation [26.2]. Petition, 30-33; EX1003, ¶¶52-55. I note that limitation [26.1] recites "changing...a line in a first line drawing representing a feature of a roof...."

127. Petitioner and Dr. Forsyth rely on the following annotation of Figure 4 and allege that "[a]s shown in FIG. 4, the line drawing overlying the second image

also changes position and size as we progress down from the top row.” Petition, 31 (citing EX1004, Fig. 4); EX1003, ¶¶52-53.



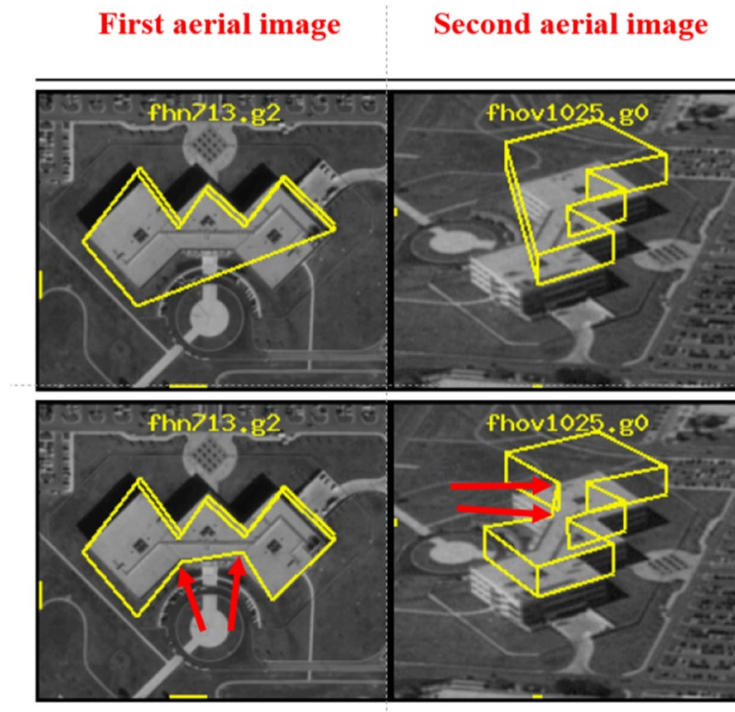
NEARMAP-1004, Detail of FIG. 4

Petition, 31; EX1003, ¶52.

In their analysis of limitation [1.4], however, Petitioner and Dr. Forsyth point to no disclosure in Heller that establishes that Heller teaches “changing...a line in a second line drawing that *corresponds to the same represented feature of the roof in the first line drawing* that was changed,” as recited in limitation [26.2]. Petition, 30-33; EX1003, ¶¶52-55. Petitioner and Dr. Forsyth may attempt to rely on the following sentence in Section 2.3.1 on page 5 of Heller: “The *Move W* operation

moves the box along the camera ray of the selected image and along the corresponding epipolar lines in the...other images.” EX1004, 5; Petition, 32 (citing EX1004, 5); EX1003, ¶54 (same citation). This sentence, however, does not teach that roof feature changes in the line drawing in the “Second aerial image” in Heller’s Figure 4 “correspond[] to the *same [represented roof] feature* in the first line drawing that was changed,” as recited in limitation [26.2]. On the contrary, the above-quoted sentence merely states that the box is moved “along the corresponding epipolar lines in the [] other images.” There is no disclosure in this cited portion of Heller that supports Petitioner and Dr. Forsyth’s argument that Heller teaches “changing...a line in a second line drawing that *corresponds to the same feature of a roof represented in the first line drawing* that was changed,” as recited in limitation [26.2].

128. Likewise, Petitioner and Dr. Forsyth point to no teaching with regard to their below annotation of Heller’s Figure 5 that establishes that Heller teaches “changing...a line in a second line drawing that *corresponds to the same feature [of a roof represented] in the first line drawing* that was changed,” as recited in limitation [26.2].



NEARMAP-1004, Detail of FIG. 5 (annotated)

Petition, 32-33; EX1003, ¶55. With reference to annotated Figure 5 of Heller above, Petitioner and Dr. Forsyth argue that vertices are added to the line drawing overlaying the first aerial image, and “the line drawing over the second aerial image is also changed to add these two vertices (denoted by red arrows).”).

Petition, 32-33; EX1003, ¶55. However, Petitioner and Dr. Forsyth’s analysis with respect to annotated Figure 5 of Heller above in their analysis of limitation [1.4] does not show that the added vertices in the first overlay line drawing represents a feature of the roof, and moreover the added vertices in the second line drawing are for the *same or any roof feature* in the first line drawing.

129. Accordingly, Petitioner and Dr. Forsyth's analysis of limitation [1.4], which they rely exclusively on for limitation [26.2], fails to teach "changing, by the computer system of the roof estimate report system, *a line in a second line drawing that corresponds to the same [roof] feature [represented] in the first overlay line drawing that was changed....*," as recited in limitation [26.2].

130. Therefore, Petitioner and Dr. Forsyth have failed to show that the Heller-Quam combination renders obvious limitations [26.0], [26.2], and [26.3] of claim 26. Claim 26 is therefore patentable over the Heller-Quam combination presented in Ground 1, because the Heller-Quam combination does not render obvious all the limitations of claim 26.

E. Petitioner Fails to Demonstrate that the Heller-Quam Combination Teaches All of the Features Recited by Claim 9.

131. Claim 9 recites "[t]he method of claim 1 further comprising: transmitting roof measurement information based at least in part on the change of the line drawing representing a feature of the roof that overlies the first aerial image of the roof." EX1001, 24:52-56. Thus, claim 9 requires that the transmission of the roof measurement information is based on the condition that there is a "change of the line drawing representing a feature of the roof that overlies the first aerial image of the roof."

132. Petitioner and Dr. Forsyth's analysis of claim 9 is incorrect for three

reasons. First, Petitioner and Dr. Forsyth's analysis of claim 9 is based on their incorrect proposal that claim 9 should be "interpreted broadly enough to encompass transmitting roof measurement information between components of the same computer system." Petition, 38; EX1003, ¶67.

133. As described with respect to limitation [1.0], Petitioner and Dr. Forsyth appear to allege that Heller's RADIUS Testbed System as implemented on Quam's RADIUS Common Development Engine (RCDE) corresponds to the claimed "computer-implemented method," despite not making that correspondence explicit. Petition, 19-20; EX1003, ¶¶34-35.

134. Neither Petitioner nor Dr. Forsyth allege that Heller or Quam teach transmitting roof measurement information outside of Heller's RADIUS Testbed System as implemented on Quam's RADIUS Common Development Engine. On the contrary, Petitioner and Dr. Forsyth allege that Heller's "object adjustment events" would be understood by a POSITA to "include roof measurement information." Petition, 38 (citing EX1004, 5); EX1003, ¶69 (citing EX1004, 5). At no point do Petitioner or Dr. Forsyth allege that these "object adjustment events" are transmitted outside Heller's RADIUS Testbed System as implemented on Quam's RADIUS Common Development Engine.

135. Instead, Petitioner and Dr. Forsyth allege that the "object adjustment

events” relate to user manipulation of a wireframe or primitive, where such “object adjustment events” include “mouse-position deltas if the user’s mouse is moved during the adjustment, an “Object ID” of the object that is moved, an “Adjustment type: (for example, vertex-xy, vertex-z, vertex-width, ...),” and a “Sequence of time deltas and mouse position deltas of the form: delta-t dx dy.” Petition, 38-39 (citing EX1004, 4-5, Figs. 4-5); EX1003, ¶¶68-69 (citing EX1004, 4-5, Figs. 4-5). None of these “object adjustment events” are transmitted outside Heller’s RADIUS Testbed System as implemented on Quam’s RADIUS Common Development Engine.

136. Second, even to the extent claim 9 is construed to encompass transmission of “roof measurement information” within the same computer system, none of Heller’s “object adjustment events” amount to “roof measurement information.” None of these “object adjustment events” relate to “measurement information” about a roof, as the term “roof measurement information” requires. For example, the ’737 Patent explains that “roof measurement information may include measurements such as lengths of the edges of sections of the roof, pitches of sections of the roof, areas of sections of the roof, etc.” EX1001, 2:55-58.

137. Petitioner and Dr. Forsyth allege that “[t]he mouse movement during the adjustment,” for which the “object adjustment events” are captured, “represents

the change in the size of the line drawing during the adjustment.” Petition, 39; EX1003, ¶69. However, Petitioner and Dr. Forsyth’s conclusion has no support in the disclosure of Heller. Petitioner and Dr. Forsyth theorize that changing the size of a line drawing in Heller would “include roof measurement information,” because “mouse movement during the adjustment represents the change in the size of the line drawing during the measurement.” Petition, 38-39; EX1003, ¶69. This argument is not supported by Heller or Quam. Petitioner and Dr. Forsyth have not pointed to any disclosure in Heller or Quam that links a line drawing to a measurement (or reference) scale such that moving a line drawing would also constitute a change in measurement information of a real world structure associated with that line drawing. For example, Petitioner and Dr. Forsyth have not pointed to any disclosure in Heller or Quam that teaches a line drawing of length “X pixels” (or other length reference scale) on an image represents a length of “Y inches/feet” (or other length reference scale) of a real-world structure shown in that image. Similarly, Petitioner and Dr. Forsyth have not pointed to any disclosure in Heller or Quam that teaches a rectangular line drawing of having an area “XxZ pixels” on an image represents a particular size area (e.g., square inches/feet) of a real world structure shown in that image. Without some explicit link between the scale of a line drawing and the real world structure, any change in the line drawing

is immaterial to measurement information of the real world structure. In this regard, Heller makes clear that the “central component” of its system “is the creation of a 3-dimensional model that captures the basic geometry of the site under examination.” Consistent with this goal, a POSITA would understand that Heller’s system creates the 3D model capturing the basic geometry of the site under examination using image analysis without the need for a link between the scale of the 3D model and measurements of the real world structures represented by the 3D model. As a result, Petitioner and Dr. Forsyth have not shown that Heller or Quam teaches that adjusting a line drawing means that roof measurement information is attributed to that change in the line drawing, let alone that any such alleged roof measurement information would be transmitted based on a change of the line drawing.

138. Thus, Petitioner and Dr. Forsyth’s argument that “[b]ecause the line drawings are used to model the roof structure of a building (see [1.2]-[1.4]), a change in the size of the line drawing represents a change in the measurements of the roof represented by the model. *Id.*” (Petition, 39 (citing EX1004, 5); EX1003, ¶69 (citing EX1004, 5)) has no support in Heller. A careful reading of the portions that Petitioner and Dr. Forsyth cite to (EX1004, 5; limitations [1-2]-[1.4]) reveals that there is no teaching whatsoever in Heller that links mouse movements or the

placement of primitives (wire drawings) to specific measurement information about a roof. Thus, there is simply no support for Petitioner and Dr. Forsyth's hopeful argument that "a change in the size of the line drawing represents a change in the measurements of the roof represented by the model." Petition, 39; EX1003, ¶69. Heller is directed to "the creation of a 3-dimensional model that captures the basic geometry of the site under examination," and contains no disclosure linking precise measurements to its 3D models. Therefore, there is no teaching in Heller or Quam for Petitioner and Dr. Forsyth's attempt to tie "mouse movements" or "adjustments to object parameters" to "roof measurement information," as recited in claim 9.

139. There is simply no support in Petitioner's analysis of limitations [1.2]-[1.4] or in pages 4-5 or Figures 4-5 of Heller to support Petitioner's (and Dr. Forsyth's) argument that the sizes of wireframes are associated with specific measurement information about a roof, and that adjustments to the wireframes represent adjustment to such (non-existent) measurement information. Therefore, the Heller-Quam combination fails to teach transmitting roof measurement information, as recited in claim 9.

140. Third, in addition to failing to show that Heller teaches transmitting "roof measurement information," as recited in claim 9, Petitioner and Dr. Forsyth

have not shown that Heller teaches that the roof measurement information is transmitted based on the condition that there is a “change of the line drawing representing a feature of the roof that overlies the first aerial image of the roof,” as required by claim 9. Instead, Petitioner and Dr. Forsyth incorrectly rely on “object adjustment events,” which are themselves changes in primitives (line drawings), but these “object adjustment events” are not transmitted *based on* a “change of the line drawing representing a feature of the roof that overlies the first aerial image of the roof,” as recited by claim 9. In other words, Heller’s “object adjustment events” are not transmitted based on the satisfaction of a condition that there is a change in “the line drawing representing a feature of the roof that overlies the first aerial image of the roof.”

141. Accordingly, Petitioner and Dr. Forsyth have failed to show that the Heller-Quam combination teaches all the recited features of claim 9. Claim 9 is therefore patentable over the Heller-Quam combination presented in Ground 1, because the Heller-Quam combination does not render obvious all the limitations of claim 9.

F. Petitioner Fails to Demonstrate that the Heller-Quam Combination Teaches All of the Features Recited by Claim 10.

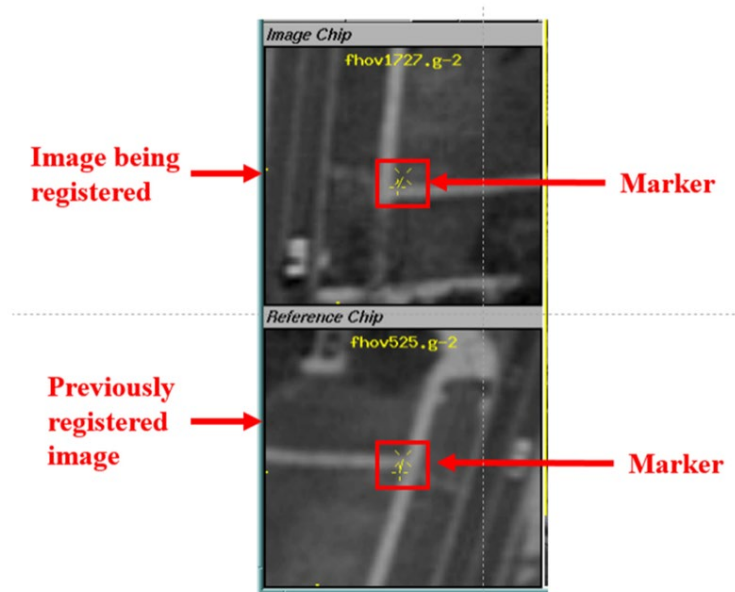
142. The Heller-Quam combination does not teach all the limitations of claim 1, as discussed above. Additionally, it does not teach all the features of

claim 10 (dependent on claim 1). Petitioner and Dr. Forsyth argue that “the combination” teaches the features of claim 10, but Petitioner and Dr. Forsyth rely exclusively on Quam in their analysis of the features of claim 10. Petition, 40-44; EX1003, ¶¶71-77. Quam does not teach limitation [10.2]. Thus, Petitioner and Dr. Forsyth have not shown that the Heller-Quam combination renders obvious claim 10.

143. Limitations [10.0] and [10.1] recite “displaying a marker operable to specify a point on an image,” and “receiving, via the marker, an indication of a point on the first aerial image.” Petitioner and Dr. Forsyth alleges that Quam’s X-shaped crosshair corresponds to the claimed “marker,” and that the user manually sets an indication of a point on the first aerial image using a mouse and the X-shaped crosshair (marker). Petition, 40-41; EX1003, ¶¶71-72

144. Contrary to Petitioner and Dr. Forsyth’s argument, Quam (and therefore the Heller-Quam combination) does not disclose “registering, based on the received indication of the point, the aerial image to a reference grid corresponding to a three-dimensional model of the roof,” as recited in [10.2].

145. Quam registers a point in an image based on that point in a previously registered image, as shown in Petitioner and Dr. Forsyth’s annotation of Quam’s Figure 8 below.



NEARMAP-1005, Detail of FIG. 8 (annotated)

Petition, 42-43; EX1003, ¶75.

146. In contrast to limitation [10.2], Quam does not disclose “registering, based on the received indication of the point, the aerial image to a reference grid corresponding to a three-dimensional model of the roof.” There is no disclosure in Quam of a “reference grid corresponding to a three-dimensional model of the roof,” or a registration of the aerial image to such a reference grid.

147. Petitioner and Dr. Forsyth allege that a “world coordinate system” is a “reference grid” (Petition, 43-44; EX1003, ¶76), but even if that were true, that “world coordinate system” is not shown to correspond to a 3D model of the roof, as required by [10.2]. A “world coordinate system,” by itself, simply does not correspond to a 3D model of a roof. Therefore, Petitioner and Dr. Forsyth have not

shown that Quam, or the Heller-Quam combination, teaches “registering, based on the received indication of the point, the aerial image *to a reference grid corresponding to a three-dimensional model of the roof*,” as recited in claim 10.

148. Accordingly, Petitioner and Dr. Forsyth have failed to show that the Heller-Quam combination teaches all the recited features of claim 10. Claim 10 is therefore patentable over the Heller-Quam combination presented in Ground 1, because the Heller-Quam combination does not render obvious all the limitations of claim 10.

VIII. PETITIONER'S GROUND 2 FAILS BECAUSE PETITIONER DOES NOT SHOW THE PRIOR ART RENDERS THE CLAIMS OBVIOUS

149. Petitioner and Dr. Forsyth additionally challenge claims 1, 6, 7, 9, 10, 16, 17, 25, 26, and 34 as allegedly being obvious over “Heller and Quam in view of Deaton.” Petition, 50 (Ground 2 heading); EX1003, p. 51 (same). Petitioner and Dr. Forsyth's analysis in Ground 2 differs only with respect to limitation [1.5] of claim 1. In particular, Petitioner and Dr. Forsyth argue that “to the extent [limitation [1.5]] is found to be entitled to patentable weight, it is nonetheless rendered obvious by the Heller-Quam-Deaton combination.” Petition, 53; EX1003, ¶100.

A. Ground 2 is Facially Deficient.

150. At the outset, Ground 2 is facially deficient because it does not

address all the features of limitation [1.5] that are lacking in the Heller-Quam combination proposed in Ground 1. As described above, limitation [1.5] includes at least the following features that are entitled to patentable weight, because these features do not relate to the “the claimed content of the information,” or “the detailed requirements as to the contents of the roof estimate report.” EX1010, 18.

[1.5] generating and outputting a roof estimate report using a report generation engine, ... wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

151. As discussed above, Petitioner and Dr. Forsyth have entirely failed to show that Heller or Quam teaches the following features (a)-(b) of limitation [1.5]:

(a) generating and outputting a roof estimate report using a report generation engine, and

(b) wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.

152. For example, as discussed above, Petitioner and Dr. Forsyth's analysis of limitation [1.5] in Ground 1 does not show that either Heller or Quam teaches (a) “generating and outputting a roof estimate report using a report generation engine,” as recited in limitation [1.5]. Petitioner and Dr. Forsyth's analysis of limitation [1.5] for Ground 2 is facially deficient because it does not show that Deaton teaches (a) “generating and outputting a roof estimate report using a report generation engine,” as recited in limitation [1.5(a)].

153. Citing only paragraph 10 of Deaton, Petitioner and Dr. Forsyth argue that “[i]n the combination, Deaton describes ‘a roof inspection system’ that generates and outputs various reports.” Petition, 53 (citing EX1006, ¶10); EX1003, ¶101 (citing EX1006, ¶10). There is, however, no discussion or suggestion in paragraph 10 of Deaton, the only paragraph cited by Petitioner and Dr. Forsyth, for the supporting the contention that “Deaton describes ‘a roof inspection system’ that *generates and outputs various reports.*” Petition, 53 (citing EX1006, ¶10); EX1003, ¶101 (citing EX1006, ¶10). Deaton’s paragraph 10, which is reproduced below in its entirety, discloses a “roof inspection system” that includes a portable communications device that “collect[s] roof inspection information” at the physical site of a roof structure being investigated, and that transmits the collected roof inspection information to a “second computing device” remote from the inspection site.

Another embodiment of a *roof inspection system* may include a portable computing device that can be transported between a first location and a second location, the second location being remote from the first location. The *portable computing device* includes at least one auxiliary component for *collecting roof inspection information at the second remote location according to an inspection plan executed by the portable computing device*. The roof inspection information collected by at least one auxiliary component includes geographic positions defining a geometric shape of at

least a portion of the roof and a geographic position of at least one component associated with the roof with respect to the portion of the roof.

The *portable communications device* includes a bidirectional communications interface for *transferring the roof inspection information from the portable computing device to a second computing device* over the bidirectional communications interface at a time when the portable computing device is located at the first location.

EX1010, ¶10.

154. Thus, there is no teaching in paragraph 10 of Deaton, the only paragraph cited by Petitioner and Dr. Forsyth, to support Petitioner and Dr. Forsyth's contention that "Deaton describes 'a roof inspection system' that *generates and outputs various reports.*" Petition, 53 (citing EX1006, ¶10); EX1003, ¶101 (citing EX1006, ¶10). In particular, paragraph 10 does not teach that the portable communications device of the roof inspection system "generate[s] and output[s] a roof estimate report using a report generation engine," as recited in limitation [1.5(a)].

155. Therefore, Petitioner and Dr. Forsyth have not shown that Deaton teaches limitation [1.5], because Deaton, like Heller and Quam, fails to teach "generating and outputting a roof estimate report using a report generation engine," as recited in limitation [1.5(a)]. Consequently, Petitioner and Dr. Forsyth have not shown that the Heller-Quam-Deaton combination renders limitation [1.5] obvious.

156. Accordingly, Petitioner and Dr. Forsyth have failed to show that the Heller-Quam-Deaton combination teaches all the recited features of claim 1, because the Heller-Quam-Deaton combination fails to teach limitation [1.5]. Claim 1 is therefore patentable over the Heller-Quam-Deaton combination presented in Ground 2, because the Heller-Quam combination does not render obvious all the limitations of claim 1.

157. In Ground 2, Petitioner and Dr. Forsyth again rely exclusively on their analysis of limitation [1.5] for their analysis of limitations [16.3] and [26.3]. Petition, 54 (limitation [16.3]), 55 (limitation [26.3]); EX1003, ¶¶106 (limitation [16.3]), 109 (limitation [26.3]). Because Petitioner and Dr. Forsyth's analysis of limitation [1.5] is deficient for the reasons provided above, Petitioner and Dr. Forsyth's analysis of limitations [16.3] and [26.3] are deficient for the same reasons.

158. Therefore, claims 1, 16, and 26, as well as dependent claims 6, 7, 9, 10, 17, 25, and 34, are patentable over the Heller-Quam-Deaton combination.

159. As noted above, limitation [1.5] also recites "wherein the roof estimate report includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof." To the extent the Board gives patentable weight to this phrase, Petitioner and Dr. Forsyth

have not shown that the Heller-Quam-Deaton combination teaches a “roof estimate report” that “includes numerical values for corresponding slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof,” as recited in limitation [1.5]. I note that Petitioner and Dr. Forsyth do not address this feature of limitation [1.5] in their analysis of limitation [1.5] in Ground 2, other than to reproduce the text of limitation [1.5]. Petition, 53-54; EX1003, ¶¶100-103.

B. There is Insufficient Motivation to Combine Deaton with the Heller-Quam Combination.

160. In addition to the Heller-Quam-Deaton combination failing to teach limitations [1.5], [16.3], and [26.3], Petitioner and Dr. Forsyth's proposed motivation to combine Deaton with the Heller-Quam combination lacks merit.

161. Petitioner and Dr. Forsyth argue that “[i]n the combination, the combined system of Heller and Quam is modified to produce a roof estimate report, as taught by Deaton, based on the site models described in Heller and Quam.” Petition, 50; EX1003, ¶94.

162. This proposed combination is not supportable based on the teachings of Heller, Quam, and Deaton. As I discussed above, Heller “create[s] a 3-dimensional model” of the basic geometry of “military and industrial sites” based on image analysis, and Quam “facilitates...three-dimensional (3-D) modeling” with the RADIUS Common Development Environment (RCDE). EX1004,

Abstract, 1 (Introduction); EX1005, Abstract, 1 (Introduction). However, neither Heller nor Quam generates and outputs a roof estimate report based on their 3-D models, as I established above.

163. On the other hand, Deaton is directed to a “roof inspection system” that includes a portable computing device that collects “roof measurement information” from the physical, on-site inspection of a roof. EX1006, ¶10. Thus, unlike Heller and Quam that are directed to creating 3D models based on images, Deaton is instead directed to collecting “roof measurement information” based on the physical inspection of a roof on-site. EX1006, ¶10.

164. Petitioner and Dr. Forsyth argue that “a POSITA would understand that *Deaton’s techniques for generating a roof estimate report based on a three-dimensional model* would operate in the same manner regardless of how the particular three-dimensional model was originally generated,” but their argument cites to no support whatsoever in Heller, Quam, or Deaton. Petition, 53-54; EX1003, ¶102. I note that the only support for this argument is Dr. Forsyth’s declaration (EX1003, ¶102), but Dr. Forsyth cites no disclosure in Heller, Quam,

or Deaton to support his conclusory assertion.⁴ Without citing to any support, Dr. Forsyth unequivocally states that “Deaton’s techniques for generating a roof estimate report based on a three-dimensional model *would operate in the same manner regardless of how the particular three-dimensional model was originally generated.*” EX1003, ¶102. This argument lacks merit, because, as I explained above, Deaton’s “project report” is created “*in accordance with the conditions identified in the assessment report.*” EX1006, ¶107. Further, Deaton expressly describes that the “assessment report” “include[s] a summary of the inspected infrastructure and a listing of the deficiencies identified during inspection data collection.” EX1006, ¶106. Thus, Deaton provides that the “project report” is likewise created based on a physical inspection of the infrastructure. EX106, ¶¶106-107. Further, Deaton’s “project report” is created without relation to any 3D model and is certainly not “based on a three-dimensional model” as alleged by Petitioner and Dr. Forsyth. Petition, 53-54; EX1003, ¶102. On the contrary, Deaton makes clear that the “project report” is based on Deaton’s “assessment report,”

⁴ I have been informed that expert testimony that expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.

which is based on an on-site, physical inspection of the roof being inspected.

Consequently, Deaton nowhere suggests that its “project report” (or “assessment report”) is in any way generated based on a 3D model.

165. Petitioner and Dr. Forsyth argue that “Deaton’s report is produced based on similar models to those in Heller-Quam” (Petition, 52 (citing EX1006, ¶70); EX1003, ¶97 (citing EX1006, ¶70)), but Deaton provides no teaching—and Petitioner and Dr. Forsyth have not pointed to any—that Deaton’s “project report” or “assessment report” is created based on a “graphical model,” as mentioned briefly in Deaton’s paragraph 70, or that Deaton’s “graphical model” are 2D or 3D models.

166. Therefore, the basic premise behind Petitioner and Dr. Forsyth’s argument that “Deaton’s techniques for generating a roof estimate report based on a three-dimensional model *would operate in the same manner regardless of how the particular three-dimensional model was originally generated*” (Petition, 53-54; EX1003, ¶102) is contradicted by the disclosure of Deaton.

167. Thus, Petitioner and Dr. Forsyth have not pointed to any teaching in Heller, Quam, or Deaton to support their proposed modification of the Heller-Deaton combination to “produce a roof estimate report, as taught by Deaton, based on the site models described in Heller and Quam.” Petition, 50; EX1003, ¶94.

168. Petitioner and Dr. Forsyth argue that “including the production of [Deaton’s project] report in the system resulting from the combination of Heller and Quam would advantageously enable the site models described in Heller and Quam to be utilized to plan and execute maintenance, repair, and new construction projects, thereby increasing the utility of the combined system.” Petition, 51 (EX1006, ¶107); EX1003, ¶95 (citing EX1006, ¶107). This argument lacks merit, because Petitioner and Dr. Forsyth have not shown why or how a POSITA would have modified the Heller-Quam combination, which is directed to building 3D models from images to capture the basic geometry of a site from images, to incorporate the “project report” of Deaton that is generated based on the physical, on-site inspection of a roof structure. Petitioner and Dr. Forsyth argue, without any support whatsoever, that “[a] POSITA would have recognized that applying Deaton’s teachings to augment the Heller-Quam system would have led to predictable results without significantly altering or hindering the functions performed by the Heller-Quam system.” Petition, 51-52; EX1003, ¶97. In addition to not citing any support in Heller, Quam, or Deaton for this motivation, modifying the Heller-Quam combination in the manner proposed would, in fact, “significantly alter[] or hinder[] the functions performed by the Heller-Quam system,” because there is no teaching in Heller or Quam of being able to incorporate “roof inspection

information” from the physical, on-site inspection that is performed in Deaton.

EX1006, ¶¶10, 106, 107. Similarly, there is no teaching in Deaton of being able to generate a “project report” from a 3D model, such as the 3D models capturing the basic geometry of a site as created by Heller-Quam.

169. Therefore, a POSITA would not have been motivated to modify the Heller-Quam combination to additionally include Deaton as proposed by Petitioner and Dr. Forsyth. Petitioner and Dr. Forsyth’s argument that “Deaton’s techniques for generating a roof estimate report based on a three-dimensional model *would operate in the same manner regardless of how the particular three-dimensional model was originally generated*” (Petition, 53-54; EX1003, ¶102) lacks merit and is contradicted by the disclosure of Deaton.

170. Further, contrary to Petitioner and Dr. Forsyth’s argument, a POSITA would not have been “motivated to incorporate the well-known techniques of Deaton into Heller-Quam to achieve the predictable benefits described in Deaton.” Petition, 52 (citing EX1003, ¶97; EX1005, 34; EX1006, ¶¶9, 12-13). None of these cited portions of Quam and Deaton support Petitioner and Dr. Forsyth’s argument that a POSITA would have been motivated to generate a “project report” from an on-site inspection of an infrastructure (EX1006, ¶¶9, 12-13) using basic 3-D site models that are generated in Heller and Quam from imagery. Deaton suggests the

opposite, because Deaton's "project report" is created based on the on-site, physical inspection of the infrastructure being investigated. EX1006, ¶¶106-107, 10. Heller and Quam are not directed to roof repair and/or construction, and are instead directed to creating basic 3D models of a site under inspection. EX1004, 1; EX1005, 1. The Petition and Dr. Forsyth identify no disclosure in Heller or Quam showing that the Heller-Quam combination could create 3D models based on information obtained from Deaton's on-site, physical inspection of the infrastructure being investigated.

171. Accordingly, in addition to the Heller-Quam-Deaton combination failing to teach limitations [1.5], [16.3], and [26.3], a POSITA would not have been motivated to additionally modify the Heller-Quam combination with Deaton as proposed by Petitioner and Dr. Forsyth.

172. Therefore, for at least the foregoing reasons, Ground 2 fails to render obvious the challenged claims.

IX. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

174. I have been asked to opine regarding issues relating to secondary considerations of non-obviousness to support my opinion that claims 1, 6, 7, 9, 10, 16, 17, 25, 26, and 34. I have been informed that secondary considerations of non-obviousness are also referred to as objective indicia of non-obviousness. I note that Dr. Forsyth addressed secondary considerations of non-obviousness but only with respect to publicly available, unredacted information from the Xactware IPR (IPR2016-00592).

175. I understand that, in the Xactware IPR, the Patent Trial and Appeal Board ("Board") found claims 1, 9, 10, 16, 19, 22, 25-28, 31, and 34-36 patentable based on secondary considerations of non-obviousness relating to commercial success and industry praise. EX1010, 26-35. I also understand that the U.S. Court of Appeals for the Federal Circuit affirmed the Board's determination that claims 1, 9, 10, 16, 19, 22, 25-28, 31, and 34-36 are patentable based on Patent Owner's secondary considerations evidence of commercial success and industry praise. EX1016, 2-3.

176. As discussed above, the combinations asserted by Petitioner and Dr. Forsyth in Grounds 1 and 2 do not render obvious the challenged claims because the art does not teach all the recited features of the challenged claims.

177. It is my opinion that Patent Owner's Twister and Render House software products embody at least claims 1, 6, 7, 9, 10, 16, 17, 25, 26, and 34. In my prior declaration in the Xactware IPR (EX2008), I included charts that I prepared showing in detail how the Twister and Render House products embody claims 1, 9, 10, 16, 19, 22, 25-28, 31, and 34-36 of the '737 Patent. EX2008, pp. 43-100. As part of my analysis in preparing the above-identified charts in my prior declaration in the Xactware IPR (EX2008), I discussed the Twister and Render House products with engineers at Patent Owner who used the Twister and Render House products on a regular basis. During those discussions when preparing my prior Declaration (EX2008), I personally directed Patent Owner's engineers to operate the Twister and Render House software products to confirm my understanding of the products' operation. Based on my analysis of the Twister and Render House products, I determined that each Twister and Render House product embodies claims 1, 9, 10, 16, 19, 22, 25-28, 31, and 34-36 of the '737 Patent. EX2008, ¶84. My understanding of the Twister and Render House products was further confirmed based on my review of respective user manuals of the Twister product (EX2007) and Render House product (EX2030). The user manuals of the Twister (EX2007) and Render House (EX2030) products were in existence as of October 15, 2008, which is contemporaneous with the October 31, 2008 priority

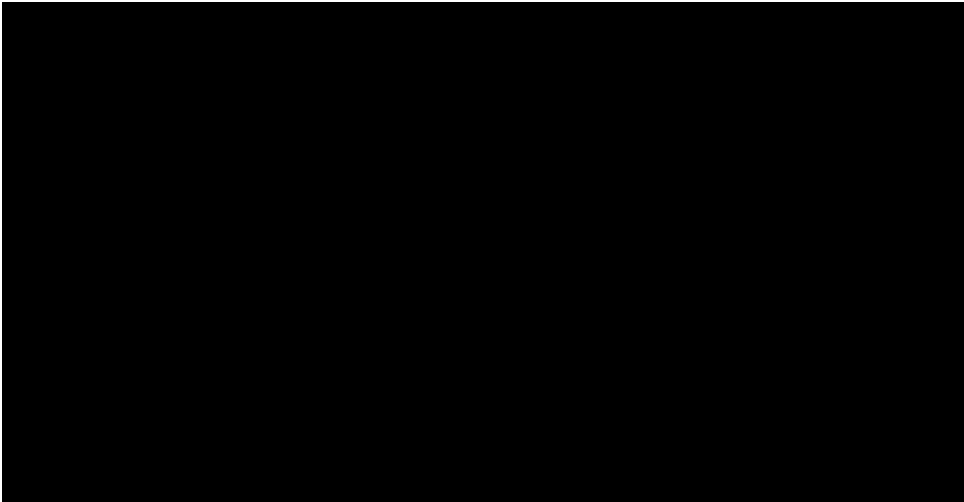
date of the '737 Patent. Thus, in my prior declaration (EX2031), I referred to screenshots of the Twister and Render House software products as well as the user manuals of the Twister and Render House products (EX2007, EX2030) that showed the operation of the Twister and Render House products as of the October 31, 2008 priority date of the '737 Patent.

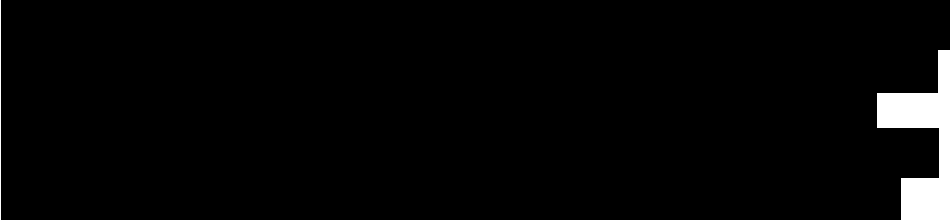
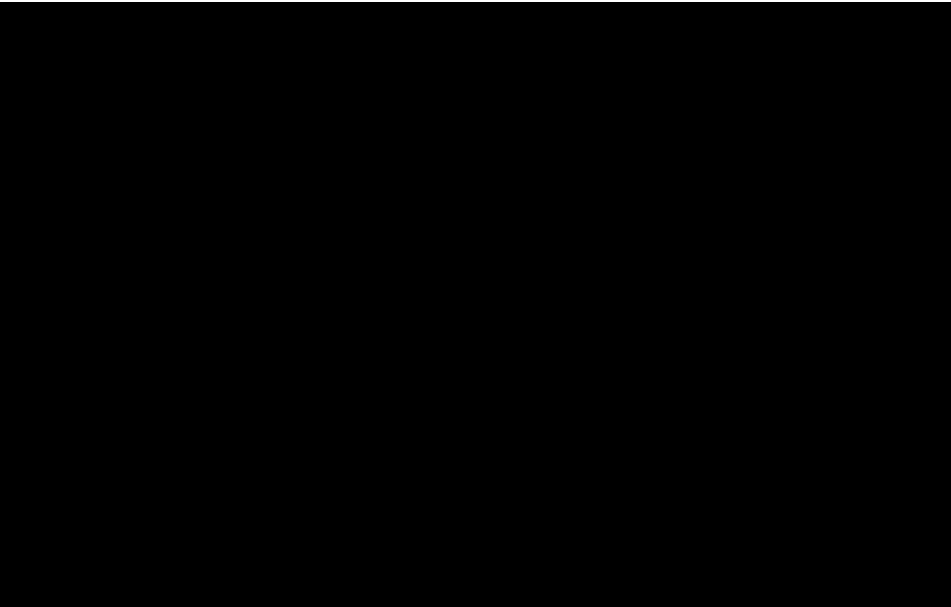
178. While preparing this declaration (EX2032), I again met with engineers at Patent Owner who explained to me how the Twister and Render House products operated in the October 2008 timeframe, as evidenced by and consistent with the screenshots that I reproduced in my prior declaration (EX2008) as well as the Twister and Render House product user manuals (EX2007, EX2030). Based on my discussions with Patent Owner's engineers, I again determined that the Twister and Render House products in use in October 2008 embody claims 1, 9, 10, 16, 25, 26, and 34 of the '737 Patent. Claims 6, 7, and 17 of the '737 Patent were not at issue in the Xactware IPR. During my discussions with Patent Owner's engineers when preparing this declaration (EX2032), I determined that the Twister and Render House products in use in October 2008 additionally embody claims 6, 7, and 17 of the '737 Patent. In particular, Patent Owner's engineers showed me how the October 2008 Twister and Render House products, as evidenced by the screenshots reproduced in my prior declaration (EX2031) as well as the October 2008 versions

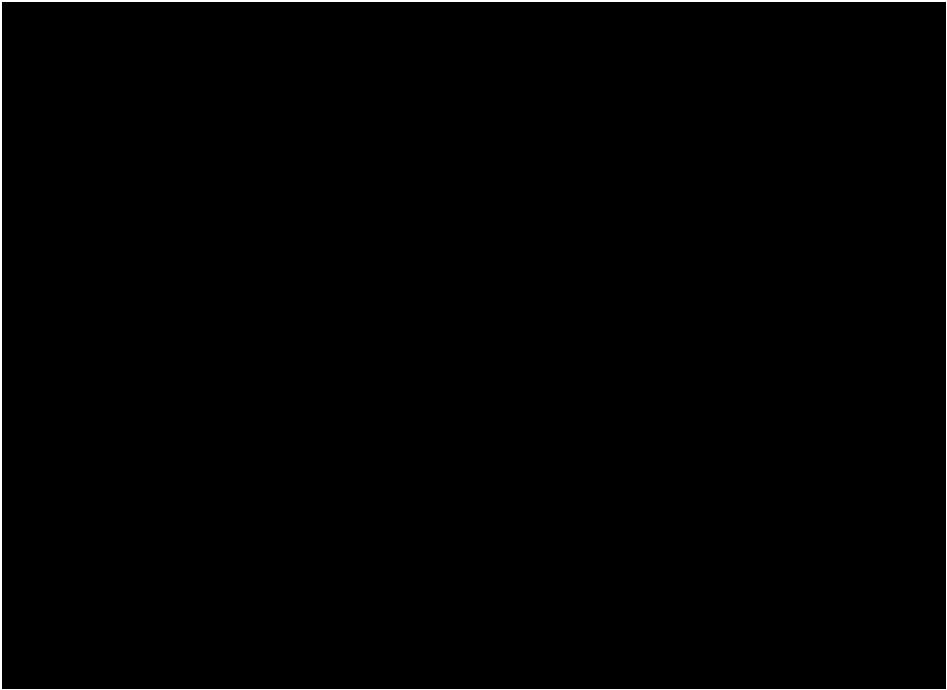
of the Twister and Render House product user manuals (EX2007, EX2030), practice the features recited in claims 6, 7, and 17 of the '737 Patent. I confirmed my understanding of the October 2008 Twister and Render House products, as evidenced by the screenshots reproduced in my prior declaration (EX2031) as well as the October 2008 versions of the Twister and Render House product user manuals (EX2007, EX2030), and determined that these products do indeed embody claims 6, 7, and 17 of the '737 Patent.

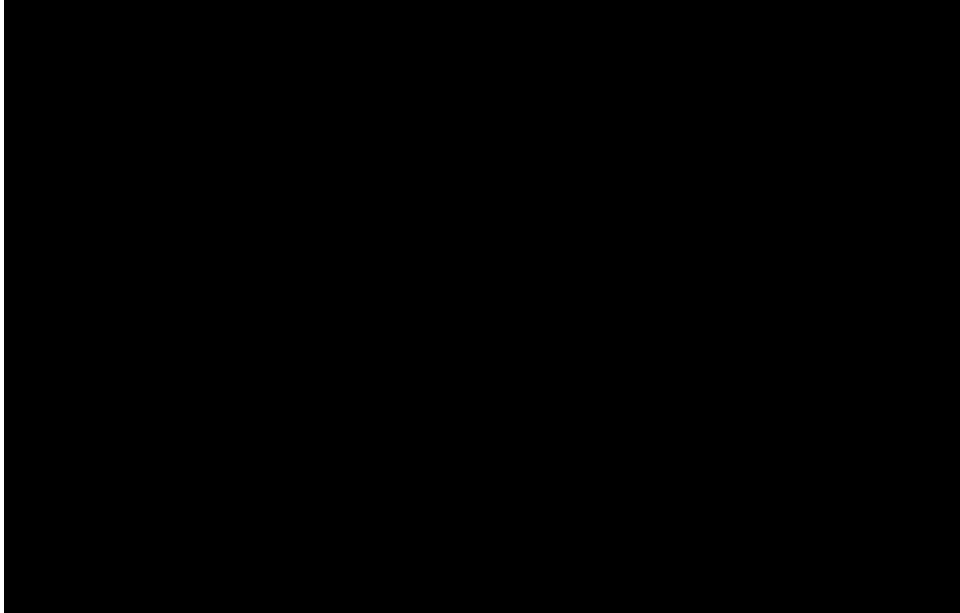
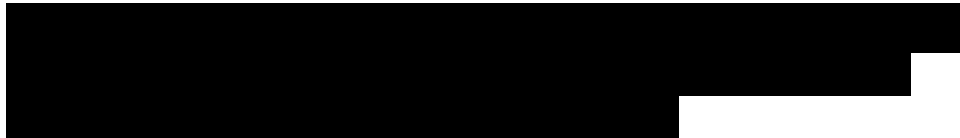
179. In my opinion, the Twister and Render House software products generate accurate 3D models and embody each of the claims 1, 6, 7, 9, 10, 16, 17, 25, 26, and 34 of the '737 Patent. To illustrate this, I include charts below showing how the Twister and Render House products embody each of claims 1, 6, 7, 9, 10, 16, 17, 25, 26, and 34 of the '737 Patent. As I did in my prior declaration (EX2031), the charts below reproduce screenshots from the Twister and Render House software products as well as the Twister and Render House user manuals (EX2007 (Twister), EX2030 (Render House)) in use on October 15, 2008, which is contemporaneous with the October 31, 2008 priority date of the '737 Patent. The charts below for claims 1, 9, 10, 16, 25, 26, and 34 of the '737 Patent incorporate my prior comparison of claims 1, 9, 10, 16, 25, 26, and 34 of the '737 Patent to the Twister and Render House products as contained in my prior declaration

(EX2031). The charts below also include my analysis of claims 6, 7, and 17 in comparison to the Twister and Render House products in use in October 2008, as evidenced by the screenshots reproduced in my prior declaration (EX2031) as well as the October 2008 versions of the Twister and Render House product user manuals (EX2007, EX2030). Unless otherwise indicated, all screenshots in the below claim chart were taken from version 28180.0 of Twister, and the version of Render House access therewith.

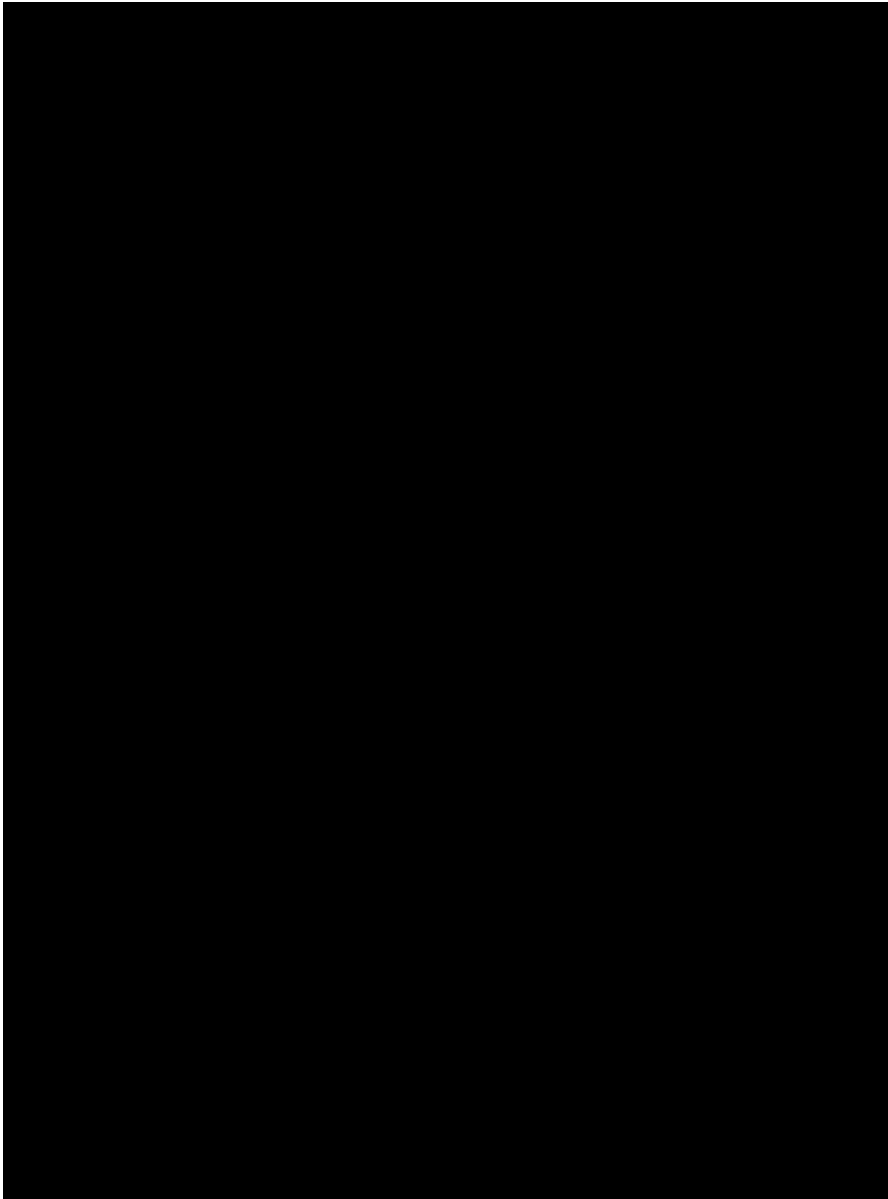
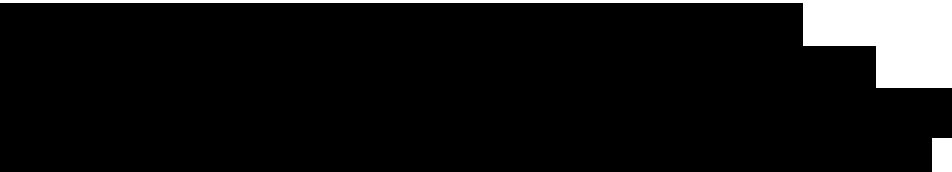
Claim 1	
Limitation	Patent Owner's Twister and Render House Products
[1.0] A computer-implemented method in a roof estimate report system including at least one processor and a memory coupled to the at least one processor, the method comprising:	    

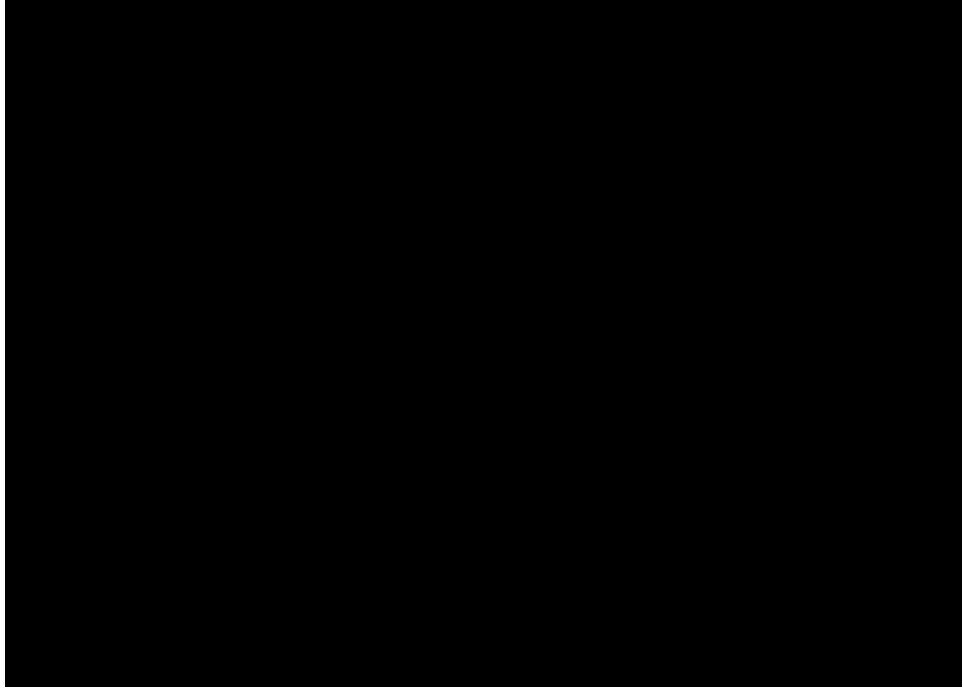
Claim 1	
Limitation	Patent Owner's Twister and Render House Products
	
[1.1] displaying, by the at least one processor of the roof estimate report system, a plurality of aerial images of a roof at the same time, each of the aerial images providing a different view, taken from a different angle of the same roof;	    

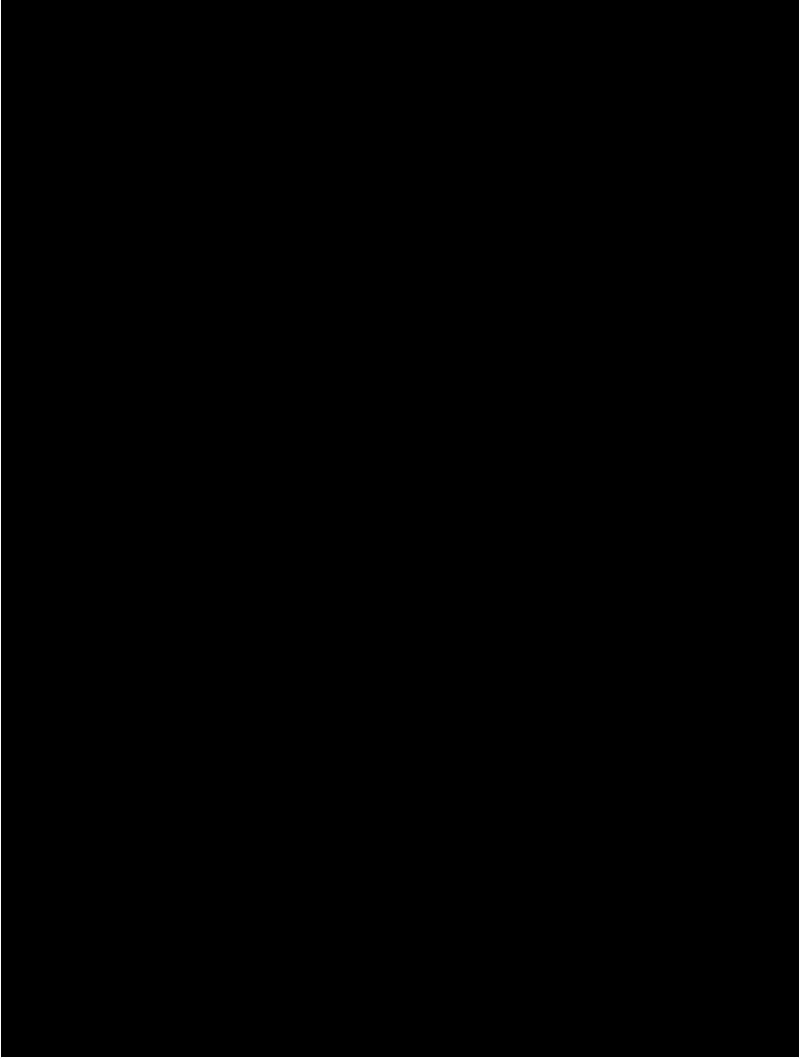
Claim 1	
Limitation	Patent Owner's Twister and Render House Products
	
[1.2] displaying, by the at least one processor of the roof estimate report system, respective line drawings representing features of the roof, the respective line drawings overlying a first and a second aerial	

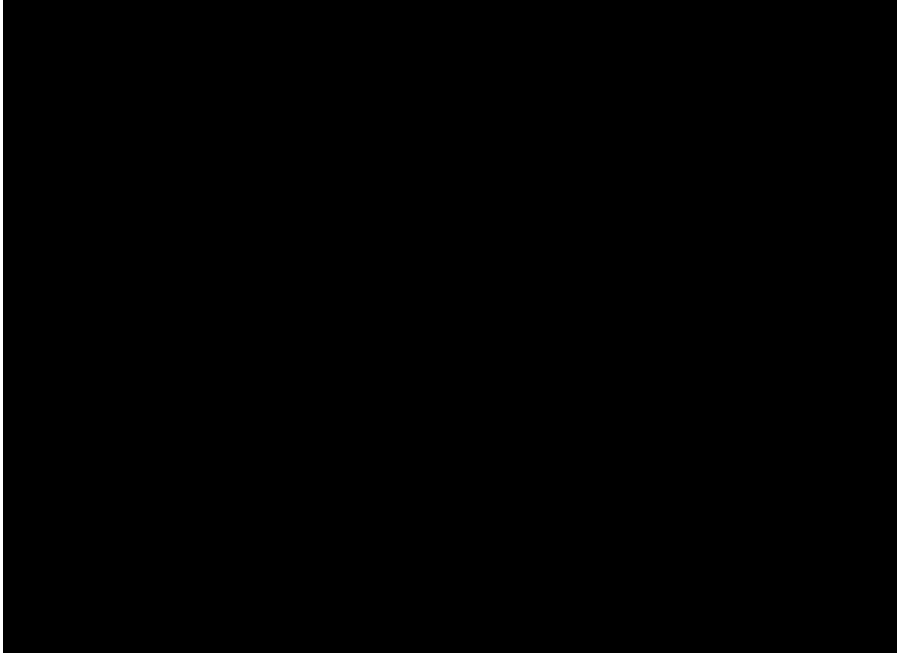
Claim 1	
Limitation	Patent Owner's Twister and Render House Products
image of the plurality of aerial images of the roof, the line drawing overlying the first aerial image of the roof having features in common with the line drawing overlying the second aerial image of the roof;	   

Claim 1	
Limitation	Patent Owner's Twister and Render House Products
[1.3] in response to user input, changing, by the at least one processor of the roof estimate report system, the line drawing representing a feature of the roof that overlies the first aerial image of the roof;	

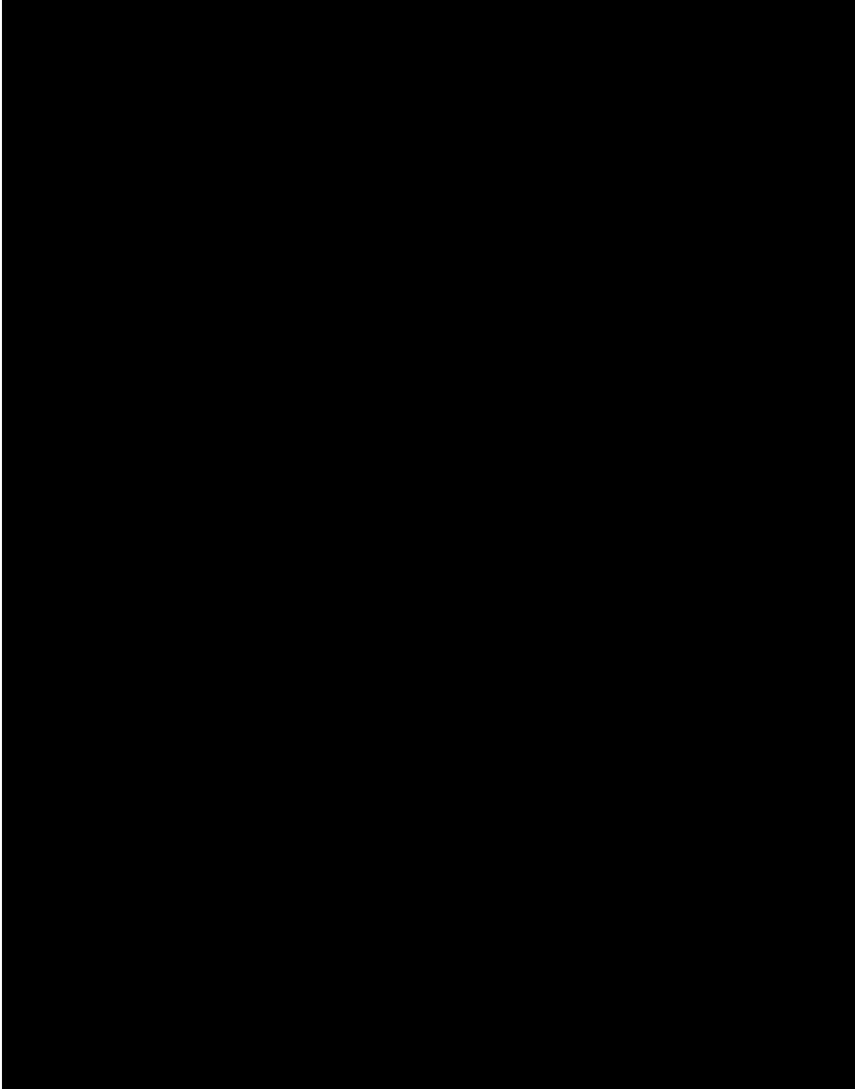
Claim 1	
Limitation	Patent Owner's Twister and Render House Products
	  

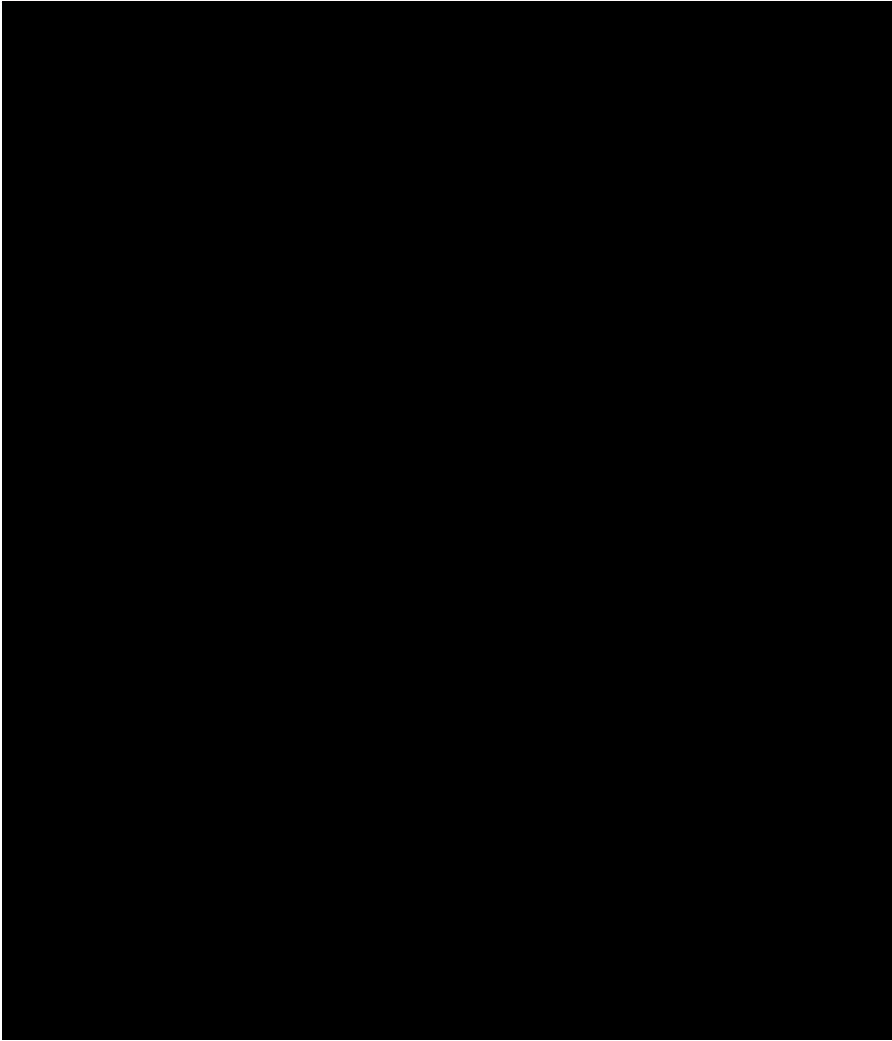
Claim 1	
Limitation	Patent Owner's Twister and Render House Products
	  
[1.4] in response to the changing, making corresponding changes, by the at least one processor of the roof	 

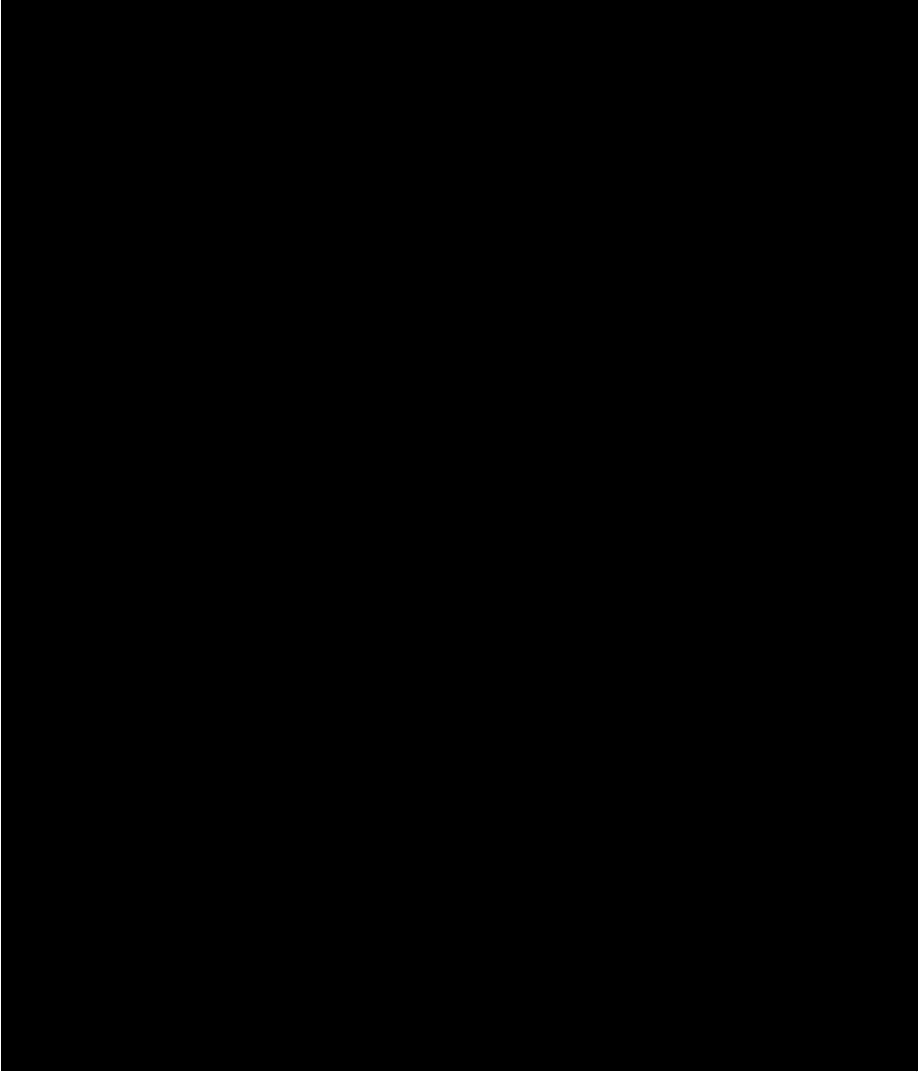
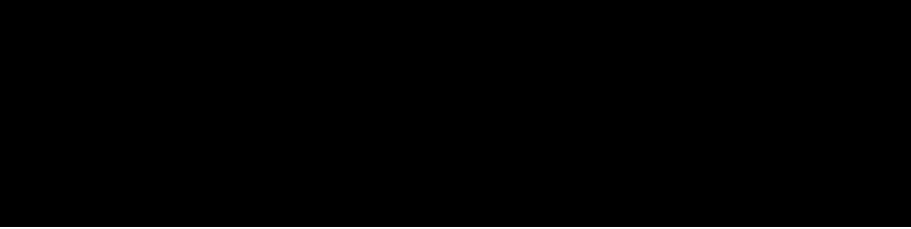
Claim 1	
Limitation	Patent Owner's Twister and Render House Products
estimate report system, to the line drawing overlying the second aerial image; and	  

Claim 1	
Limitation	Patent Owner's Twister and Render House Products
	
[1.5] generating and outputting a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for correspondin g slope, area, or lengths of edges of at	

Claim 1	
Limitation	Patent Owner's Twister and Render House Products
least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.	

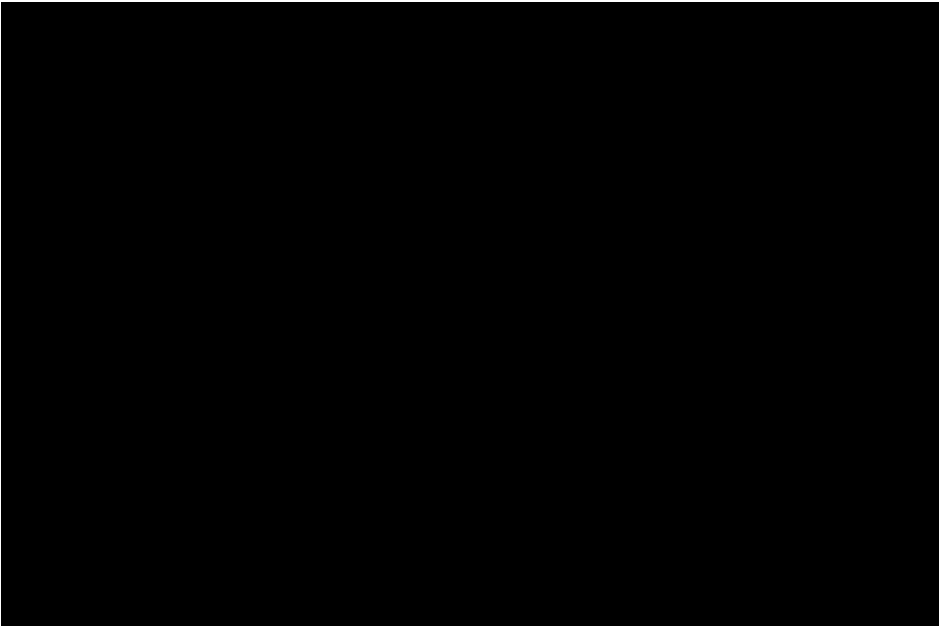
Claim 1	
Limitation	Patent Owner's Twister and Render House Products
	

Claim 1	
Limitation	Patent Owner's Twister and Render House Products
	

Claim 1	
Limitation	Patent Owner's Twister and Render House Products
	 

Claim 1	
Limitation	Patent Owner's Twister and Render House Products

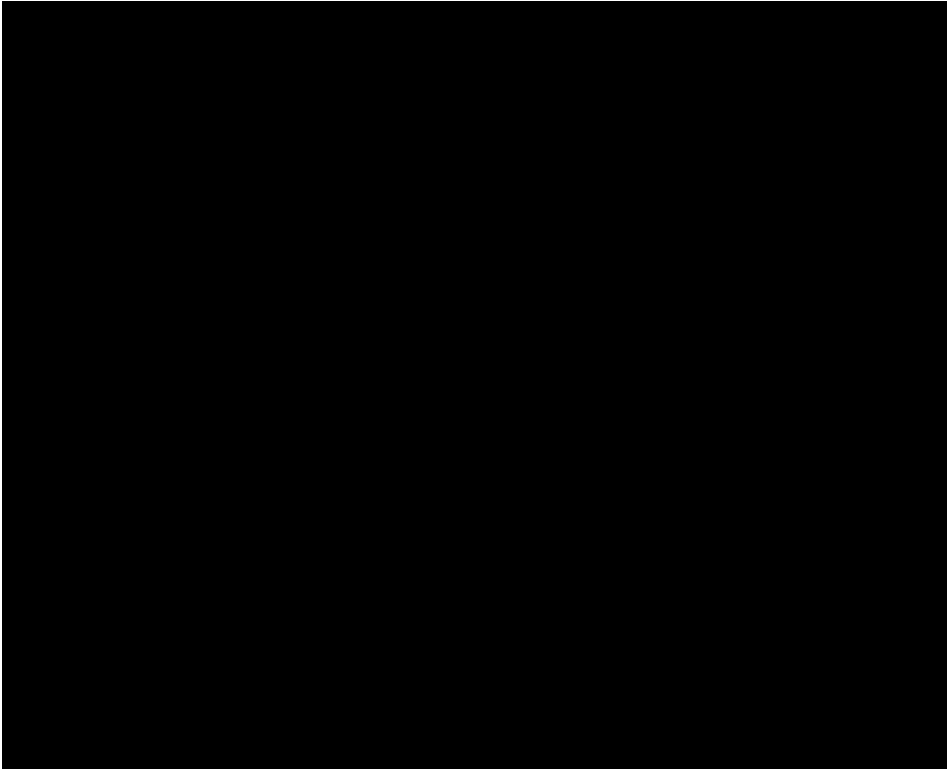
Claim 6	
Limitation	Patent Owner's Twister and Render House Products
[6.0] The method of claim 1 wherein the displaying the respective line drawings includes initiating display of a line on the first and second image.	

Claim 6	
Limitation	Patent Owner's Twister and Render House Products
	  

Claim 6	
Limitation	Patent Owner's Twister and Render House Products

Claim 7	
Limitation	Patent Owner's Twister and Render House Products
[7.0] The method of claim 1 wherein the first image provides a substantially top plan view of the roof of the building, and	

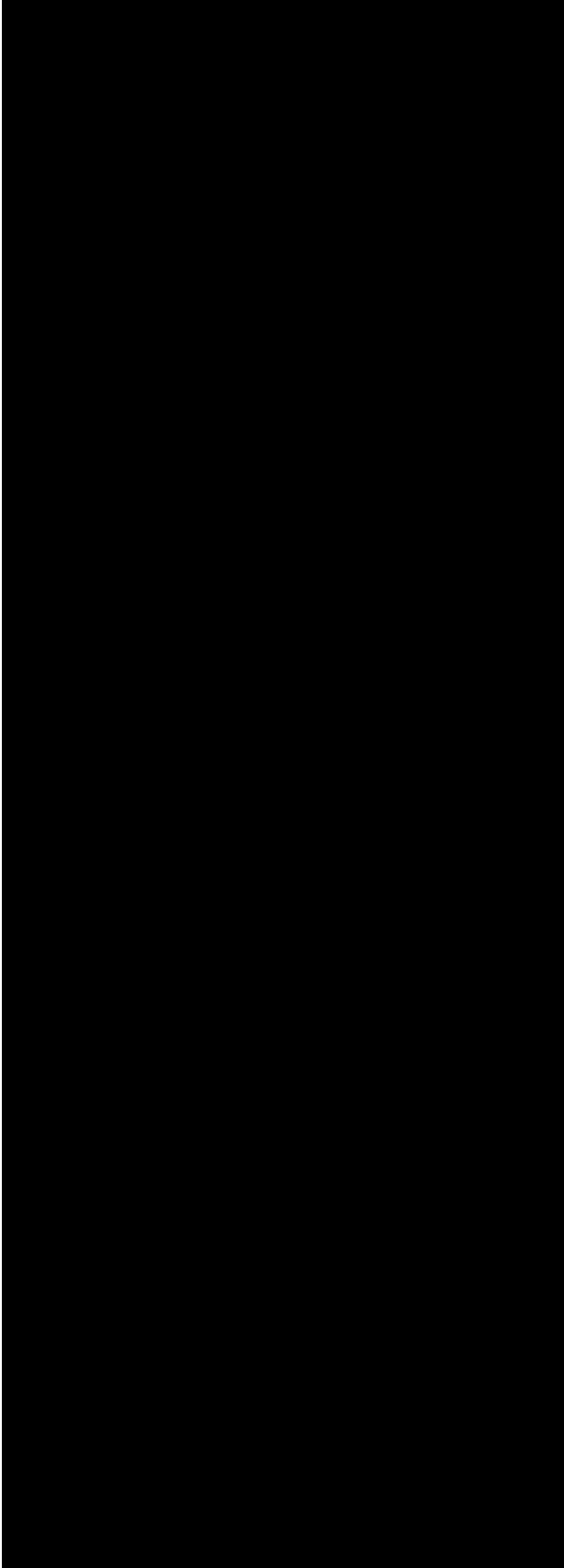
Claim 7

Claim 7	
Limitation	Patent Owner's Twister and Render House Products
	
[7.1] wherein the second image provides a perspective view of the roof of the building.	

Claim 7	
Limitation	Patent Owner's Twister and Render House Products

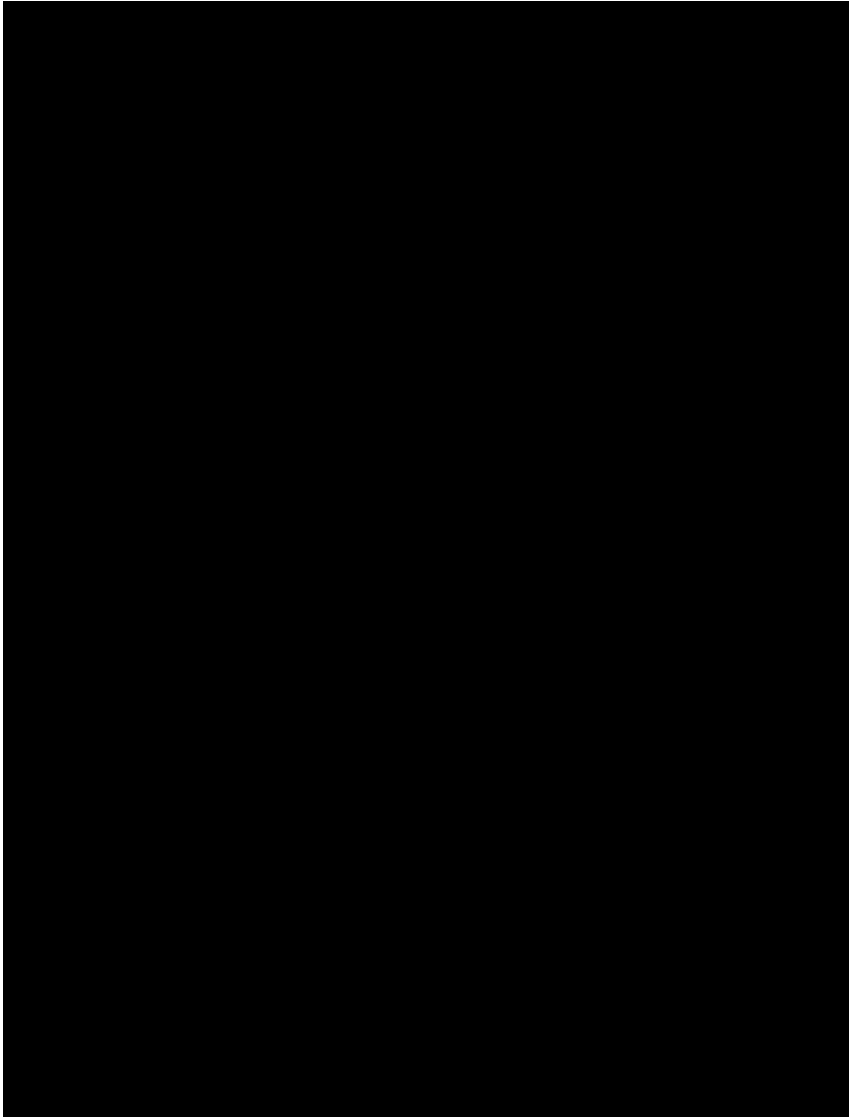
Claim 7	
Limitation	Patent Owner's Twister and Render House Products

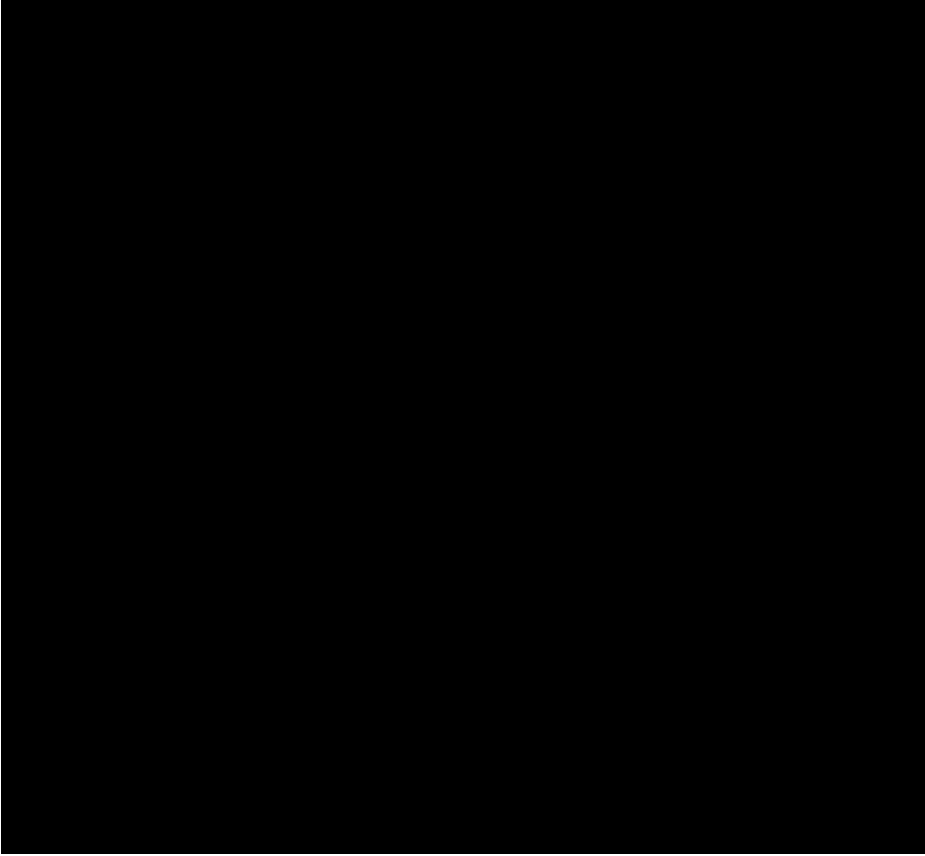
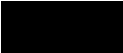
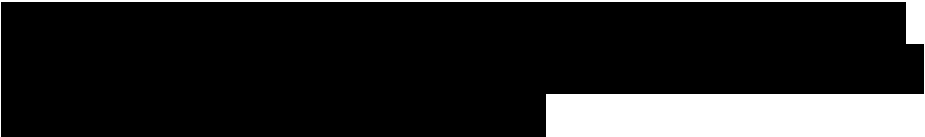
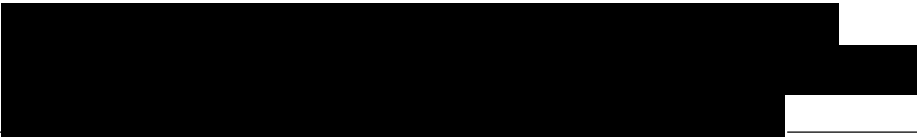
Claim 9	
Limitation	Patent Owner's Twister and Render House Products
[9.0] The method of claim 1 further comprising: transmitting roof measurement information based at least in part on the change of the line drawing representing a feature of the	

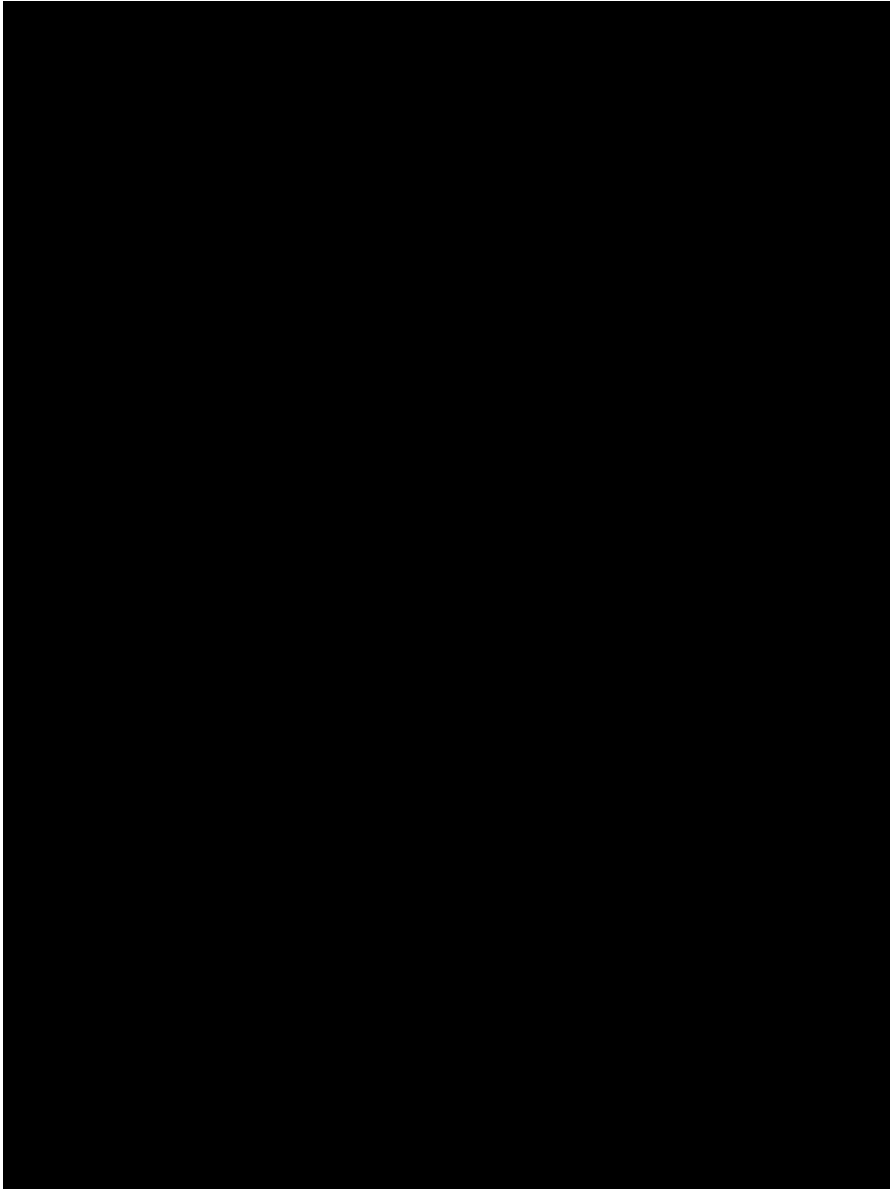
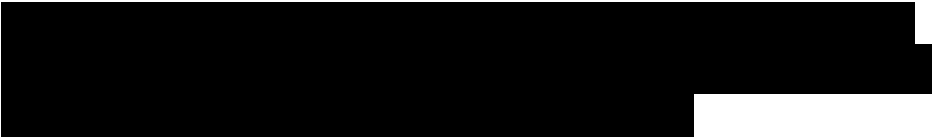
roof that overlies the first aerial image of the roof.	
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Claim 9	
Limitation	Patent Owner's Twister and Render House Products

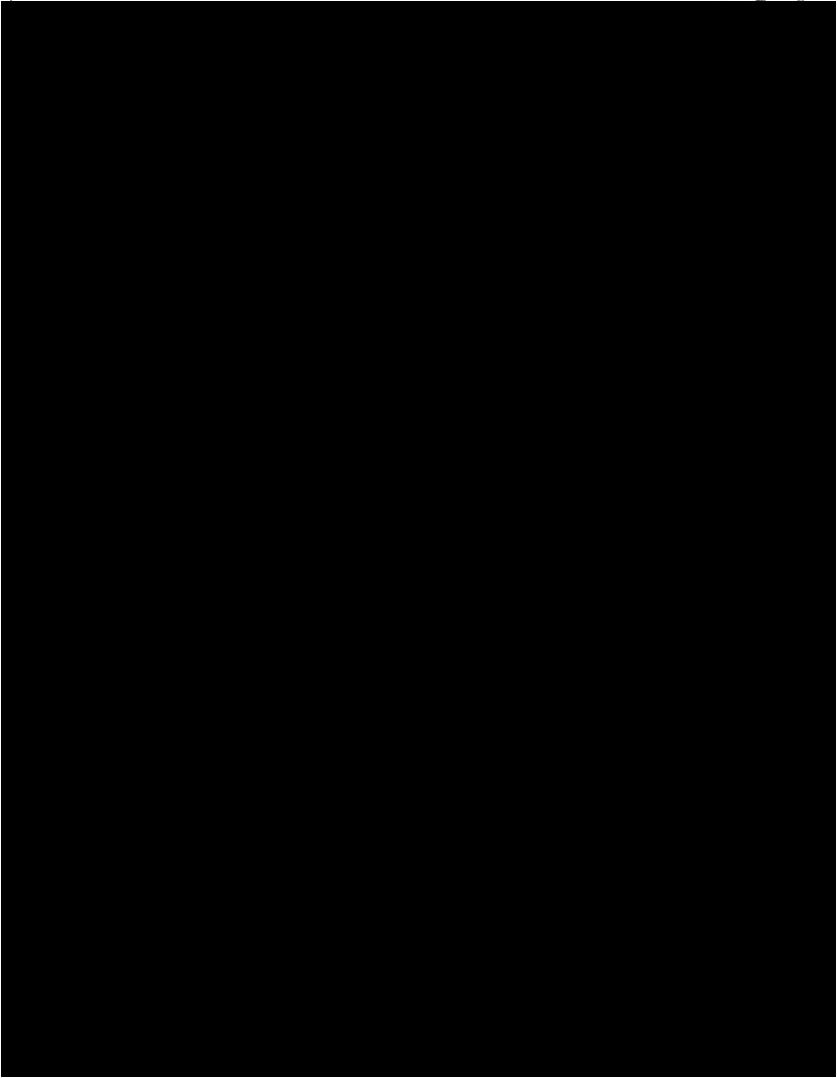
Claim 10	
Limitation	Patent Owner's Twister and Render House Products
[10.0] The method of claim 1 further comprising: displaying a marker operable to specify a point on an image;	

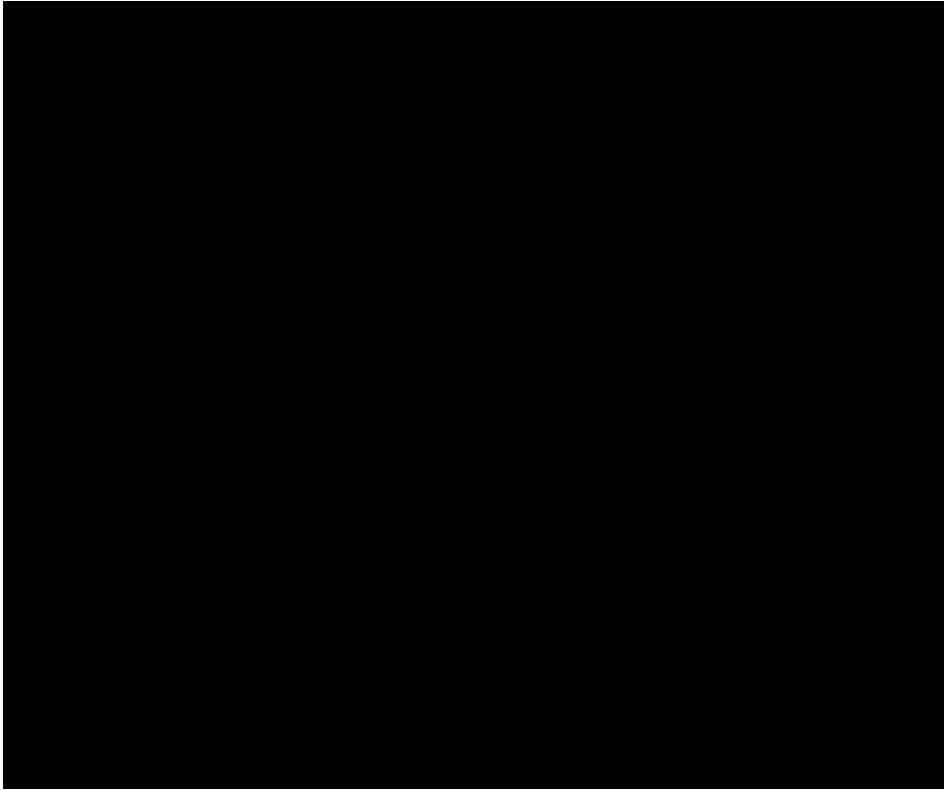
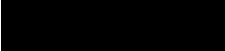
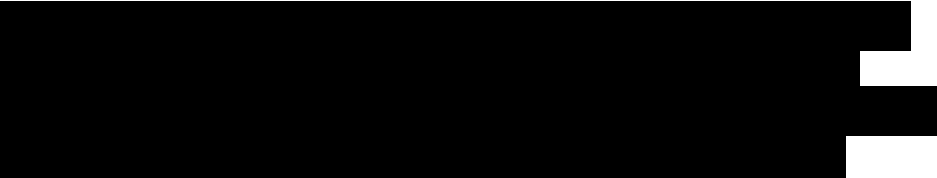
Claim 10	
Limitation	Patent Owner's Twister and Render House Products
	  

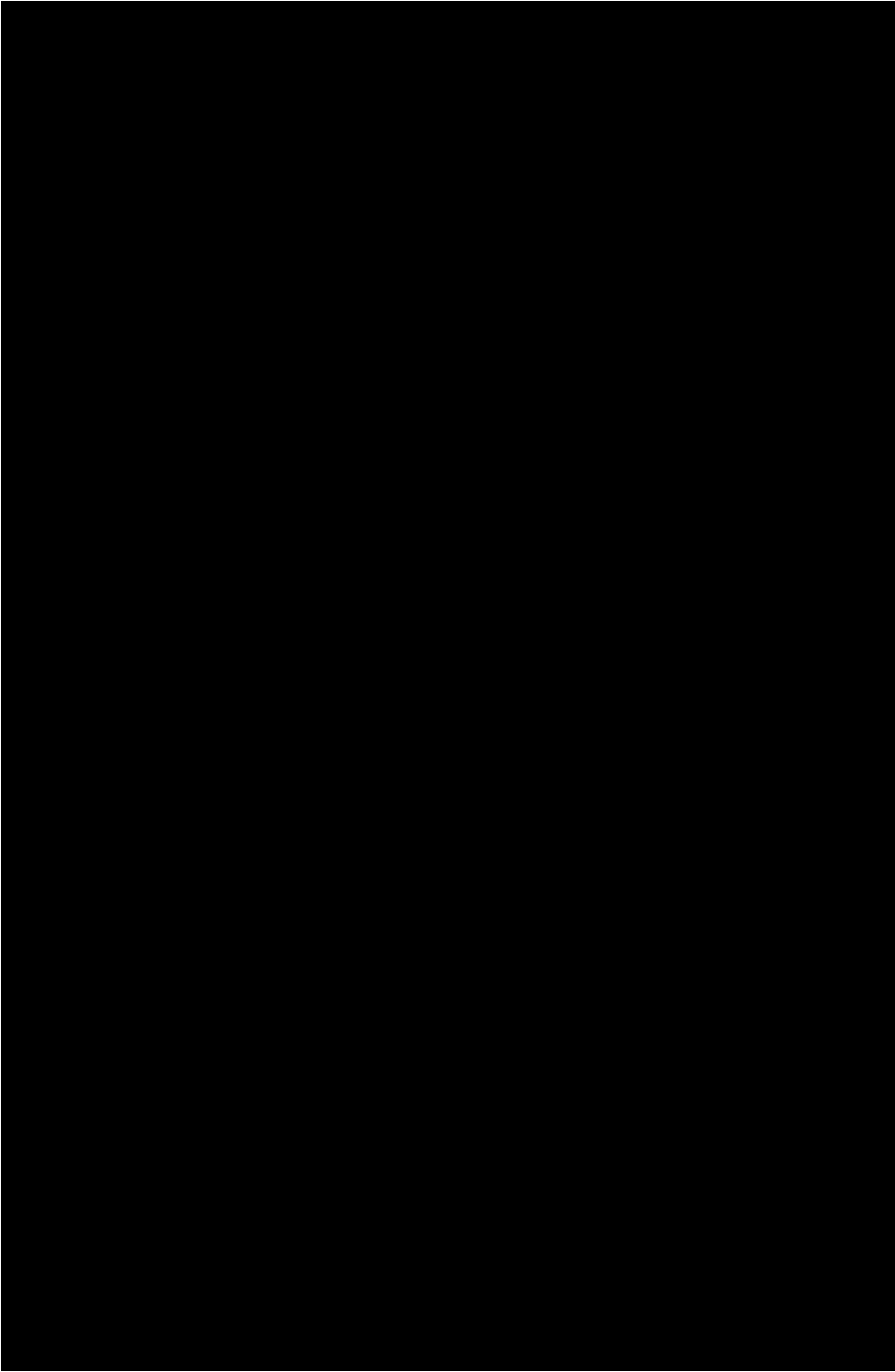
Claim 10	
Limitation	Patent Owner's Twister and Render House Products
	 
[10.1] receiving, via the marker, an indication of a point on the first aerial image; and	  

Claim 10	
Limitation	Patent Owner's Twister and Render House Products
	  

Claim 10	
Limitation	Patent Owner's Twister and Render House Products
	
[10.2] registering, based on the received indication of the point, the aerial image to a reference grid corresponding to a three- dimensional model of the roof.	 

Claim 10	
Limitation	Patent Owner's Twister and Render House Products
	

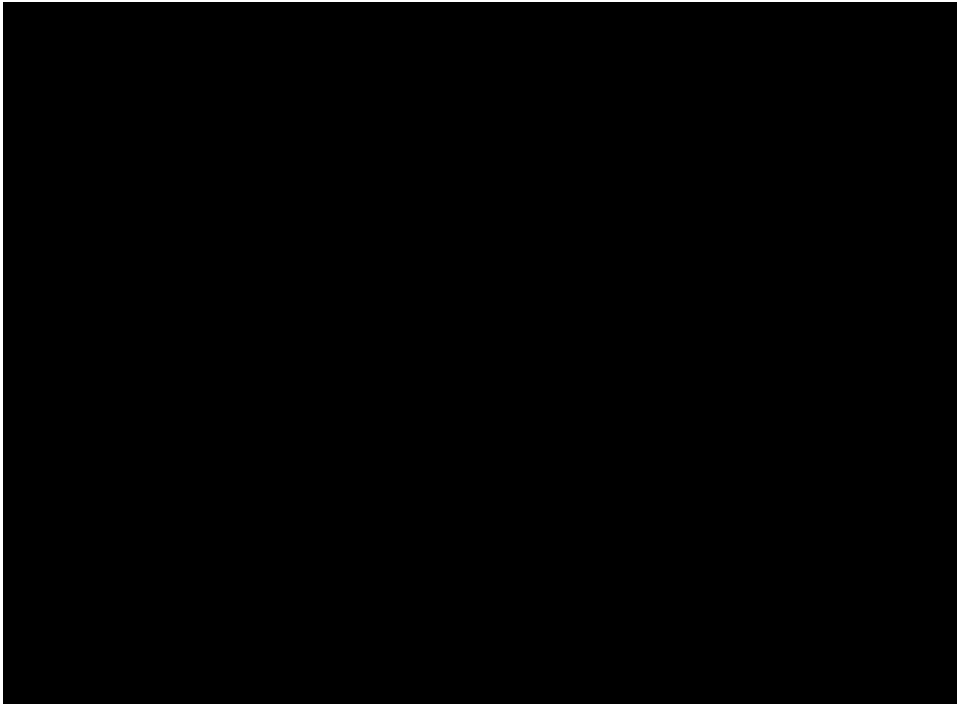
Claim 10	
Limitation	Patent Owner's Twister and Render House Products
	   

Claim 10	
Limitation	Patent Owner's Twister and Render House Products
	 

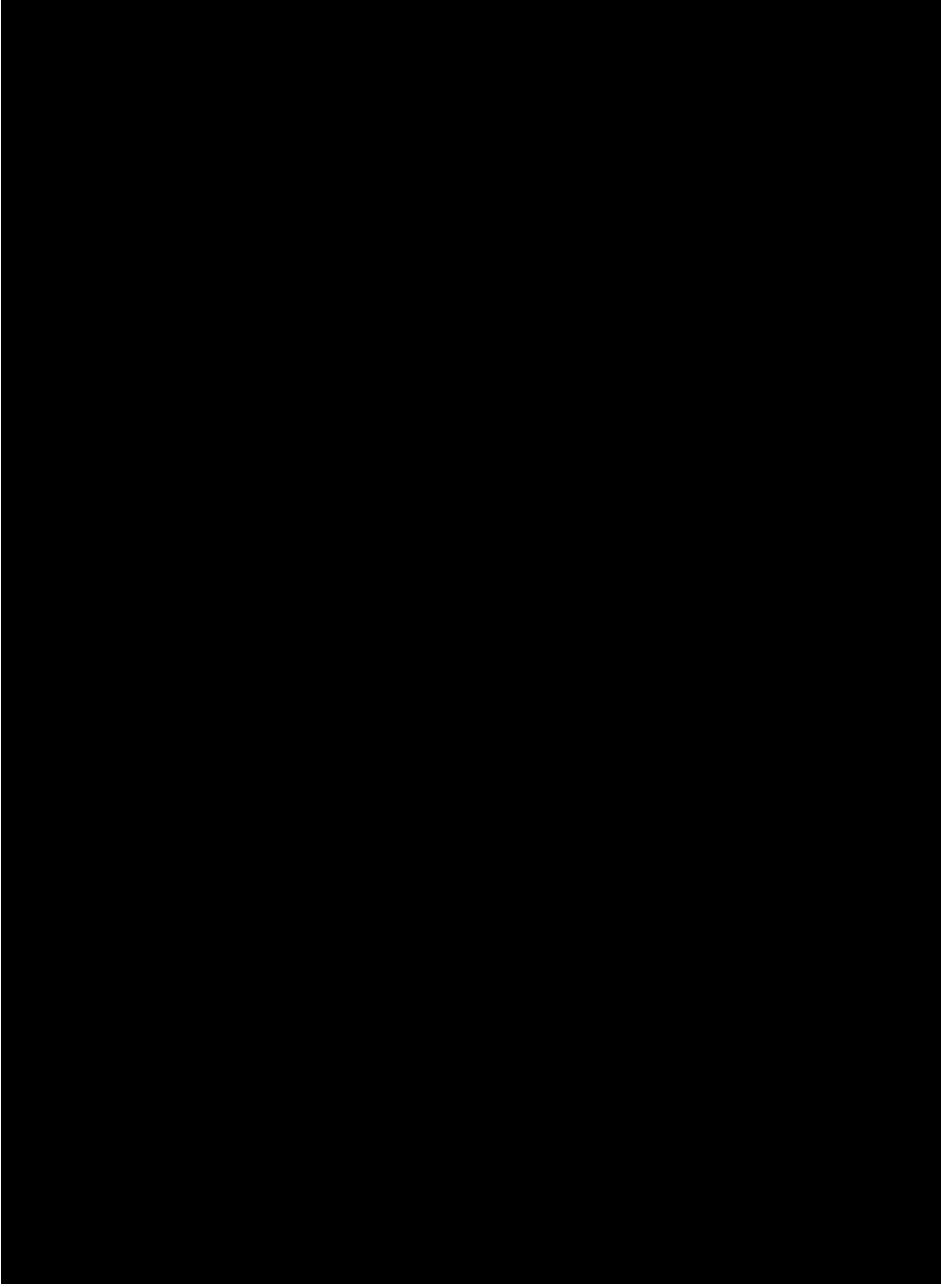
Claim 10	
Limitation	Patent Owner's Twister and Render House Products

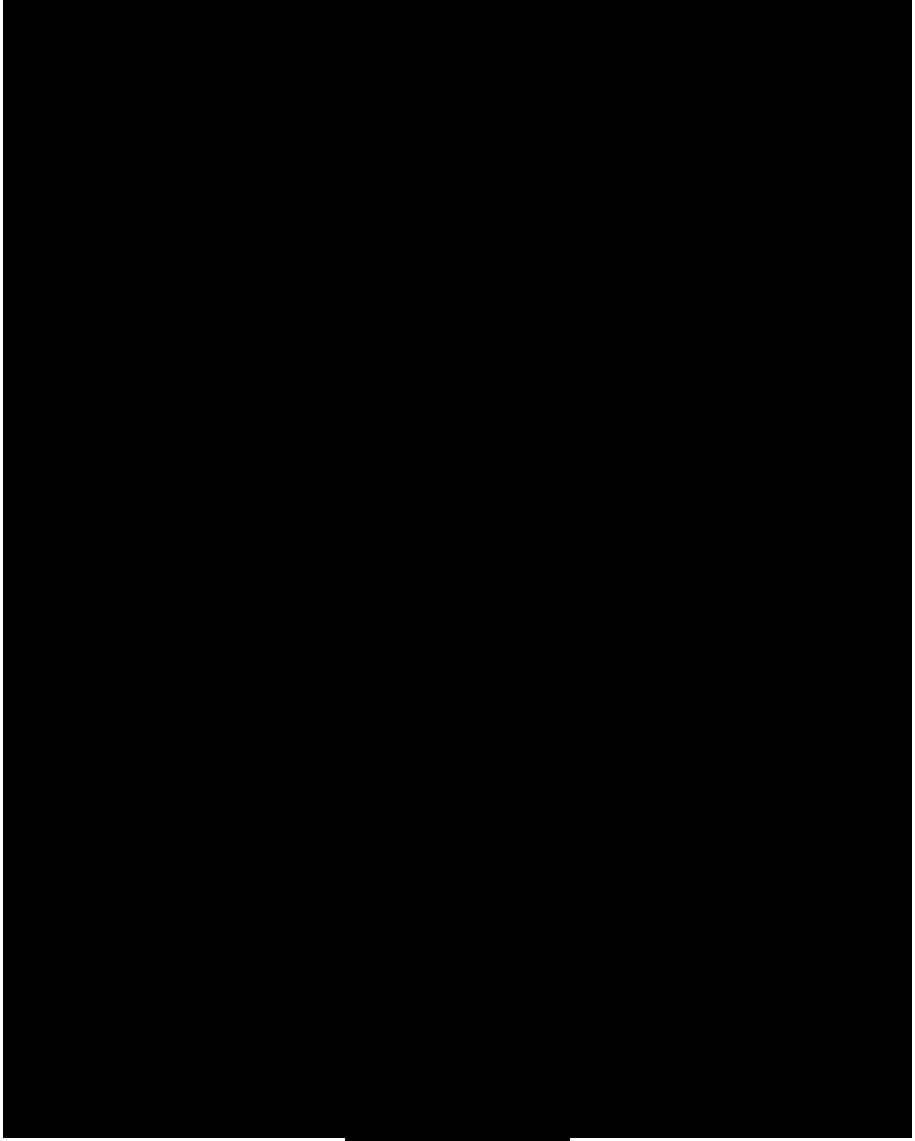
Claim 16	
Limitation	Patent Owner's Twister and Render House Products
[16.0] A non-transitory computer-readable storage medium, having computer executable instructions stored thereon that, when executed by at least one computer processor, cause the at least one processor to enable a computing system to generate a roof estimate report for a building having a roof, by	

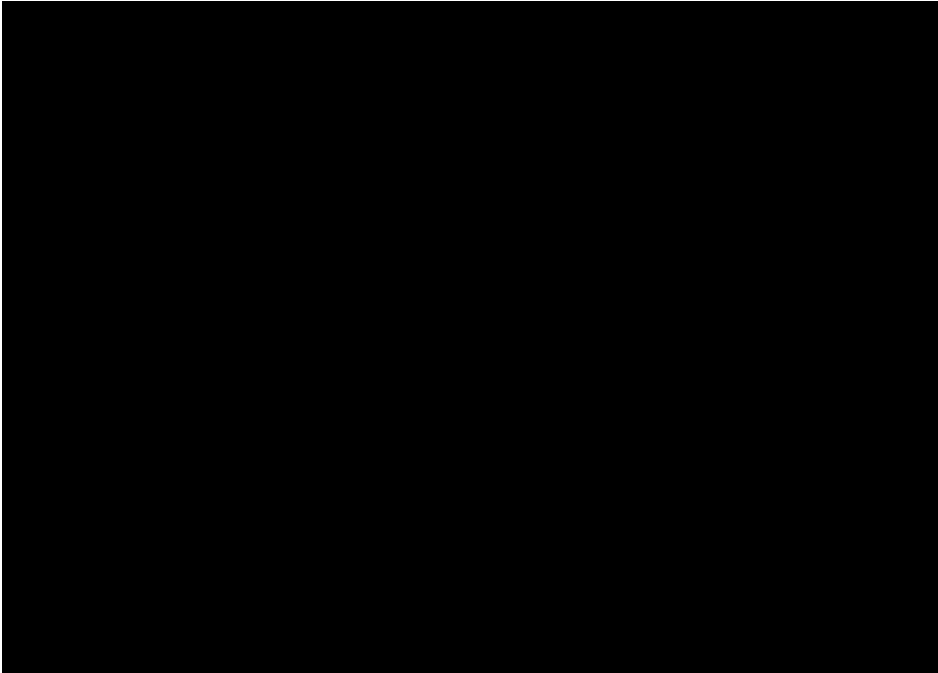
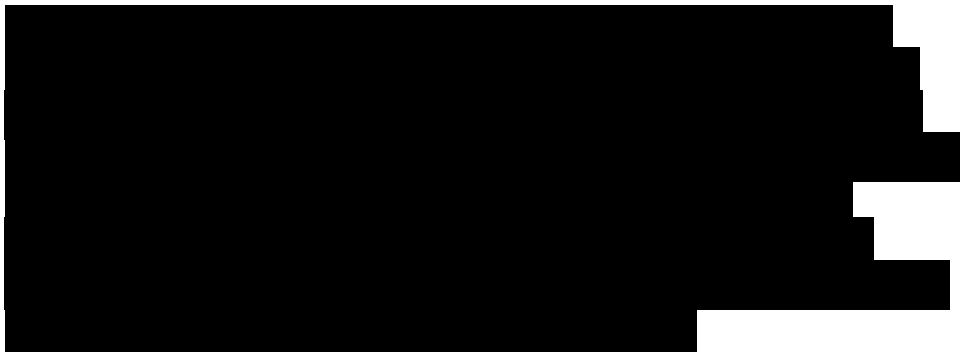
Claim 16	
Limitation	Patent Owner's Twister and Render House Products
performing a method comprising:	
[16.1] overlaying a line drawing on corresponding locations of a roof feature of the roof on first and second aerial images of the roof, wherein the first aerial image provides a first view of the roof of the building and the second aerial image	

Claim 16	
Limitation	Patent Owner's Twister and Render House Products
provides a second view of the roof of the building;	  

Claim 16	
Limitation	Patent Owner's Twister and Render House Products
	
[16.2] in response to changes in the line drawing overlaid on the first aerial image, displaying corresponding changes to the line drawing overlaid on the second aerial image; and	

Claim 16	
Limitation	Patent Owner's Twister and Render House Products
	

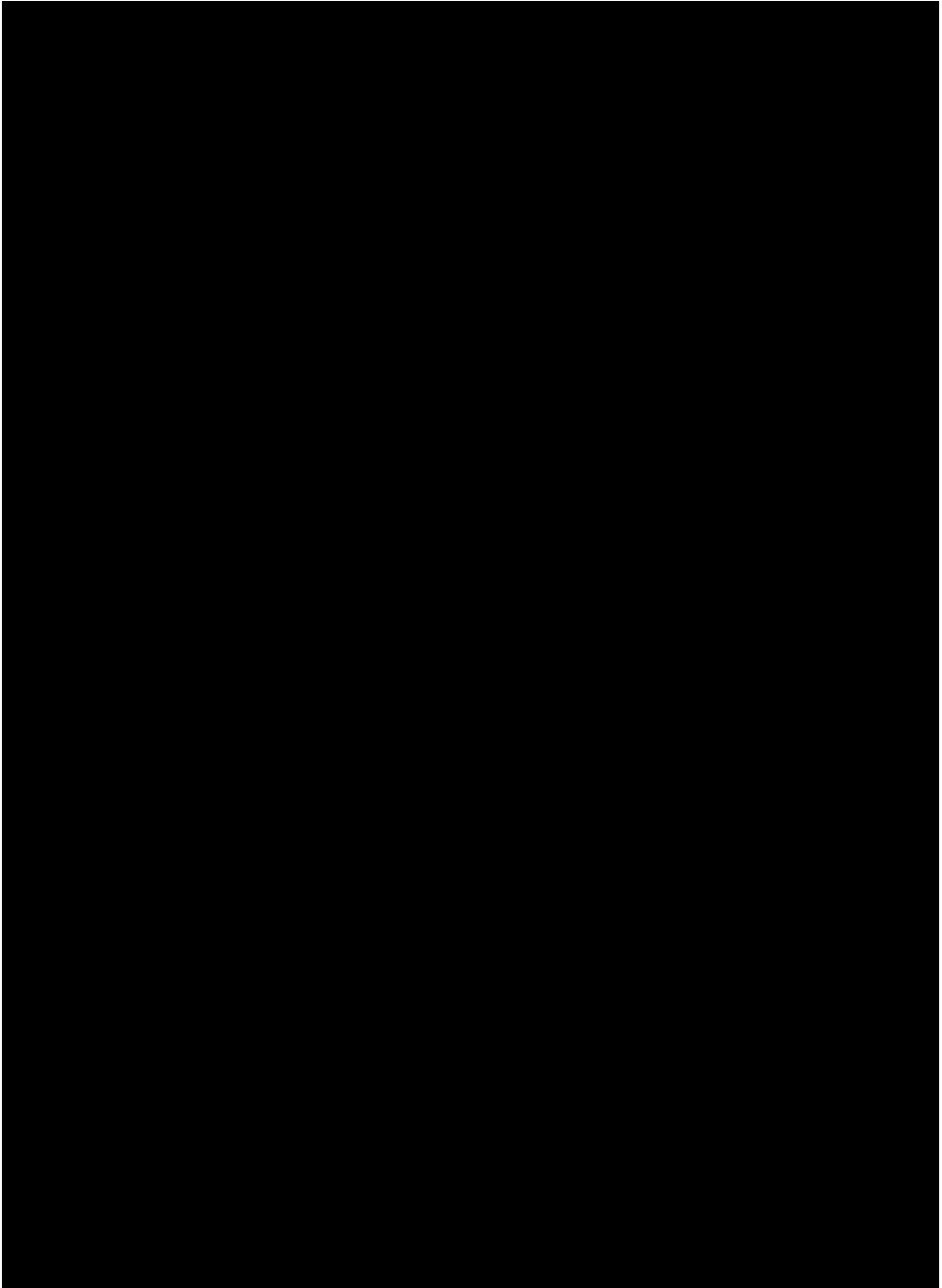
Claim 16	
Limitation	Patent Owner's Twister and Render House Products
	 

Claim 16	
Limitation	Patent Owner's Twister and Render House Products
	 
[16.3] generate and output a roof estimate report using a report generation engine, wherein the roof estimate report includes numerical values for correspondin g slope, area, or lengths of	

Claim 16	
Limitation	Patent Owner's Twister and Render House Products
edges of at least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.	

Claim 16	
Limitation	Patent Owner's Twister and Render House Products

Claim 16	
Limitation	Patent Owner's Twister and Render House Products

Claim 16	
Limitation	Patent Owner's Twister and Render House Products
	 

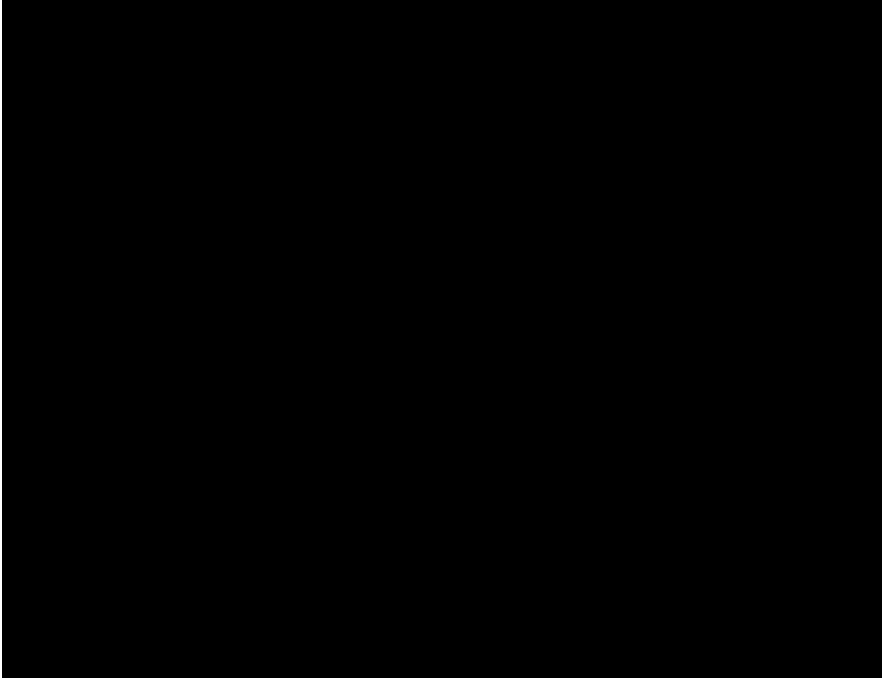
Claim 16	
Limitation	Patent Owner's Twister and Render House Products
	

Claim 17	
Limitation	Patent Owner's Twister and Render House Products
[17.0] The non-transitory computer-readable storage medium of claim 16 wherein the method further comprises modifying a three-dimensional model of the roof by adding a planar roof section to the three-dimensional model.	

Claim 17	
Limitation	Patent Owner’s Twister and Render House Products

Claim 17	
Limitation	Patent Owner's Twister and Render House Products

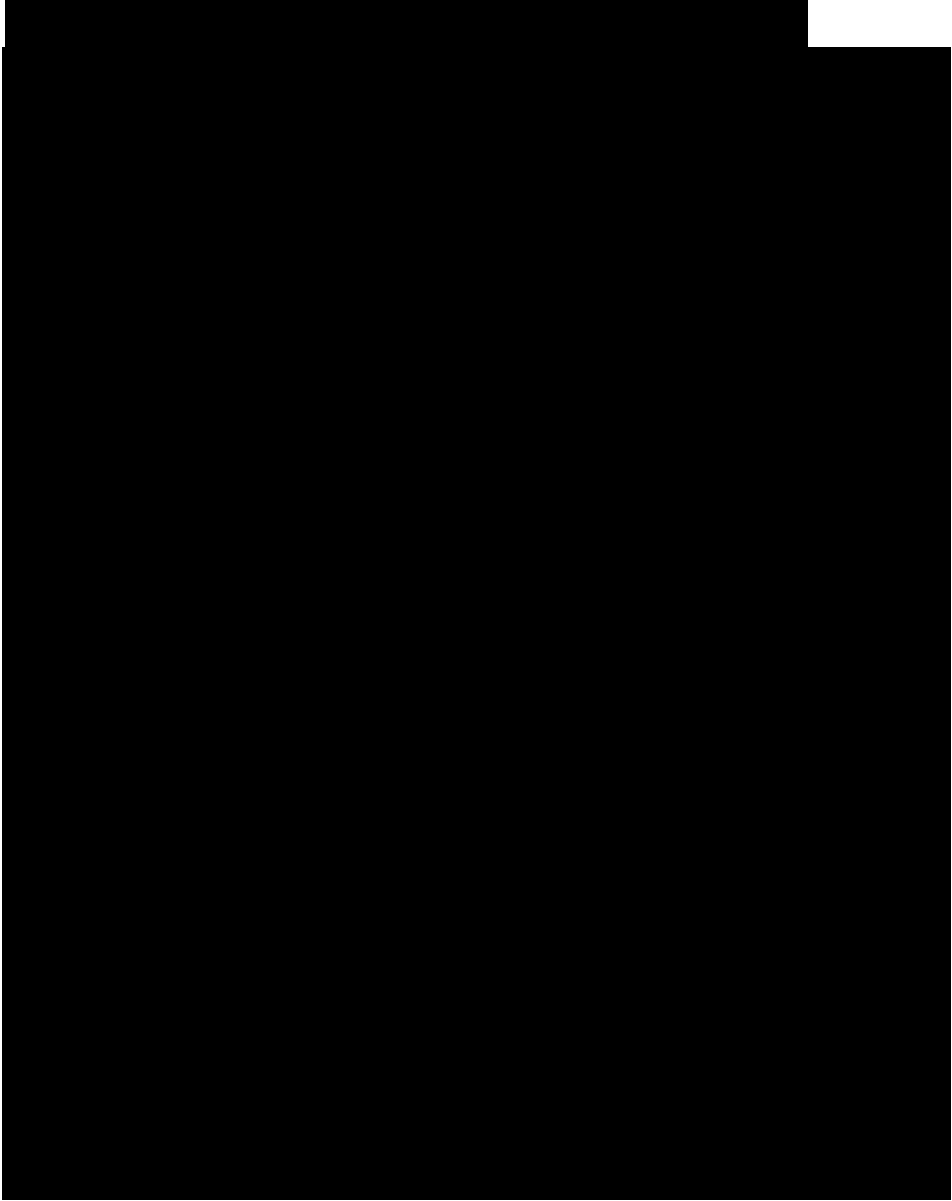
Claim 17	
Limitation	Patent Owner’s Twister and Render House Products

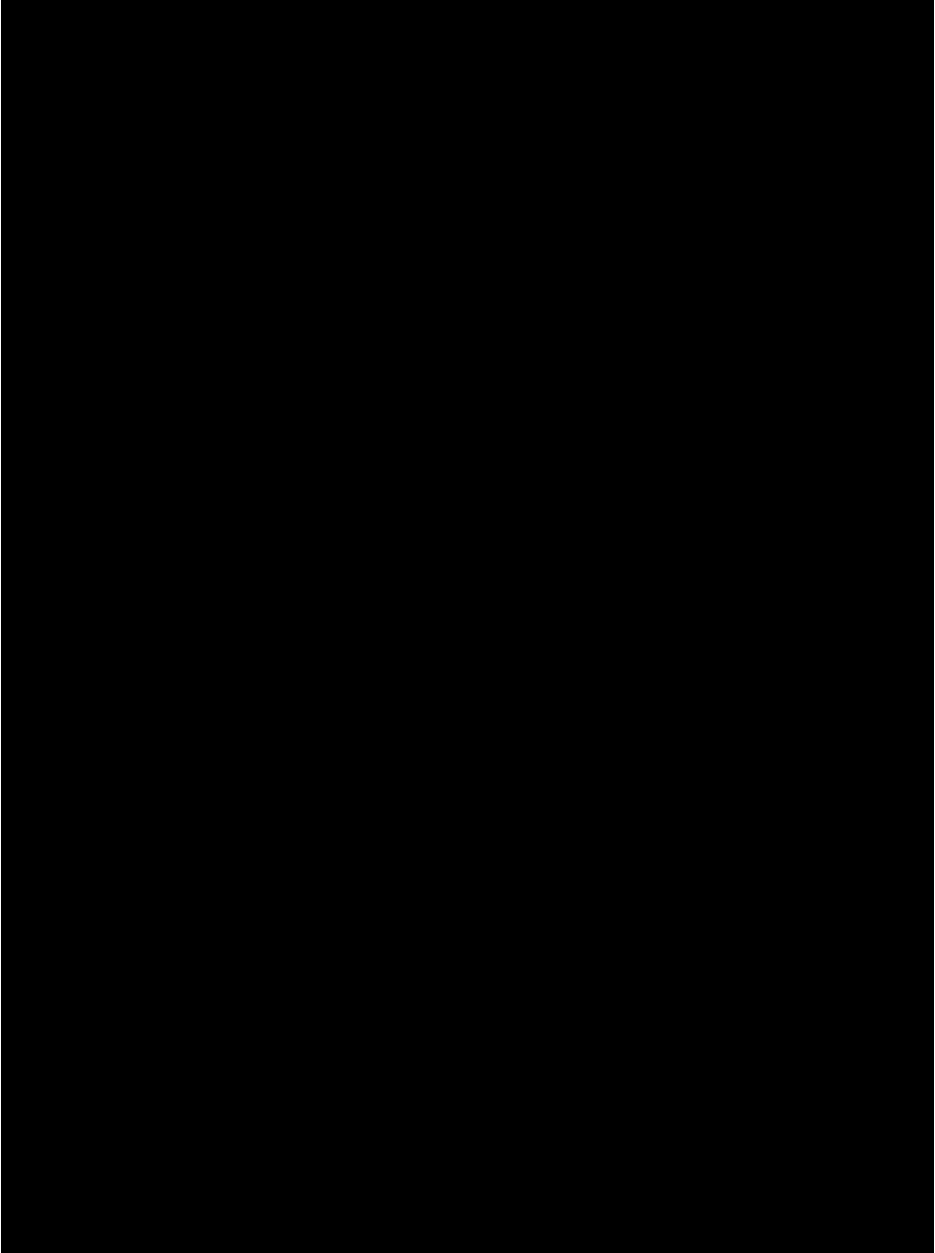
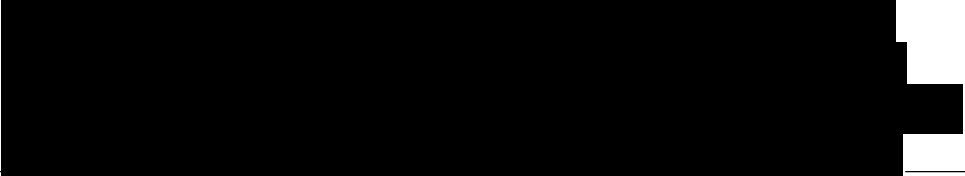
Claim 25	
Limitation	Patent Owner's Twister and Render House Products
[25.0] The non-transitory computer-readable storage medium of claim 16 wherein the method further comprises: modifying a three dimensional model of the roof based at least on the modification of the line drawing overlaid on the first aerial image.	 r

Claim 25	
Limitation	Patent Owner’s Twister and Render House Products

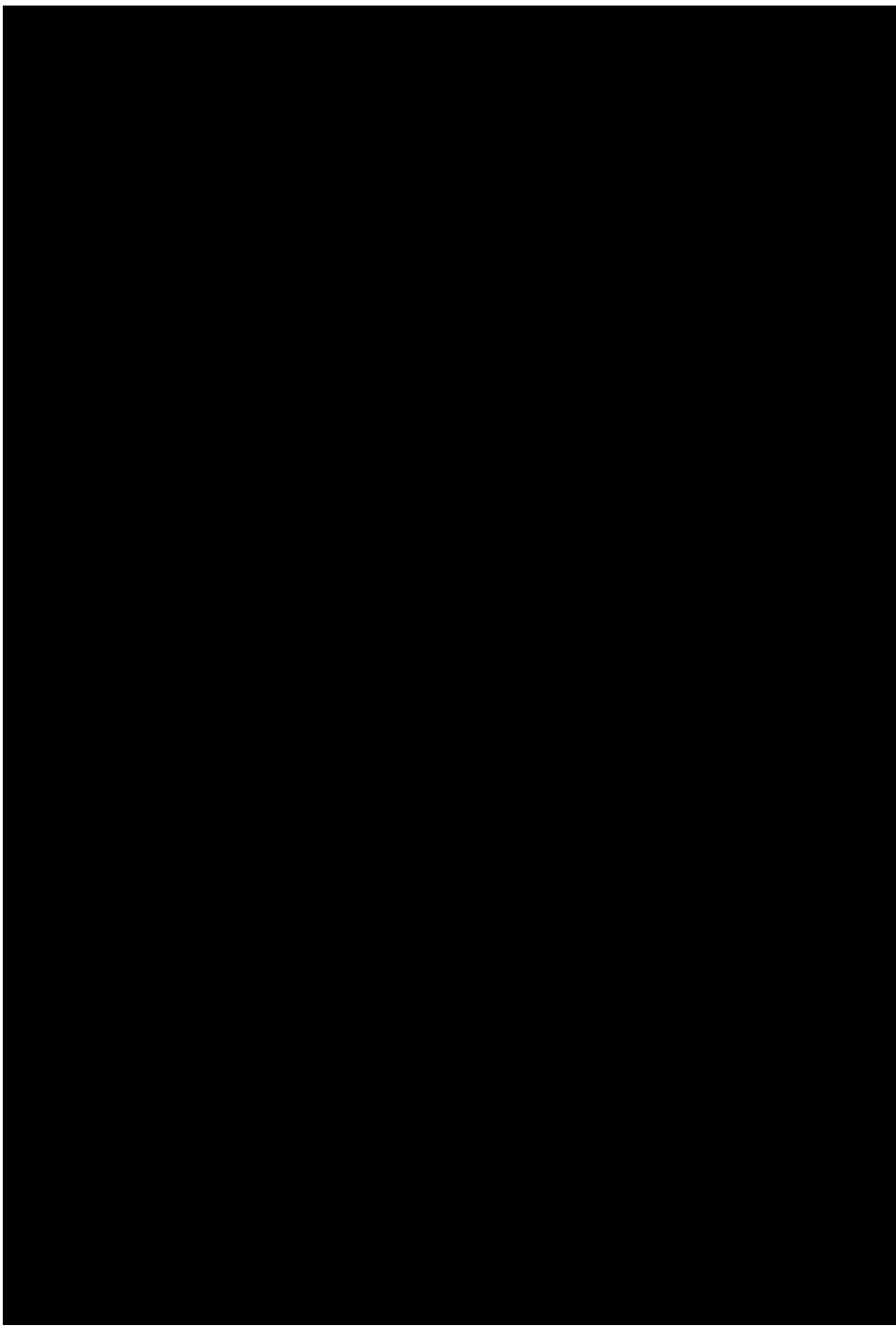
Claim 25	
Limitation	Patent Owner's Twister and Render House Products

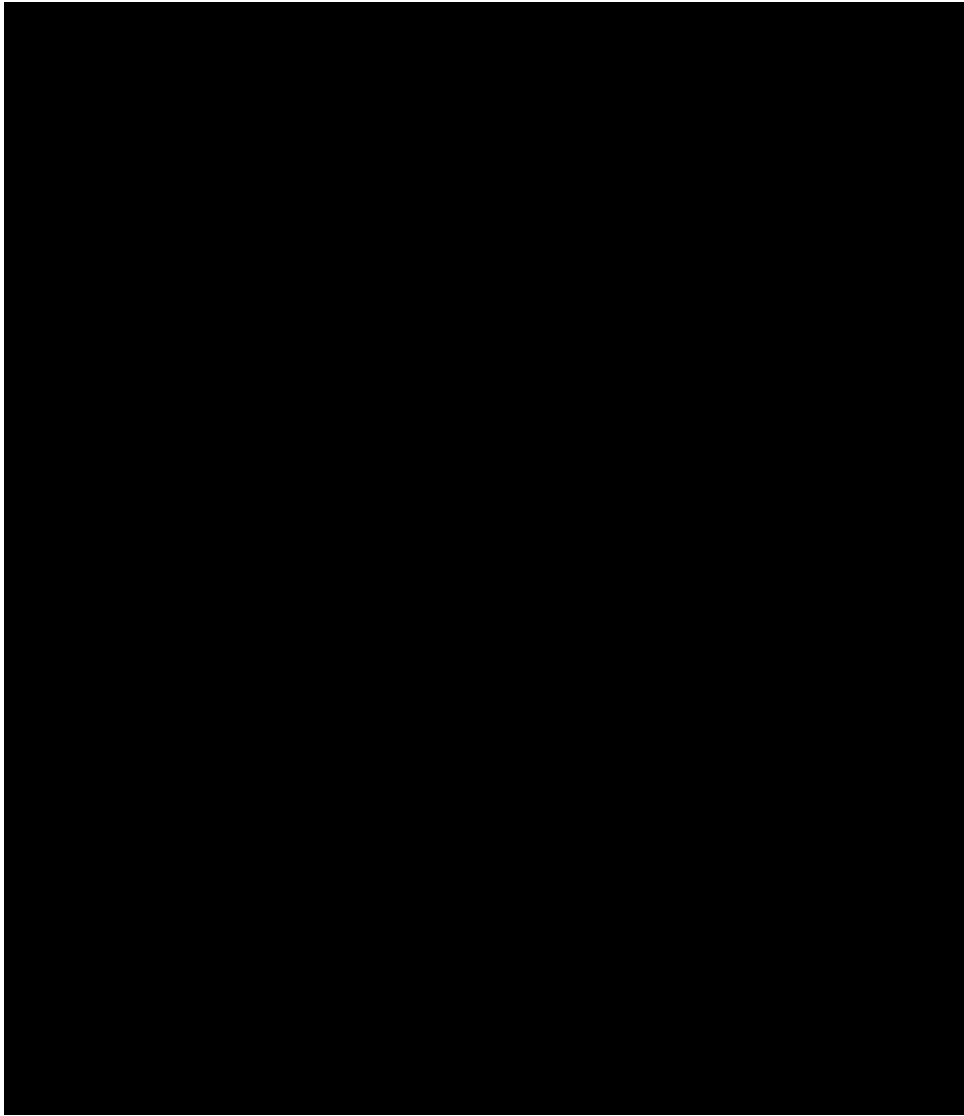
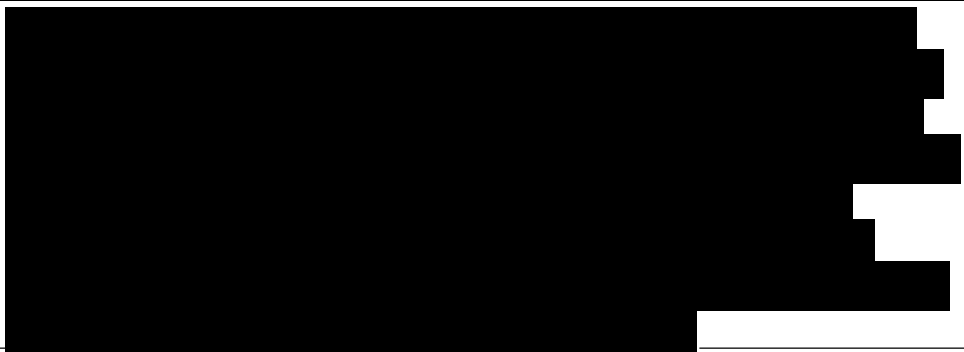
Claim 26	
Limitation	Patent Owner's Twister and Render House Products
[26.0] A computer-implemented method in a roof estimate report system including a computer system and a memory coupled to the computer system, the method comprising:	
[26.1] changing, by the computer	

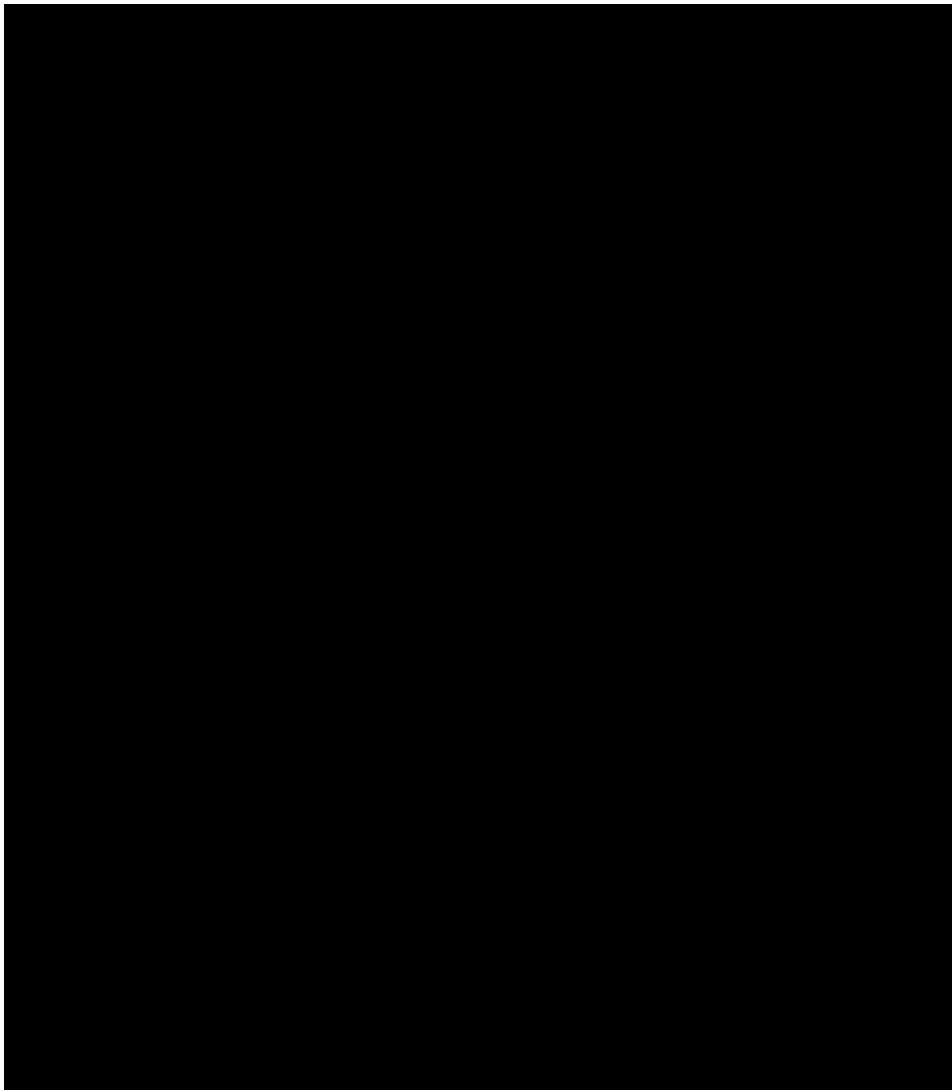
Claim 26	
Limitation	Patent Owner's Twister and Render House Products
system of the roof estimate report system, a line in a first line drawing representing a feature of a roof that overlies a first aerial image of the roof;	

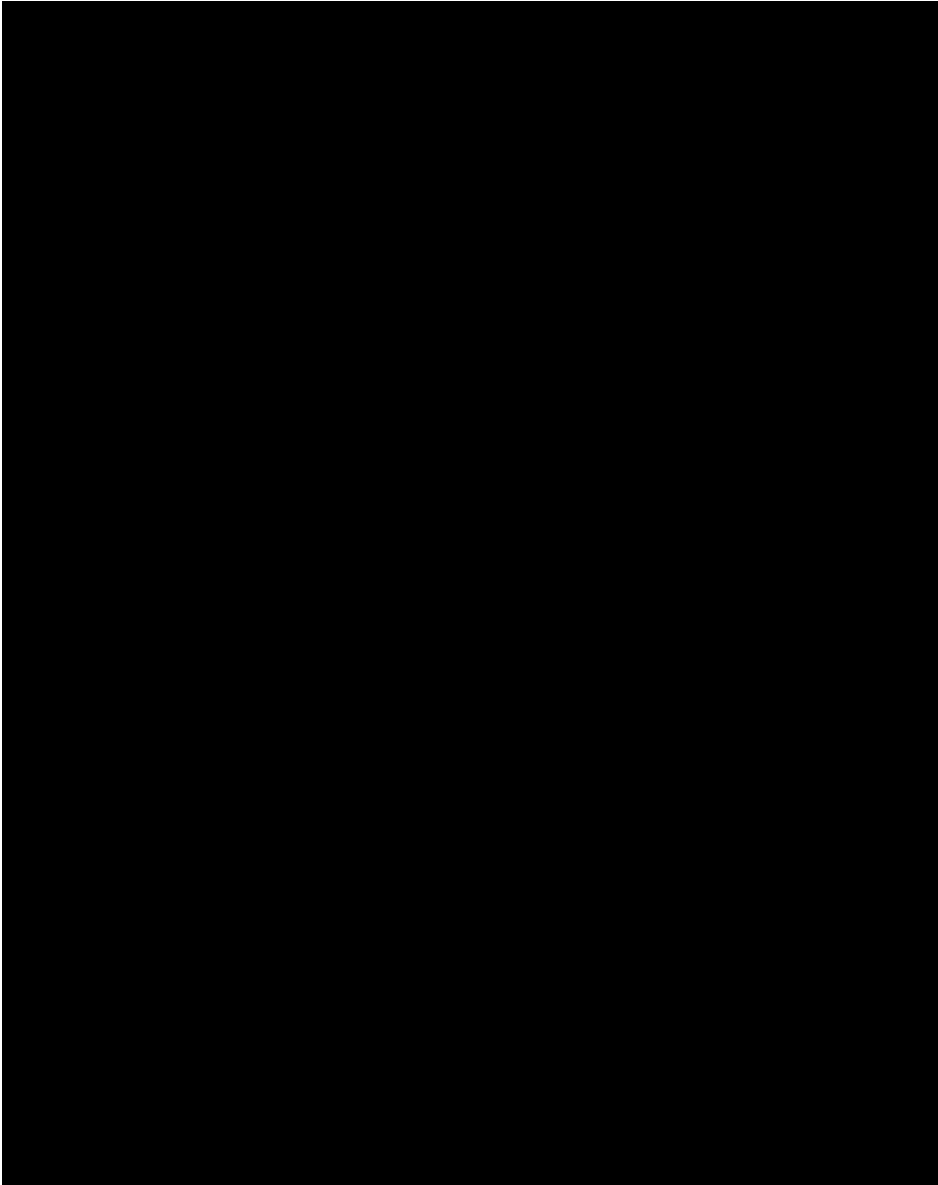
Claim 26	
Limitation	Patent Owner's Twister and Render House Products
	 

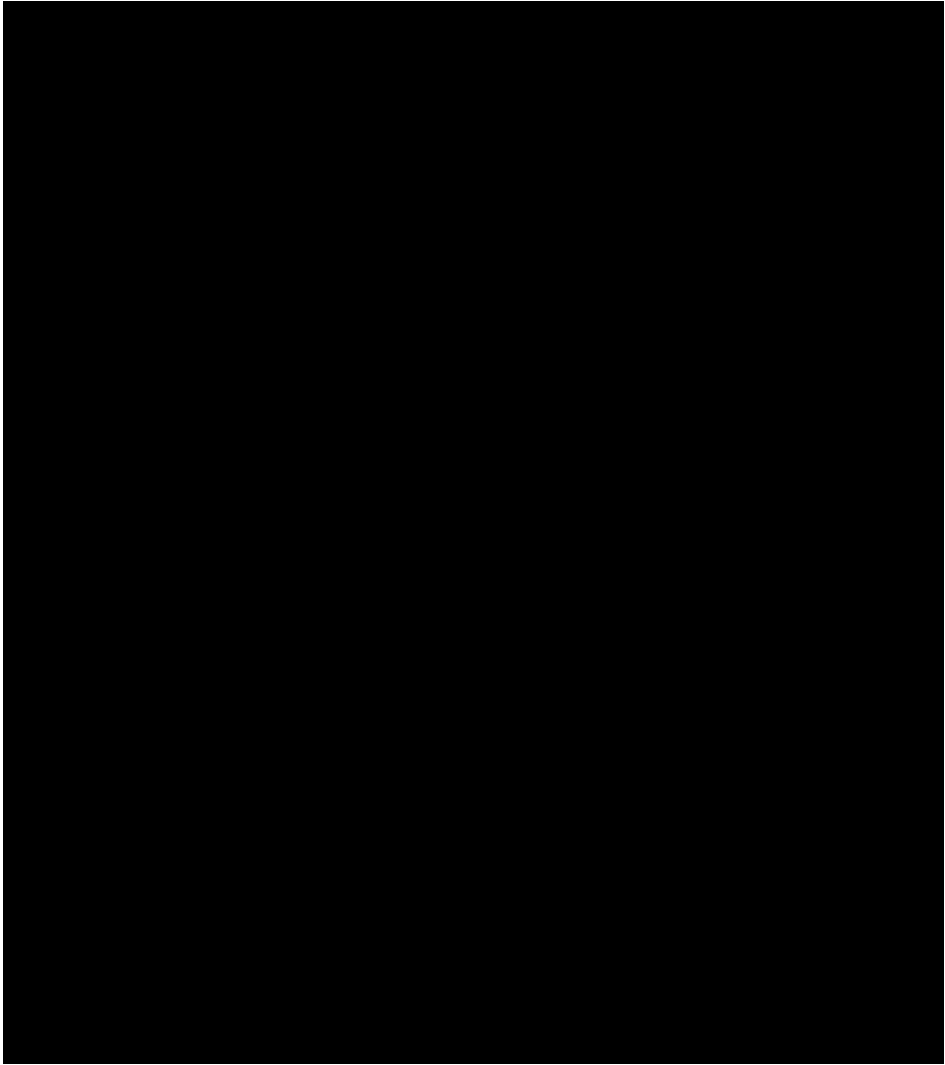
Claim 26	
Limitation	Patent Owner's Twister and Render House Products

Claim 26	
Limitation	Patent Owner's Twister and Render House Products
[26.2] changing, by the computer system of the roof estimate report system, a line in a second line drawing that corresponds to the same feature in the first line drawing that was changed, the change in the second line drawing being made by the computer system in response to the change that was made in the first line drawing; and	

Claim 26	
Limitation	Patent Owner's Twister and Render House Products
	
[26.3] generating and outputting a roof estimate report using a report generation	

Claim 26	
Limitation	Patent Owner's Twister and Render House Products
engine, wherein the roof estimate report includes numerical values for correspondin g slope, area, or lengths of edges of at least some of a plurality of planar roof sections of the roof, wherein the generated roof estimate report is provided for repair and/or constructing the roof structure of the building.	

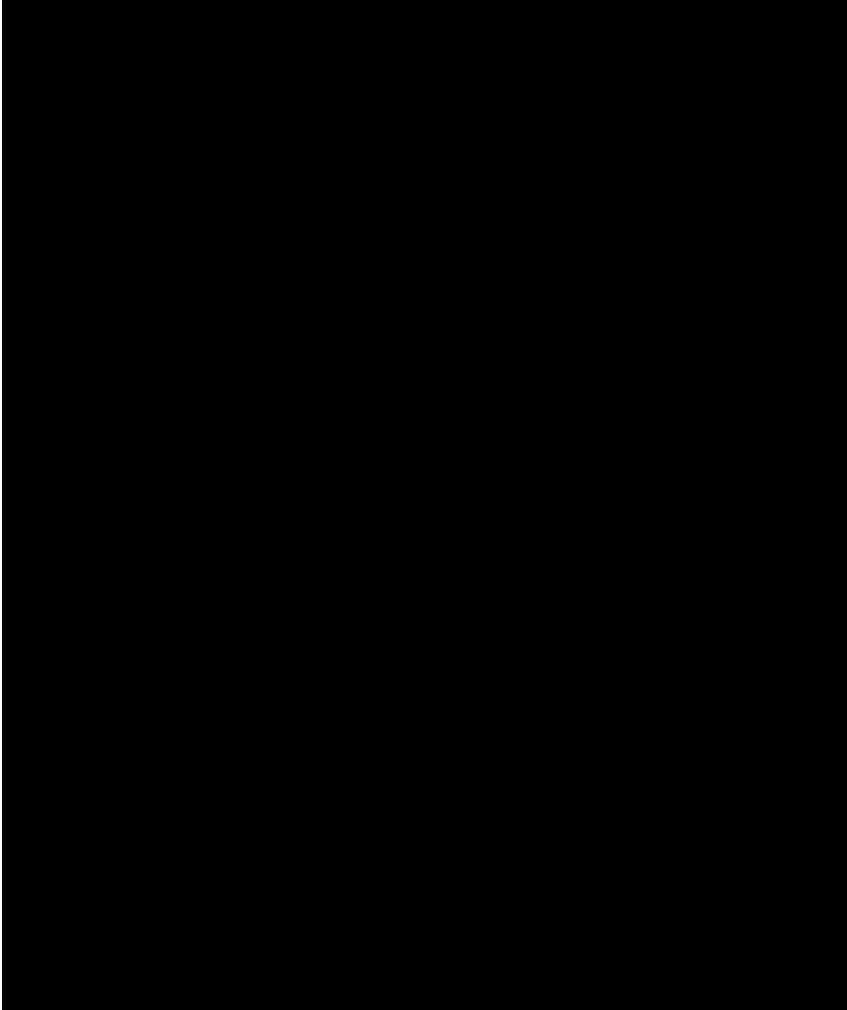
Claim 26	
Limitation	Patent Owner's Twister and Render House Products
	

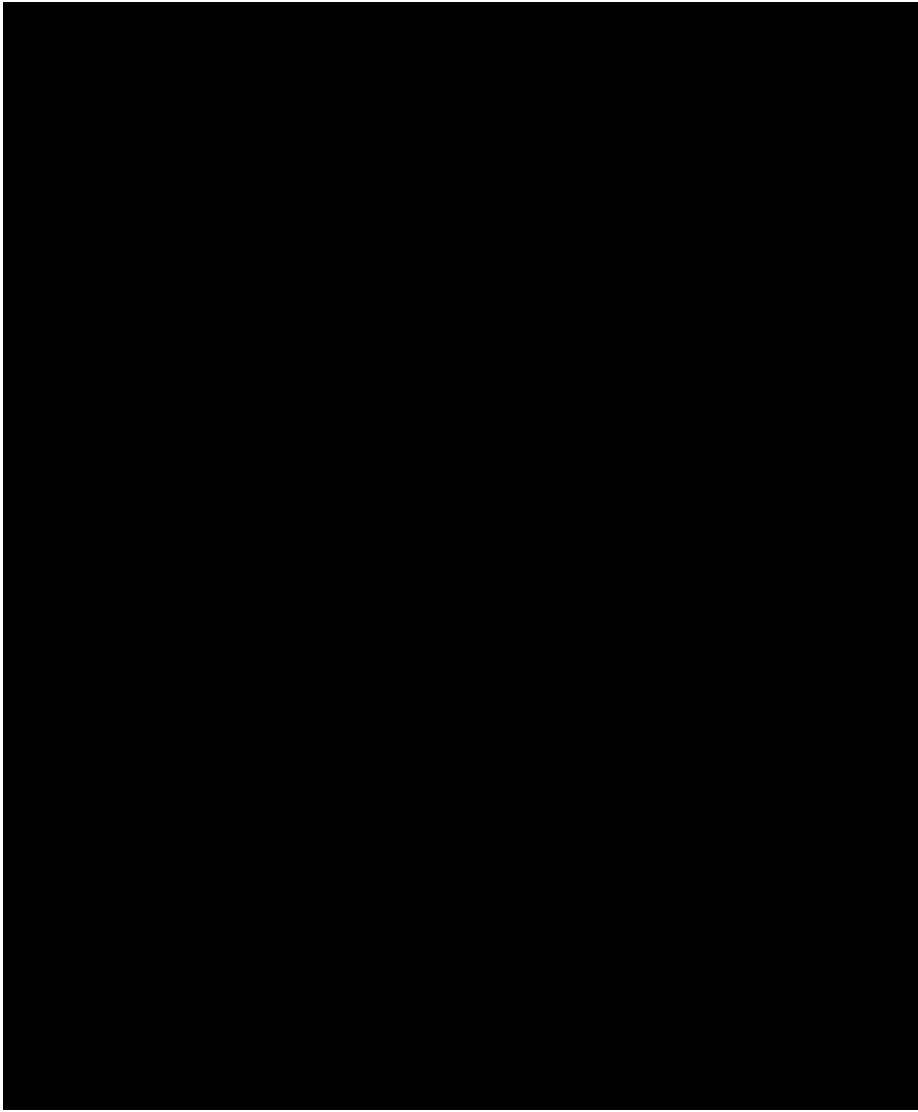
Claim 26	
Limitation	Patent Owner's Twister and Render House Products
	

Claim 26	
Limitation	Patent Owner's Twister and Render House Products

Claim 26	
Limitation	Patent Owner's Twister and Render House Products

Claim 34	
Limitation	Patent Owner's Twister and Render House Products
[34.0] The method of claim 26 further comprising: displaying roof measurement information on the same display concurrently with the first line drawing being displayed.	

Claim 34	
Limitation	Patent Owner's Twister and Render House Products
	

Claim 34	
Limitation	Patent Owner's Twister and Render House Products
	

Claim 34	
Limitation	Patent Owner's Twister and Render House Products

X. CONCLUSION

180. This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on 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 or Title 18 of the United States Code.

Date: Feb 14, 2023

Chandrajit Bajaj