

AMERICAN OAK COFFEE TABLE

PROJECT DESIGN & DOCUMENTATION

CAMERON MILLS
STUDENT ID: 22104340
DES10653 • Session 2 • 2014

TABLE OF CONTENTS

STATEMENT OF INTENT – INSPIRATIONAL PLANNING	3
TIMBER SELECTION	5
HISTORICAL USES	5
COFFEE TABLE PLANS	7
CUTTING LIST	18
TIME MANAGEMENT PLAN	21
PRE-WORKSHOP TASKS	21
WORKSHOP TASKS	21
FINANCE PLAN	23
REFERENCES	24

STATEMENT OF INTENT – INSPIRATIONAL PLANNING

The assigned task called for variation to a coffee table that included 2 drawers. This presented an excellent opportunity to build a stylish, quality and practical coffee table for our lounge room. My initial reaction to the example design was to address the two drawers. I felt the drawers both facing the same direction and side by side to be unbalanced and knew my design needed to modify the drawer design to oppose each other. The decision to locate them on the long axis of the coffee table meant the drawer face could be included into the design without dominating it.

A very important benefit of the design process was being allowed to complete it during a parallel CAD unit assignment. This allowed me to dedicate a lot of time not only to the design but also to the detailed construction issues. During this time I explored a range of possibilities and was able to really consider how I would approach the various stages of construction.

I realised I could incorporate the drawer face into the design and yet let them be completely concealed. By extending the leg top beyond the carcass edge I would be able to fit the drawer face flush with the leg sides, careful fitment would improve the deception. Using a concealed finger pull routed into the backside of the lower drawer face meant I didn't need to use any cabinetry hardware which I felt would have detracted from the sleek design. The taper of the leg design required research as to how I could cut them. I found the solution in a jig that pivoted at one end and could be fixed to various angles at the other. This proved to work perfectly although some initial head scratching was in order until I realised the cutting process required to stopping the first cut about 10mm from the end so the remaining timber would support the leg on a 90° plane for the second cut of the same angle.

The design called for an inner carcass. When I began modifying the coffee table I wasn't certain of the timber species I would use although I knew it would be a hardwood capable of functioning with a less complex design. Therefore I decided to put the carcass to good use and took a leaf from Daves Ellis's book when he mentioned secret compartments in an earlier semester. My carcass would have a secret compartment that would only be accessible when the drawers are open. (Don't tell anyone!)

My design included an in-built tray. Research (and an old teak coffee table we have at home) made me realise the functional value of a tray, being a place to store extra books and kids games. The tray also served an important aesthetic function in balancing the overall appearance of the coffee table. Without the tray the table design seemed top heavy with its elegant legs appearing too long. Many appealing coffee table designs I reviewed included a tray and it was important for me to include it into the design. The other

benefit of the tray was to provide a significant back stop in the event that something went very wrong with my time plan. The table could be build and function without the tray. The tray would be one of the final activities in the build and would only be attempted when I was sure everything was on track. If I needed to I could build the tray at a later date. Necessary timber was ordered for the tray and would be reserved until it was completed.

Although the tray added a lot of appeal to the design I realised its build and inclusion into the table, within the given time of five days would challenge my skills. Being able to pre-cut my timber, and also joint the table top allowed me sufficient time in the planning of the build to allocate the time required. The tray included a mitered frame with 25 slats. Every slat needed to be perfectly cut to meet its frame in length, thickness and housing joint dimensions so as to appear at ease with the overall design and demonstrate my current skills (or lack of) in furniture making.

Finally my coffee table design needed to meet my & my wife's tastes. We wanted it to be an attractive piece of furniture that would be practical, durable (with 3 kids) and feature elements that would harmonise with some other furniture in our house, in particular an old Parker lounge suite including a 3 seater lounge and 2 single seats. A slim design including curved tabletop, integrated apron and slightly tapered legs suggested a heritage that might have come from a 1960's Danish design catalogue.

TIMBER SELECTION

I have always admired the history and character (colour, grain patterns and texture) of Oak and decided although there are many excellent Australian timbers (especially my favourite Otway Blackwood - *Acacia melanoxylon*), this coffee table had to be recycled Oak.

My personal preference was to source English Oak (*Quercus robur*) or French Oak (*Quercus pretaea*) for three reasons:

- its rich brown colour
- as a kid we spent many hours up an old English Oak tree in the front yard of the farm.
- because I had forgotten about another Oak option.

I was able to locate a supplier of French Oak, Salvage Group of Melbourne (salvage.com.au), Salvage were supplying beams and not being able to sight them I had concerns about the quality of the timber they would select for me and also the costs of transporting to Sydney. Added to my concern was the need to re-saw them on a quality bandsaw, a machine that I didn't have easy access to and would cost another \$100 to \$200 to contract a shop to do for me.

Further research revealed Harpers timbers in Sydney had a small selection of American White Oak (Various species exist but possibly *Quercus alba*) that was left over from a major domestic flooring order. The home-owner had engaged Harpers to import 4 shipping containers of 32mm tongue & groove floor boards, a very expensive flooring system! Although it was not recycled, it was a sort of re-use and I am very glad my use will be far more appealing and practical than somebody's flooring. I feel strongly about the beauty and value of trees and their place in the environment. Oak is a particularly life giving tree, being a source of habitat, food and shade for many animals and I feel using it for man's needs warrants that those needs are justified and put to good use.

HISTORICAL USES

I then recalled an historical movie based on the American naval frigate, USS Constitution – America's Ship of State. Research revealed she was nicknamed Old Ironsides following a sea battle with the British frigate HMS GUERRIERE August 19, 1812, where the British 18 pound (8 kg) canon balls bounced harmlessly off the USS Constitutions' sides. The frigate was launched in 1797, is fitted with 44 canon (up to 55 at times) and is the oldest commissioned naval ship afloat today. Her primary construction of

Live Oak (*Quercus virginiana*) included a 530mm thick hull. Live Oak shares many of the same traits as White Oak, which includes being practically impervious to liquids and is one of the finest timbers for top quality wood working projects.

White Oak has many other uses including fine cabinetry, paneling, flooring, caskets, shingles and importantly as a quality material in cooperage, being the making of barrels and casks. Several Oaks are suitable for cooperage although the species used has a major influence of the flavor characteristics of the final product. White Oak imparts a strong aromatic, woody character suitable for Bourbons where French Oaks are subtler, being ideal for fine wines. Various compounds within Oak, including volatile phenols impart these flavor characteristics and these are the same that give Oak its rich aroma when being worked. Smelling a handful of shavings is an experience.

One of the negatives of the selected timber is that it is a pale tone, typical of *Quercus alba* it has various shades of yellow, olive and light brown. I contacted Evan Dunsford of Dunsford Designs who allowed me to do an industry study on his fine furniture business. He suggested rather than staining I could fume the table in a plastic tent with a jar of strong ammonia for 24 hours. The fumes release the tanins within the timber bringing out a darker brown tone. I tested this with an offcut and found it worked very well. The colour swatch below was sampled from before & after fuming in Photoshop.



*Before & after 12 hours of ammonia fuming.
Colours sampled in Photoshop from same location on offcut.*

COFFEE TABLE PLANS

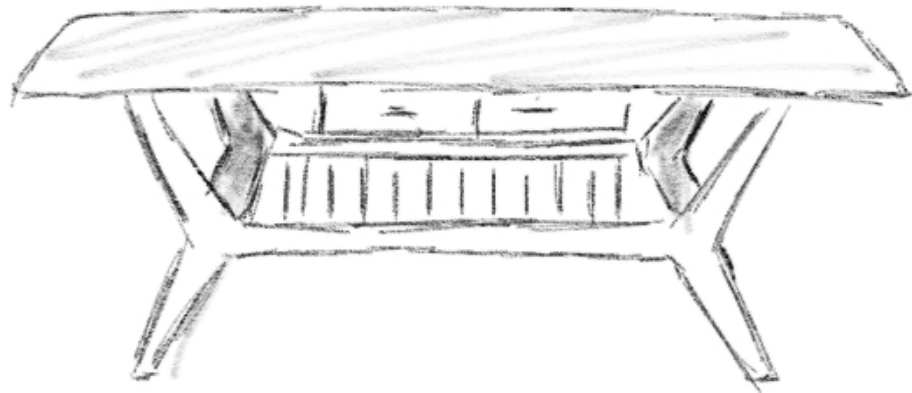
The following drawings are taken from my CAD assignment and detail the design of the coffee table.

As a postscript to building most of the coffee table I can say the drawings overleaf were sufficient to allow me to build the table without any significant problems. Some changes that had to occur, and their reasons for are listed below:

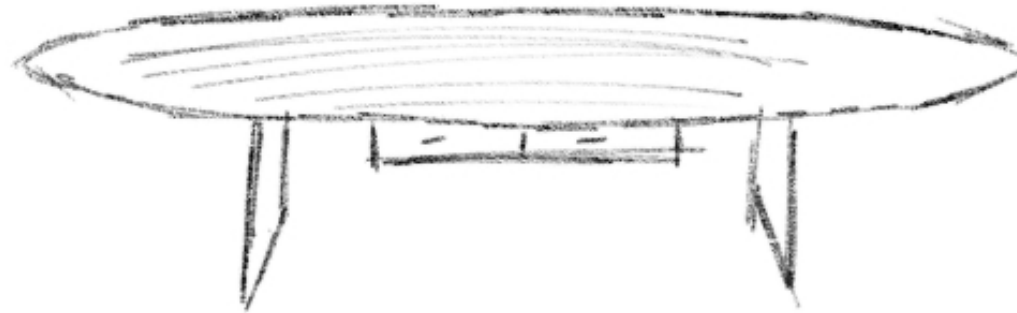
- My initial design had a slightly wider tabletop. After sourcing my timber I selected various boards for the tabletop. Given the cost of each board and their widths I elected to joint the table top with one less board and this required shortening then width by about 30mm. Instead of changing the radius of the arc I decided to pull the same arcs closer to the centre of the table by about 15mm. This wasn't a major change and had no significant impact on the aesthetic. In hindsight a slightly larger arc (without pulling the corners closer to the centre) might have been appropriate.
- Once I had settled on a design and selected timber I went about match planing selected Oak boards to make the tabletop. This assignment justified (I needed some good justification for my wife) the purchase of a quality Veritas low angle jack plane, something I have wanted for 2 years. I also bought a Dewalt biscuit jointer. In my hurry to use both tools I forgot to consider exactly where the biscuits should be cut in relation to the final tabletop dimensions. My biscuits took account of the overall board length but later I realised they would likely be visible when I cross cut the tabletop to final length dimensions. This was the case and I needed to fix the visible biscuits. Using spare Oak I made thin edge bands and jointed them to the edge grain of the tabletop. The result was very good and I should have included their design from the outset.
- The tabletop was designed to be fitted to the carcass by way of metal brackets allowing for expansion. I never envisaged a need to remove the tabletop although this fitting method would have allowed it. During discussions with Pat, our workshop supervisor, it was suggested there would be no expansion issues and so in the interest of time, and a shortage of appropriate brackets, I decided on gluing the tabletop to the carcass. The end result is fine and perhaps in using plenty of premium glue (Titebond III) it is even stronger than screw fixing the tabletop.
- The final design modification was to build both drawers using dovetails with a dovetailing jig. This was approved by our workshop supervisor and I gladly accepted as an improvement over the dowel method proscribed in the assignment.

Freehand Sketching

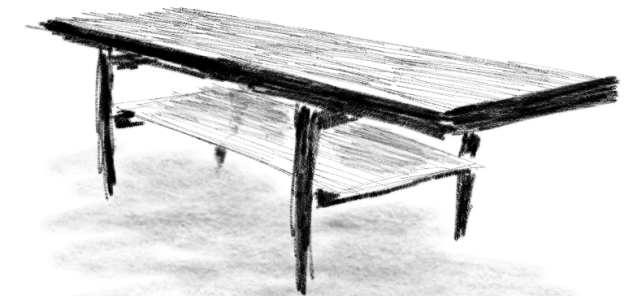
Quick rough capture and working of influential and researched items. Elements are freely identified and refined on paper, or tablet. A record of these workings is useful for ongoing evaluation and development. Below are some drawings prepared in the research of this project and my comments.



Interesting design. Ample storage, joinery construction maybe too complex. Design too retro for my taste? Dislike visible drawers and their side-by-side bulk which clashed with classic design.



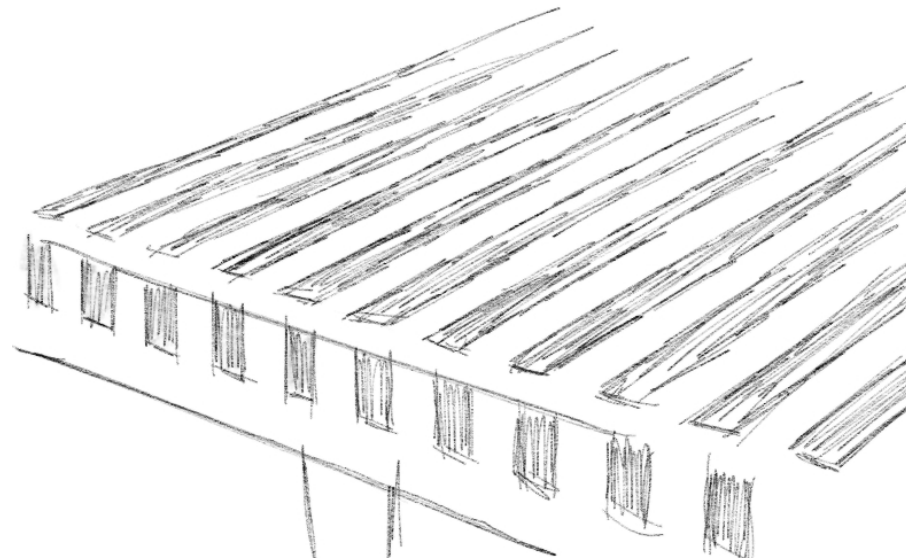
Curved surface is appealing. Same issues with bulky visible drawers. Appears structurally inadequate for my family needs.



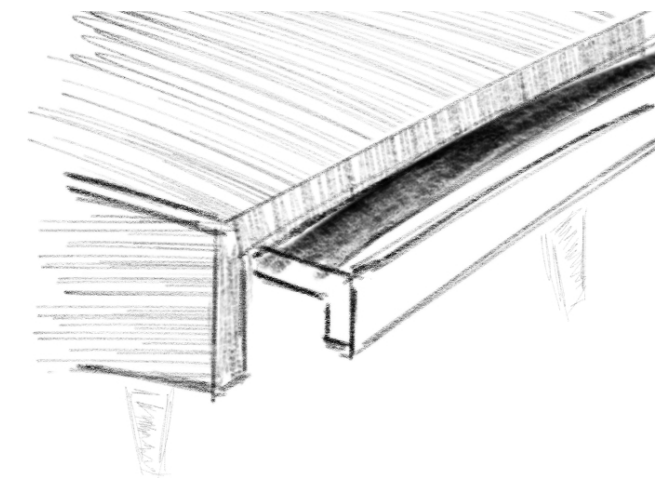
Great design, maybe too light with complex joinery. How to incorporate drawers?



Very appealing design with joinery modified to remain simple enough for production constraints. Drawes still need a location, ends? Can the bulk of 2 coplanar surfaces be minimised... ideas?



Modify this style of production joinery to build a slatted under-tray.

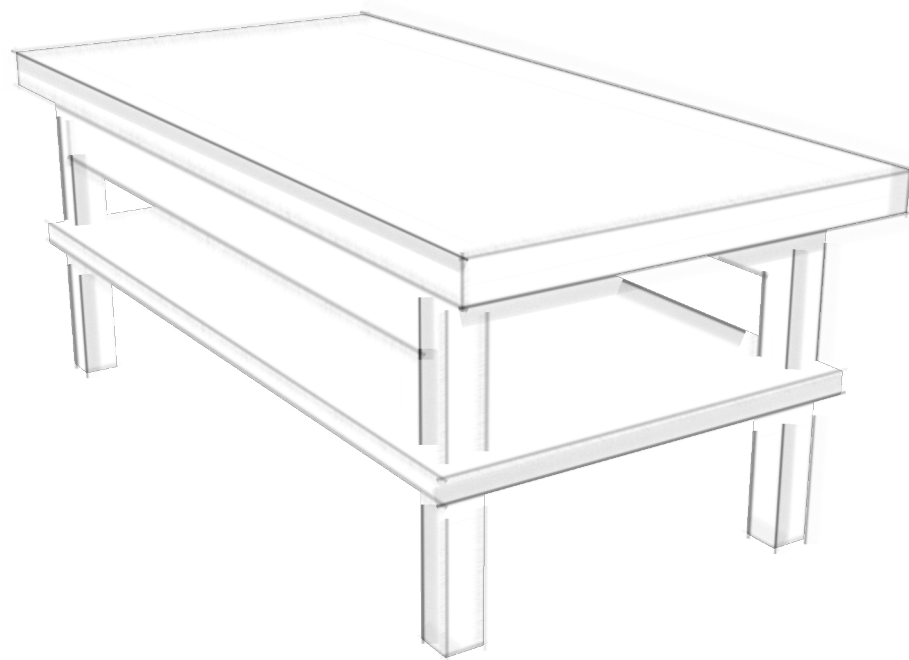


Build drawers at table ends and conceal faces. Perfect!

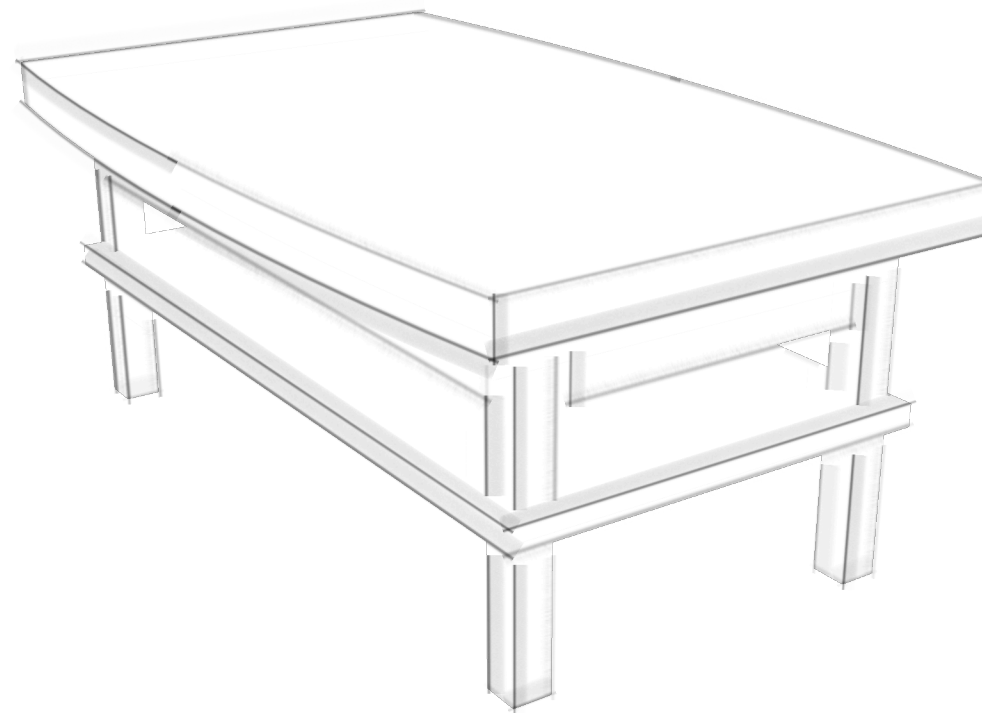
PAPER SIZE	SCALE	DRAWING	PROJECT	DRAWN BY	DATE
A3			Coffee Table	Cam Mills	August, 2014

Design Development

Quick rough capture and working of influential and researched items. Elements are freely identified and refined on paper, or tablet. A record of these workings is useful for ongoing evaluation and development. Below are some drawings prepared in the research of this project and my comments.



Overall size, scale & function is OK yet requires drawers and some softening curves & refinement.



Experimentation with tabletop shape found a curve which looks appealing. Drawers work when locating at either end of table, rather than sides. Table design still looks stocky, legs and under tray needs refinement to reduce bulkiness, but retain overall strength.



Angling legs inward from about $\frac{1}{4}$ height works well although width appears unbalanced. Reduced table-top thickness combines with tray down-size reduces bulk but does little to reduce the final structural strength of the table.

PAPER SIZE

SCALE

DRAWING

PROJECT

DRAWN BY

DATE

A3

Coffee Table

Cam Mills

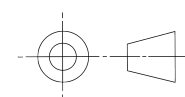
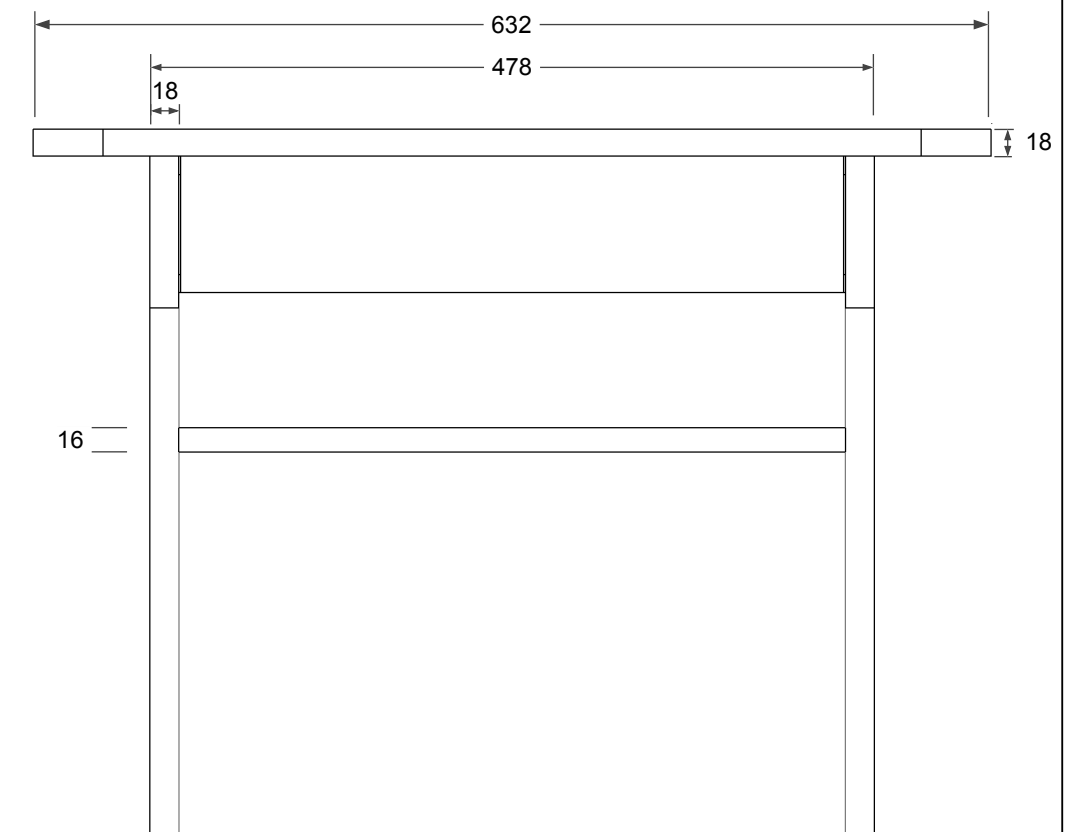
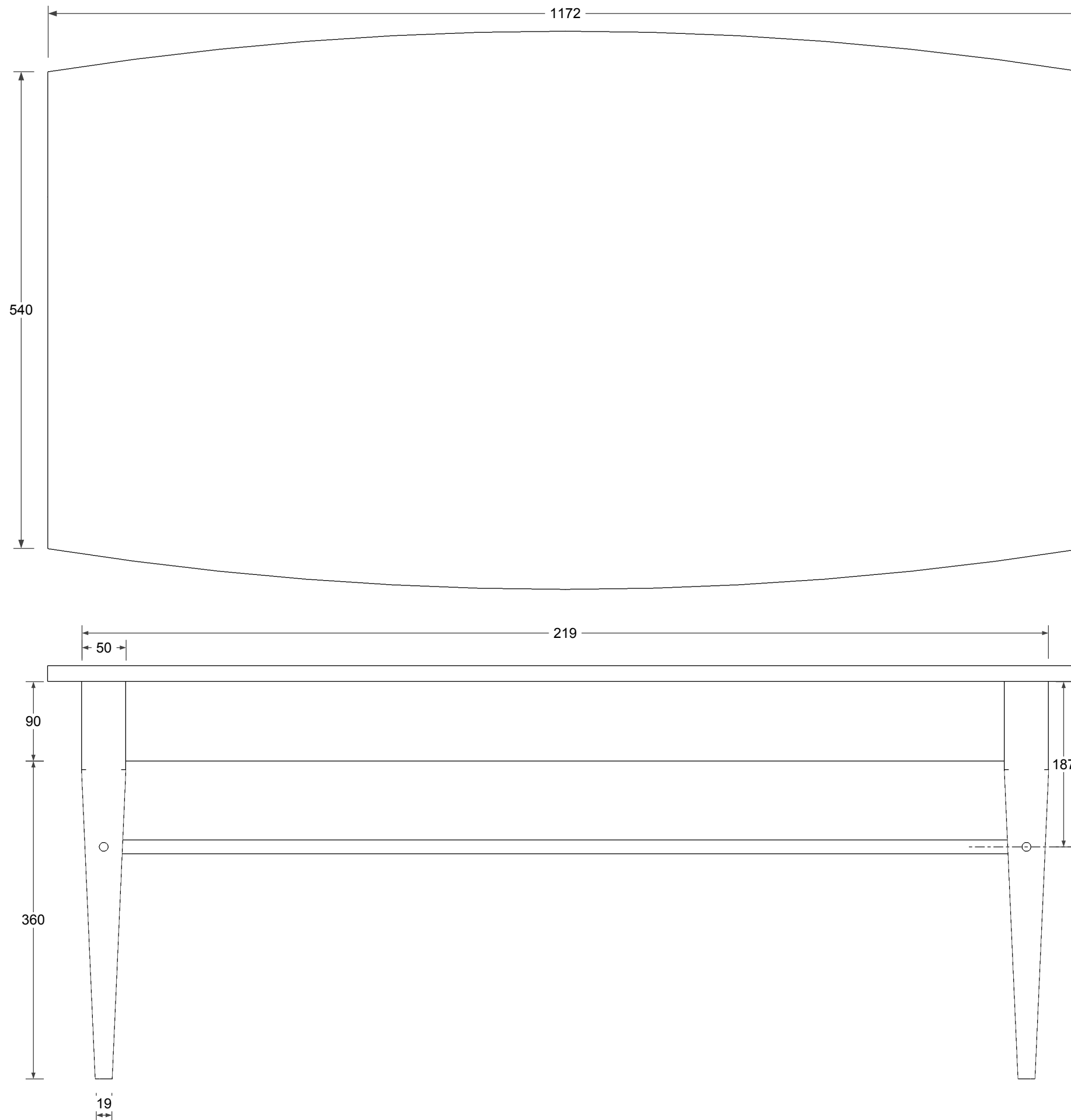
August, 2014

ORTHOGONAL DRAWING

Orthogonal (also orthographic and working) drawings provide the viewer with all the information to convert a 2D object into 3D by projecting the plan, front and end views. This type of drawing is common to production, technical and engineering applications.

Standards Australia recommend 3rd Angle projection to lay out orthogonal drawings (SAA HB1-1986). The symbol in the title block below indicates 3rd angle projection and this tells the reader how the drawing is laid down.

Orthogonal drawings can include hidden line geometry, section cuts and cutaway views.



PAPER SIZE

A3

SCALE

1:5

DRAWING

1

PROJECT

Coffee Table

DRAWN BY

Cam Mills

DATE

August, 2014

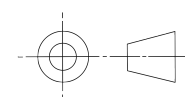
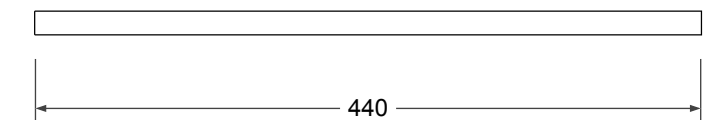
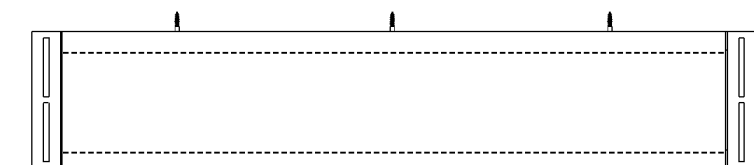
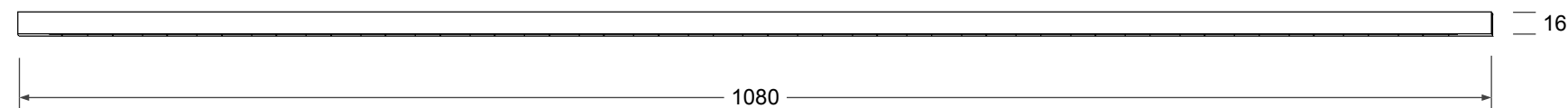
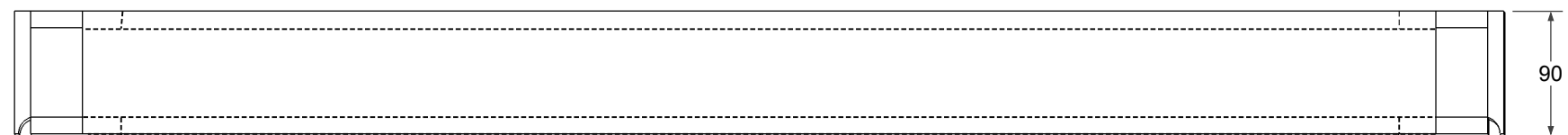
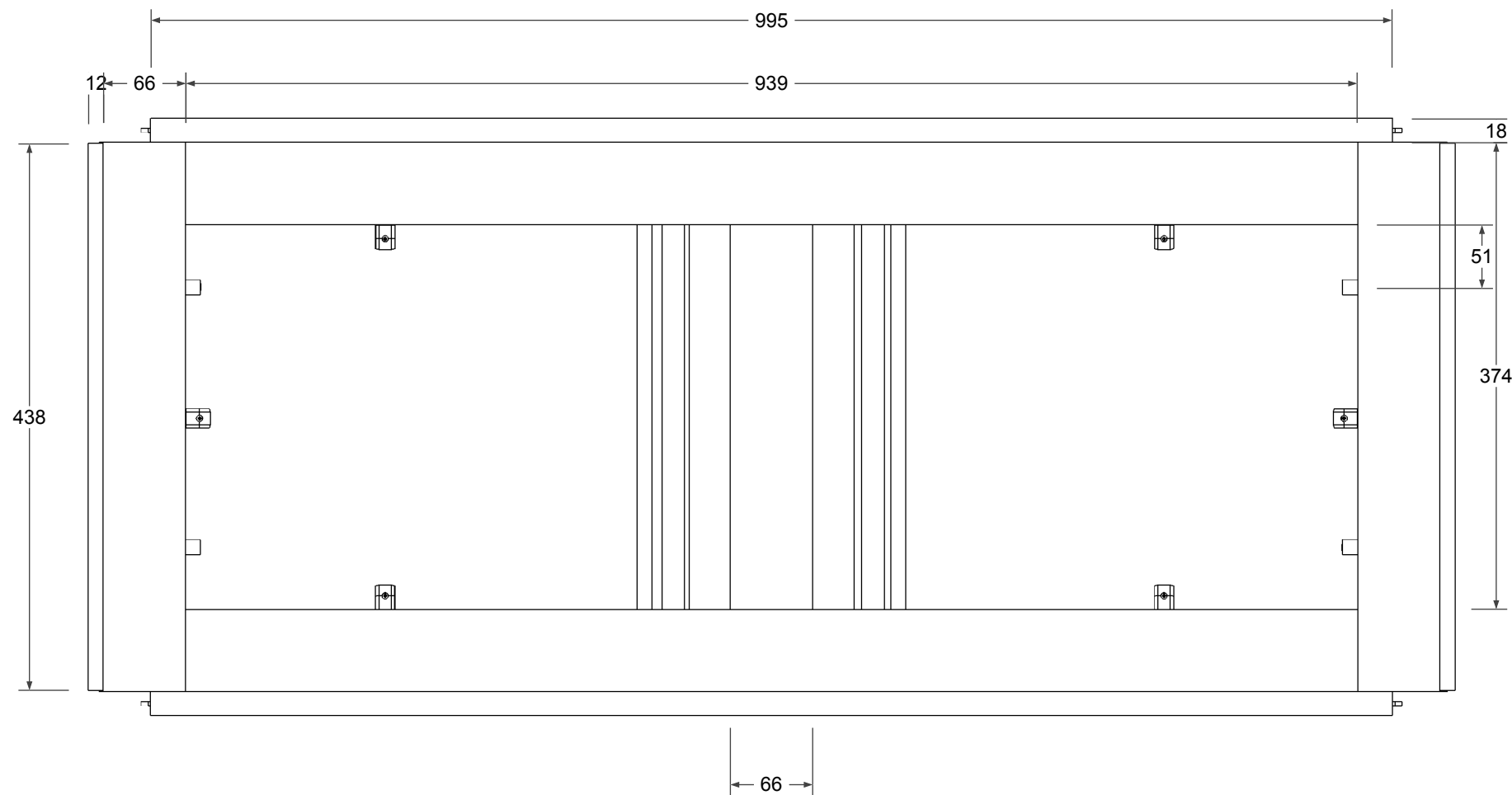
ORTHOGONAL DRAWING (Cont.)

As material is removed from the view other components are revealed. Simple objects may present these hidden components as dashed lines whilst more complex objects are more clearly understood across multiple sectioned drawings.

Here some components have been presented with hidden lines. Can you identify these in the exploded drawing?

TIP

When preparing orthogonal drawings in Sketchup be sure to change camera view to parallel projection.



PAPER SIZE

A3

SCALE

1:5

DRAWING

2

PROJECT

Coffee Table

DRAWN BY

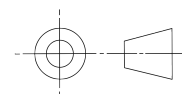
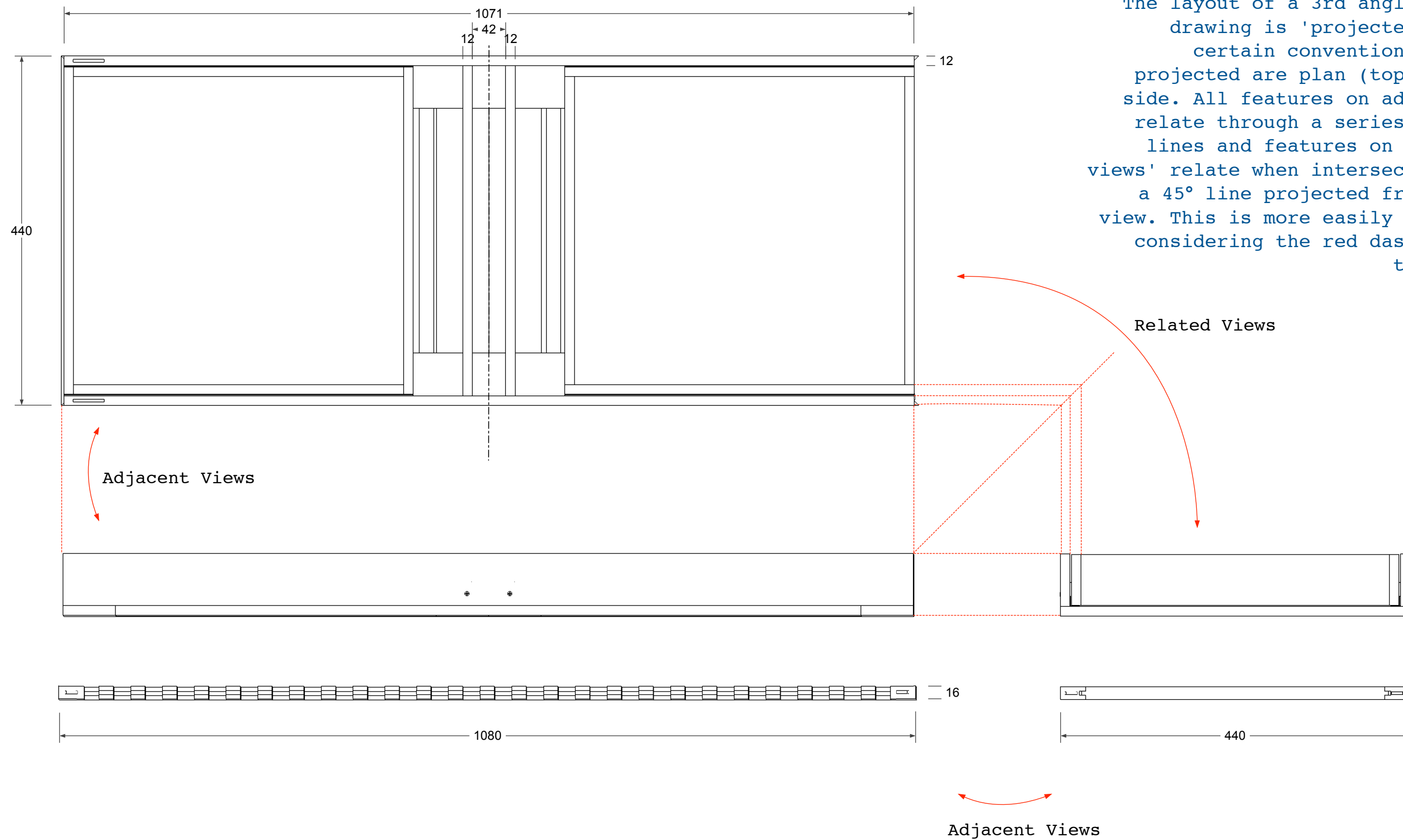
Cam Mills

DATE

August, 2014

ORTHOGONAL DRAWING (Cont.)

The layout of a 3rd angle orthogonal drawing is 'projected' following certain conventions. The views projected are plan (top), front and side. All features on adjacent faces relate through a series of parallel lines and features on the 'related views' relate when intersecting through a 45° line projected from the front view. This is more easily explained by considering the red dashed lines on this drawing.



PAPER SIZE

A3

SCALE

1:5

DRAWING

3

PROJECT

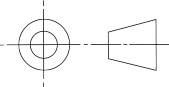
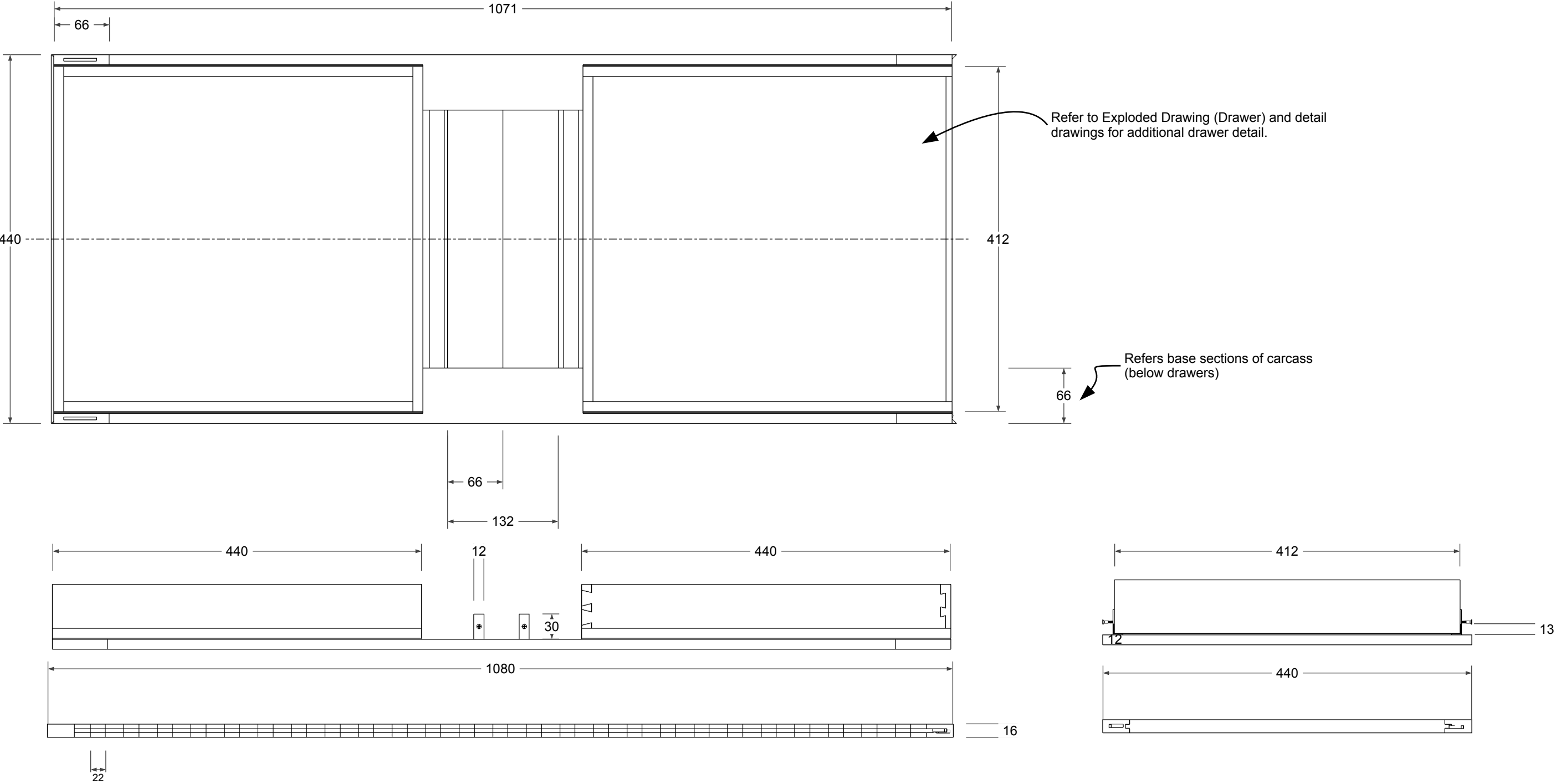
Coffee Table

DRAWN BY

Cam Mills

DATE

August, 2014



PAPER SIZE
A3

SCALE
1:5

DRAWING
4

PROJECT
Coffee Table

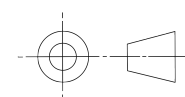
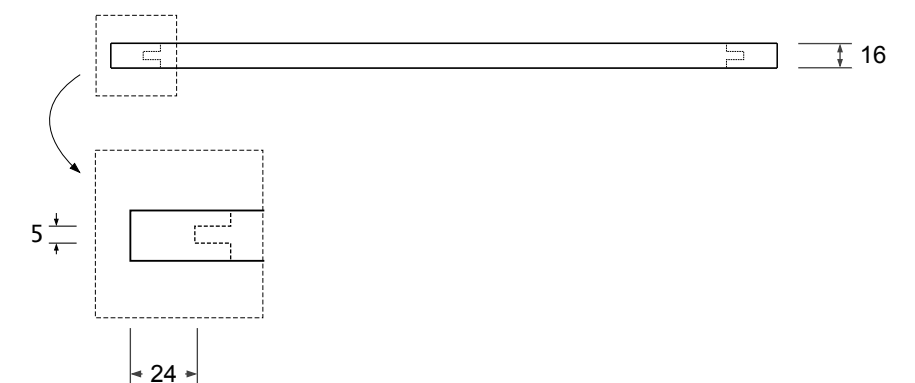
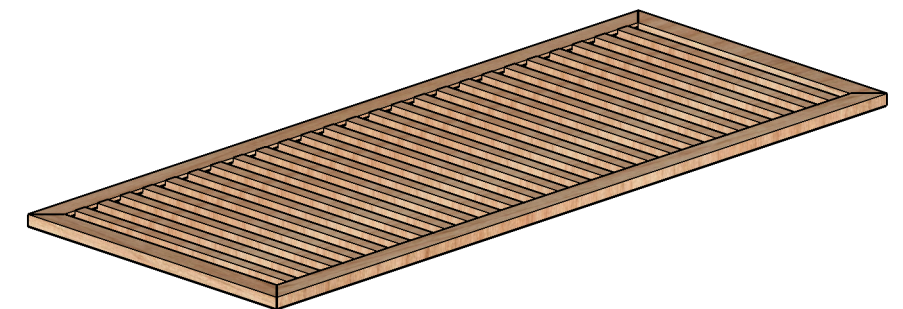
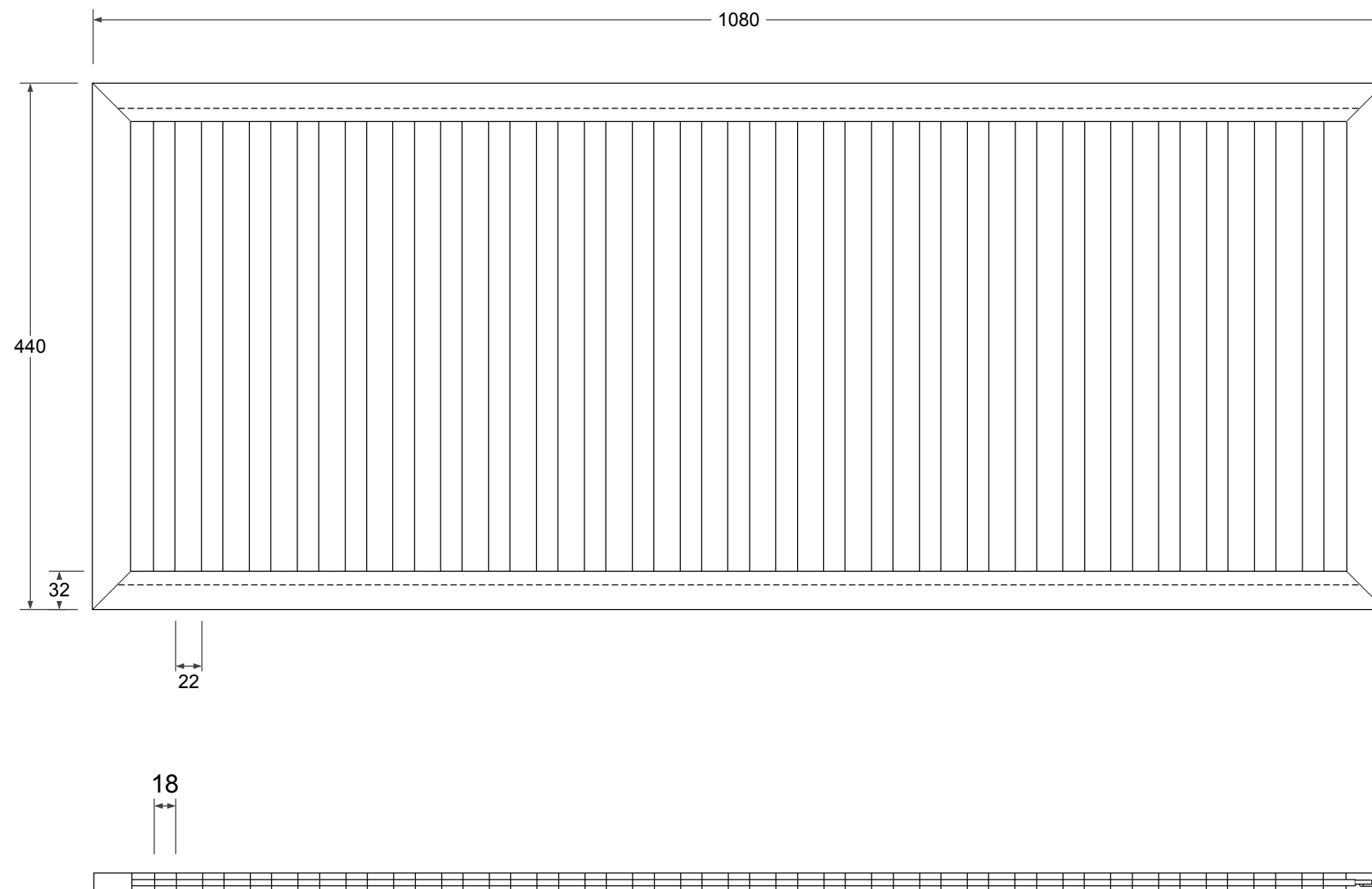
DRAWN BY
Cam Mills

DATE
August, 2014



ORTHOGONAL DRAWING (Cont.)

It is helpful to include an isometric, or perspective view of the object being projected when presenting orthogonal drawings.



PAPER SIZE

A3

SCALE

1:5

DRAWING

5

PROJECT

Coffee Table

DRAWN BY

Cam Mills

DATE

August, 2014

RENDERED DRAWING (Cont.)

Various angles and objects states can add value to a rendered image.

Again, the rendering is a creative approach so some liberty should be allowed in presenting the object with interest. Here the magazines suggest scale and the open drawer suggests a place to find the remote!



PAPER SIZE

SCALE

DRAWING

PROJECT

DRAWN BY

DATE

A3

NTS

8

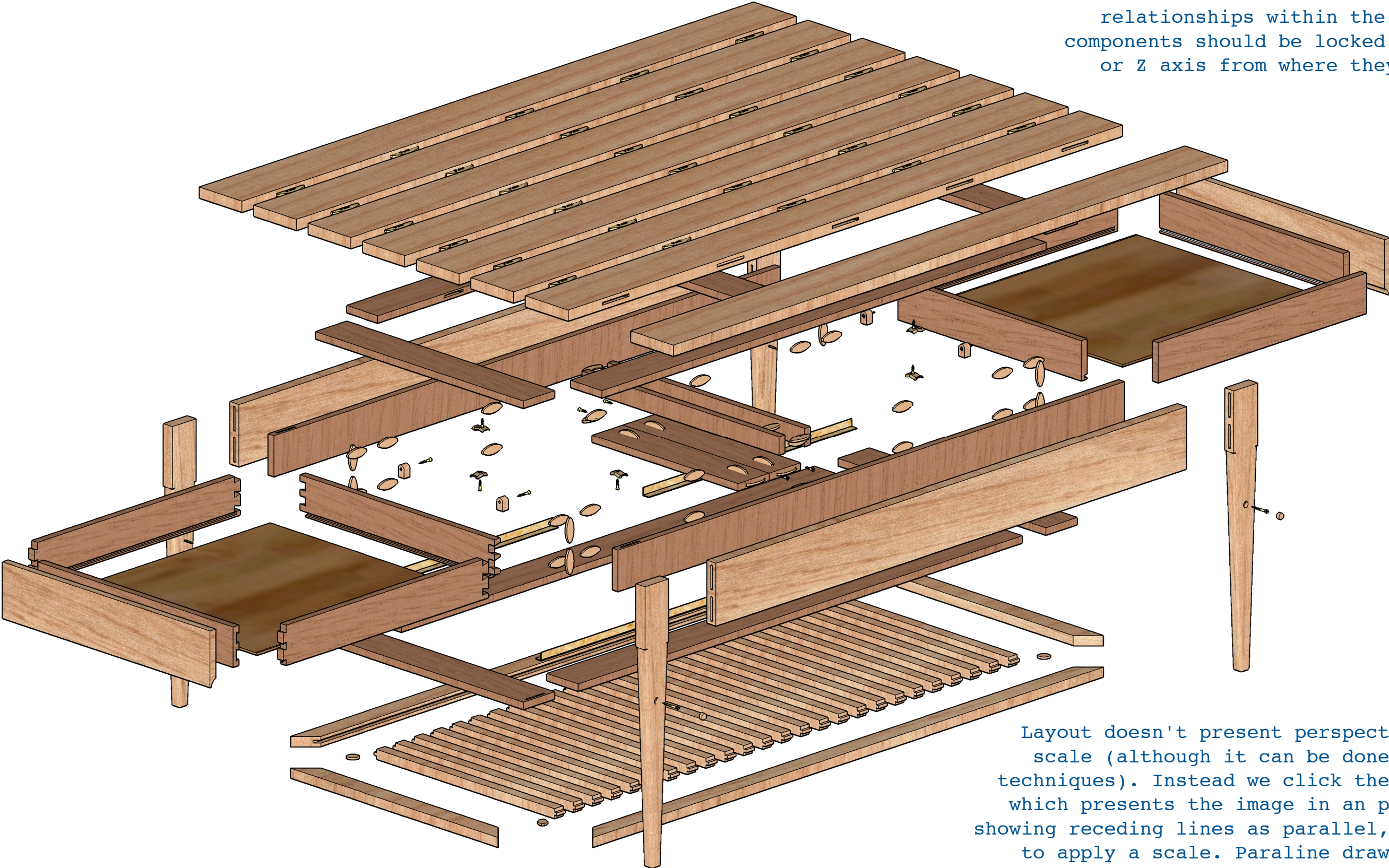
Coffee Table

Cam Mills

August, 2014

EXPLODED DRAWING

Exploded drawings are useful as a 3D pictorial representation of a design, that reveals hidden components and relationships within the design. All components should be locked to the X, Y or Z axis from where they originate.

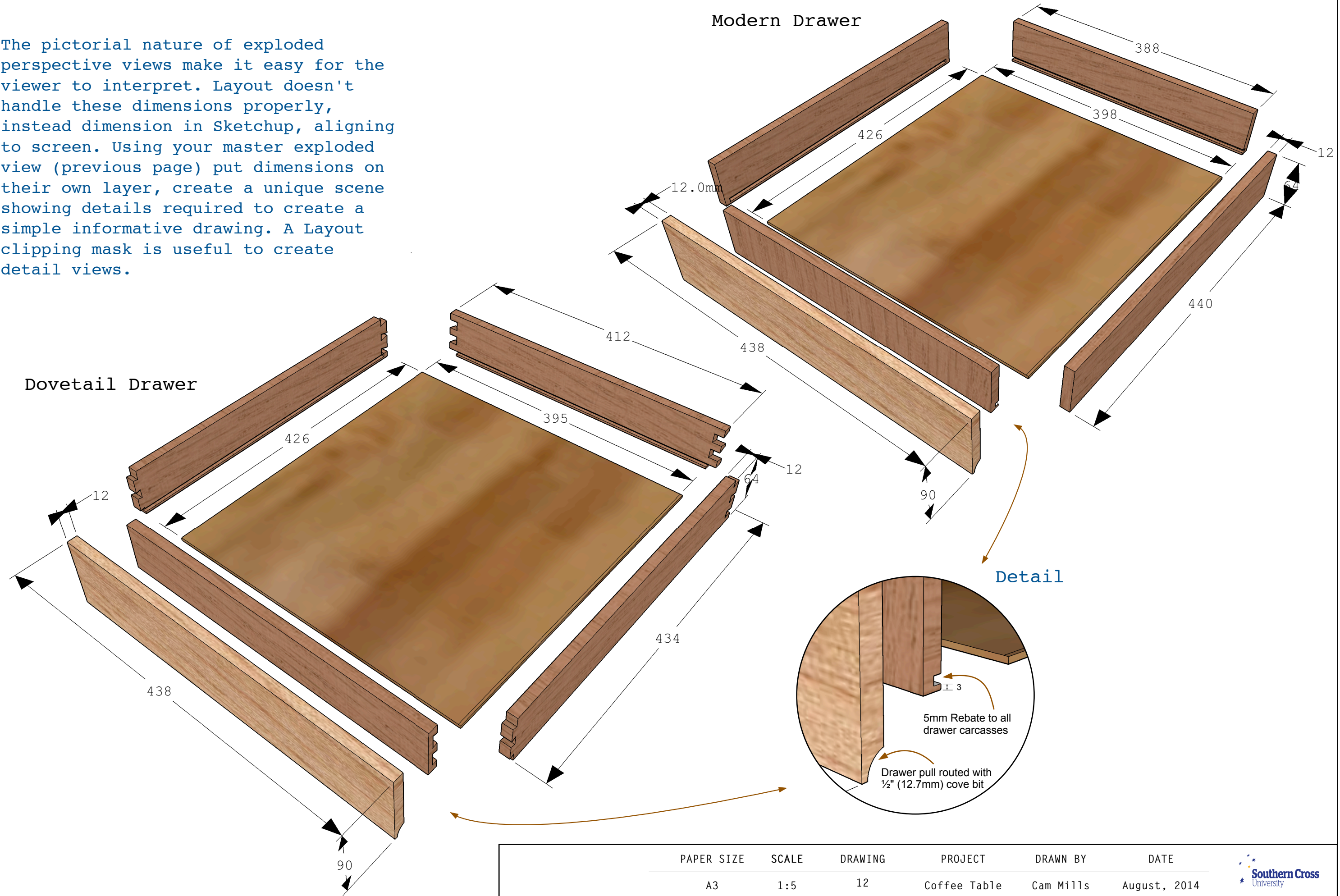


TIP

Layout doesn't present perspective views to scale (although it can be done using other techniques). Instead we click the "ortho" tab which presents the image in an paraline view showing receding lines as parallel, allowing us to apply a scale. Paraline drawings include oblique, isometric and planometric views.

EXPLODED DRAWING (cont.)

The pictorial nature of exploded perspective views make it easy for the viewer to interpret. Layout doesn't handle these dimensions properly, instead dimension in Sketchup, aligning to screen. Using your master exploded view (previous page) put dimensions on their own layer, create a unique scene showing details required to create a simple informative drawing. A Layout clipping mask is useful to create detail views.



PAPER SIZE	SCALE	DRAWING	PROJECT	DRAWN BY	DATE
A3	1:5	12	Coffee Table	Cam Mills	August, 2014

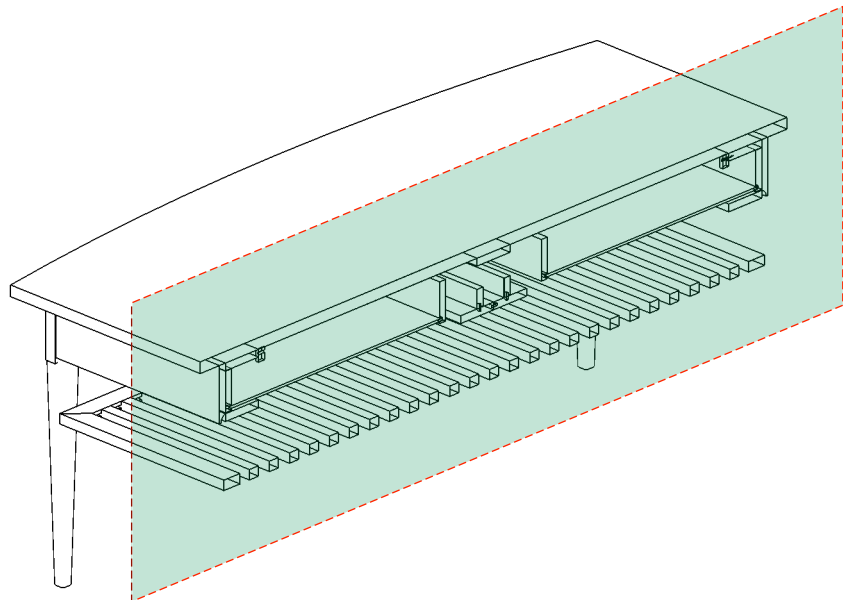
SECTIONED DRAWING

A sectioned drawing allows the viewer to look within a design to see information that is normally obscured.

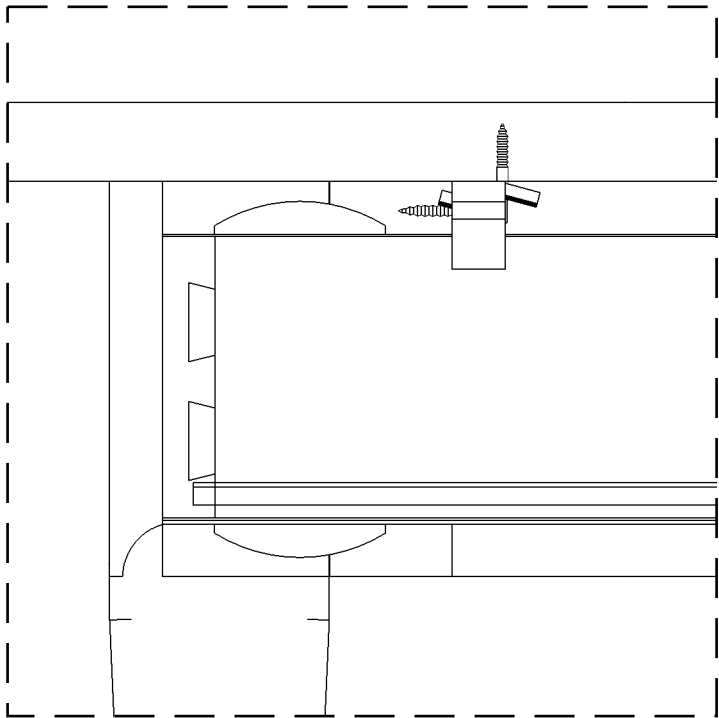
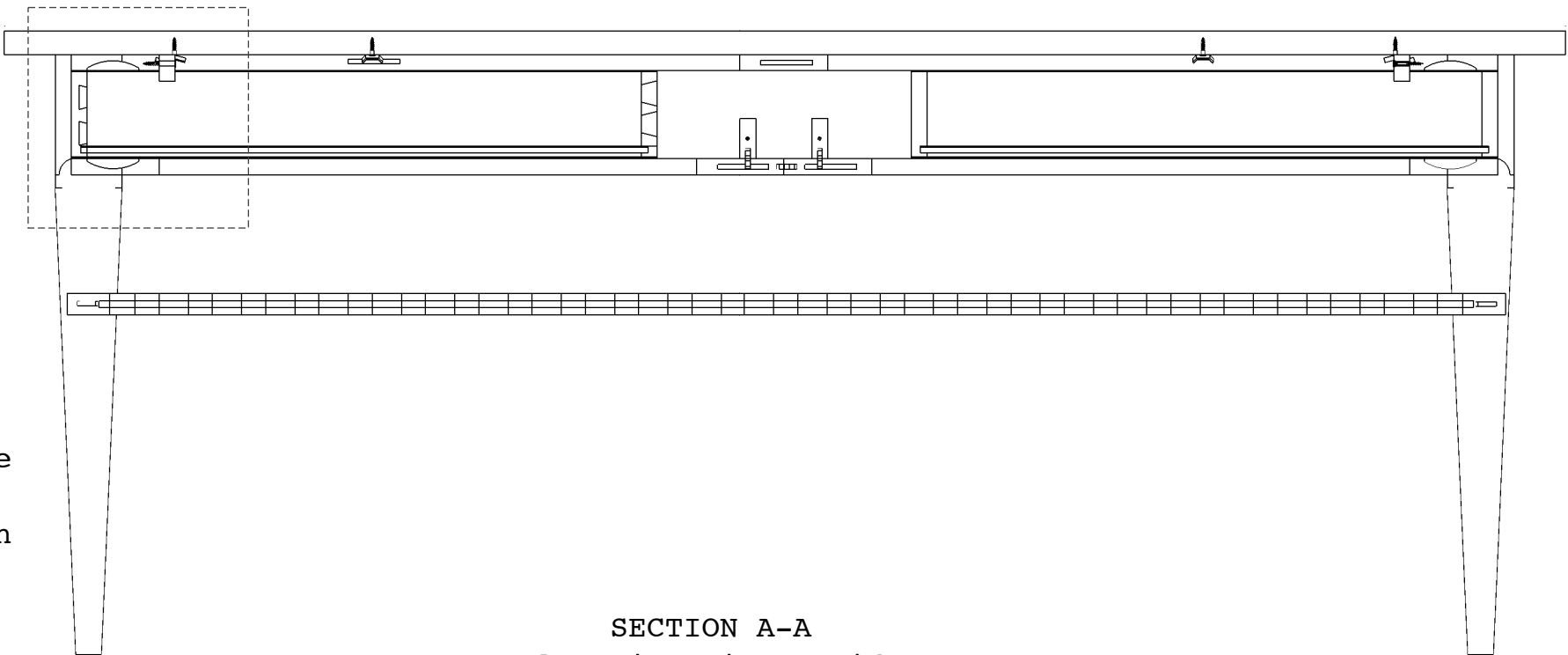
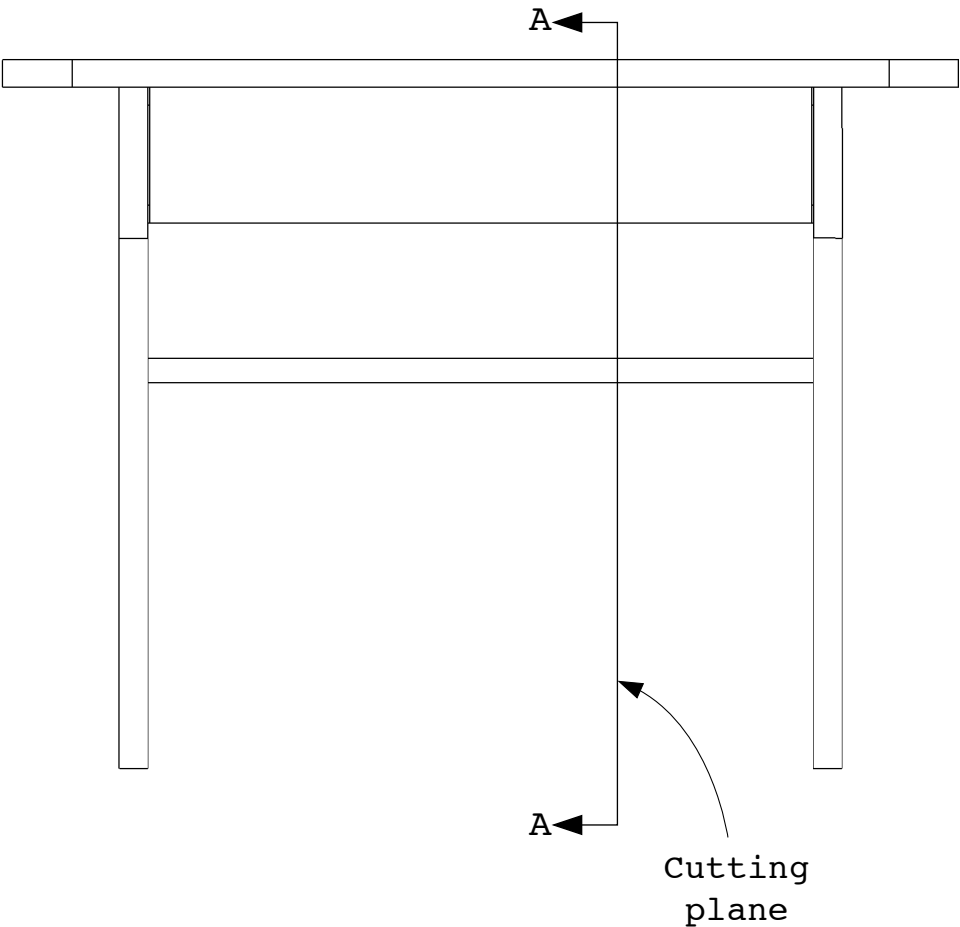
Two pieces of information are required to inform the viewer how to interpret a section view:

- The cutting plane line with arrows pointing the the direction of the object that remains,
- The section plane or drawing projected in a range of possible views (iso, elevation etc) with material exposed at the point of the cutting plane line.

The example shows letters AA at each end of the cutting plane line and these match the title "Section AA" so the viewer knows which section to relate when more than one exist.

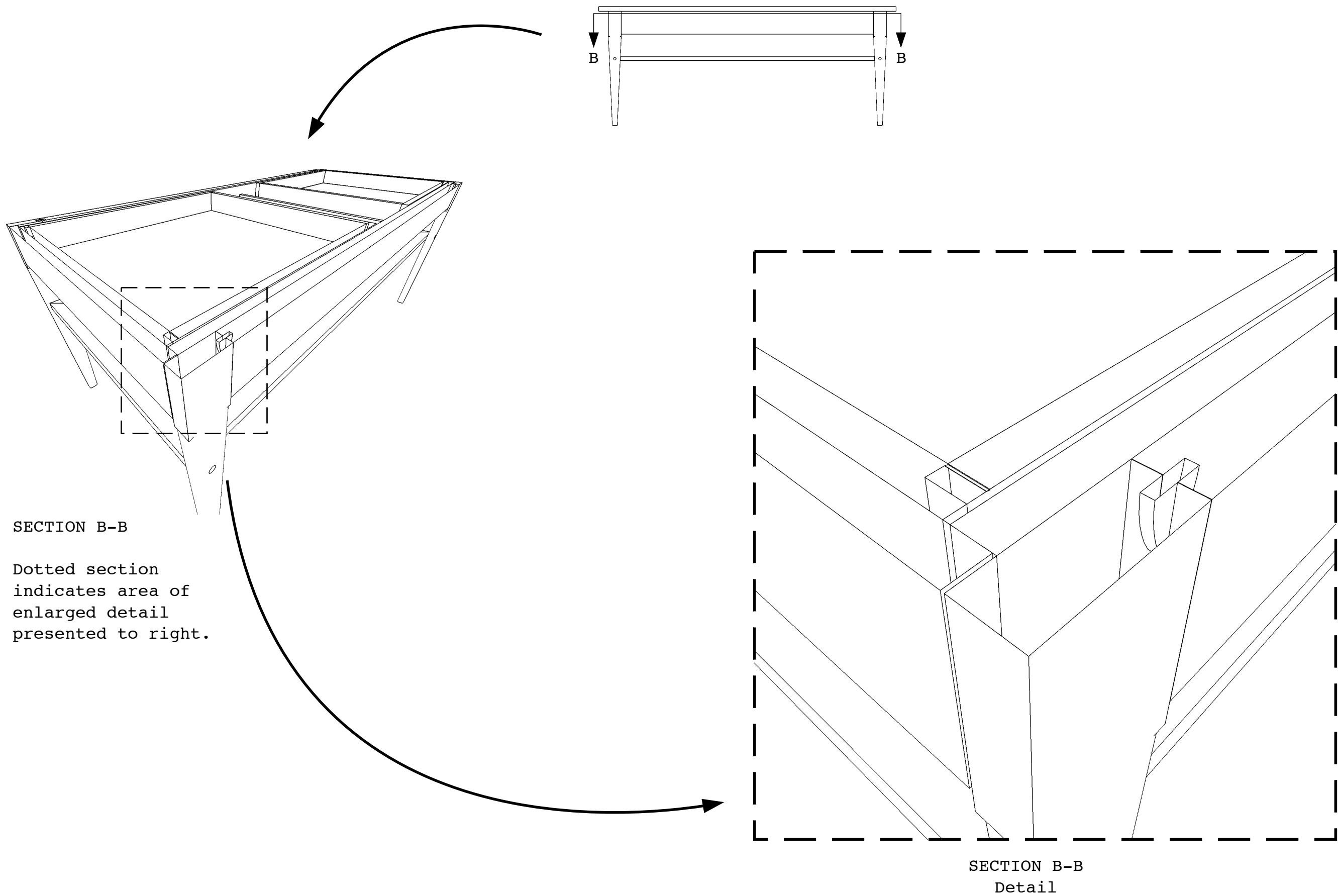


SECTION A-A
Isometric View including imaginary 'cutting-plane' revealing elevation view shown asSection A-A



Detail including dovetail, drawer stop, table ties, biscuits, drawer front and legs are all apparent with the use of section cuts.

Did you spot the secret compartment?

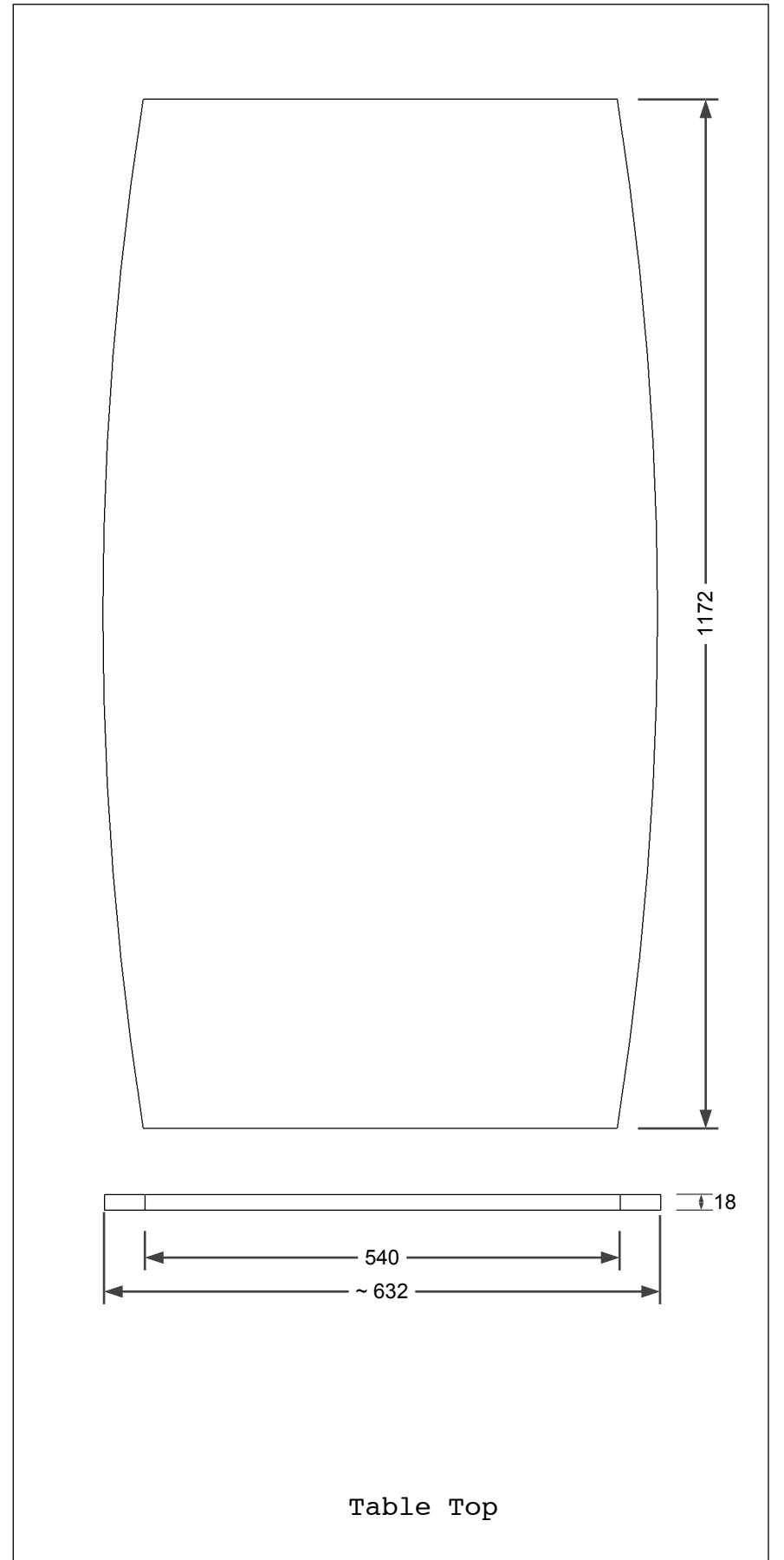
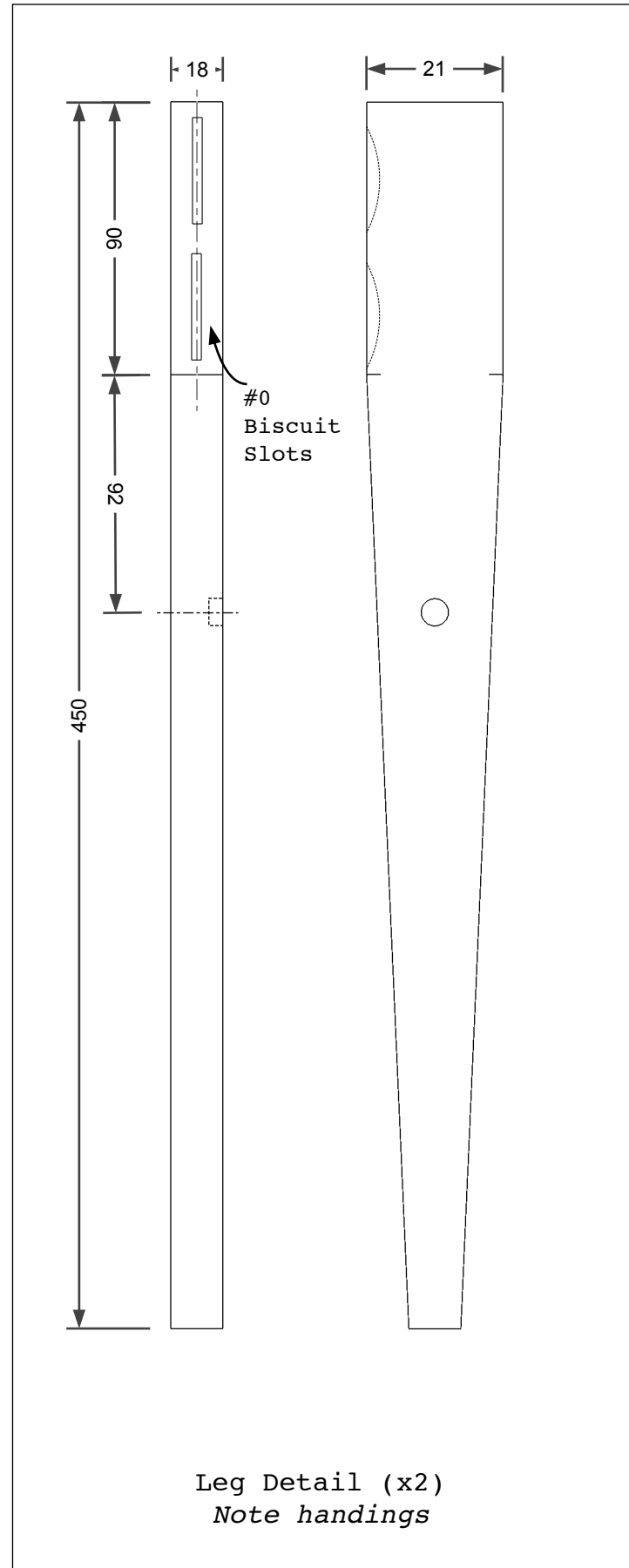
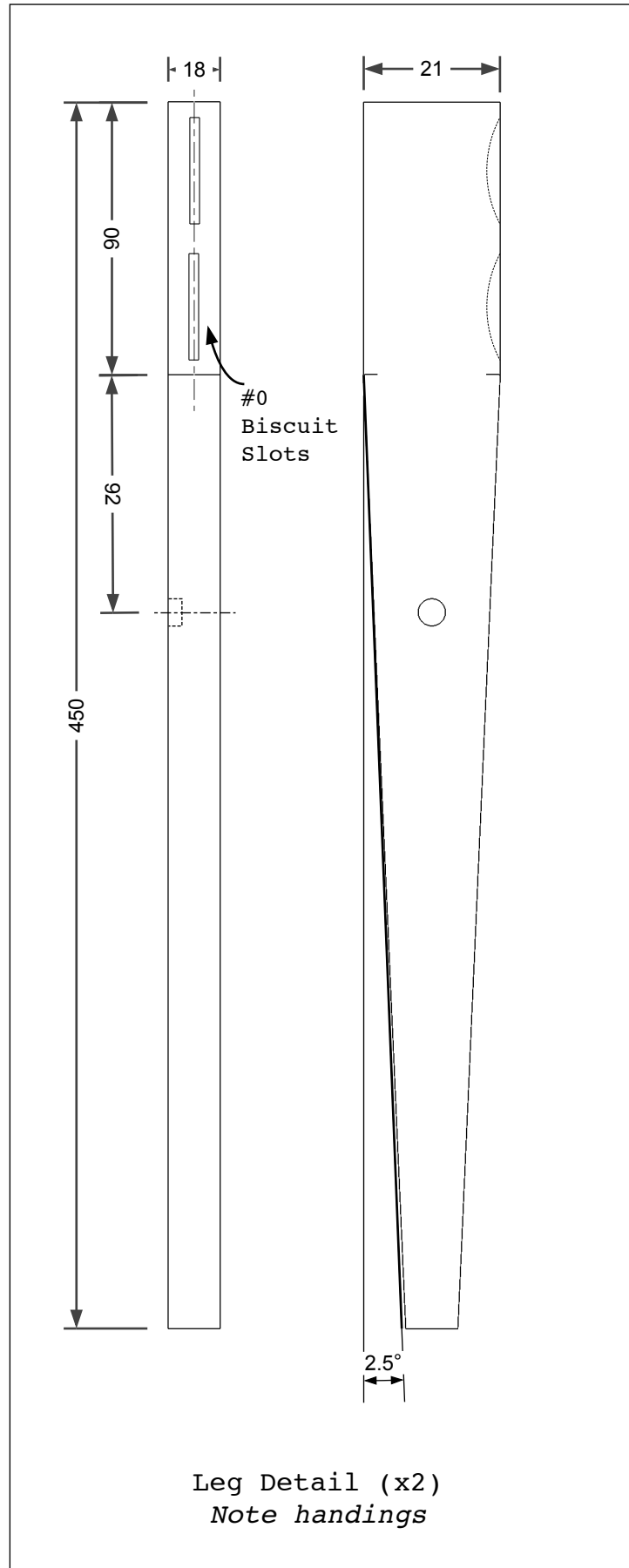
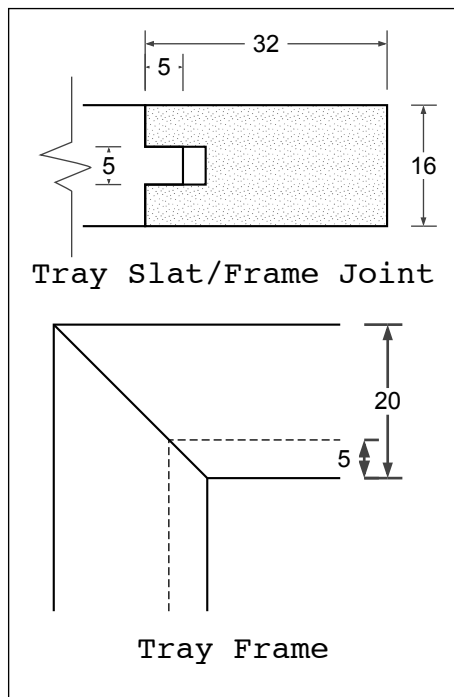
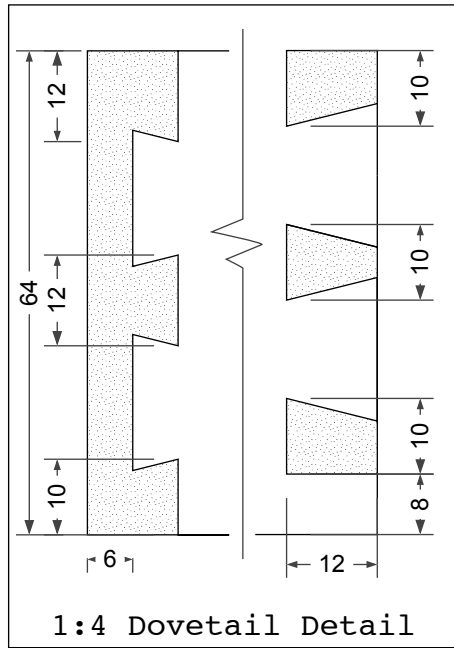
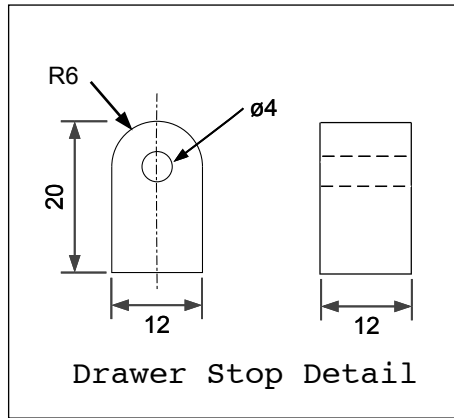


SECTION B-B

Dotted section indicates area of enlarged detail presented to right.

SECTION B-B
Detail

PAPER SIZE	SCALE	DRAWING	PROJECT	DRAWN BY	DATE
A3	NTS	14	Coffee Table	Cam Mills	August, 2014



TIP
Dotted lines indicate hidden geometry that is relative to the component in view.

PAPER SIZE	SCALE	DRAWING	PROJECT	DRAWN BY	DATE
A3	NTS	15	Coffee Table	Cam Mills	August, 2014

CUTTING LIST

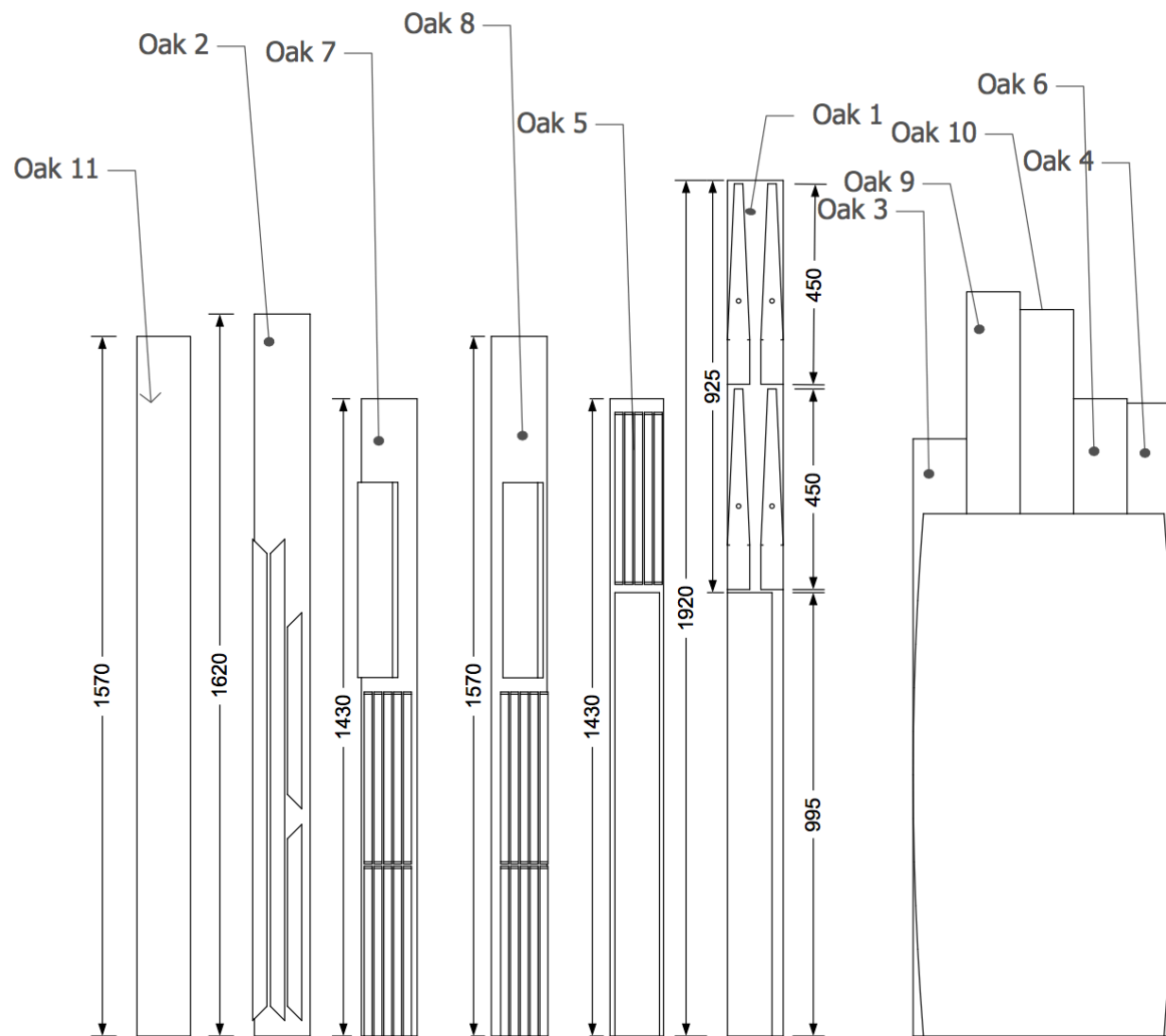
A cutting list was prepared for two reasons:

- to ensure I had sufficiently planned for materials required to complete the build
- to enable costing of the materials

In addition to a cutting list I prepared a cutting template which allowed me to overlay all components onto purchased boards so I could be double sure I had sufficient material without spending excess cash on spare boards, or worse, being left without sufficient timber to complete the project. Tassie Oak is no alternative to Quercus alba!

Description	WxTxL	Qty	Material
A			
A Tabletop boards	90x18x1172	7	White Oak
B Aprons	90x18x995	2	White Oak
C Legs	50x19x450	4	White Oak
D Drawer Face	90x12x438	2	White Oak
E Dovetail Side	64x12x434	2	Tassie Oak
F Dovetail Ends	64x12x412	2	Tassie Oak
G Drawer Base	426x4x398	1	6mm ply
H Carcase Sides	66x12x1071	2	Meranti
I Carcase Longs	66x12x939	4	Meranti
J Carcase Shorts	66x12x440	4	Meranti
K Carcase Midrail	66x12x308	1	Meranti
L Carcase Midbase	66x12x308	2	Meranti

Description	WxTxL	Qty	Material
M Carcase secret	30x12x416	2	Meranti
N mod' drw' end	66x12x388	2	Tassie Oak
O mod' drw' side	66x12x440	2	Tassie Oak
P Drawer Base	426x4x398	1	ply
Q Tray Long	32x16x1080	2	White Oak
R Tray Slat	16x18x386	25	White Oak
S Tray Short	32x16x440	2	White Oak
T Drawer Stop	12x12x40	4	Hardwood offcut
U Table Tie		10	
V #20 Biscuit		100	(allowance)
W Special Biscuit	15x4x20	4	Hardwd offcut
X Wood Plug	R5x5	4	French Oak
Z spare			



Cutting Template used to determine timber usage with all components allocated to numbered boards.

TIME MANAGEMENT PLAN

My time management plan recognizes that students were allowed to pre-cut timber and joint & glue up their tabletops prior to the workshop. I took advantage of this opportunity and therefore have not included this detail in the weekly time management chart. Planning of time allows for various miscellaneous tasks including sharpening of tools, jostling for sanders, clamps & other workshop tools, glue set times (allow 1 hour minimum using Titebond 3) and workshop instruction/conversations. By way of planning the time required for various listed tasks I have allowed:

PRE-WORKSHOP TASKS

	Hours
Researching, sourcing, travel, selection & collection of American White Oak timber boards	8
Preparation of cut list, including assigning each component to numbered Oak boards	6
Cutting of timber to size (only carcass)	1
Match planning and biscuit cutting of tabletop boards	2
Gluing of tabletop in sash clamps	1
Setting up & printing of A0 tabletop template	1
Hand-planing of tabletop in preparation of workshop	3 (with a few rest stops!)

WORKSHOP TASKS

	MON	TUE	WED	THU	FRI
Biscuit joint carcass, assemble, glue-up & clamp					
Cut apron to size. Cut legs to size and shape with table saw jig.					
Stick A0 (scale 1:1) template to table top					
Domino jointing of legs to aprons					
Glue-up of legs to aprons					
Cut table top end grain, jigsaw curved edges & handplane to finish					
Rout finger pulls for drawer faces. (Cut & thickness post table glue-up)					

WORKSHOP TASKS

	MON	TUE	WED	THU	FRI
Prepare end grain edge strip for table top, glue-up & clamp					
Sand table top and leg/apron components					
Check fitting of carcass to table top & leg/aprons. Final adjustments					
Final assembly, glue-up & clamping of leg/apron to carcass to tabletop					
Cut lower tray components					
Assemble check & glue up table tray					
Apply any required filler					
Fit lower tray					
Final sand & clean up					

FINANCE PLAN

Material	Units	Price per Unit	Total
American White Oak 25mm x 115mm boards (various lengths)	17.2m	\$18.50	\$318.20
Meranti DAR 66mmx12mm	7.6m	\$3.59	\$27.28
Tassie Oak DAR 65mm x 12mm	3.2m	\$10.55	\$33.76
Titebond III Glue	1	\$21	\$21
Drawings Printing (Including A0 template)	1	\$32	\$32
6mm AA plywood for drawers	1	\$16.85	\$16.85
Screws (used temporarily during glueup)	1	\$3.80	\$3.80
Total			\$452.89

The materials listed above were intended for full use in the production of the coffee table. Some tools were required to build the table although as these are not added into the table's cost as they will be used again & again. The costs of driving to collect timber and attending workshop are not included either. About 1.8m of American White Oak remained as spare which I will use of other projects.

REFERENCES

Sources

- http://en.wikipedia.org/wiki/USS_Constitution
- <http://www.history.navy.mil/ussconstitution/history.html>
- <http://www.wood-database.com/lumber-identification/hardwoods/live-oak>
- <http://www.wagnermeters.com/flooring/wood-flooring/aboutamericanwhiteoakandredoak>
- http://www.bouchardcooperages.com/australia/news/forest_origin.html