# TIPS and TRICKS

# A Tutorial on AppliCad's RXF File Format

This function is used to read roof and wall geometry data from other modeling programs. These would typically be from roof truss design programs.

The AppliCad RXF Format is a simple format that has been designed by AppliCad to permit Roof Plane information to be imported into the AppliCad software. As at **Version 1.0, only flat roof planes can be imported since the immediate requirement** is to be able to import roof geometry from Truss/Framing Manufacturers where these models are typically flat. Where a roof has an arc or curved plane perimeter to be imported, the current requirement is for the exporting software to triangulate the roof plane to permit it to be read into the AppliCad software.

Select the option and a dialog is displayed with a list of RXF files available to be read in. These will typically be saved from the originating program into the ..\User folder so they are easy to find.
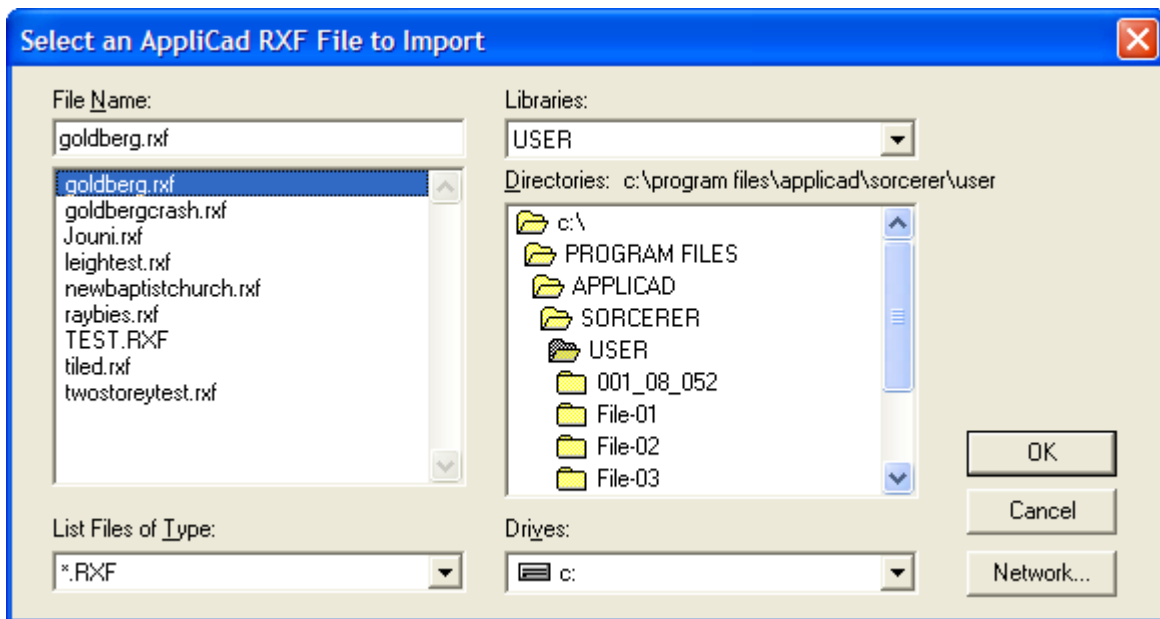
Select the file you wish to read in and then select OK. The roof geometry is re-constructed from the data file with all the line tags as defined by the originating program. Check the line types and then the model is then ready to be used for preparing a full and detailed estimate. The roof plane material category is indicated by the direction of the lines on the plane hatching. If the roof requires different material, use the function **Tools > Change Plane Mat** to set the material type to your requirements. This model indicates a metal roof material is selected.
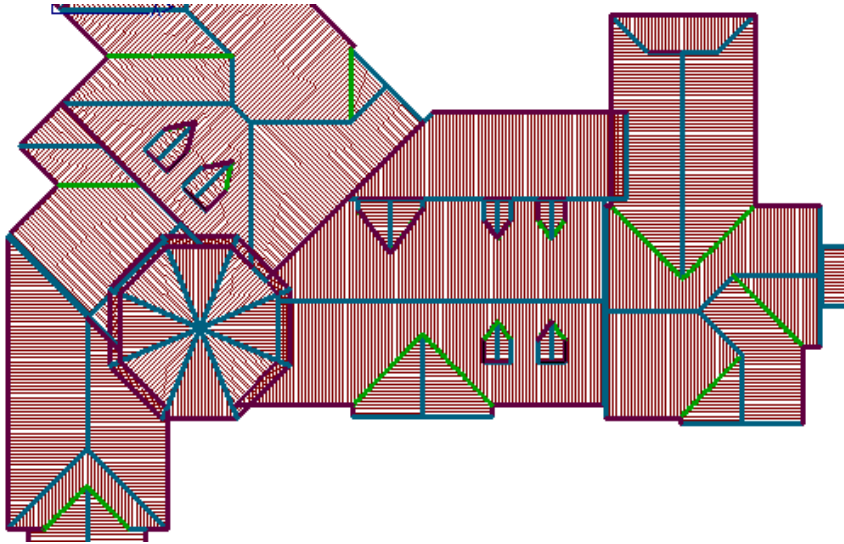
RXF File Format

The RXF format is very simple and is structured so that the model is built using the data structures native to AppliCad. The RXF file format, when completed, will contain 3 basic areas and they must be in the order specified below:

P – Point Area

All points in the model (e.g. endpoint for lines) are specified firstly. The order of these points is important, as the following 2 Areas will reference these points by their index.

L – Line Area

All lines in the model (e.g. bounding entities for roof planes). The order of the lines is also important, as the Surface Area references these lines by their index.

S – Surface Area

All surfaces / roof-planes / wall-planes in the model.

```
#RXF File - Exported from AppliCad Software
P 7000.000000 3000.000000 4905.255952
P 3000.000000 3000.000000 4905.255952
P 10300.000000 -300.000000 3000.000000
P 10300.000000 6300.000000 3000.000000
P -300.000000 6300.000000 3000.000000
P -300.000000 -300.000000 3000.000000
P 10000.000000 0.000000 3000.000000
P 10000.000000 6000.000000 3000.000000
P 0.000000 6000.000000 3000.000000
P 0.000000 0.000000 3000.000000
L 4 1 1 HIP
L 5 2 1 HIP
L 2 1 1 RIDGE
L 3 1 1 HIP
L 6 2 1 HIP
L 3 6 1 FASCIA
L 4 3 1 FASCIA
L 5 4 1 FASCIA
L 6 5 1 FASCIA
L 10 9 1 WALL
L 7 10 1 WALL
L 8 7 1 WALL
L 9 8 1 WALL
S 3 34 31 28 1 Metal
S 3 36 29 32 1 Metal
S 4 35 28 30 29 1 Metal
S 4 33 32 30 31 1 Metal
```

The software reads sequentially through the file, so it is important that entities are written to the file in their proper order and that the P, L and S areas are written in this order when specifying the file. An example of a file is shown herein, with the resultant model on the right-hand side:
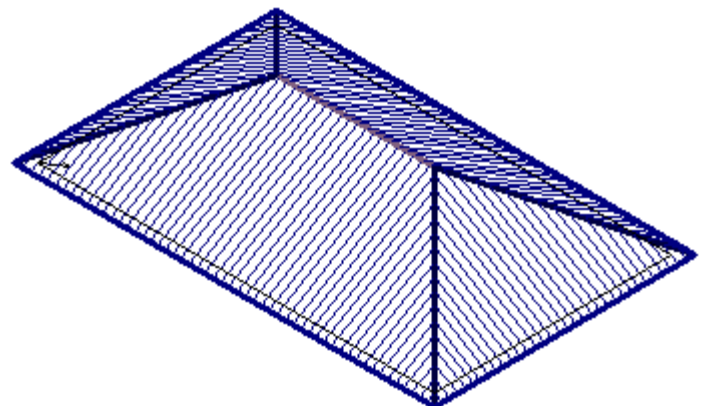
The onus is on the software developer using this method to sort the file into the structure of points, then lines and finally surface planes. See next section for a description of why this is important.

Explanation of AppliCad Surface Structure
The RXF file is formatted with points first, then lines and then surfaces because the AppliCad software follows a hierarchical structure. A line only exists because it has a point at each end. Therefore, the 2 points must be defined in the file prior to the line being defined. Similarly, a surface plane exists because it is bounded by co-planar lines. If any of the lines are not defined before the surface plane, then the surface plane cannot exist. Furthermore, if any of the planes do not lie in the plane, the surface plane will not be correctly inserted.
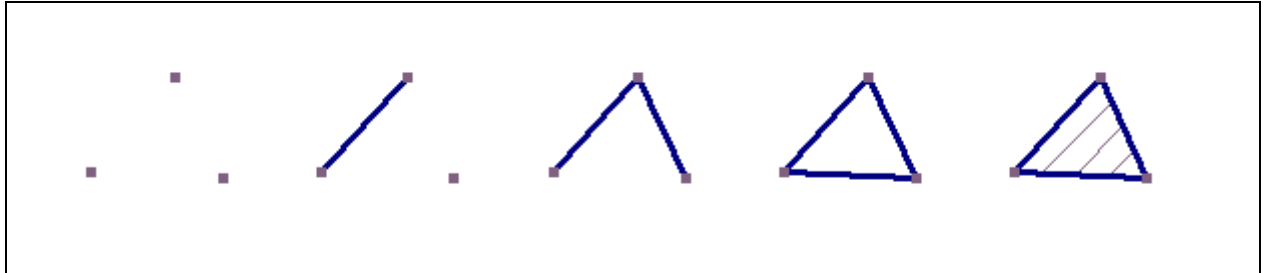
Points are inserted, then lines and then finally the surface plane. On larger models you will actually see this occur as the data is imported.

Structure of Each Data Type
Only 4 line types are allowed in the RXF file, comprising 3 data types and comment lines. These 4 options are now explained in detail.

 # - Comment Line
> Any line within the file can be prefixed with a '#' symbol to comment that line out. Multiple lined comments must have each line prefixed with a '#' (hash) symbol. This is the ASCII symbol for "number" and has a Decimal value of 35, Hex value of 23.
> Example: #This is a comment line
>   #So is this

P – Point Type
> **Syntax: P X Y Z**
> > P : single character 'P'
> > X, Y, Z : double-precision floating point constants

> **Explanation**
> > A point is specified by the 'P' character, followed by 3 coordinates representing the x, y and z components of the point. The x, y and z coordinate values are expected to be floating-point numbers, and can be specified to any accuracy. Each coordinate is to be separated from the previous piece of information by a "space" (ASCII Dec 32, Hex 20) character.

> **Example**
> > P 1000.000000 2000.000000 3125.187876
> > P 2414.312167 3414.312167 4657.935421

L – Line Type
> **Syntax: L i1 i2 storey linetype**
> > L : single character 'L'
> > i1, i2 : integer constants
> > storey : integer constant
> > line-type : string constant

Explanation

A line is specified by the 'L' character, followed by the indexes to 2 points, previously specified in the file. Following the 2 indexes, then the storey of the line is specified and finally a string of characters representing the line "type".

i1, i2

When points are specified within the RXF file, their order in the file dictates their "index" to the AppliCad RXF File reading code. Thus, the first point-type read will have index 1, the second point will have index 2 and so on. These index values are then used to specify the 2 points between which the line is defined. Thus, for obvious reasons, the points must be specified firstly in the file and their order noted to allow the line to be specified. This is most easily done using a linked-list structure or a variable-length array with some code written to store or retrieve the index of each point when required.

The 2 indexes should be specified as integer constants and be separated by a "space" (ASCII Dec 32, Hex 20) character.

storey

The storey of the line is used by the AppliCad software to determine whether the line being specified is part of a second-storey, third-storey roof etc. The AppliCad software permits up to 10 storeys to be specified per roof. If more than this number of storeys is required, it is suggested to break the roof model into 2 parts and export both parts separately. The storey value is specified as an integer value, in the range of 1 to 10 inclusive.

linetype

The linetype must be a value understood by the AppliCad software. As such, the following string constants have been defined for use within the RXF file and cover the majority of roofing and wall cladding applications.

NONE	Used generally for construction lines
RIDGE	
VALLEY	
HIP	
FASCIA	Specified for Fascia/Gutter
GABLE	Specified for a Gable/Barge line
FASCIA-BARGE	
FASCIA-ONLY	Specified where Fascia required but no Gutter
GUTTER-ONLY	Specified where Gutter required but no Fascia
BARGE-ONLY	
APRON	
TUCK-UNDER	
BOX-GUTTER	
STEP	
MONORIDGE	
<USER 1>	Must be matched to User Defined Linetype 1 under Tools Preferences.
<USER 2>	Must be matched to User Defined Linetype 2 under Tools Preferences.
<USER 3>	Must be matched to User Defined Linetype 3 under Tools Preferences.
<USER 4>	Must be matched to User Defined Linetype 4 under Tools Preferences.
DRAWING ENTITY	
WALL-BASE	
WALL-TOP	
WALL-CORNER	
WINDOW-HEAD	
WINDOW-SILL	
DOOR-HEAD	
DOOR-EDGE	

For further explanations of the roof geometry line-types above and their use within the software, refer to the AppliCad Reference Manual.

Example

```
P 1000.000000 2000.000000 3125.187876
P 2414.312167 3414.312167 4657.935421
L 1 2 1 HIP
```

S – Surface Type

Syntax: S numindexes i1 i2….i<n> storey surfacetype

S : single character 'S'
numindexes : integer constant
i1, i2…i<n> : integer constants
storey : integer constant
surfacetype : string constant

Explanation

A Surface is specified by the 'S' character, followed by a number representing the number of lines bounding the surface plane. The indexes to each line are then listed, followed by a number representing the storey and finally the surfacetype.

numindexes

Each surface is bounded by a number of lines. This integer constant tells the RXF File Reader how many line indexes to expect in the string following this value.

i1, i2…i<n>

When lines are specified within the RXF file, their order in the file dictates their "index" to the AppliCad RXF File reading code. Thus, the first line-type read will have index 1, the second line will have index 2 and so on. These index values are then used to define the boundary of the surface. Thus, for obvious reasons, the lines must be specified firstly in the file and their order noted to allow the surface to be specified. This is most easily done using a linked-list structure or a variable-length array with some code written to store or retrieve the index of each point when required.

The indexes should be specified as a list of integer constants each separated by a "space" (ASCII Dec 32, Hex 20) character. The number of integers specified must match the numindexes value.

The lines bounding the surface must be co-planar, form a loop and be provided in order. If the lines specified are not co-planar, do not form a loop or the indexes are specified out of order then the result may be an incorrect surface or the surface not being inserted at all.

storey

The storey of the surface is used by the AppliCad software to determine whether the surface being specified is part of a second-storey, third-storey roof etc. The AppliCad software permits up to 10 storeys to be specified per roof. If more than this number of storeys is required, it is suggested to break the roof model into 2 parts and export both parts separately. The storey value is specified as an integer value, in the range of 1 to 10 inclusive.

surfacetype

The surfacetype specifies the cladding type to be applied to the surface. This value must be specified as a string constant and can be any of the following values.

NONE	*Use this if cladding type is not to be specified*
Metal	*Metal Roofing (Long-Run / Strip Roofing)*
Tiles	*Tiled Roofing (Mosaic Covering)*
Shingles	*Shingle Roofing (Mosaic Covering)*
Shakes	*Shake Roofing (Mosaic Covering)*
Low-Slope	*Industrial Roofing (Asphalt, Strip-Roll, BUR, Single/Multi Ply etc.)*

**The string constants specified here are case-sensitive.**

Example
```
#Produces Simple Double-Gable Roof
P 0.000000 0.000000 0.000000
P 0.000000 3000.000000 0.000000
P 5000.000000 3000.000000 0.000000
P 5000.000000 0.000000 0.000000
P 0.000000 1500.000000 866.025433
P 5000.000000 1500.000000 866.025433
L 1 5 1 GABLE
L 2 5 1 GABLE
L 2 3 1 FASCIA
L 3 6 1 GABLE
L 4 6 1 GABLE
L 4 1 1 FASCIA
L 5 6 1 RIDGE
S 4 1 7 5 6 1 Metal
S 4 3 4 7 2 1 Metal
```
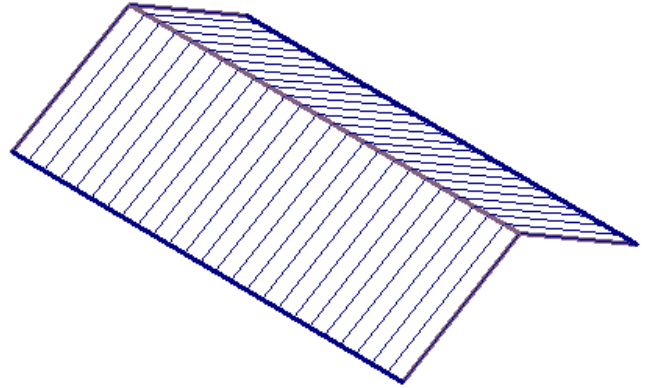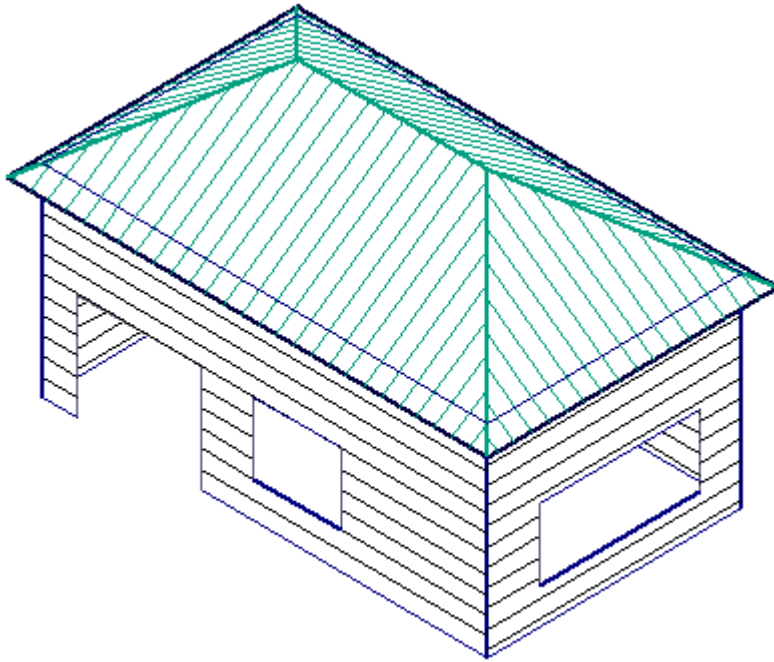
Walls
If you export walls, then openings (holes) can be added by incorporating a 0 into the loop of the entities making up the outline. For instance:
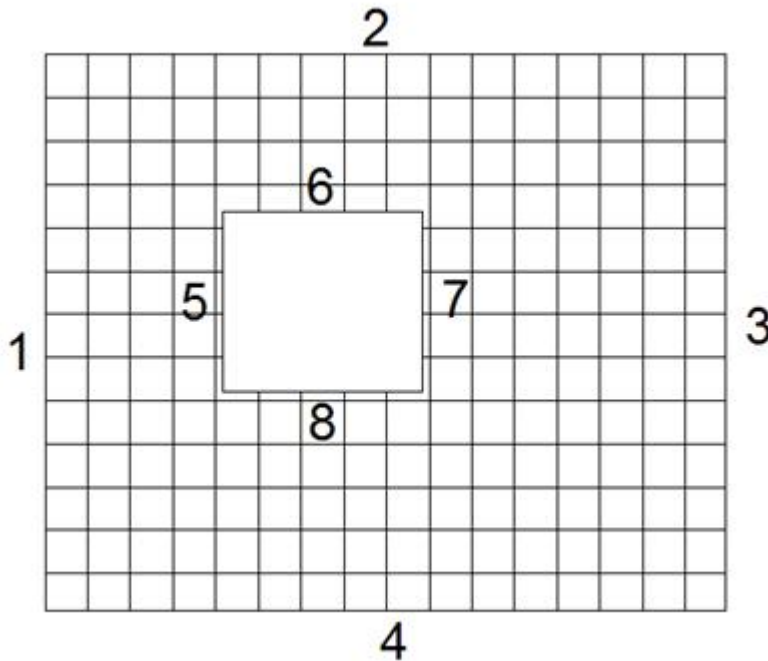
In the above example, you would output "S 9 1 2 3 4 0 5 6 7 8 1 Metal".

The numbers are the example, 1,2,3,4 being the outer loop, 5,6,7,8 being the inner loop. The 0 is the separator.

For this roof and wall system, the following RXF file is created:

```
#RXF File - Exported from AppliCad Software
#Lines marked thus are comment lines and can be placed
anywhere in the file
#The following items marked P are point definitions with x,
y, z dimensions following
P -1087.500000 -347.129506 1800.002261
P -2587.500000 -347.129506 1800.002261
P -2587.500000 -347.129506 600.002261
P -2587.500000 -347.129506 600.002261
P 1405.500000 3302.870494 1800.002261
P 1405.500000 552.870494 1800.002261
P -2040.602953 -1347.129506 1899.594760
P -5587.500000 -347.129506 1800.002261
P -3487.500000 -347.129506 1800.002261
P -3487.500000 -347.129506 0.002261
P -5587.500000 -347.129506 0.002261
P -2391.000000 5026.870494 1705.032261
P -2391.000000 4026.870494 1705.032261
P -2391.000000 4026.870494 1705.032261
P -2391.000000 4026.870494 1705.032261
P 2405.500000 1814.869638 1848.511604
P 1405.500000 1814.869638 1848.511604
P -1087.500000 -347.129506 600.002261
P 1405.500000 4026.870494 0.002261
P 1405.500000 4026.870494 0.002261
P 1405.500000 4026.870494 3410.062261
P -2040.602953 -347.129506 1899.594760
P 1405.500000 3302.870494 600.002261
P 1405.500000 552.870494 600.002261
P 1405.500000 -347.129506 0.002261
P 1405.500000 -347.129506 0.002261
P 1405.500000 -347.129506 3410.062261
P -7187.500000 1839.870494 1705.032261
P -6187.500000 1839.870494 1705.032261
P -6187.500000 4026.870494 0.002261
```

```
P -6187.500000 -347.129506 0.002261
P -6187.500000 4026.870494 3410.062261
P -781.500000 1839.870494 4941.416137
P -6187.500000 -347.129506 3410.062261
P -4000.500000 1839.870494 4941.416137
P 1705.500000 -647.129506 3200.000000
P 1705.500000 4326.870494 3200.000000
P -6487.500000 4326.870494 3200.000000
P -6487.500000 -647.129506 3200.000000
P 1405.500000 -347.129506 3200.000000
P 1405.500000 4026.870494 3200.000000
P -6187.500000 4026.870494 3200.000000
P -6187.500000 -347.129506 3200.000000
P -6187.500000 -347.129506 3200.000000
#The following items marked L are line definitions, all
planes must be bounded by lines.
#Point indexes based on order of points above then follow and
then the storey number and
#finally a specified line tag typ. See documentation for
valid line types.
L 18 3 1 WINDOW-SILL
L 1 18 1 WINDOW-EDGE
L 2 1 1 WINDOW-HEAD
L 3 2 1 WINDOW-EDGE
L 24 23 1 WINDOW-SILL
L 6 24 1 WINDOW-EDGE
L 6 24 1
L 6 24 1
L 11 31 1 WALL-BASE
L 25 10 1 WALL-BASE
L 8 11 1 DOOR-EDGE
L 9 8 1 DOOR-HEAD
L 10 9 1 DOOR-EDGE
L 19 30 1 WALL-BASE
L 32 21 1 WALL-TOP
L 25 19 1 WALL-BASE
L 19 21 1 WALL-CORNER
L 21 27 1 WALL-TOP
L 23 5 1 WINDOW-EDGE
L 5 6 1 WINDOW-HEAD
L 25 27 1 WALL-CORNER
L 27 34 1 WALL-TOP
L 30 31 1 WALL-BASE
L 30 32 1 WALL-CORNER
L 31 34 1 WALL-CORNER
L 34 32 1 WALL-TOP
L 37 33 1 HIP
L 38 35 1 HIP
L 35 33 1 RIDGE
L 36 33 1 HIP
L 39 35 1 HIP
L 36 39 1 FASCIA
L 37 36 1 FASCIA
L 38 37 1 FASCIA
L 39 38 1 FASCIA
L 43 42 1 WALL
L 40 43 1 WALL
L 41 40 1 WALL
```

```
L 42 41 1 WALL
#The following items marked S are surface plane definitions,
all planes must be bounded by lines.
#The number of lines is then specified, then the storey
number and finally a list if line indexes
#defining the plane boundary. The index of 0 is used to
define a loop.
S 4 32 31 29 30 1 Metal
S 4 34 27 29 28 1 Metal
S 3 35 28 31 1 Metal
S 3 33 30 27 1 Metal
S 4 26 25 23 24 1 Metal
S 9 18 17 16 21 0 5 6 20 19 1 Metal
S 4 15 24 14 17 1 Metal
S 13 21 22 25 9 11 12 13 10 0 1 2 3 4 1 Metal
```

All roof and wall entities are described and the correct attributes applied.

The line in bold above (`S 9 18 17 16 21 0 5 6 20 19 1 Metal`) is the line that describes the wall area.

END OF DOCUMENT

```
L 42 41 1 WALL
#The following items marked S are surface plane definitions,
all planes must be bounded by lines.
#The number of lines is then specified, then the storey
number and finally a list if line indexes
#defining the plane boundary. The index of 0 is used to
define a loop.
```