

ISS Research Design Challenge: CELERE

Capillary Effects on Liquids Exploratory Research Experiments

[CELERE - ISS Research Design Challenge](#) | [Glenn Research Center](#) | [NASA](#)



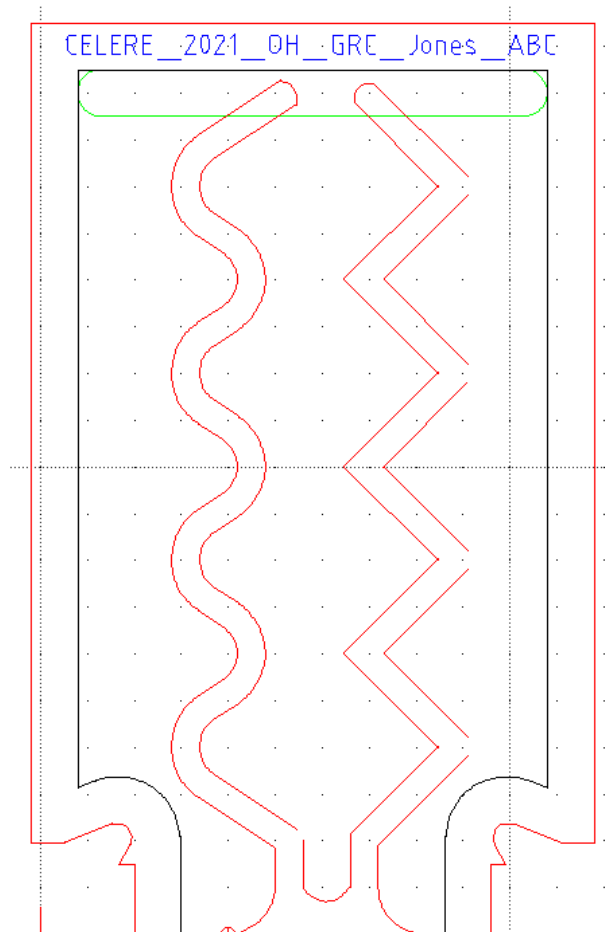
2021 Tutorial

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and Nancy Hall (NASA Glenn Research Center, Cleveland, Ohio)

The CELERE handbook is a separate document and can be downloaded from
[CELERE - ISS Research Design Challenge](#) | [Glenn Research Center](#) | [NASA](#)

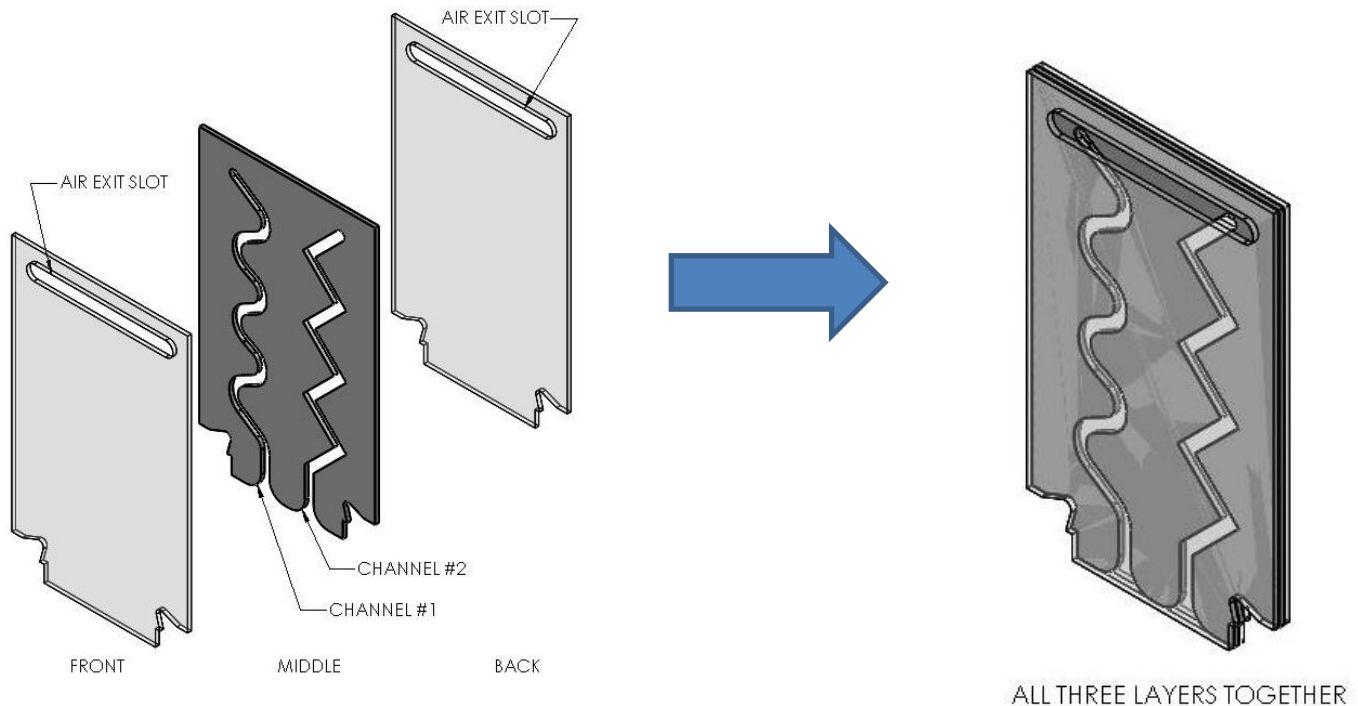
Capillary Rise in Zigzagging Channels

Through this tutorial, you will use Computer-Aided Design (CAD) to draw two zigzagging channels, one with round corners and one with sharp corners, as shown in the middle-layer figure below.



It is strongly recommended that you go through all of this tutorial's steps at least once, especially if you are not familiar with *LibreCAD*!

Only an example middle layer is designed in this tutorial because all of the CELERE test cells use the same front and back layers (with exit slots for the air), as shown below. Note that it is critical that the channels reach the exit slots so that the oil can rise during free fall as a result of the capillary action.



As a start:

1. Download LibreCAD for free from [LibreCAD - Free Open Source 2D CAD](#) for Mac, Windows, and Linux systems. This tutorial is most applicable to LibreCAD version 2.2, although older versions should be similar.
2. Download the CELERE_2021_TEMPLATE.DFX file from this link: [CELERE - ISS Research Design Challenge | Glenn Research Center | NASA](#). This will be used for you to design the test cell's middle layer.

Mac Help: Downloading LibreCAD onto a Mac may require a few extra steps compared to a Windows or Linux system.

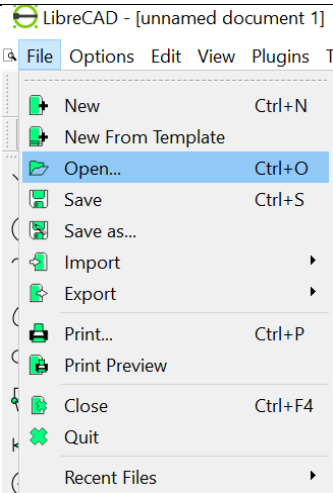
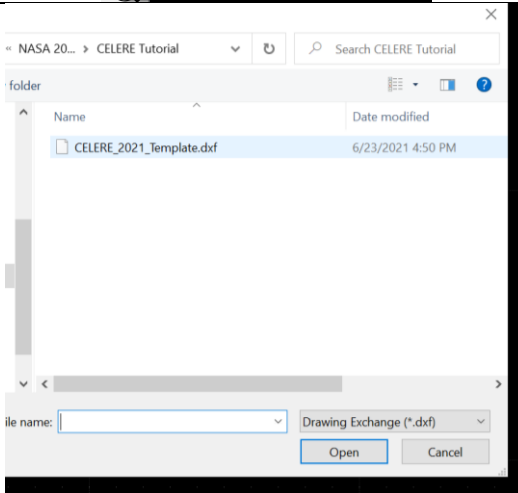
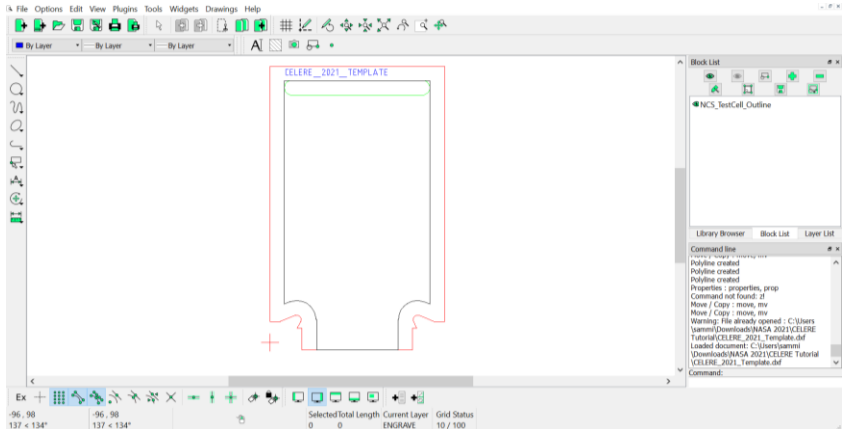
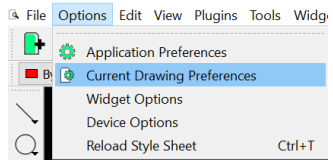
If you need help installing LibreCAD onto your Mac please see the following steps for assistance.

1. Go to the download page on LibreCAD listed above and begin the download as normal.
2. Once the download has completed find LibreCAD in your system, move it to your applications folder if it is not already there to save it permanently.
3. If you experience an error when opening LibreCAD go into your system's settings and select Security and Privacy. Once you log in you should see a pop up for LibreCAD with a selection saying, "Open Anyway". Select that to resolve the error.

While this tutorial uses many of the tools available in *LibreCAD*, it is not an exhaustive instructional tool. For more guidance on *LibreCAD*, go to the help page at:

[start \[Wiki\] \(librecad.org\)](#)

Note that product references do not indicate an endorsement on the part of NASA or the federal government.

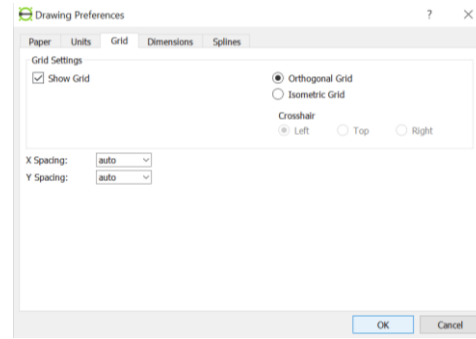
Instructions & comments	Screen shots, images, and diagrams				
FILE SETUP Launch LibreCAD and open the template file by selecting file and then open	 LibreCAD - [unnamed document 1] File Options Edit View Plugins T - New Ctrl+N - New From Template - Open... Ctrl+O - Save Ctrl+S - Save as... - Import - Export - Print... Ctrl+P - Print Preview - Close Ctrl+F4 - Quit - Recent Files				
Select and open the CELERE_2021_TEMPLATE.dfx file	 NASA 20... > CELERE Tutorial Search CELERE Tutorial folder <table border="1"> <thead> <tr> <th>Name</th> <th>Date modified</th> </tr> </thead> <tbody> <tr> <td>CELERE_2021_Template.dfx</td> <td>6/23/2021 4:50 PM</td> </tr> </tbody> </table> file name: Drawing Exchange (*.dxf) Open Cancel	Name	Date modified	CELERE_2021_Template.dfx	6/23/2021 4:50 PM
Name	Date modified				
CELERE_2021_Template.dfx	6/23/2021 4:50 PM				
The screen similar to that on the right will appear. The design will be restricted to inside the black lines. Note: The background has been changed to white for picture clarity	 LibreCAD - [unnamed document 1] File Options Edit View Plugins Tools Widgets Drawings Help By Layer By Layer By Layer CELERE_2021_TEMPLATE Block List NCS_TestCell_Outline Command line <pre> polyline created polyline created polyline created Properties - properties, prop Command not found: d Move / Copy - move, mv Move / Copy - move, mv Warning: file already opened: C:\Users\ \user\Downloads\NASA 2021\CELERE Tutorial\CELERE_2021_Template.dfx Loaded document: C:\Users\user\ Downloads\NASA 2021\CELERE Tutorial \CELERE_2021_Template.dfx Command: </pre> Ex + -96, 98 -96, 98 Selected Total Length: Current Layer Grid Status 137 x 134 0 0 ENGRAVE 10 / 100				
Under "Options" select current drawing preferences to reveal the setting for this current drawing.	 File Options Edit View Plugins Tools Widg - Application Preferences - Current Drawing Preferences - Widget Options - Device Options - Reload Style Sheet Ctrl+T				

Make sure that the Paper size is A3 and that the Units are in Millimeters.

Under the Grid tab, select “Show Grid” and make sure that the Orthogonal Grid is also selected.

Dimensions and Spline should remain in this default setting.

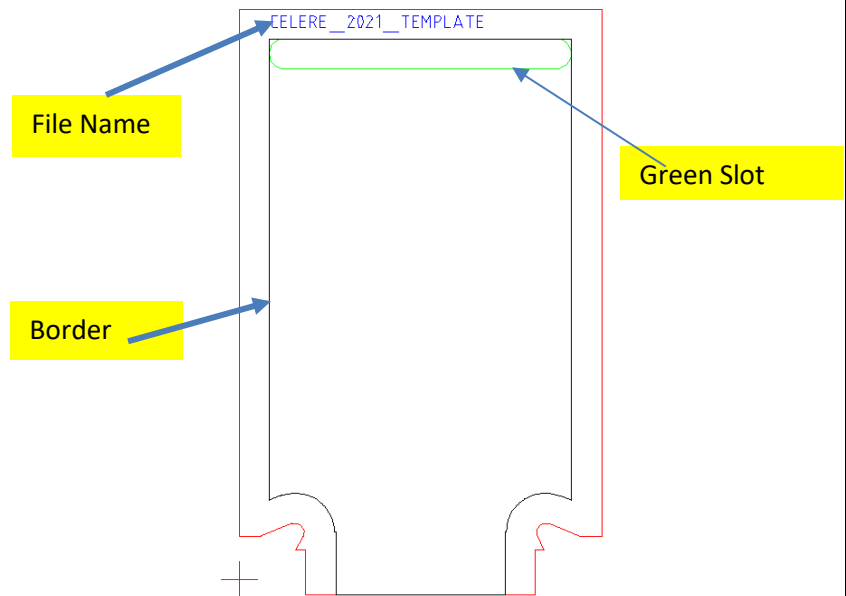
Select Okay to close the Drawing Preferences.



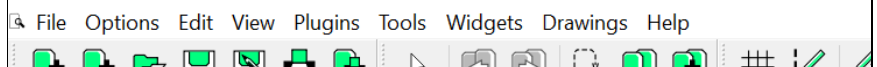
The template file, which provides the test cell outline including these main features:

- *Border (Black Lines): The channels that you design must fit within the border.*
- *File name: The file name appears at the top of the test channel so Glenn Research Center (GRC) can identify your middle layer and tell it apart from those of other teams.*
- *Green slot: The green slot is where the air will exit out the front and rear layers of the assembled test cell. The channels you design must extend into the green slot.*

DO NOT ALTER THE TEST CELL OUTLINE BLOCK IN ANY WAY!



Across the top is the main menu which contains: File, Options, Edit, View, Plugins, Tools, Widgets, Drawings, and Help. For more information on these features visit [Main Menu — LibreCAD 2.2.0 documentation](#)



On the left side are the Drawing Tools. To learn more about each tool and what it is used for visit: [Drawing Tools — LibreCAD 2.2.0 documentation](#)

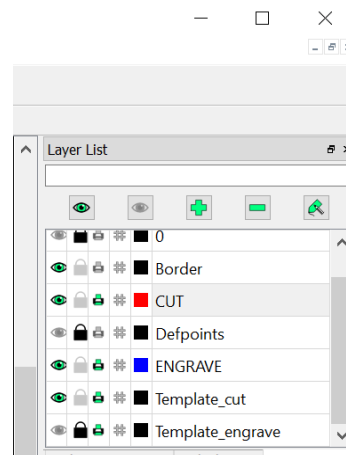


At the bottom is the Snapping Menu. This menu includes the tools for attachment of 2-D shapes to the design platform. For more information on these specific tools visit: [Snapping — LibreCAD 2.2.0 documentation](#)

When you first begin, none of the snap menu items should be selected.

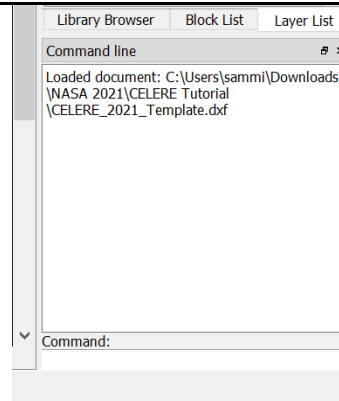


On the top right side of the screen is the Layer List. This section is used to layer the components of the design and create new layers if desired



On the bottom right side of the screen is the Command Line. This line is used to get precise locations in the software if desired.

For more information on the Layer List and Command Lines visit: [Dock Widgets — LibreCAD 2.2.0 documentation](#)

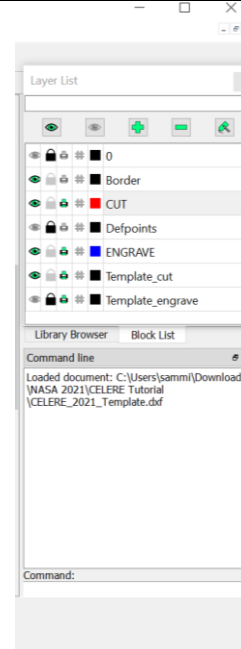


*The template file includes several unique layers, where the most important layer is the **CUT** layer. Lines drawn on this layer will tell the laser cutter to cut through the acrylic.*

Make sure your channel design is on the CUT layer (AKA the red layer).

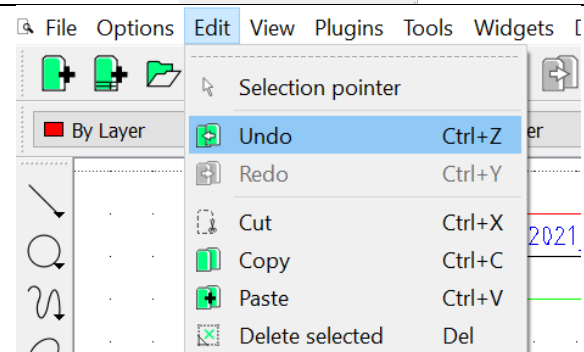
Items not on the cut layer will not be cut or printed at all. The other layers should not be used and are either LibreCAD default layers or used by NASA.

DO NOT MODIFY THE LAYERS BESIDES CUT AND ENGRAVE IN ANY WAY!



Additionally if at any point you would like to go back there is an undo key in the edit tab.

Ctrl Z also will perform the undo function if selected.



RENAME THE DRAWING

Do not modify the provided CELERE template file. Instead, re-save the file with a unique name and modify that copy. The file name of your submitted drawing will be used to identify your part and help NASA keep track of all the experiments. Especially for that final drawing, use the following steps to format and name your new file.

In the menu toolbar, navigate to:

File  Save As...

Save the template file as a new file using the following convention:

CELERE_2021_<StateAbbrev>_<OrgAbbrev>_<AdvisorLastName>_<ParticipantAbbrev>.dxf

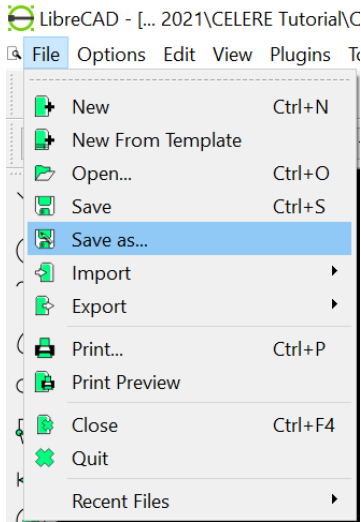
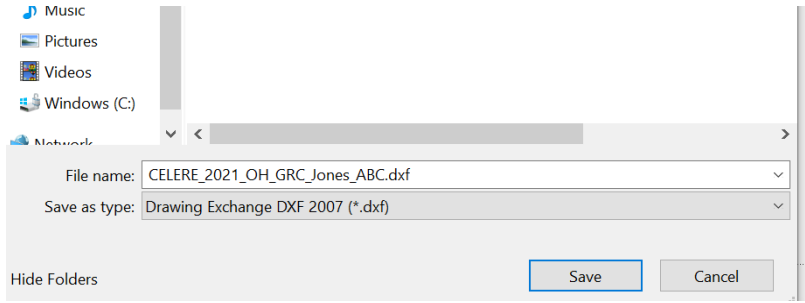
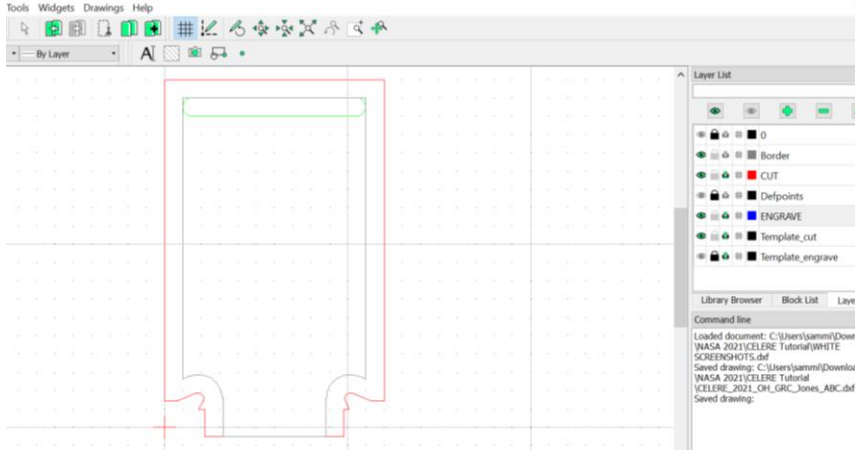
An example name:

CELERE_2021_OH_GRC_Jones_ABC.dxf

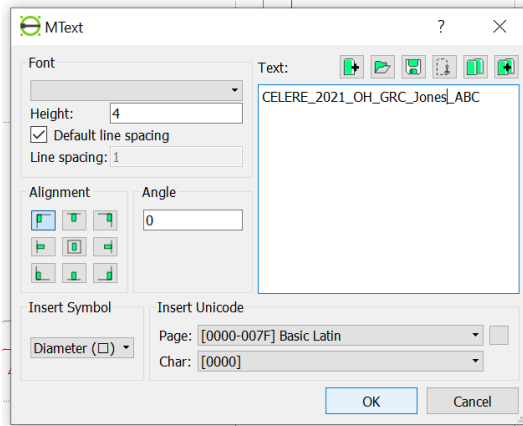
Sufficient abbreviation is required that the file name fits within the test cell outline in a single line, i.e., so the name doesn't extend off of the test cell! You may need to abbreviate the advisor name too.

Field	Description
<StateAbbrev>	Use the two-letter mailing abbreviation for your state or territory, where they are listed below for reference. If you are from a DODEA school outside of the U.S. (including the listed territories) then use 'DOD' instead.
<OrgAbbrev>	An abbreviation for your team's organization, e.g., school, Scout troop, etc. For example: Franklin Middle School = FMS Helen Keller School for the Blind = HKSB Girl Scout Troop 123 = GST123 In the case of schools, please use the school name for the abbreviation rather than the name of a school club. If you are participating as an individual, please use an abbreviation for your school even if you aren't participating in CELERE as a school project. If you are home-schooled, you can use HOME.
<AdvisorLastName>	The last name of the team's adult advisor, e.g., teacher, Scout leader, etc., who serves as the team's principal contact with NASA.
<ParticipantAbbrev>	The end of the file name should be an abbreviation identifying your team or your initials if you are participating as an individual.

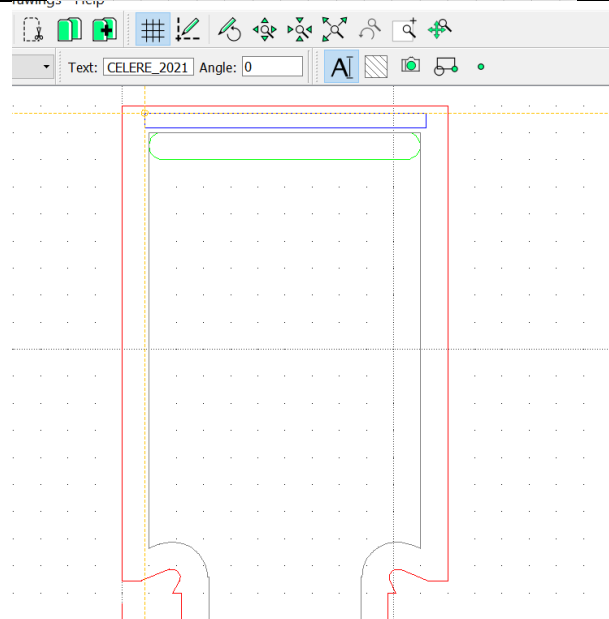
US State	Abbrv	US State	Abbrv	US State	Abbrv	US Territory	Abbrv
Alabama	AL	Louisiana	LA	Ohio	OH	American Samoa	AS
Alaska	AK	Maine	ME	Oklahoma	OK	District of Columbia	DC
Arizona	AZ	Maryland	MD	Oregon	OR	Guam	GU
Arkansas	AR	Massachusetts	MA	Pennsylvania	PA	Northern Mariana Islands	MP
California	CA	Michigan	MI	Rhode Island	RI	Puerto Rico	PR
Colorado	CO	Minnesota	MN	South Carolina	SC	U.S. Virgin Islands	VI
Connecticut	CT	Mississippi	MS	South Dakota	SD	DODEA schools	DOD
Delaware	DE	Missouri	MO	Tennessee	TN		
Florida	FL	Montana	MT	Texas	TX		
Georgia	GA	Nebraska	NE	Utah	UT		
Hawaii	HI	Nevada	NV	Vermont	VT		
Idaho	ID	New Hampshire	NH	Virginia	VA		
Illinois	IL	New Jersey	NJ	Washington	WA		
Indiana	IN	New Mexico	NM	West Virginia	WV		
Iowa	IA	New York	NY	Wisconsin	WI		
Kansas	KS	North Carolina	NC	Wyoming	WY		
Kentucky	KY	North Dakota	ND				

Under the top menu, File ➤ Save As...	 LibreCAD - [... 2021\CELERE Tutorial\C File Options Edit View Plugins Tr - New Ctrl+N - New From Template - Open... Ctrl+O - Save Ctrl+S Save as... - Import - Export - Print... Ctrl+P - Print Preview - Close Ctrl+F4 - Quit - Recent Files
Rename the file per the instructions on the previous page.	 Music Pictures Videos Windows (C:) Network File name: CELERE_2021_OH_GRC_Jones_ABC.dxf Save as type: Drawing Exchange DXF 2007 (*.dxf) Hide Folders Save Cancel
Switch to the “Engraved” Layer by clicking on the layer name. Then select the template name and click the delete or backspace key to remove the name. This will leave you with a blank top line as shown here.	 Tools Widgets Drawings Help By Layer Layer List 0 - Border - CUT - Defpoints ENGRAVE - Template_cut - Template_engrave Library Browser Block List Layer Command line Loaded document: C:\Users\jammi\Down NASA 2021\CELERE Tutorial\WHITE SCREENSHOTS.dxf Saved drawing: C:\Users\jammi\Downloa NASA 2021\CELERE Tutorial CELERE_2021_OH_GRC_Jones_ABC.dxf Saved drawing:
In the top bar select the A to open a text box.	 By Layer By Layer By Layer A

Type into the textbox the same name you used for the filename. Change the text size to 4 and select ok.

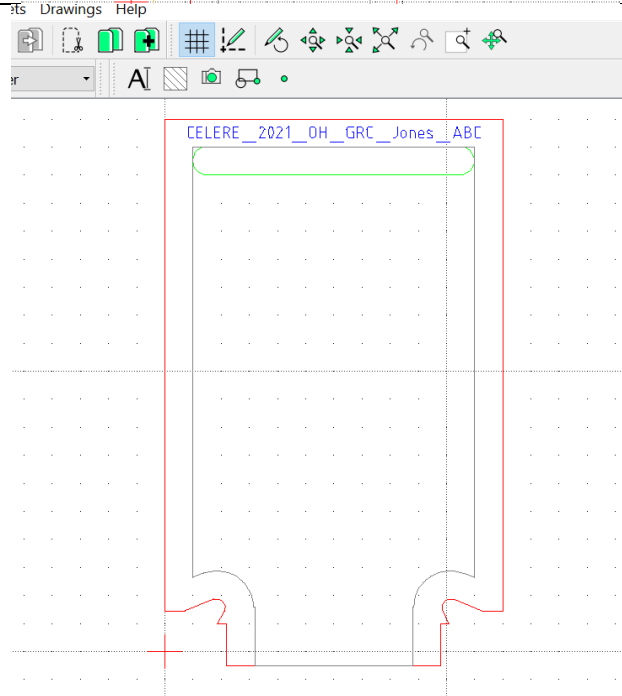


Place the text in between the red and white lines starting in the top left corner as shown.



Now the text will read as the new file name.

Note: Use the escape key to get rid of the text attached to the cursor after you place the name.

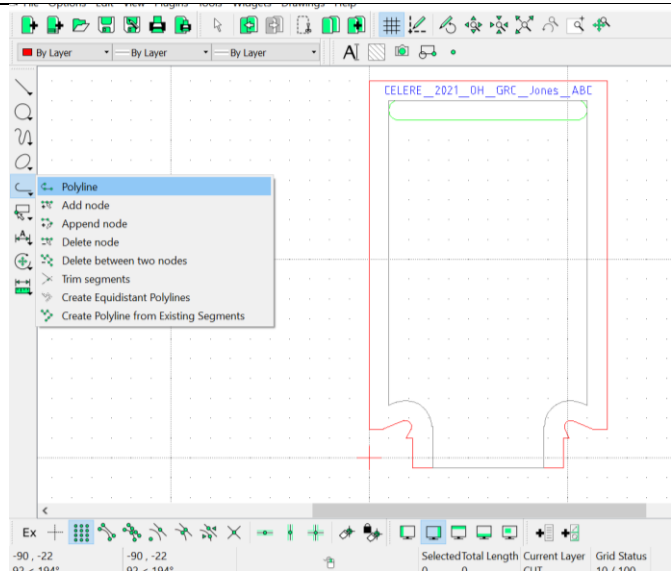


DRAW A ZIGZAG IN THE CUT LAYER

Ensure the CUT layer is active.

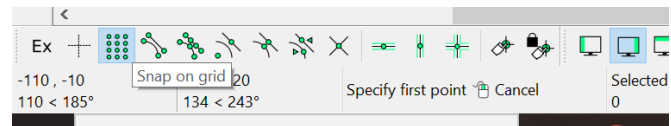
Select the fifth icon from the top in the drawing tools. Then select the Polyline icon.

A 'polyline' is a group of connected straight and arched lines. For this example, we will use a 'polyline' to outline the borders of the capillary channels of the test cell.



On the snapping menu select the "Snap on Grid" button.

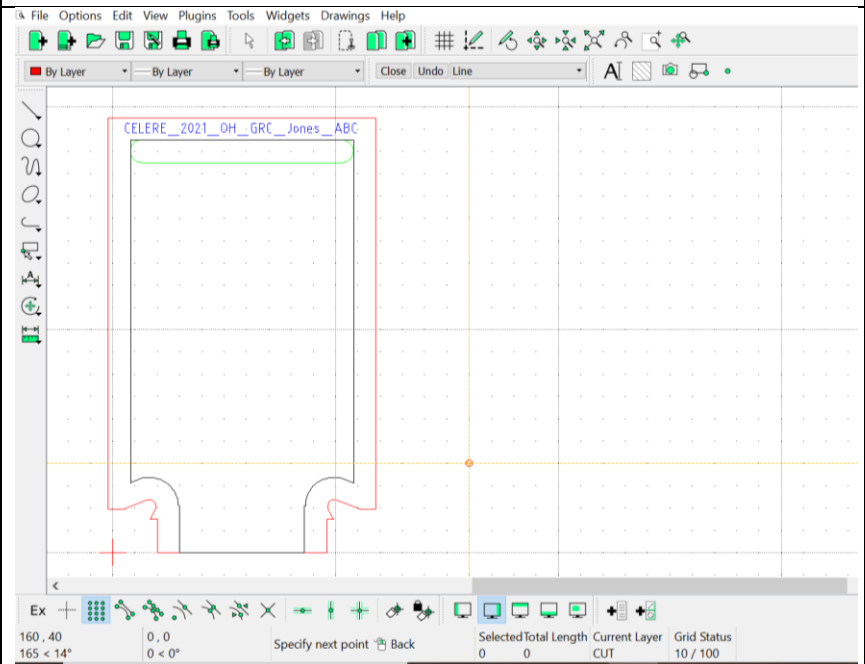
This button means that the line can only travel through the grid points.



If you are going to free sketch the channel, do so within the borders of the test cell. Since this example problem uses predefined geometry we'll work off to the right of the test cell.

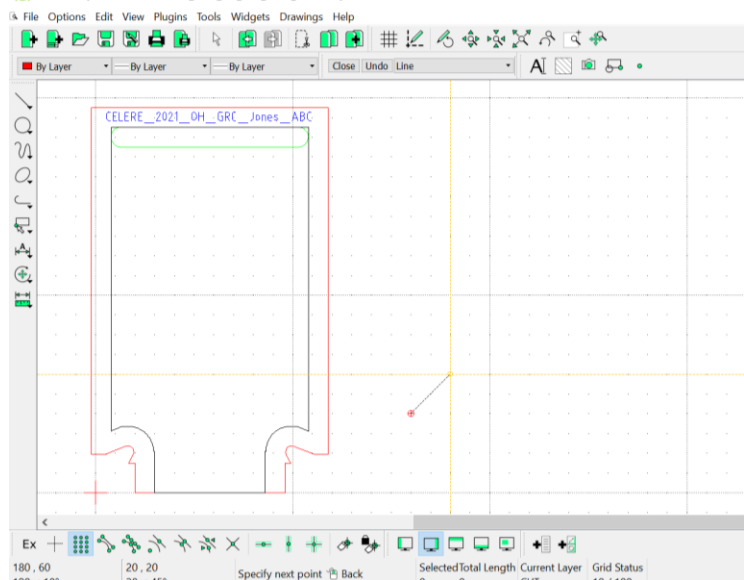
Off to the side of the Template, select the first point of the POLYLINE.

Click to specify the start point.



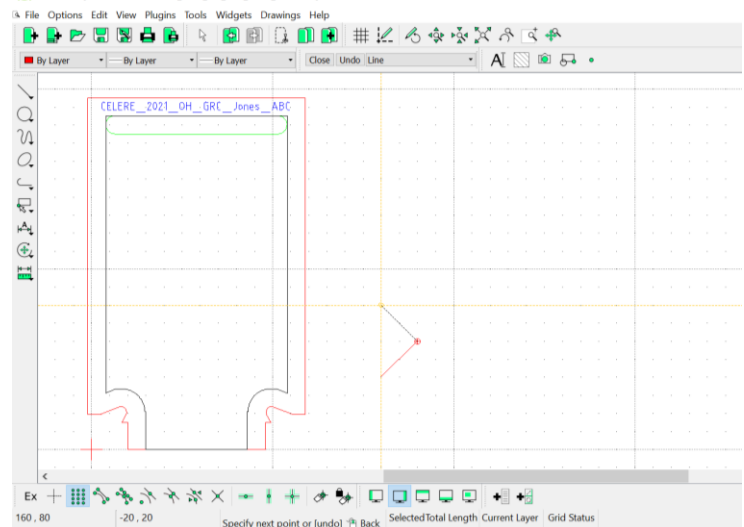
Some tools require that you specify an object's location by typing in coordinates into the command plane. Since we have selected "Snap to Grid " we will not have to do this step.

Move the cursor diagonally to the side, two grid points. Click the cursor again to lay a second point.



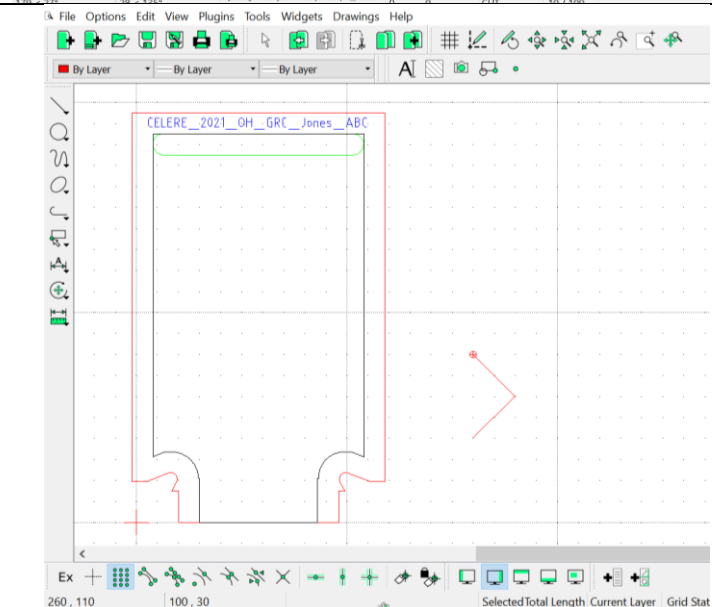
Move the line in the opposite diagonal direction two grid points again.

Click the cursor to drop the third point.



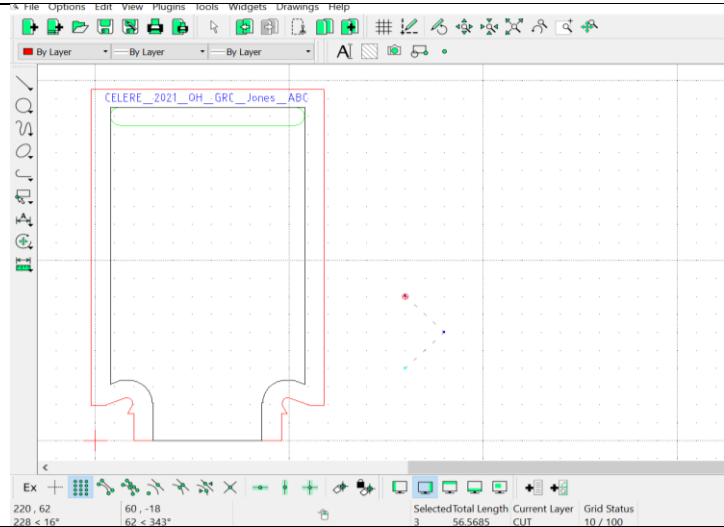
Click the escape key on the keyboard.

This will deselect the polyline feature.



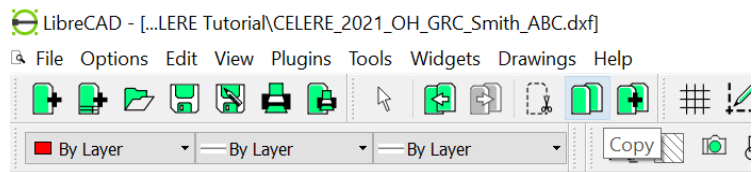
DUPLICATE THE ZIGZAG TO MAKE A ZIGZAGGING LINE

Using the regular cursor, select the corner of the angle that was just created. It should now turn into a dashed line to show that it is selected.

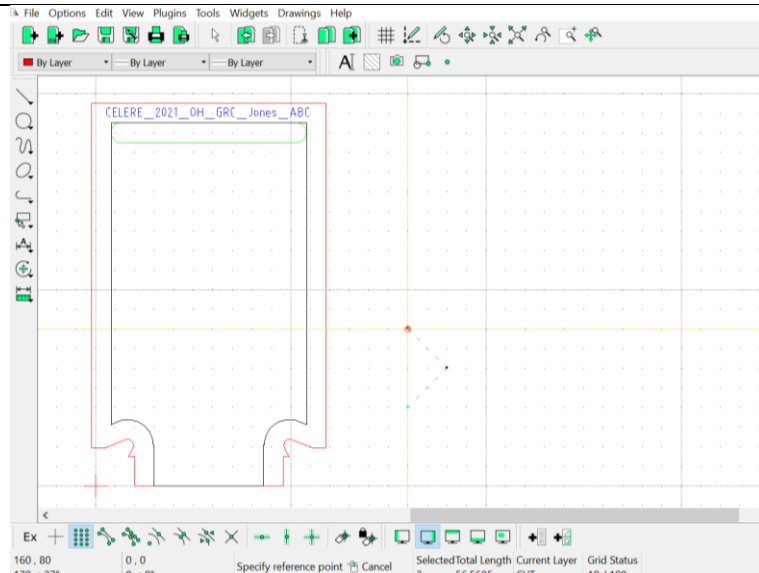


Move to the bar underneath the main menu. Select the copy button.

This button looks like two green sheets of paper overlapping.

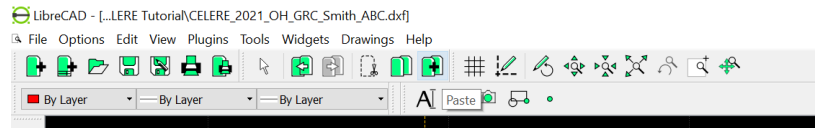


Select the reference point to be the top corner of the angle created.

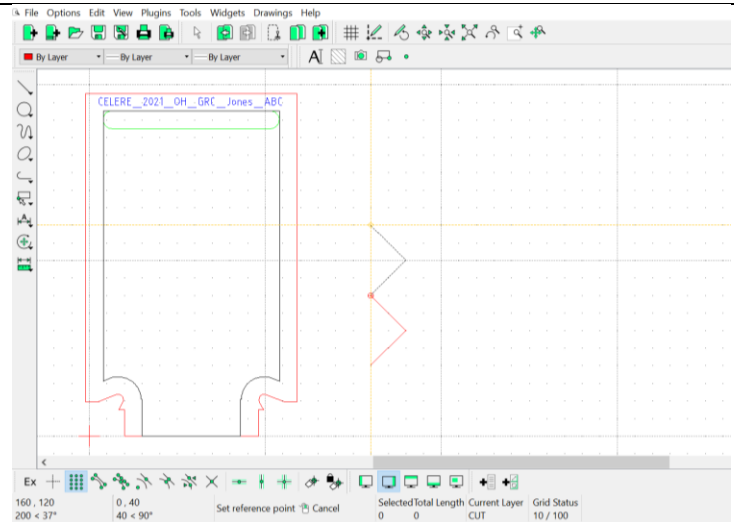


Select the paste button which is located directly to the right of the copy button.

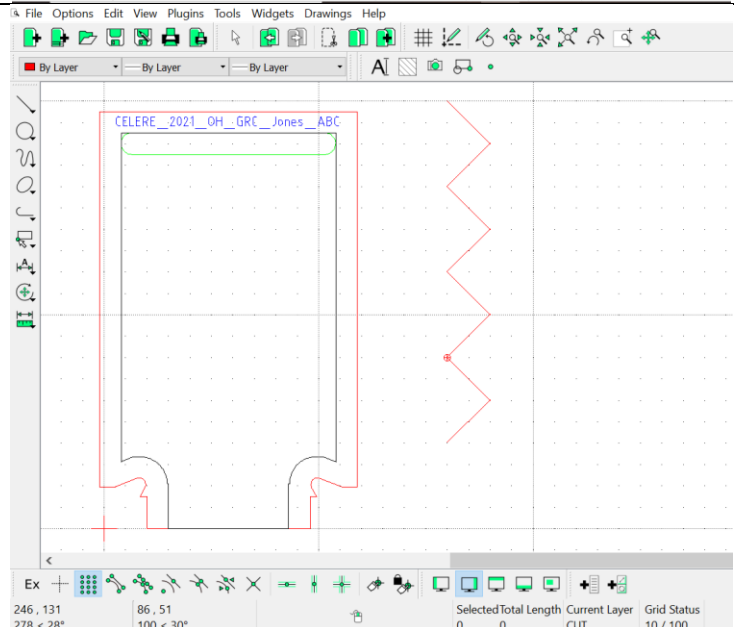
The cursor is now attached to a copy of the angle.



Click the cursor and attach the copied angle on top of the original.



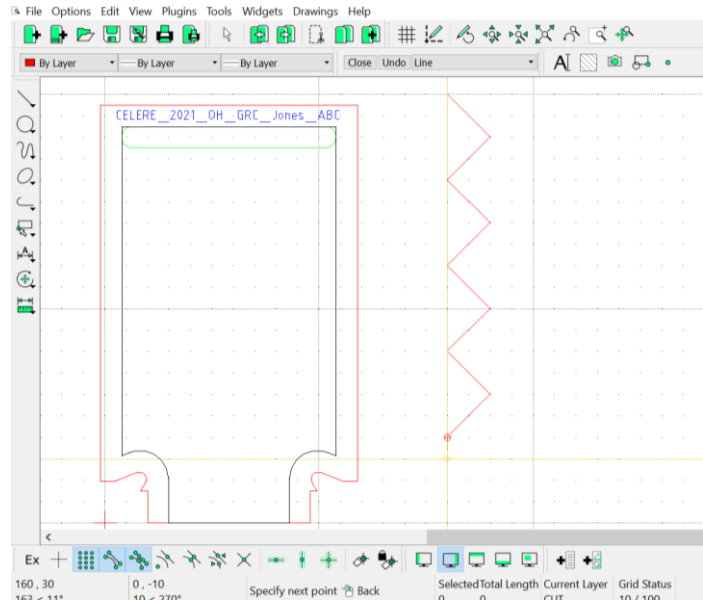
Click the paste button again and repeat the previous step. Continue to do this until you have four angles stacked on top of one another as shown in the image.



We now need to add the stem for this zig-zag channel. Reselect the polyline feature.

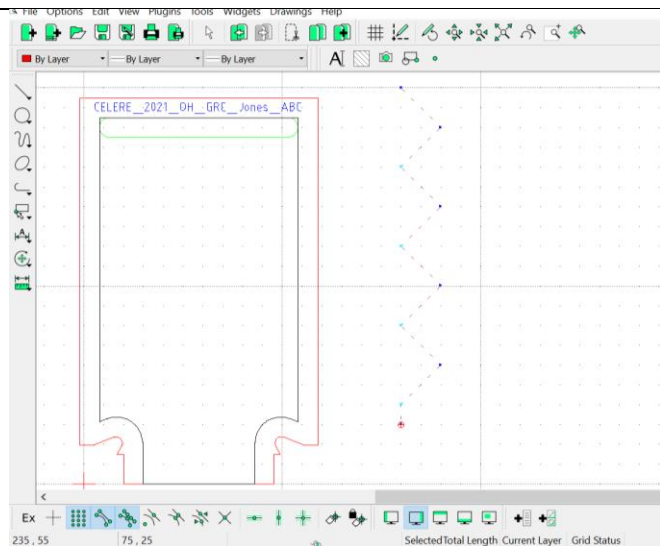
Click once at the bottom corner of the bottom angle. Move the line downwards one grid point and select the second point of the line.

Hit escape to finish the stem.

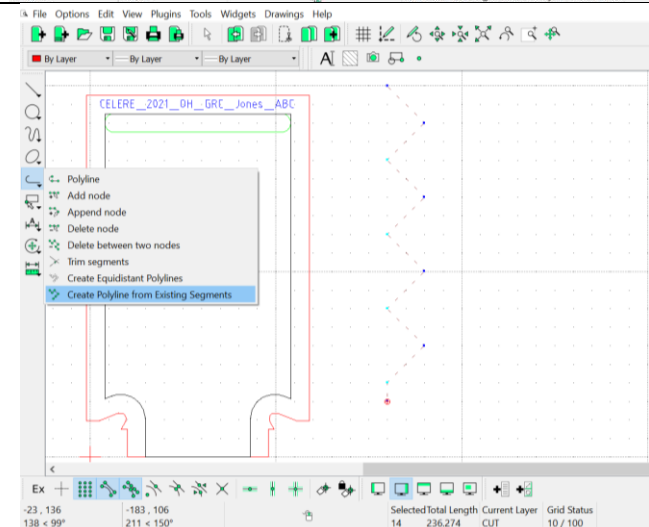


WELD THE ZIGZAGGING LINE SEGMENTS TOGETHER

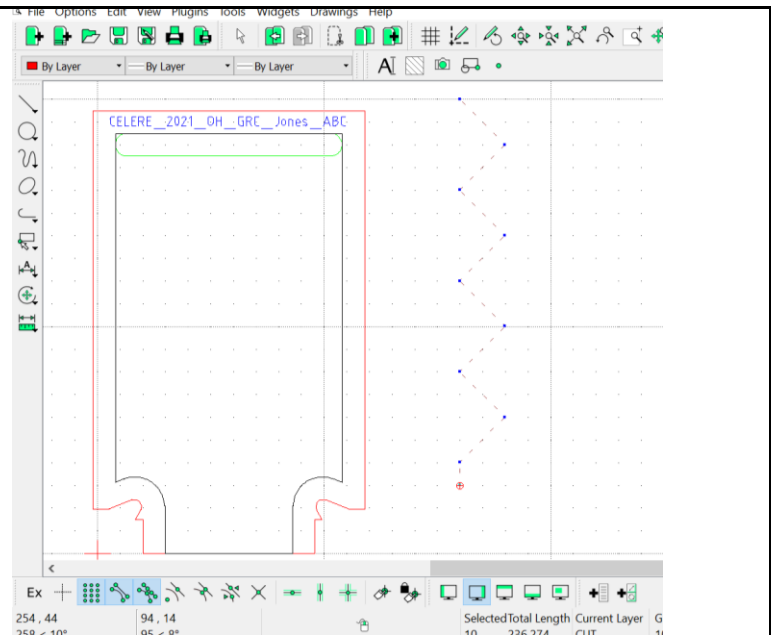
Highlight the entire polyline using the regular cursor. The line should be dashed to show it has been selected.



Select the fifth icon and then select "Create Polyline from Existing segments." This will merge each polyline segment into one object.

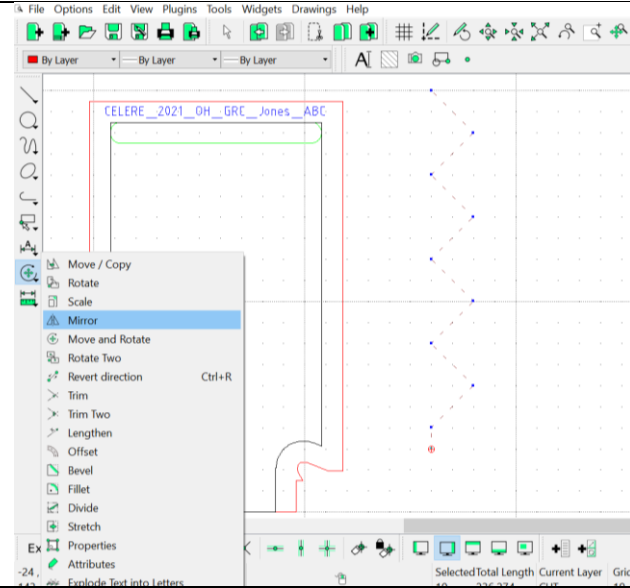


To confirm that the object is welded together, click on one section of the polyline. If the entire line becomes highlighted at once, then the line is welded together properly.



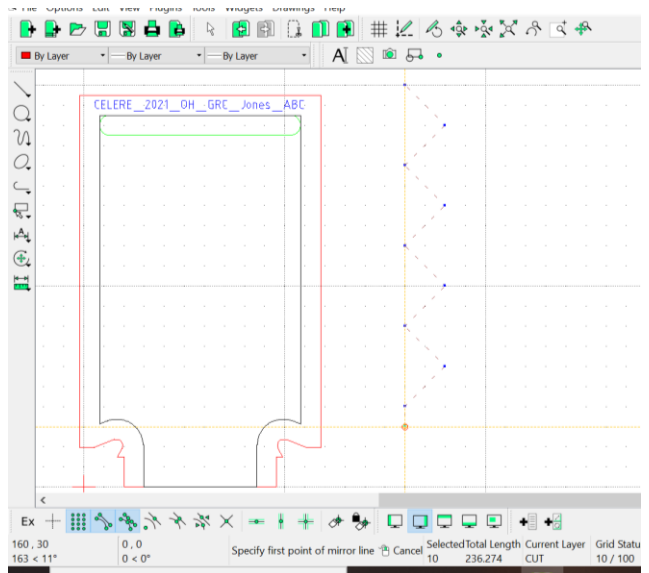
DUPLICATE THE ZIGZAGGING LINE ... IN A MIRRORED ORIENTATION

Highlight the polyline, select the 8th tool from the top and click "Mirror".



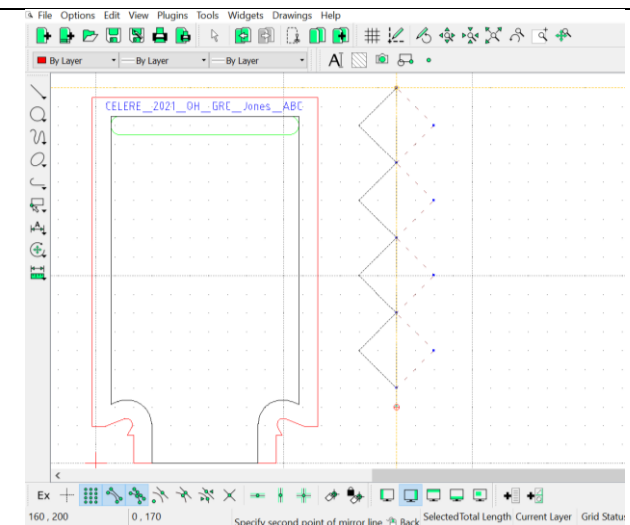
LibreCad will ask to "Specify the first point of the mirror line".

Click the first point of the polyline at the base.

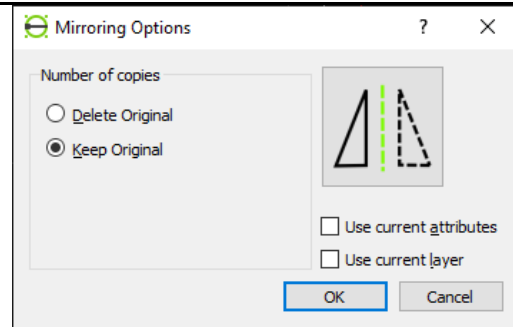


LibreCad will ask to "Specify the second point of the mirror line."

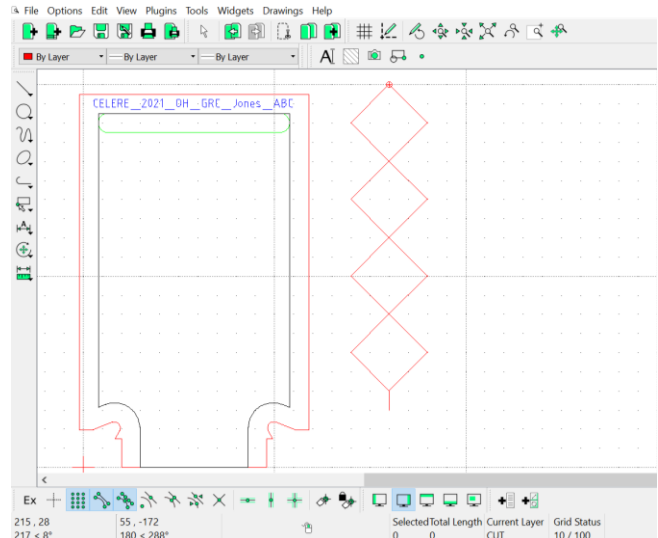
Click the last point of the polyline at the top of the zigzag but make sure to remain in line with the base point.



In the pop-up, ensure “Keep Original” is selected and click ok.

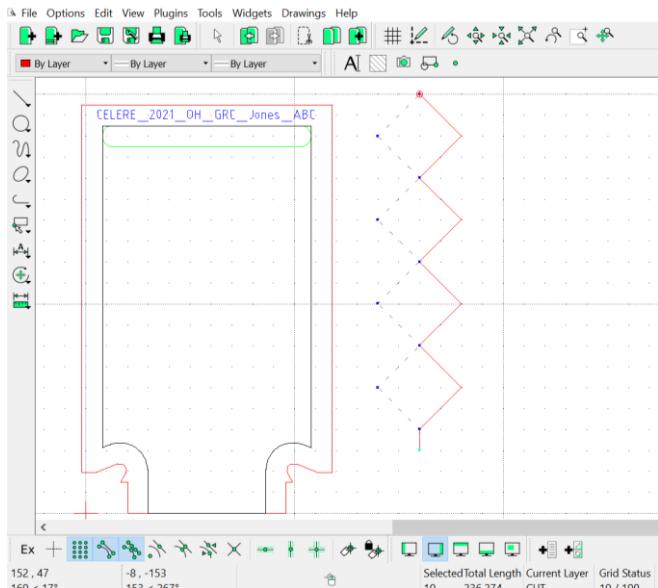


There should now be two mirrored polylines

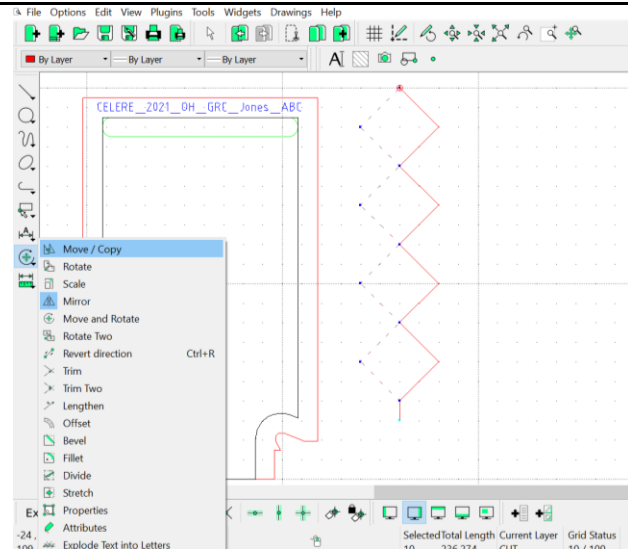


To move the right polyline, click to highlight it.

Make sure to only highlight that one polyline, not both of them.

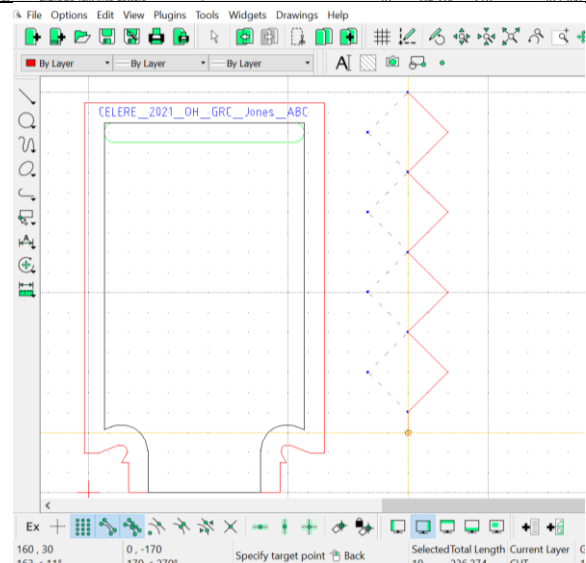


On the left panel, down 8, select the “Move/Copy” option.



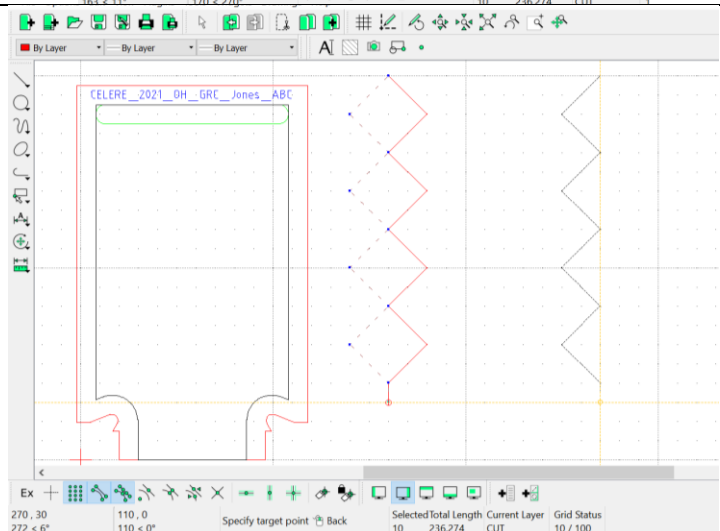
LibreCAD will ask you to select “Reference Point”

Choose the lowest point of the base.



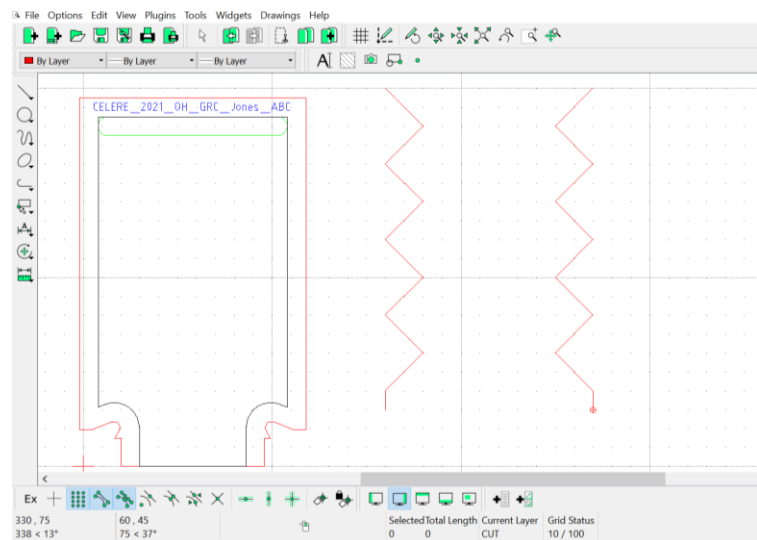
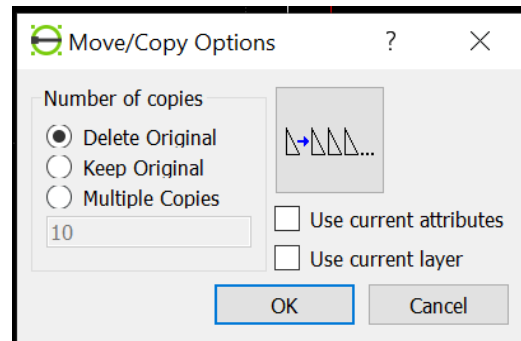
LibreCAD will then ask to “Specify a Target Point”.

Move the cursor over to the left and click the cursor to place the polyline.



Make sure to select “delete original”.

The moved polyline should now resemble this image.

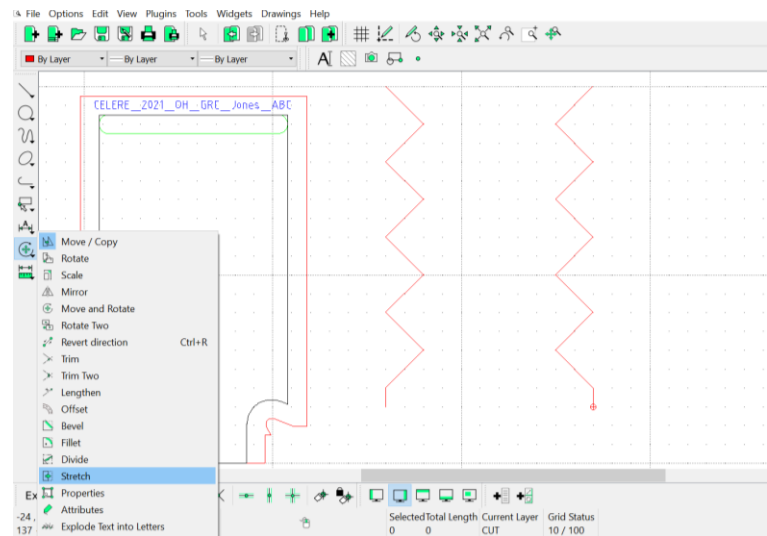


HORIZONTALLY STRETCH THE ZIGZAGS IN THE LEFT LINE

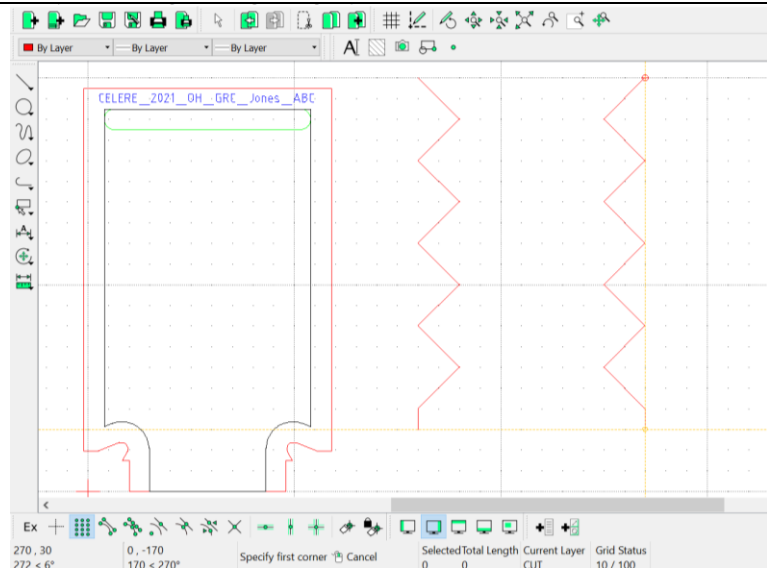
This tutorial includes two differences between the channels even though the channels in CELERE test cells should ideally have just one difference. The presence of curved vs. sharp corners in the zigzags is the most obvious, but the left channel is also stretched such that the zigzags in the two channels are at different angles. However, as a result of the stretching, the horizontal span of the zigzags is similar when the left channel's corners are curved. To be clear, if the left channel was not stretched, the horizontal span would be much shorter with the curved corners. This is an example where it is sometimes not possible to have a single difference between two channels, which is why the design requirement is **ideally** one difference between channels and why the design hint MOOD is **Mainly** Only One Difference.

We will be stretching the rightmost line.
To stretch the polylines, ...

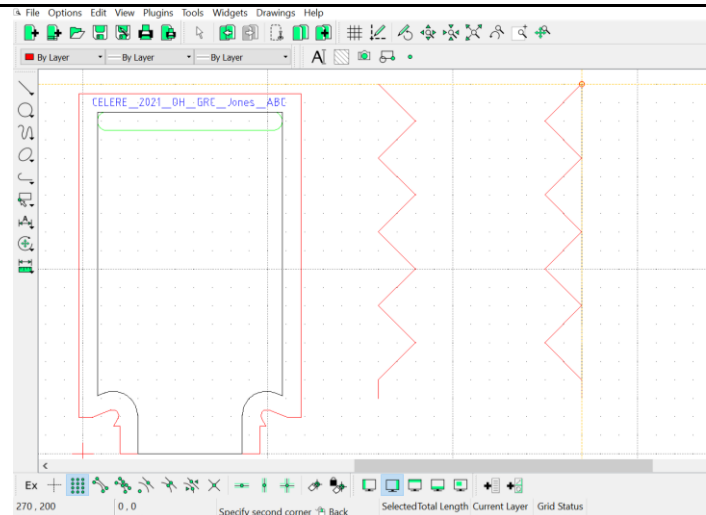
In the toolbar, select the 8th tool from the top and select "Stretch".



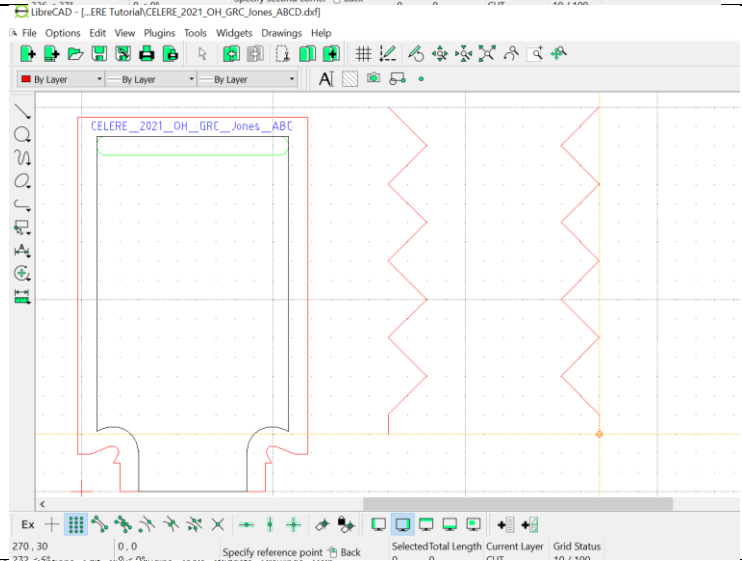
When prompted to "Specify the First Corner" click on the bottom point of the base



When prompted to “Specify the Second Corner” move the cursor up to the top of the polyline.



When prompted to “Specify a Reference Point” again select the bottommost point on the base

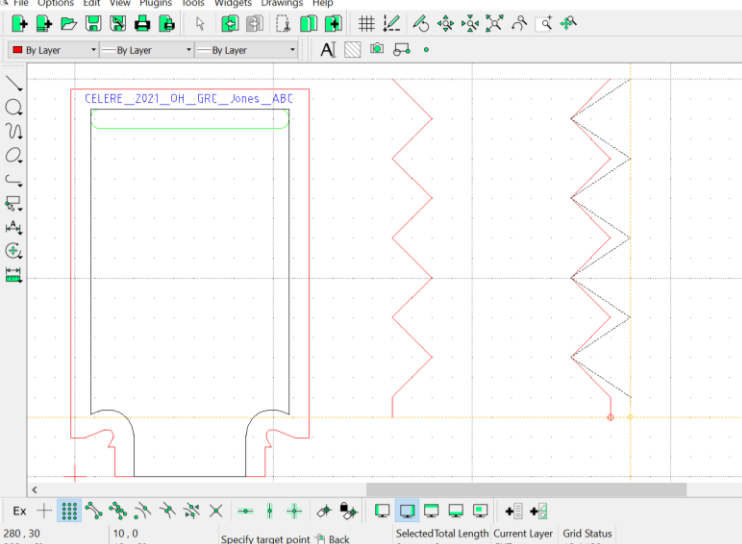


Move the cursor to the right one grid point.

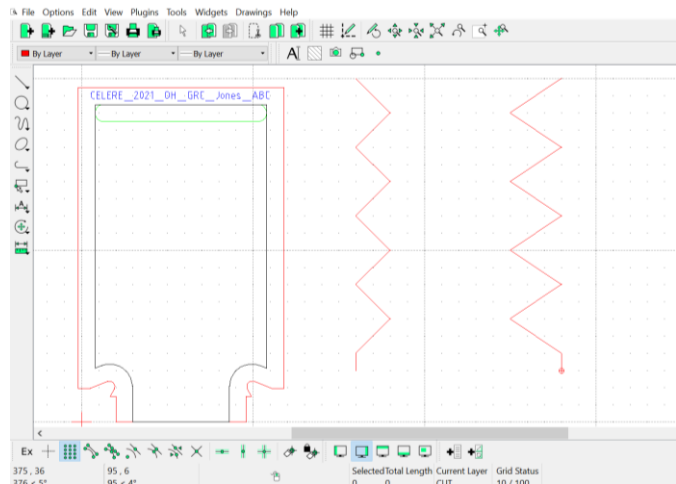
You will see a black line representing the stretched entity following your cursor.

Select the location of the new stretched line to be one grid point to the right of the original.

This is the new stretched line.



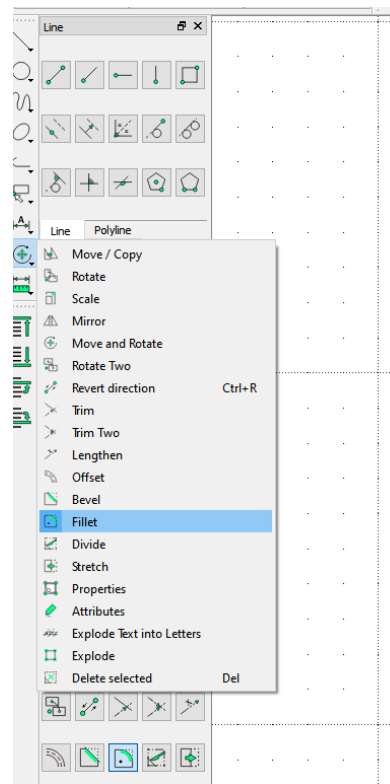
The new stretched line should resemble this image.



MAKE THE CORNERS CURVED (INSTEAD OF SHARP) IN THE RIGHT LINE

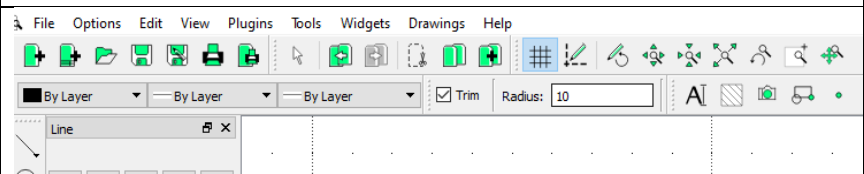
To curve the polyline, ...

On the toolbox on the left, select the 8th tool and click Fillet.



The fillet tool works to smooth out the sharp points and adds in arcs instead.

Enter 10 for the radius at the top.

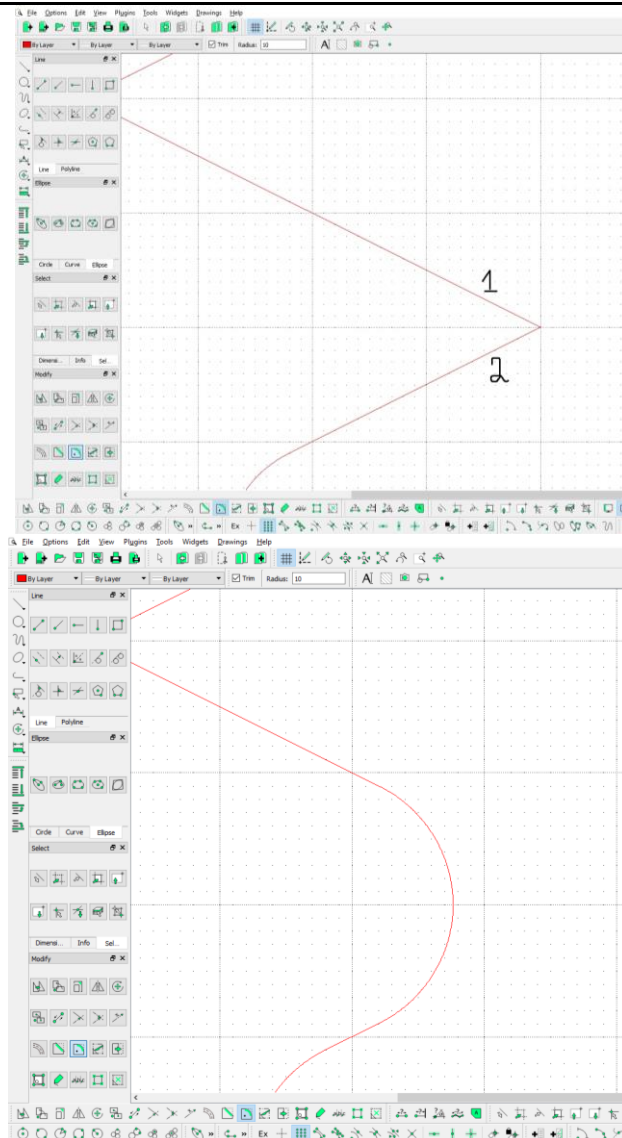


For each sharp edge, select one line connecting to the edge when prompted "Specify the first entity."

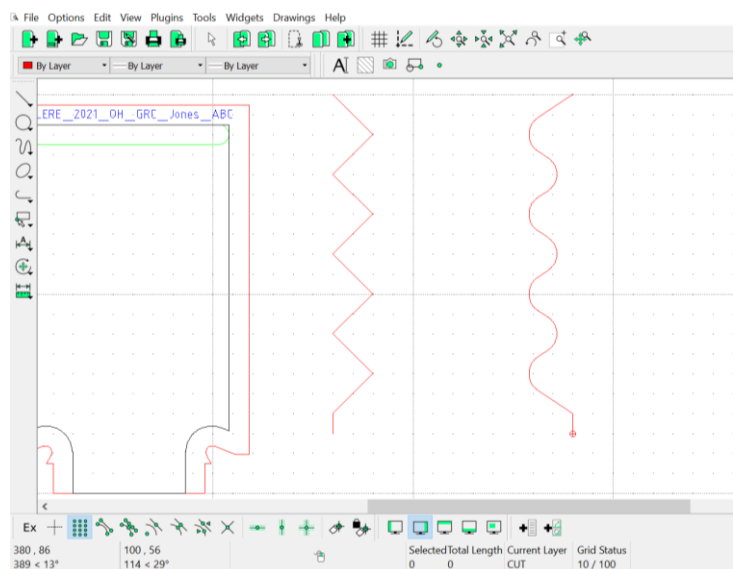
Select the second line for each edge when prompted "Select second entity."

Line 1 and 2 shown to the right. This should create a rounded arc as shown.

The result is shown to the right.



Repeat the process for each sharp edge until there is an arc added around each edge.

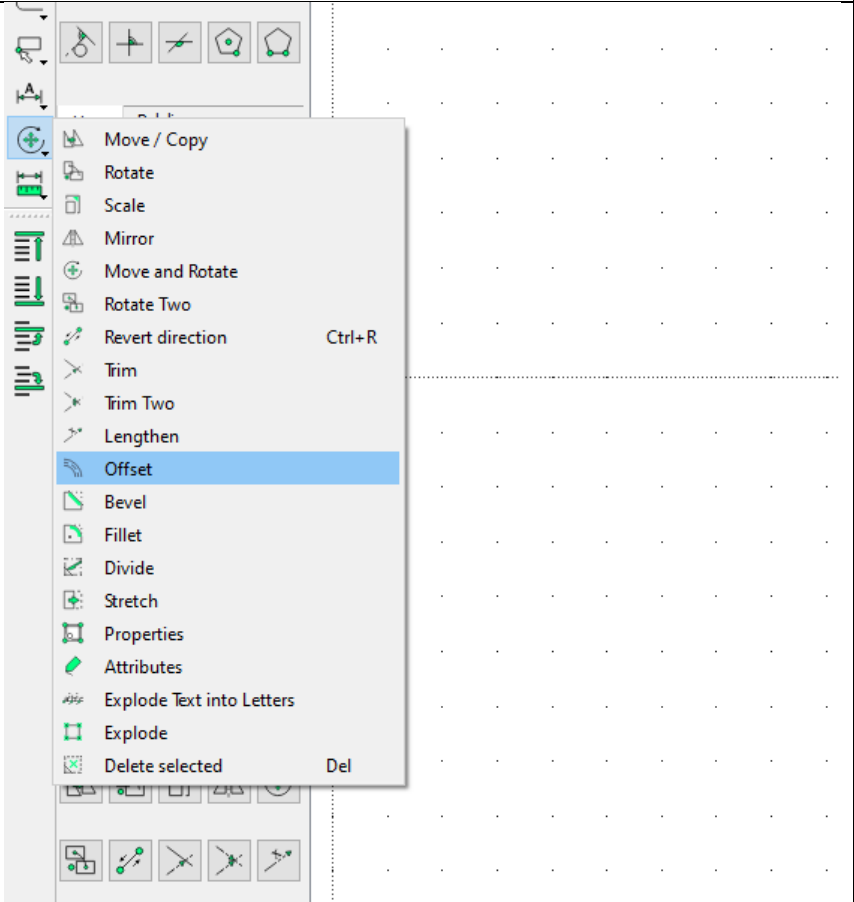


CHANGE THE ZIGZAGGING LINES INTO CHANNELS

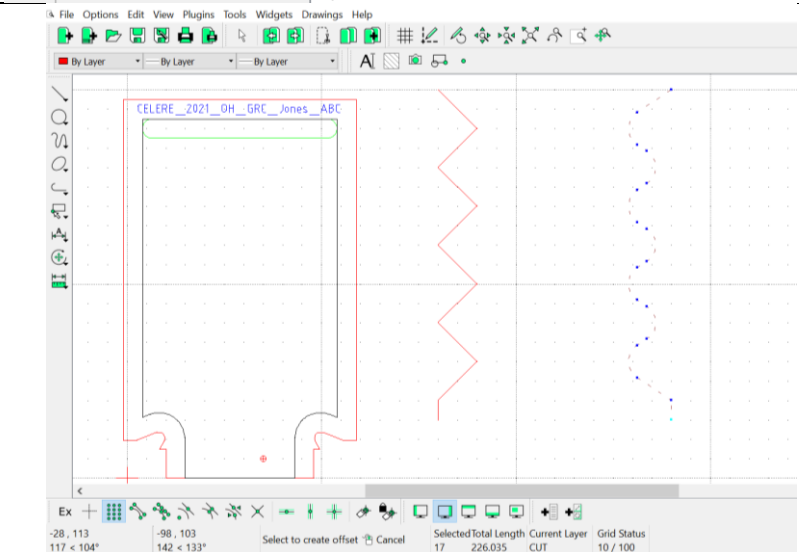
We have drawn the centerline of the channel.

To offset the center line to form the channel walls, ...

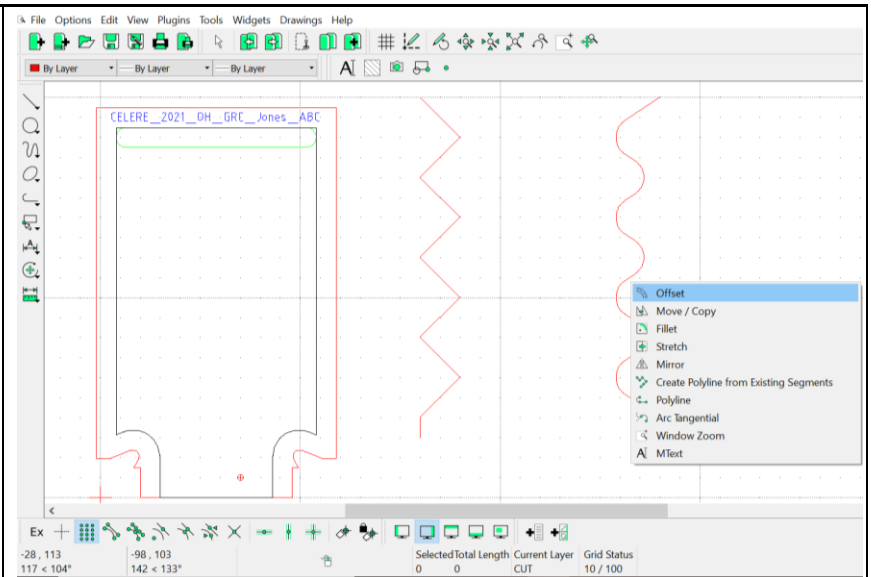
Select the 8th tool from the top and click "Offset."



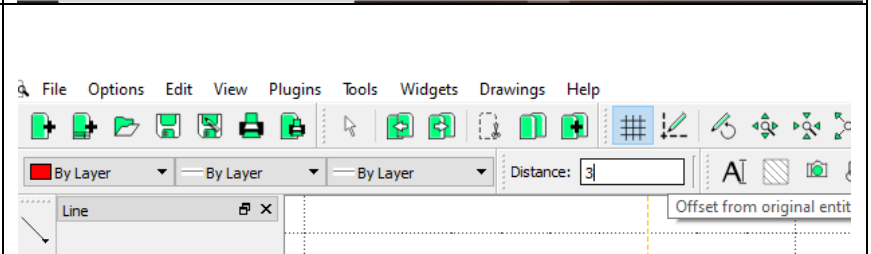
Click on the curved channel. It will highlight in blue as shown.



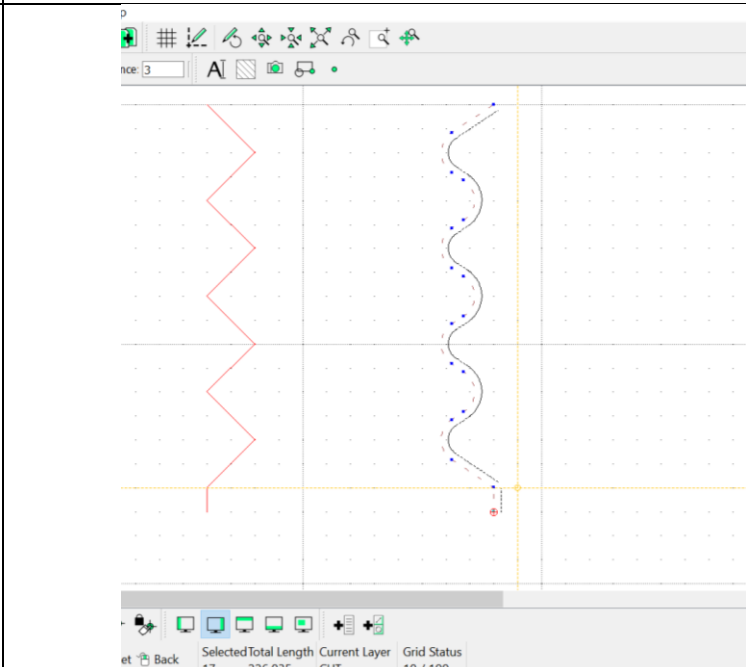
Once highlighted, right click on the line and select "Offset."



Ensure 3 mm is entered into the "Distance" bar at the top.



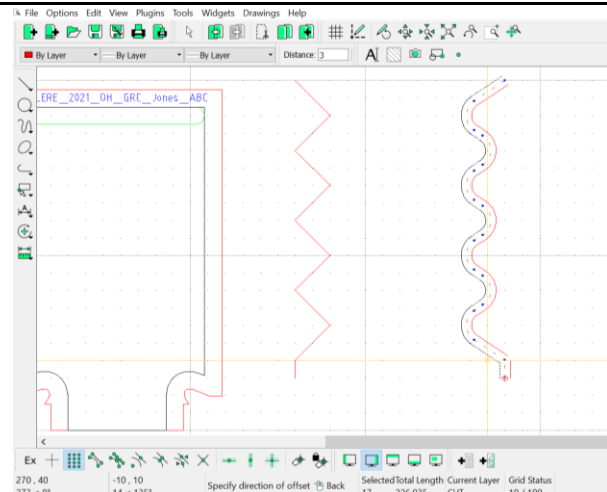
Click on the right side of the polyline.



Make sure that you unselect the new line and reselect the original line again so that only the centerline is dashed.

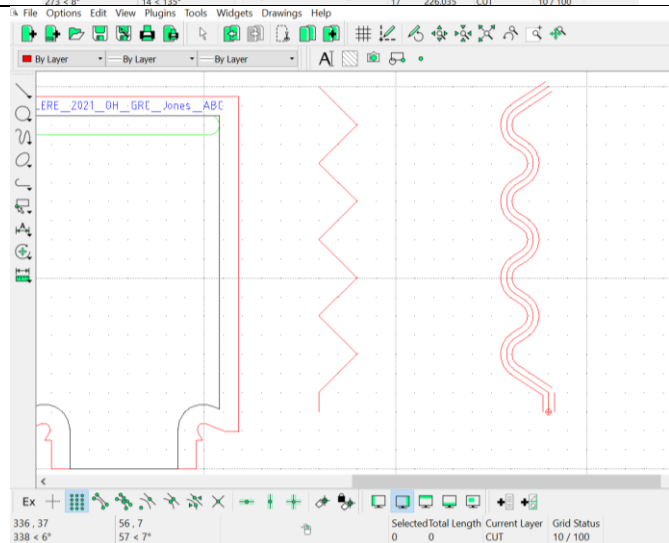
Right click again on the original line and select offset.

Click on the left side of the polyline and click to place the other side of the channel.



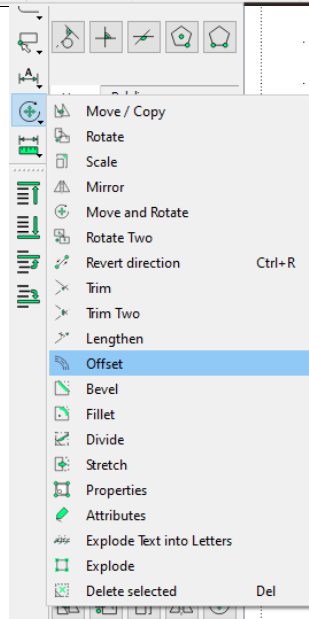
Unselect all lines to see the finished product.

It should resemble this image.



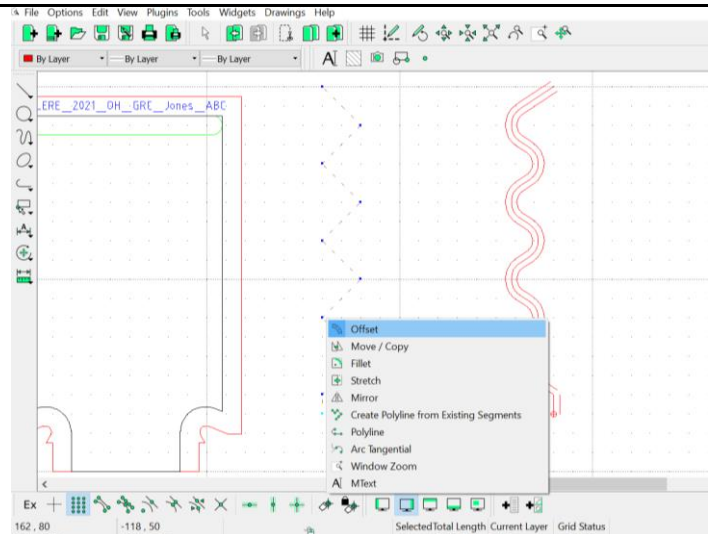
Now we are going to follow the same procedure for the other line.

Select the 8th tool from the top and click "Offset."



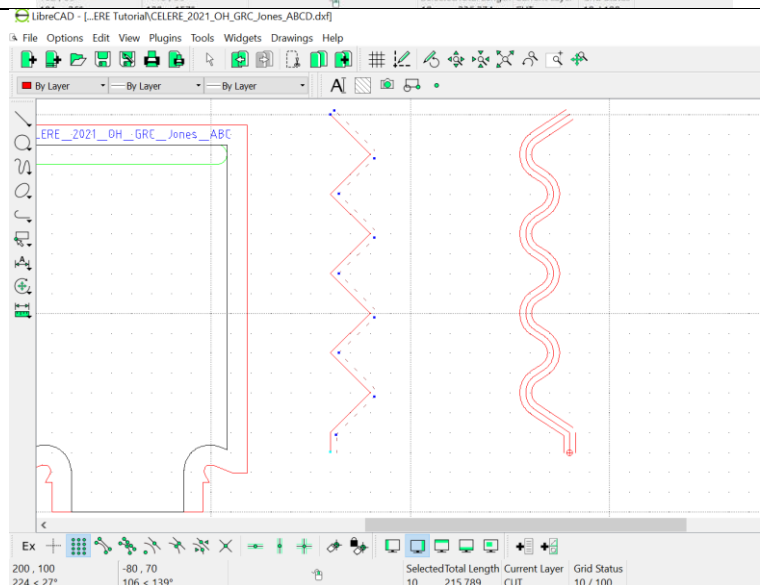
Click on the second channel and it will highlight in blue.

Once highlighted, right click on the line and select offset.



Ensure that 3mm is typed into the distance bar.

Click to the right side of the original line to place the offset channel.

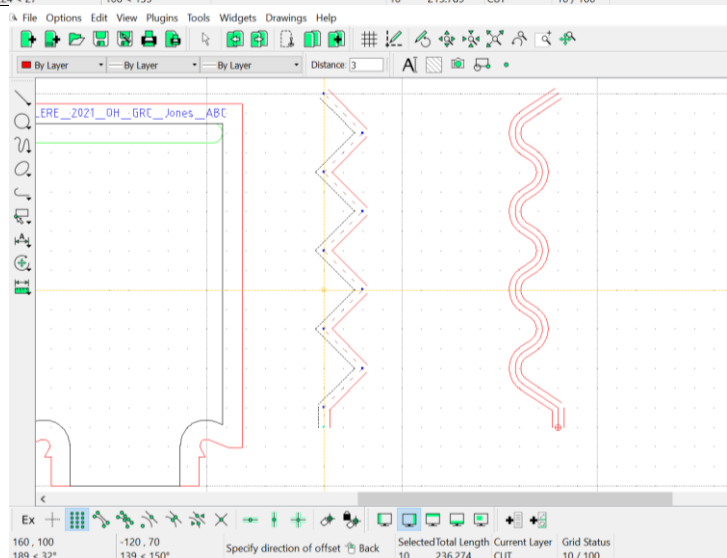


The offset line is now highlighted, and the original line is not. Unselect the offset line and select the original line.

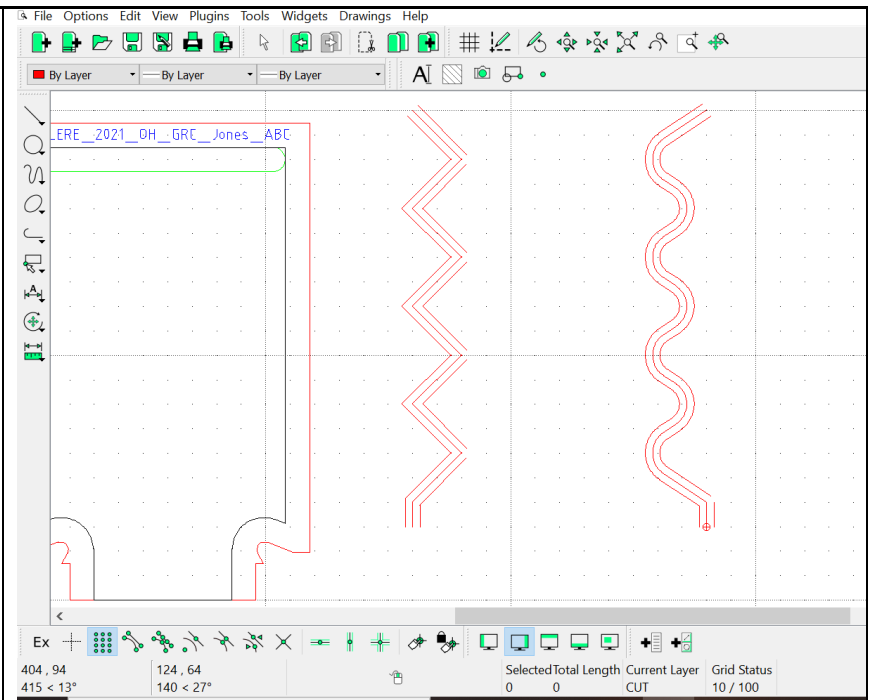
Then select the offset feature again.

Ensure that 3 is typed into the distance bar.

Click to the right side of the offset polyline to create the second half of the channel.



The final product should resemble the image to the right.



CLOSE THE CHANNEL TOPS

A common mistake is to skip this step, which in this example would yield 4 narrow channels that are the width of the laser cut.

To draw an arc to cap the two channels, ...

On the left menu, click on the 3rd item down and select 3 points.

Additionally at the snap menu on the bottom select "Snap to Endpoints" to turn on that feature in addition to the "Snap to Grid points" feature that was already turned on.

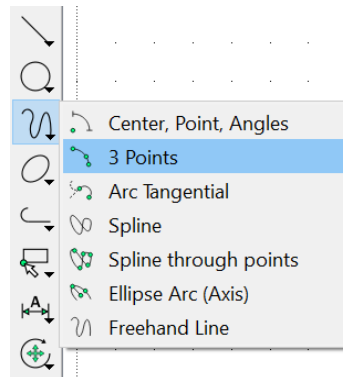
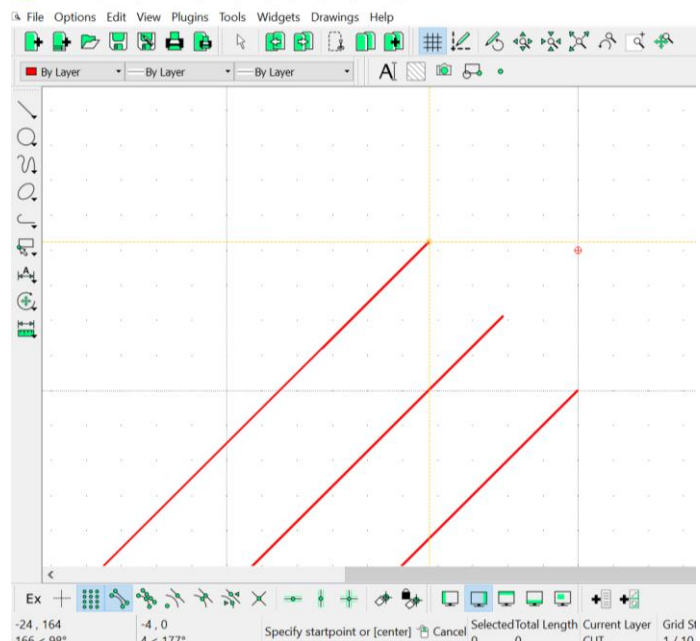


Image has been zoomed in for clarity.

We will begin on the curved line.

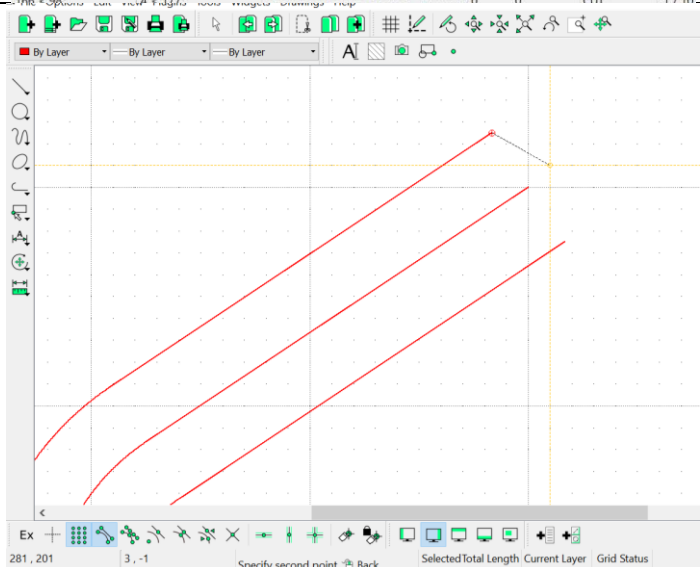
Hover over the three lines at the top until the cursor lands on the rightmost line.

Click to select the far-right line.



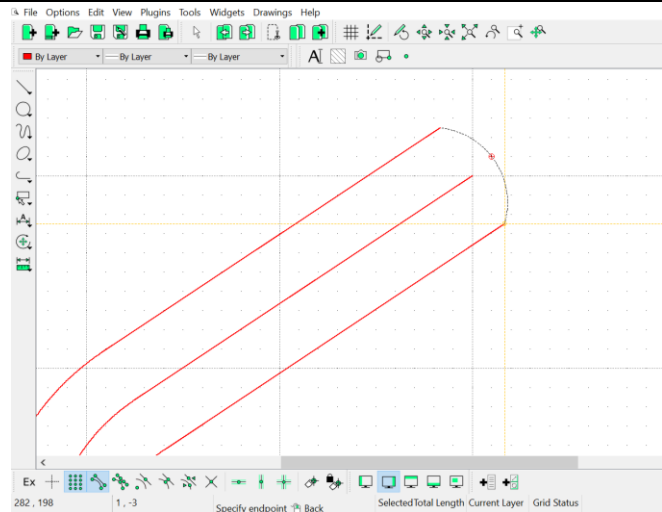
Move the cursor to the grid point that is directly one diagonal grid point away from the center line as shown in the picture.

Click on this point to create the center of the arc.

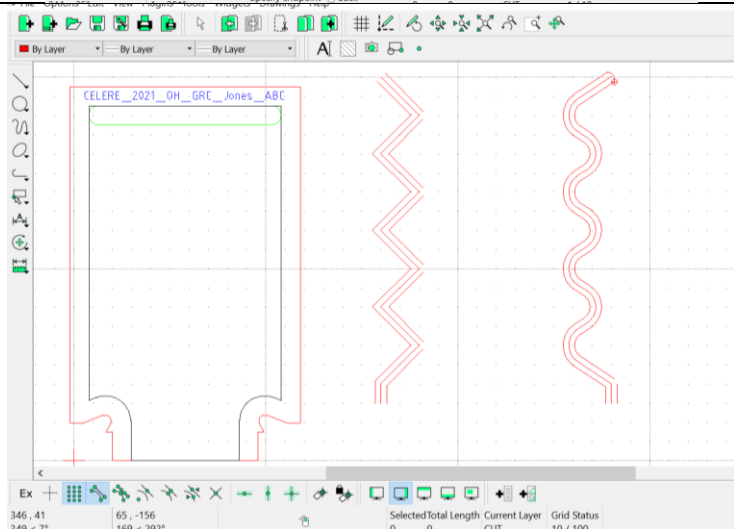


Move the cursor to the farthest left line. The arc should be created as you move.

Click on the farthest left line to finalize the arc.



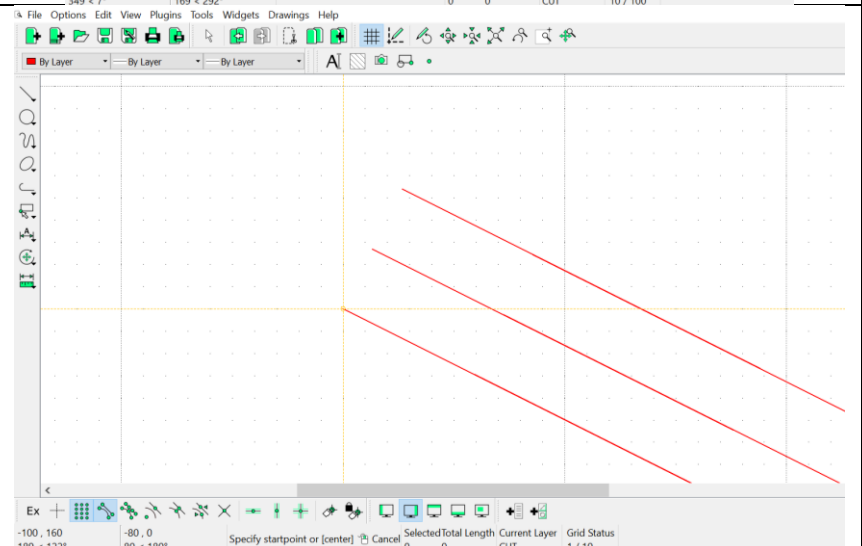
The completed arc should look like this.



We will now follow the same steps for the other channel.

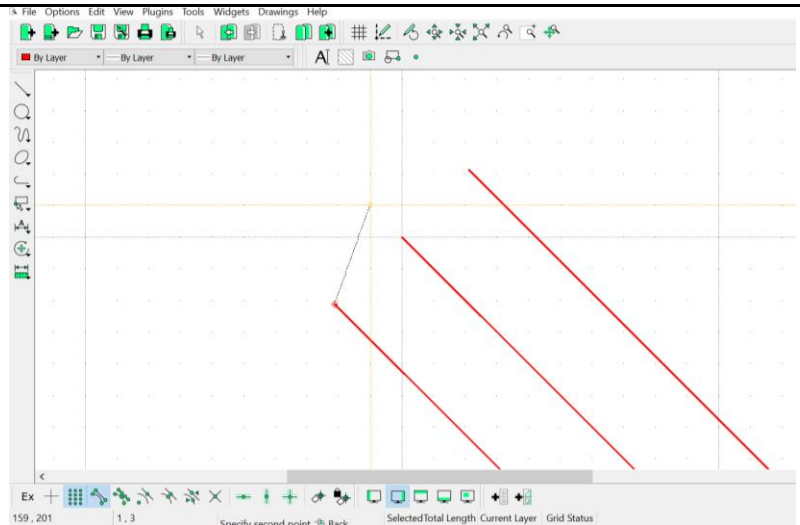
On the left menu, click on the 3rd item down and select 3 points.

On the curved channel select the rightmost line as the starting point.



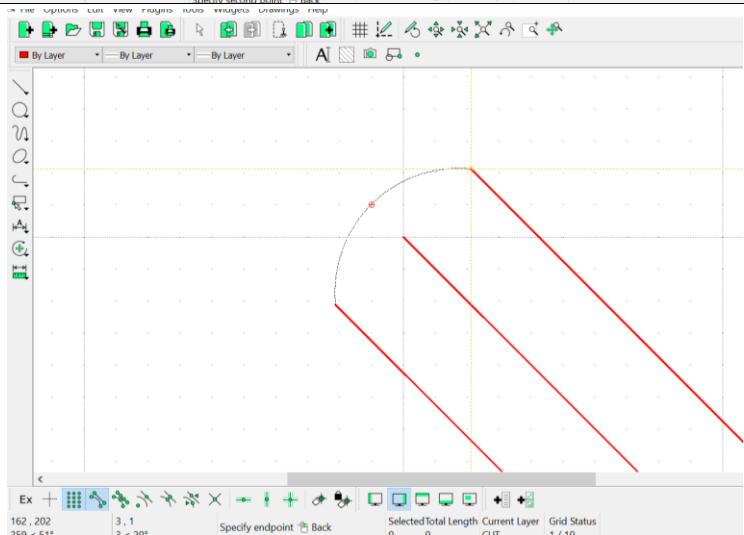
Move the cursor to the grid point that is directly one diagonal cube away from the center line as shown in the picture.

Click on this point to create the center of the arc.

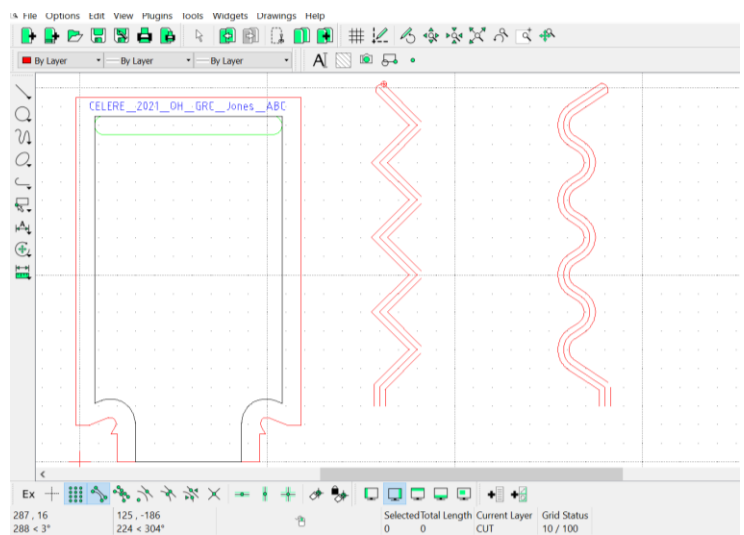


Move the cursor to the farthest right line. The arc should be created as you move.

Click on the farthest right line to finalize the arc.



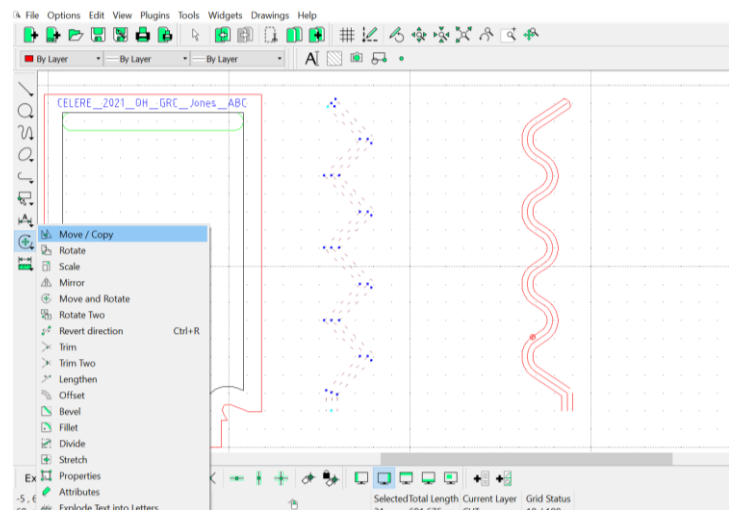
The final channels should look like this image



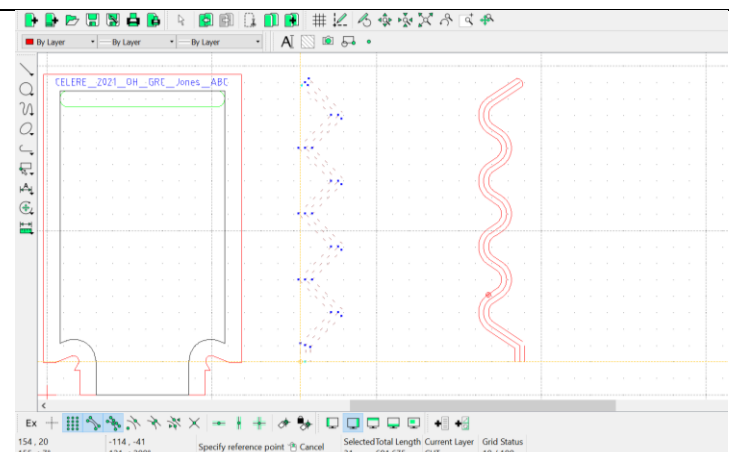
CREATE THE BASE OF THE TEST CELL'S MIDDLE LAYER

Select the entirety of the zig-zagged channel including the curve at the top.

Select move/copy from the side menu.

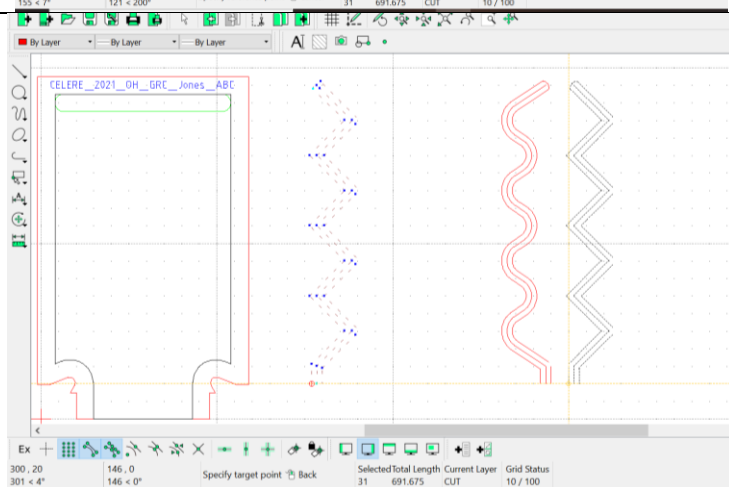


Select the bottom leftmost line as the reference point.



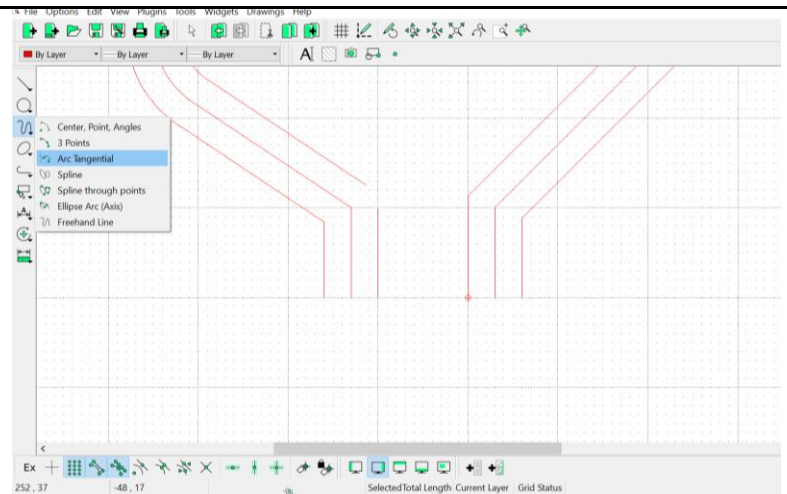
Move the channel to the right side of the curved channel with the selected basepoint placed exactly one grid point to the right of the other channel.

When prompted, make sure to "Delete Original".



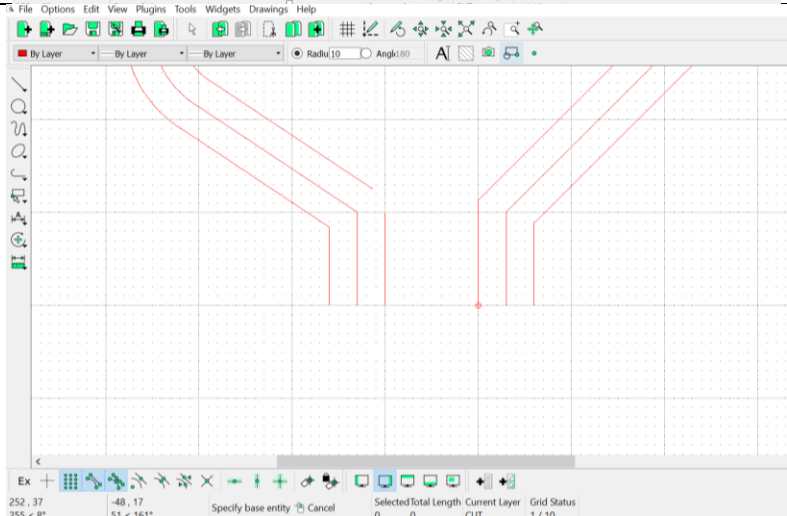
Zoom into the bottom section of the channels for clarity.

Using the tools on the left, select the Arc Tangential tool.

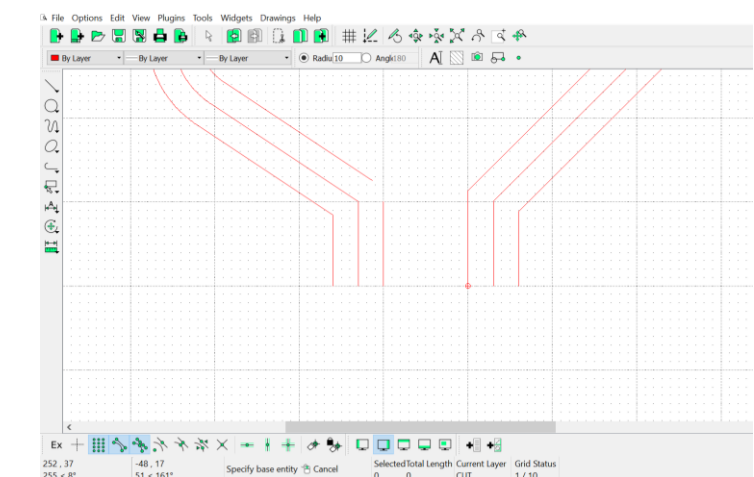


The radius should be set to 10 for the following steps.

Additionally, in the snap bar at the bottom make sure that “Snap on Grid point”, “Snap on Endpoints”, and “Snap on Entity” are all turned on



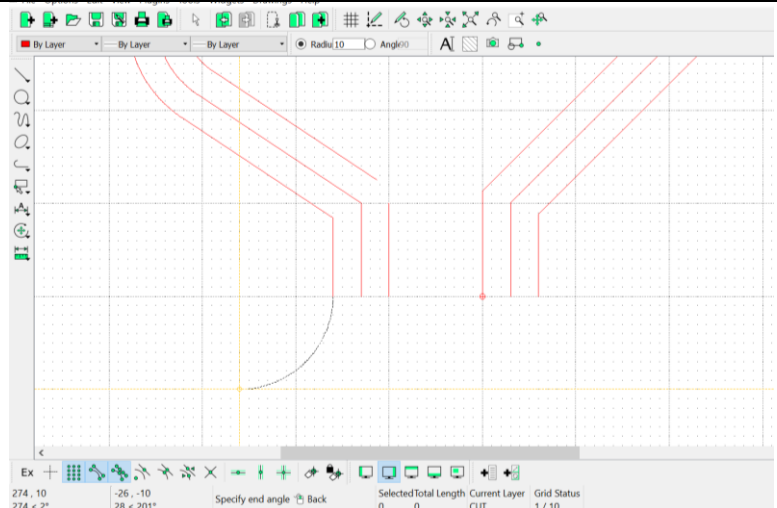
For the first point move your cursor to the leftmost line of the left most channel. Select the first point to be at that line's base.



When you select that point, move the curve downwards until it lines up with the grid line below. Your cursor should move down about one and a half grid points and move to the left one and a half grid points to achieve desired placement.

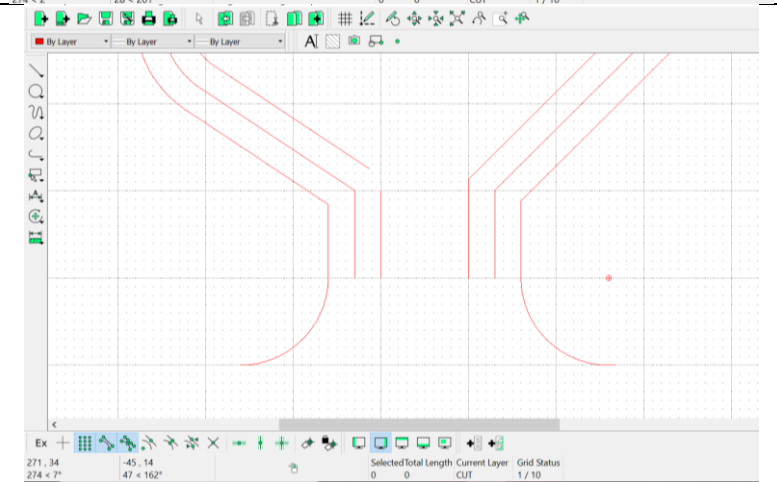
It should resemble this image.

Click to finalize the line.

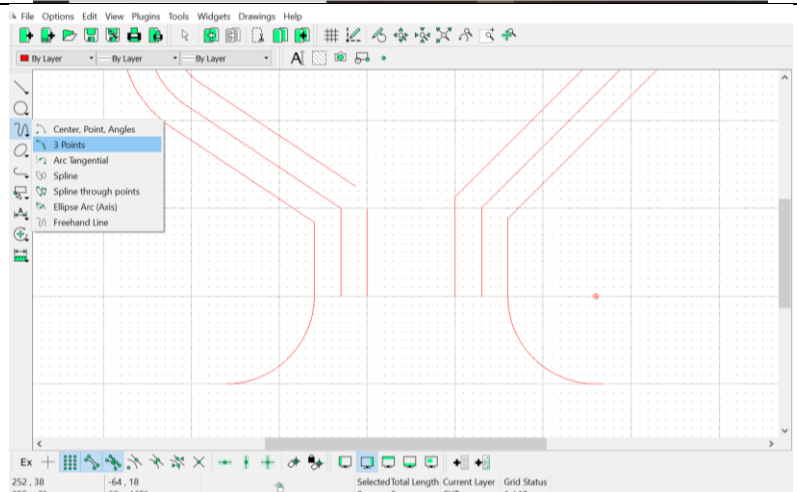


Do the same to the rightmost line of the rightmost channel, leaving the inner lines alone.

The figure should now look like this.

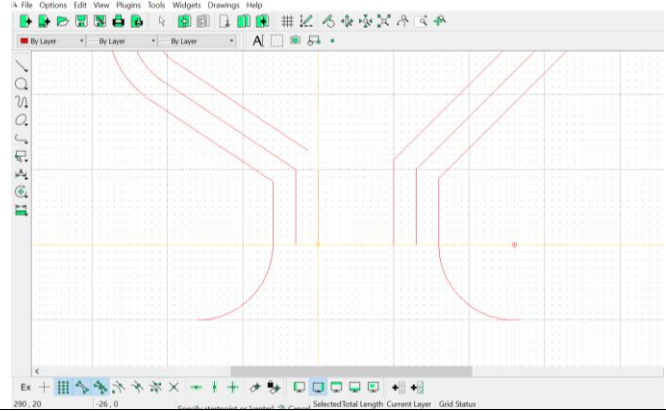


Now, using the tools in the left menu select “3 points” under curves.

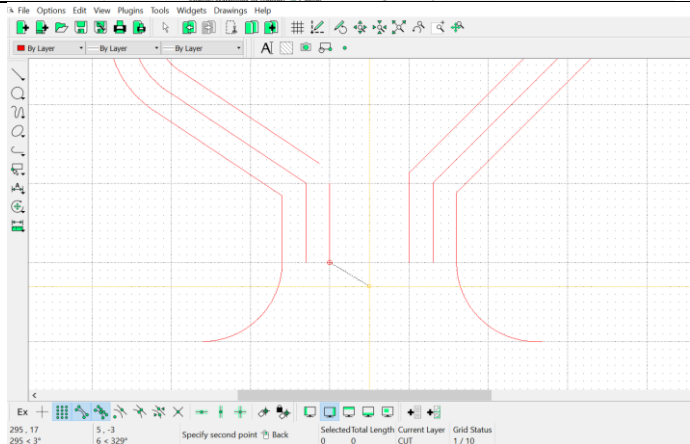


Use this tool to make a connecting semi-circle between the two innermost lines of the channels.

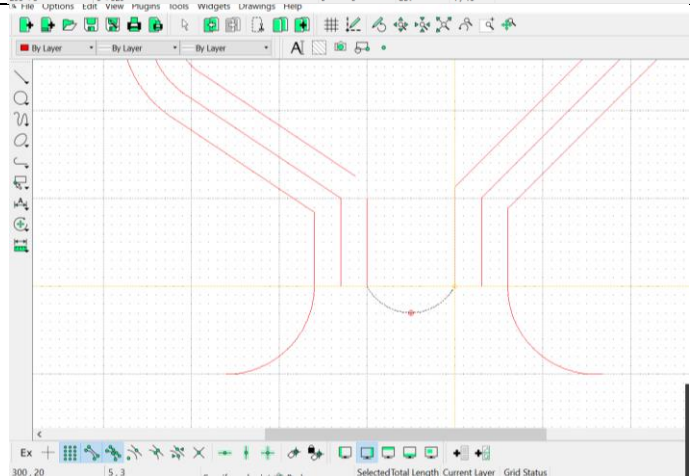
The first selection should be at the base of the left channel's inside line.



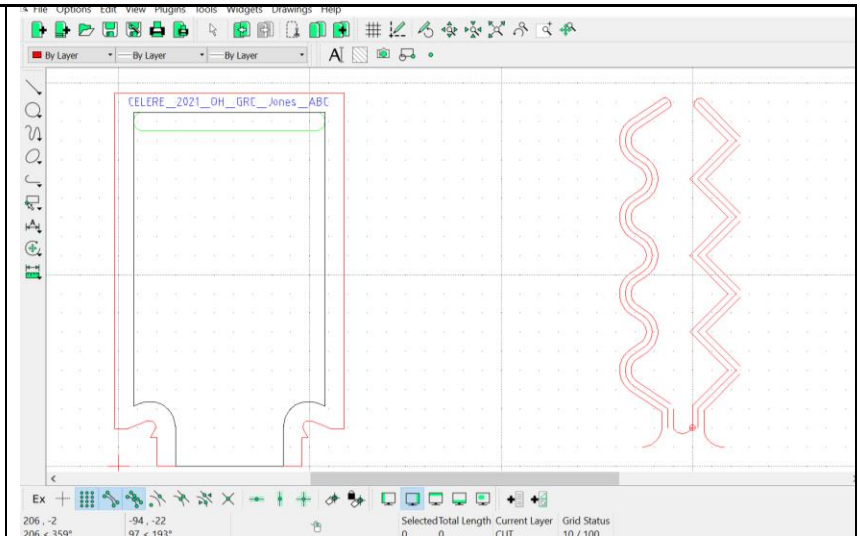
The second point should be slightly down and in the center of the channels.



The third point should connect the curve to the right channel.



The final product should resemble this image.

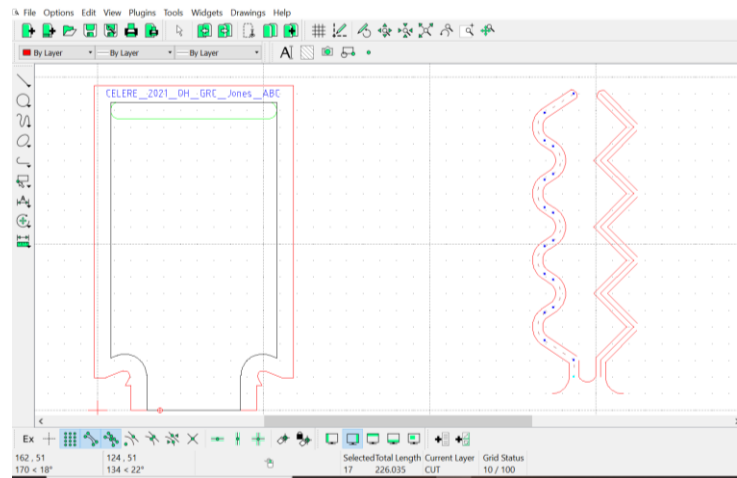


Remove the Middle Line of the Channels

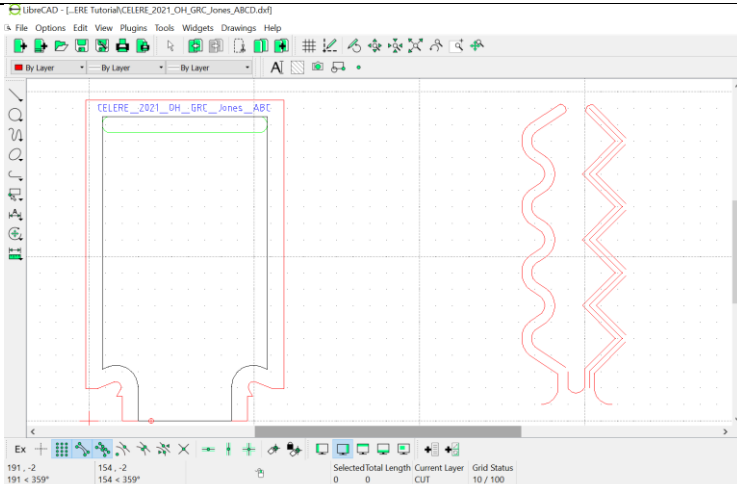
To eliminate segments that we do not want anymore....

Select the middle line of the curved channel. It should become a dashed line to show that it is highlighted.

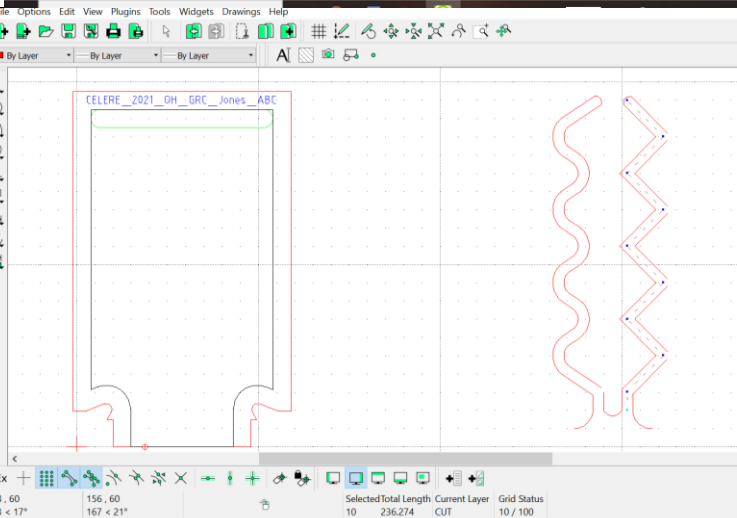
Make sure that this is the only line highlighted.



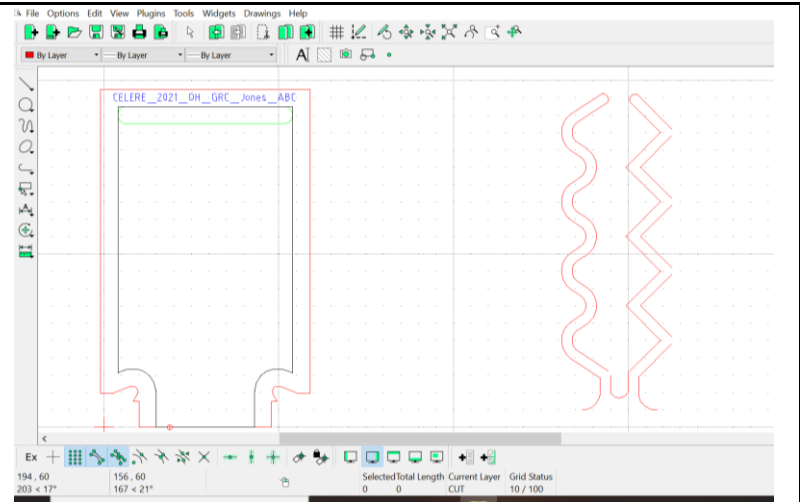
Press the delete key on your keyboard. This will remove the highlighted line.



Repeat the process with the other centerline.



The figure should now resemble this image.

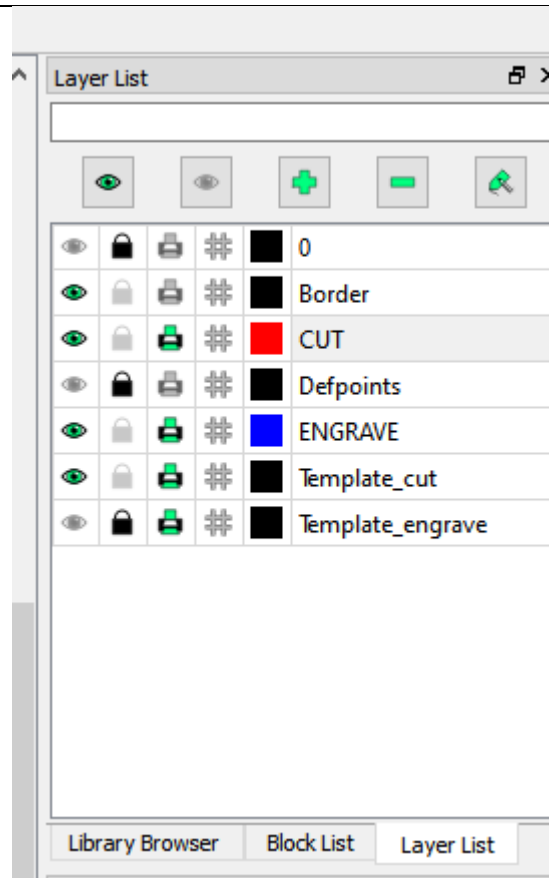


JOIN TOGETHER ALL OF THE PARTS OF EACH CHANNEL

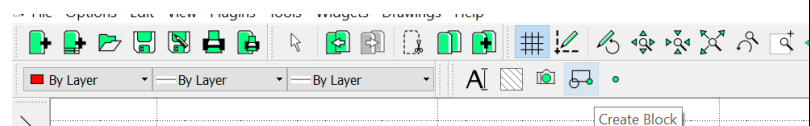
To join the left, top, and right parts of each channel (i.e., the polylines and arc) together,

On the right side of the screen switch from the layer list to the block list.

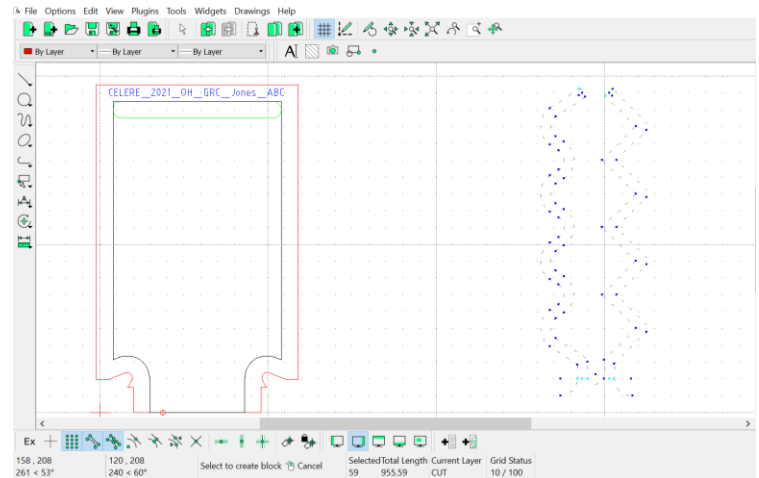
There is only one current block created and it is the "TestCell_Outline".



In the top line select the "Create Block" icon. It looks like a rectangle with two circles in the corners.

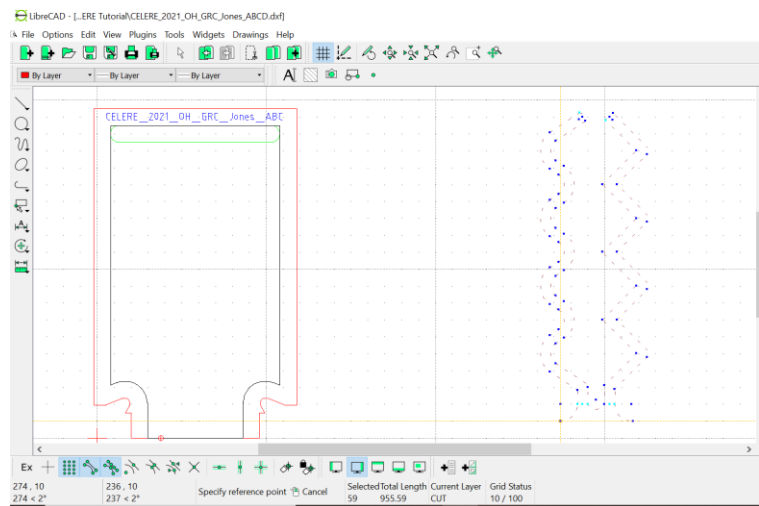


Use the cursor to select all the lines of the connected channels. Make sure to select every single line and every single curve.



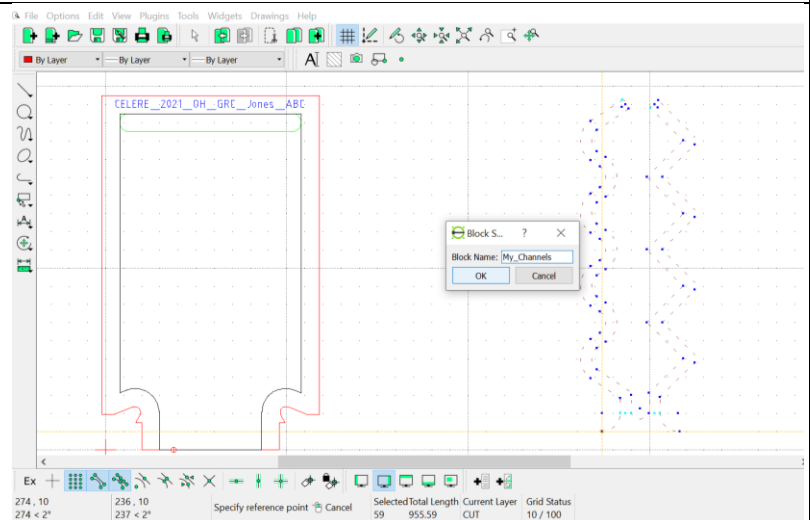
Once everything is highlighted, hit enter on your keyboard.

You will then be prompted to specify a reference point for the block. I chose the leftmost point of the bottom curve.



After selecting a reference point a box will prompt you to name your block.

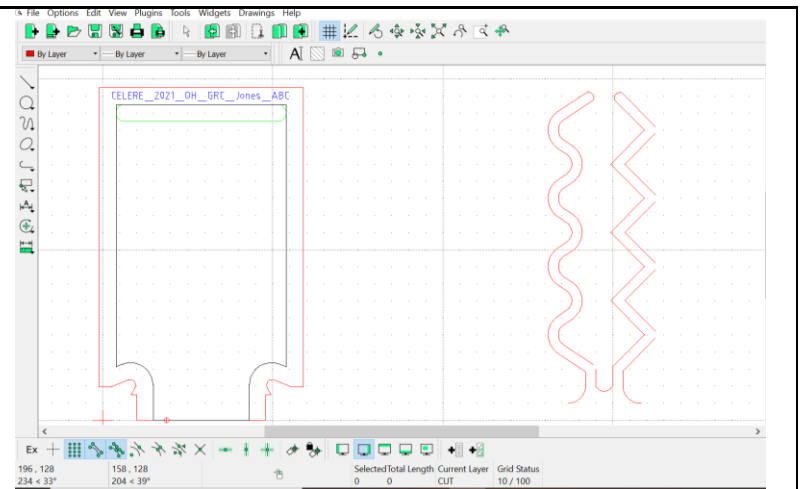
In this example the block is named "My_Channels"



Select Okay to finalize the block.

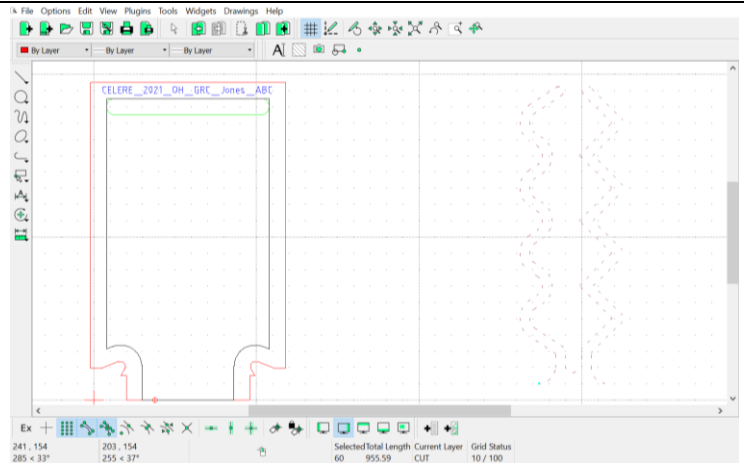
The block name should now appear in your block list.

To test the block's creation, select one of the channel lines. The entire block should highlight at once if a successful Block was created.

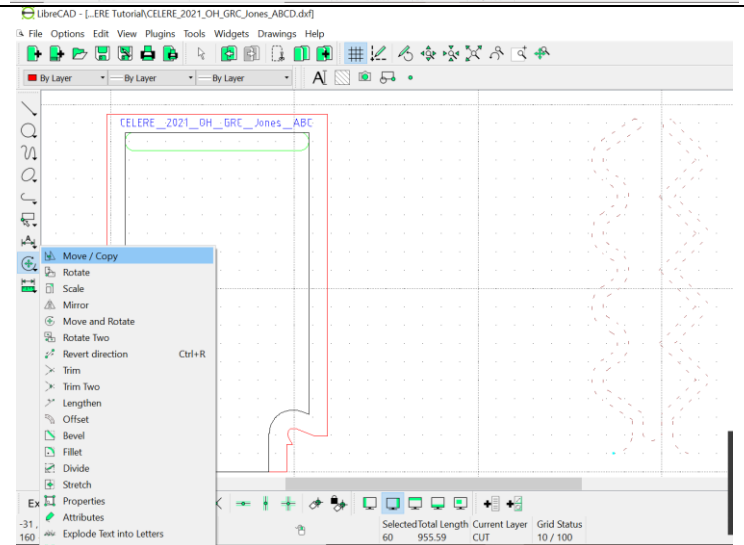


MOVE THE CHANNELS INTO THE TEST CELL

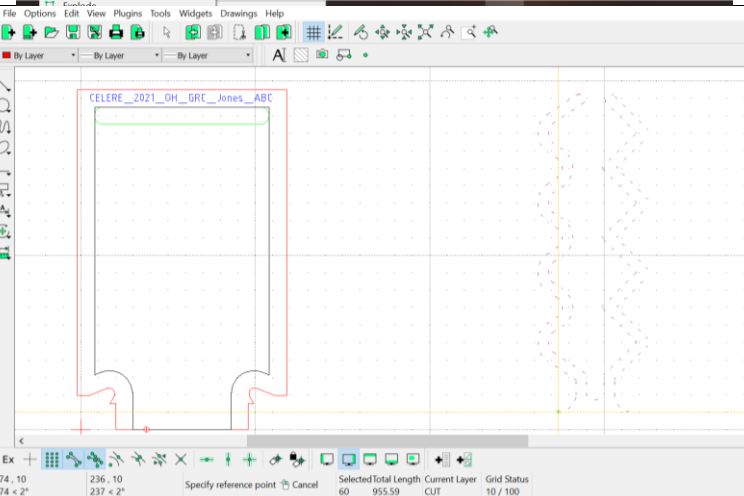
Again, highlight the block that contains the two channels.



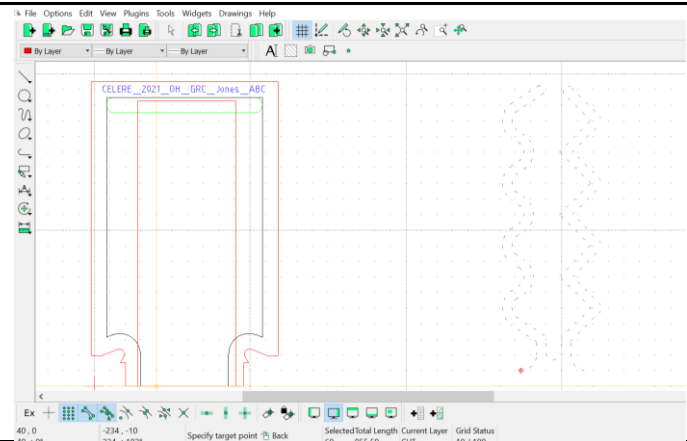
In the menu on the left, select the move/copy feature.



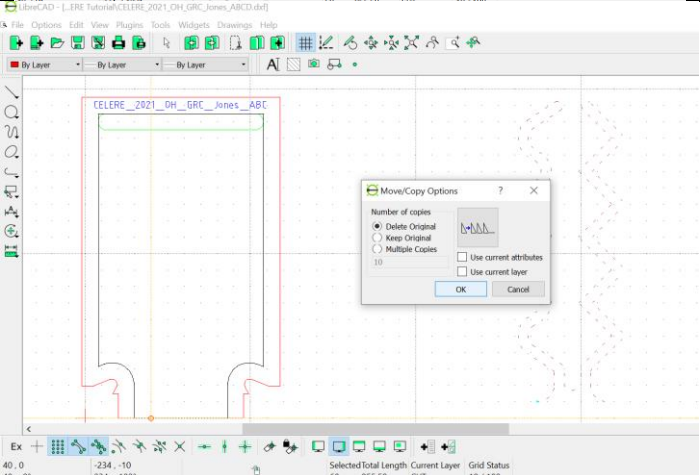
Choose the reference point to be the one of the endpoints on the bottom curves. For this demonstration the left curve was chosen.



Move the block into the center of the template. The reference point should be located one grid point away from the left side for accurate placement.

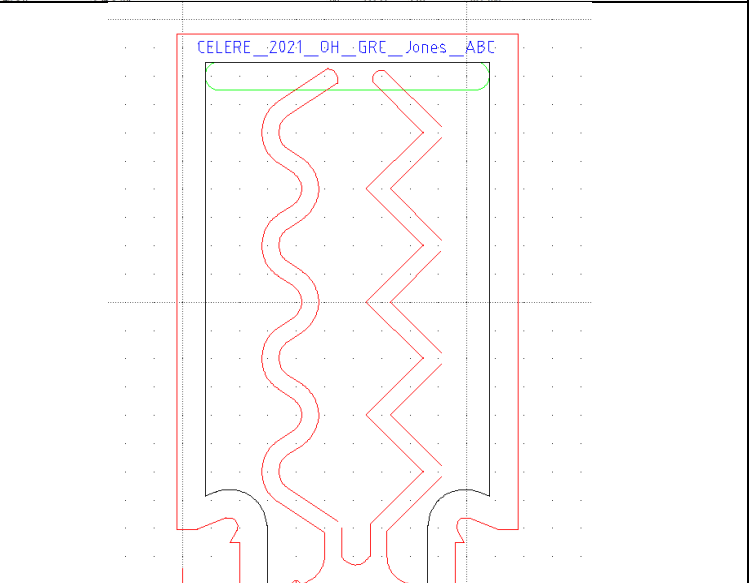


Click to place and when prompted select "Delete Original"



The channels have now moved into the test cell.

The finish product should resemble the image to the right.



Questions

As a start, please review the CELERE information available on the web at:

[CELERE - ISS Research Design Challenge](#) | [Glenn Research Center](#) | [NASA](#)

www.facebook.com/NASA.celere

For more information, please e-mail celere@lists.nasa.gov.