

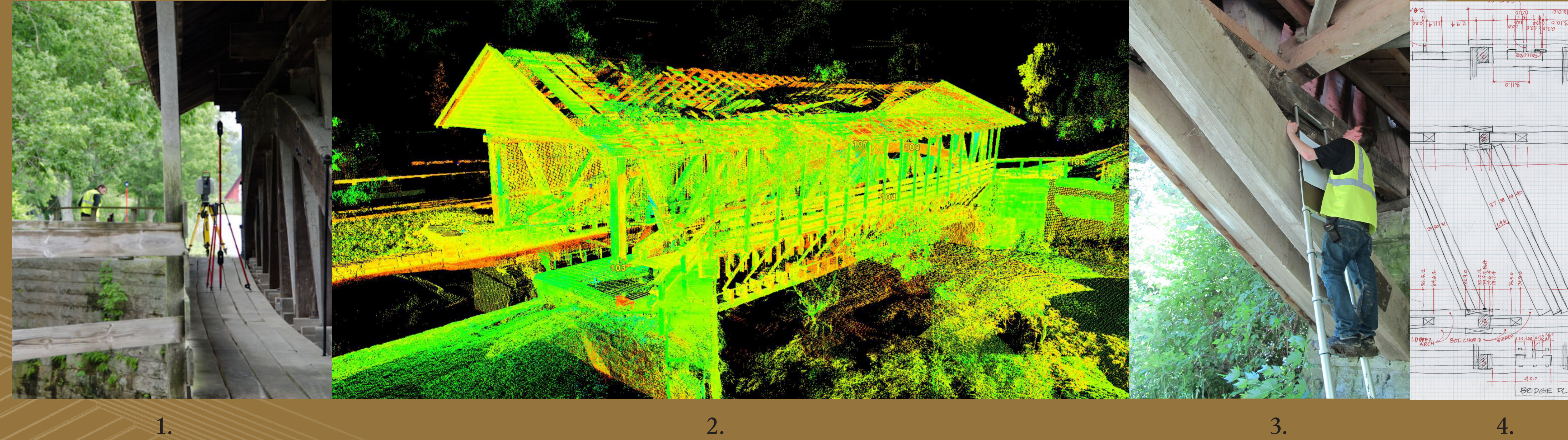


# Recording Structure and Process: HAER Digital Documentation Methods

The most commonly recognizable feature of a covered bridge may be its gabled roof and its weather protected interior space, although what is most significant about a covered bridge is its truss. Extant covered bridges have a variety of truss types that are the result of several bridge designs patented by American engineers in the nineteenth century.

Successful documentation depends on adequately illustrating the many members that compose the truss. Accurate and detailed drawings of each member, connections, and overall geometry are necessary to reveal the engineer's methods of transferring load to the abutments. This poster outlines the methods used by architects at the Historic American Engineering Record (HAER) to create archival documentation that illustrates and explicates the most significant aspects of historic covered bridges. HAER drawings also record the existing conditions of the bridge and can be used for preservation or general maintenance purposes.

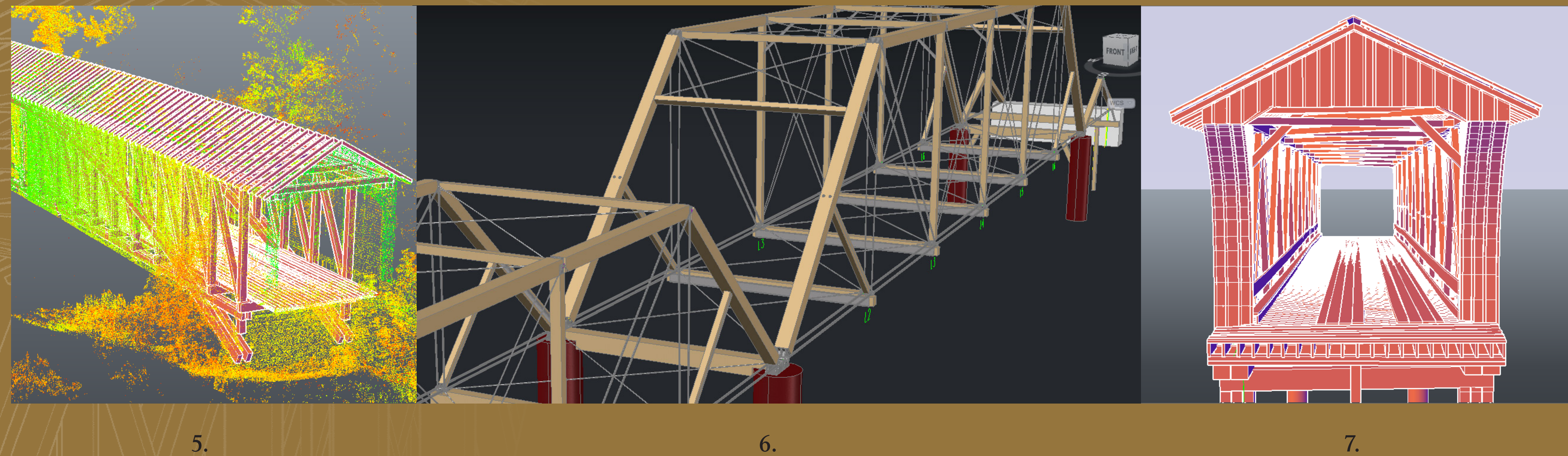
## Data Collection



While scan technology has become an indispensable tool for bridge documentation, the point cloud must be augmented with hands-on investigation and field notes to fill scan shadows and to better understand the structure. A point cloud gives the viewer a good sense of the structure's overall composition and massing, but does not adequately illustrate details or focus on its more important parts.

1. Scanning Duck Creek Aqueduct, Metamora, Indiana, constructed 1847.
2. Pointcloud of Duck Creek Aqueduct viewed in Cyclone.
3. HAER field team member Benjamin Shakelton investigates the lower chord of Forsythe Bridge, Indiana.
4. Field notes of bridge deck plan.

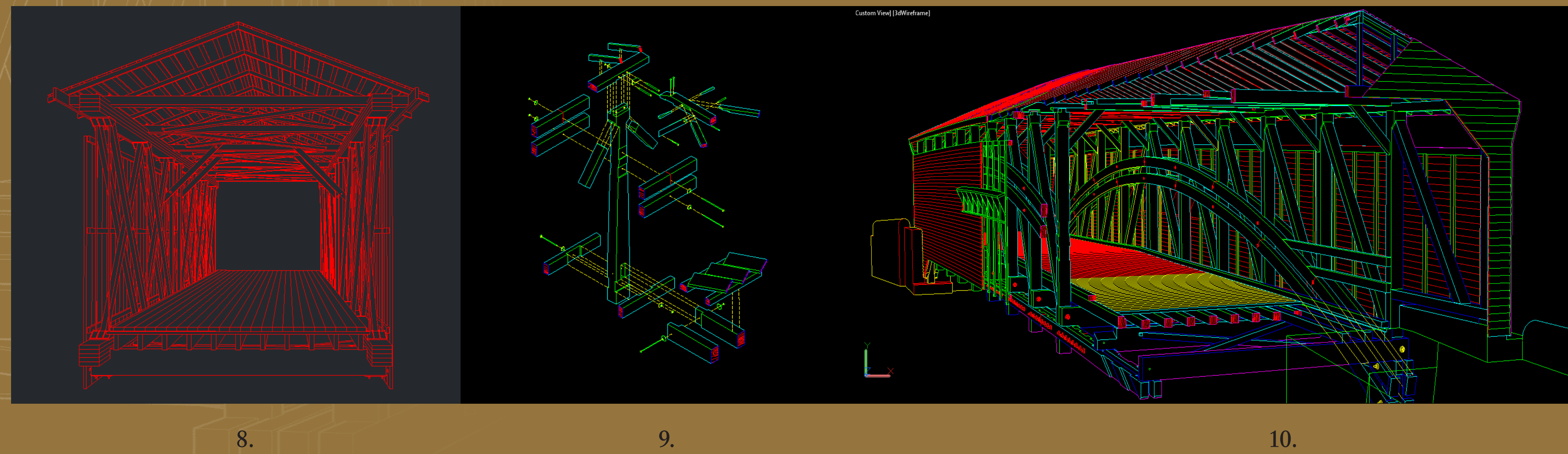
## 3-D Solid Modeling



3-D modeling creates definitive edges that the pointcloud lacks. The modeling process requires the modeler to bridge gaps in the point cloud and discern and ignore point cloud anomalies using field notes and field photos. The accuracy of the model relies on knowledge gained during hands-on investigation of the structure. These edges are later extracted for use as 2-D measurable documentation.

5. 3-D solids are created over the pointcloud using Kubit plug-in in AutoCAD2012.
6. AutoCAD model of Honey Run Bridge (constructed 1886), Butte, California.
7. Perspective view through portal of 3-D model of Powder Works Bridge (constructed 1872), Santa Cruz, California.

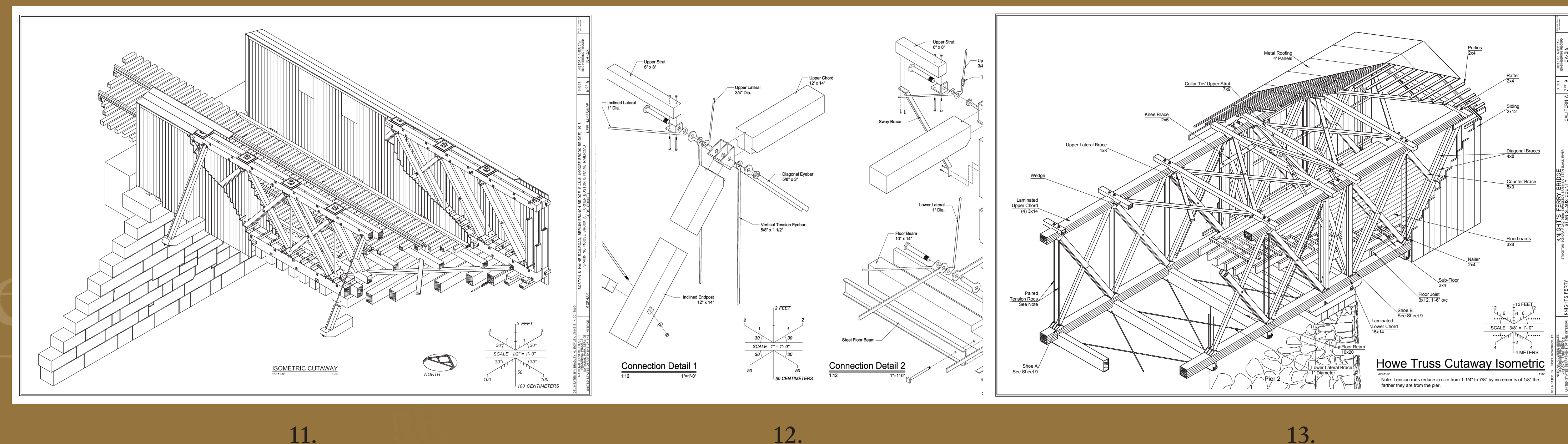
## 2-D Editing



Flatshots of the 3-D models are used to create measurable isometric drawings of details and cut-aways. Perspective drawings are also created to illustrate components of the bridge. These drawings create a visual hierarchy to clearly show important components. Lineweights are used to add clarity.

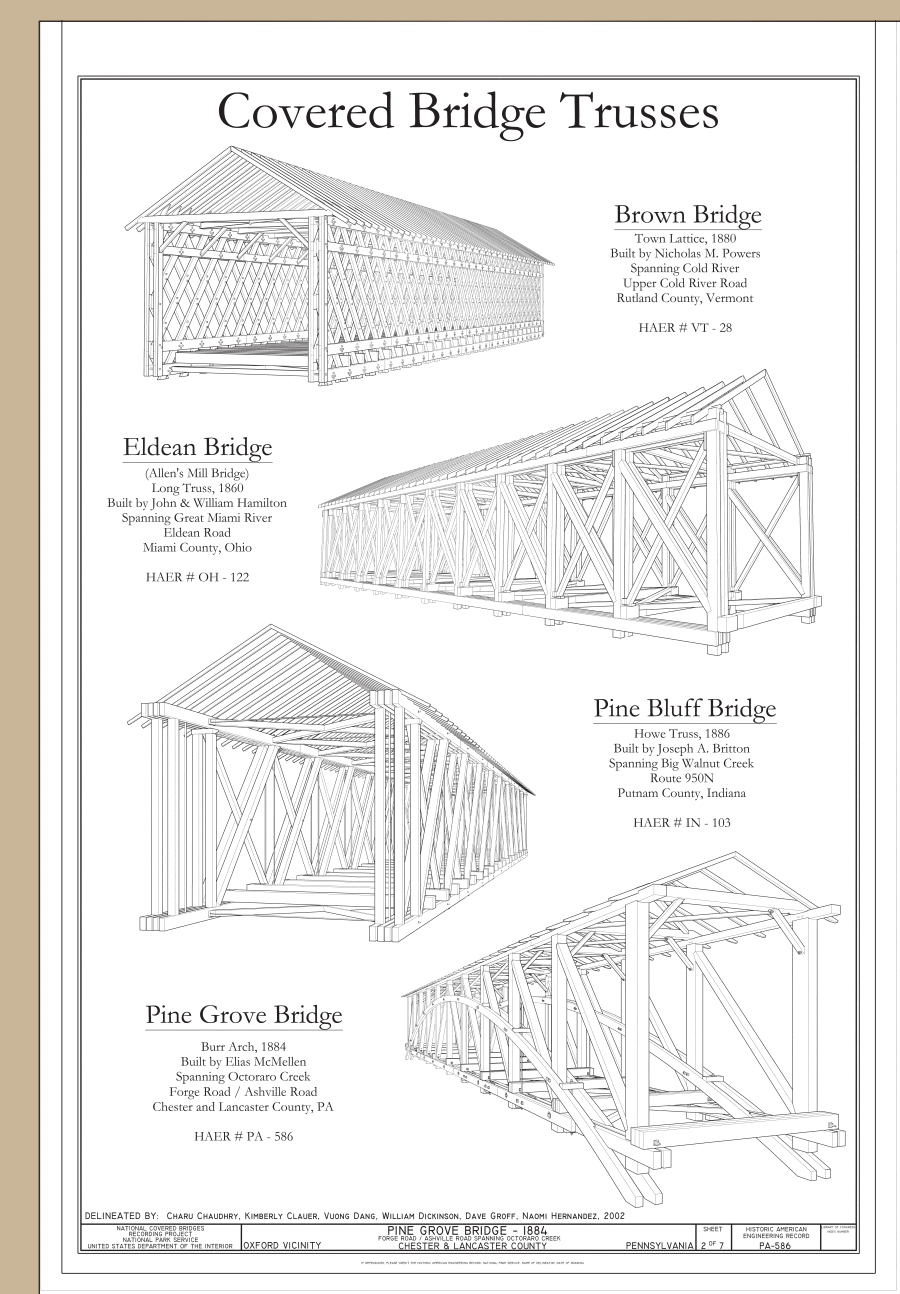
8. Flatshot created in AutoCAD of perspective view of 3-D model. Knights Ferry Bridge (constructed 1862), Knights Ferry, California.
9. Isometric drawing of king-post connection on Gilpin's Falls Covered Bridge (constructed 1860) North East, Maryland.
10. Perspective view of Gilpin's Falls Bridge created from 3-D model with components removed to show interior.

## Final Product



The final drawings are plotted on 24"x36" vellum for transmittal to the Library of Congress. The drawings meet the 500 year permanency standard set by the Library of Congress for the HABS/HAER/HALS collection, are easily accessed by facility managers or researchers, document existing conditions and explicate what is most valuable about the bridge based on the research of HAER historians and architects.

11. Isometric cut-away of Moose Brook Bridge (constructed 1918), Gorham, New Hampshire. Delineated by Bradley M. Rowley, 2009.
12. Isometric details of Honey Run Bridge. Delineated by Benjamin Shakelton and Jeremy Mauro, 2011.
13. Isometric of Knight's Ferry Bridge. Delineated by Pavel Gorokhov, 2011.



The goal of our documentation, as stated in the *Secretary of the Interior's Standards for Architectural and Engineering Documentation* is to convey "the historic significance of the building, site, structure or object" to future and present generations of "scholars, researchers, preservationists, architects, engineers and others interested in preserving and understanding historic properties."

[http://www.cr.nps.gov/local-law/arch\\_stnds\\_6.htm](http://www.cr.nps.gov/local-law/arch_stnds_6.htm)

The Historic American Engineering Record (HAER) was established in 1969 by the National Park Service, the American Society of Civil Engineers and the Library of Congress to document historic sites and structures related to engineering and industry.

<http://www.nps.gov/history/hdp/>