



IMAGE BY DANIEL WIDRIG

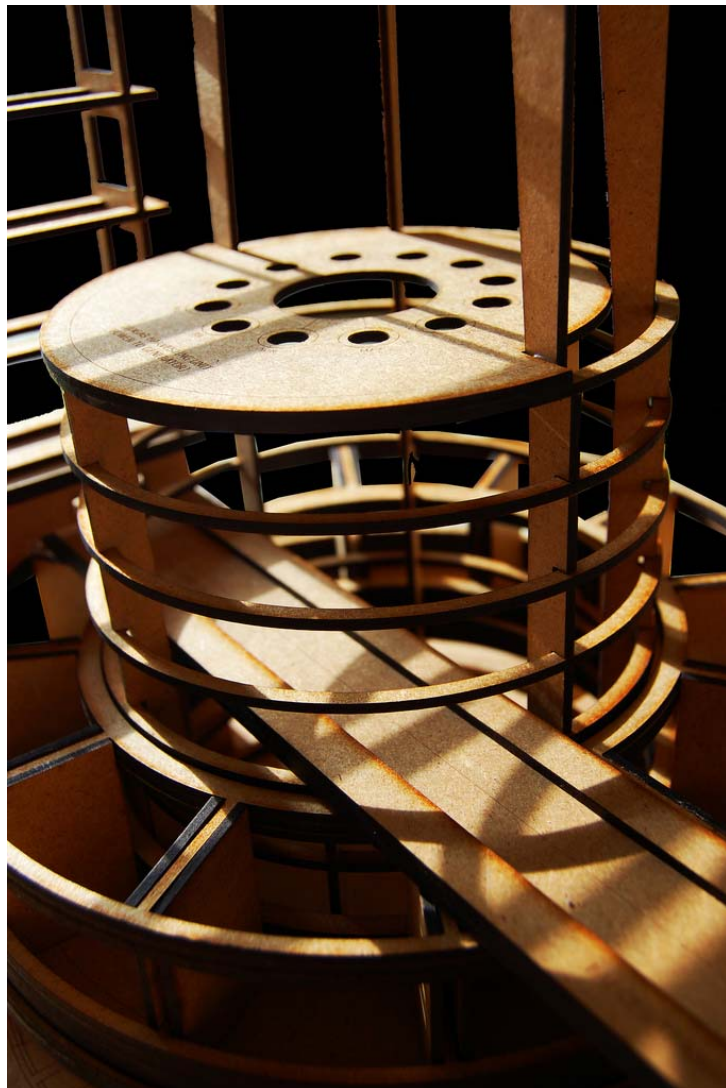
LASER CUTTING INDUCTION

ANTONIO PASSARO

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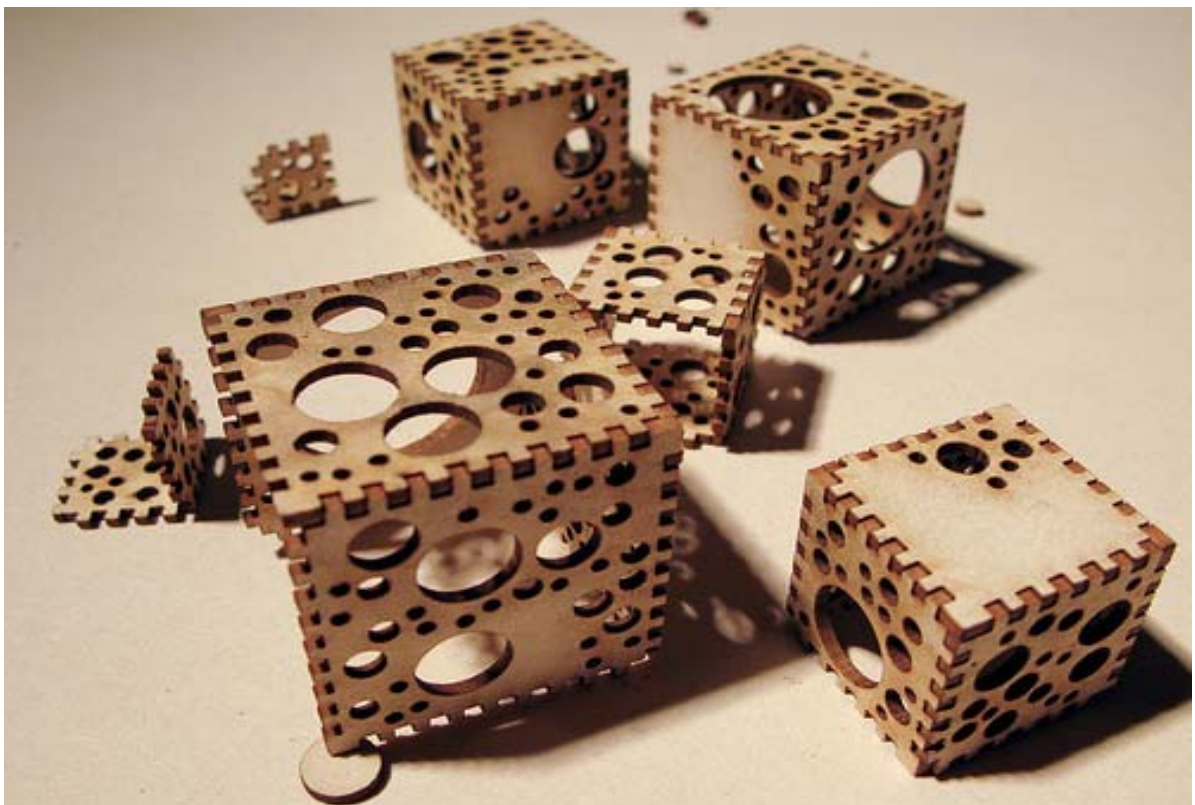
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1. INTRODUCTION

THE LASER CUTTER HAS ONE PRIMARY FUNCTION AND THAT IS TO CUT SHEET MATERIAL. THIS MEANS THAT THE MOST DIFFICULT TASK MAY IN FACT BE TO WORK OUT HOW YOUR MODEL CAN BE REDUCED TO A FLAT CUTTING PATTERN. THE LASER CUTTER CAN, HOWEVER ALSO BE USED TO ETCH THE SURFACE OF THE MATERIAL OR TO SEMI-CUT (OR SCORE) THE SURFACE. IT CUTS LINES, SHAPES AND PATTERNS AND SO ON. LASER CUTTING IS USED TO PERFORM A VARIETY OF CUTTING TASKS, AND IT IS IDEAL FOR CURVED SHAPES, INTRICATE STRUCTURAL SYSTEMS, AND DELICATE DETAILS. IT CAN ALSO SPEED THE PROCESS OF MAKING BASE MODELS, SITE MODELS, AND A VARIETY OF OTHER ARCHITECTURAL MODEL PARTS AND PIECES.

ADVANTAGES OF LASER CUTTING OVER MECHANICAL CUTTING VARIES ACCORDING TO THE SITUATION, BUT TWO IMPORTANT FACTORS ARE THE LACK OF PHYSICAL CONTACT AND TO SOME EXTENT PRECISION (SINCE THERE IS NO WEAR ON THE LASER). THERE IS ALSO A REDUCED CHANCE OF WARPING THE MATERIAL THAT IS BEING CUT, AS LASER SYSTEMS HAVE A SMALL HEAT-AFFECTED ZONE. SOME MATERIALS ARE ALSO VERY DIFFICULT OR IMPOSSIBLE TO CUT BY MORE TRADITIONAL MEANS. OUR LASER CUTTER USES A METHOD OF CUTTING KNOWN AS VECTOR CUTTING WHICH MEANS THAT THE LASER FOLLOWS THE THIN LINES IN YOUR DESIGNS, CUTTING RAPIDLY AND EFFICIENTLY SAVING TIME AND MONEY;



2. MATERIALS

MORE OR LESS ANY MATERIAL THAT CAN BE BURNT CAN ALSO BE CUT IN THE LASER CUTTER. MATERIALS THAT ARE TYPICALLY USED ARE, FOR EXAMPLE, PAPER, CARDBOARD, FABRIC, ACRYLIC, PLYWOOD AND MDF. VARIOUS PAPERS AND CARDBOARDS ARE AVAILABLE TO BUY FROM THE CAMPUS BOOKSHOP; MDF AND THIN PLYWOOD CAN BE OBTAINED FROM THE CAMPUS WORKSHOPS. IF YOU WISH TO USE PLASTIC, IT IS BEST TO BUY ACRYLICS, WHEN BURNT MATERIALS SUCH AS PVC GIVE OFF POISONOUS AND CORROSIVE GASES, IT IS THEREFORE IMPORTANT TO KNOW WHAT THE MATERIAL YOU PLAN TO CUT IS MADE OF. IF YOU ARE NOT SURE DON'T USE IT. OTHER PLASTICS SUCH AS STYRENE STOCKED BY THE WORKSHOP ARE NOT SUITABLE FOR LASER CUTTING BECAUSE THEY HAVE A LOW MELTING POINT.

THE QUALITY AND SPEED OF THE CUT IS RELATED TO THE MATERIAL THICKNESS. REALISTICALLY THE MAXIMUM THICKNESS THE MACHINE CAN CUT IS ABOUT 6 MM, HOWEVER, DUE TO A HIGH DEMAND ON LASER CUTTING WE ONLY ALLOW MATERIALS UP TO 4 MM WHICH TAKES QUITE A LONG TIME TO CUT, SO PLEASE BE SENSIBLE WHEN CHOOSING YOUR MATERIALS.

IT IS NOT POSSIBLE TO CUT ANY KIND OF METAL IN THE LASER CUTTER, THIS IS PARTLY BECAUSE THE LASER BEAM WILL BE REFLECTED BY THE METAL, AND THIS RESTRICTION THEREFORE APPLIES TO ALL REFLECTIVE MATERIALS.

THE MAXIMUM MATERIAL SIZE THAT CAN FIT IN THE MACHINE IS 730MM X 430MM. HOWEVER, YOU CAN USE ANY SIZE OF MATERIAL AS LONG AS IT IS SMALLER THAN THE MAXIMUM.

ALLOWED MATERIALS

CARDBOARD: VERY GOOD RESULT

PAPER: VERY GOOD RESULT

WOOD / VENEERS: QUALITY DEPENDING OF DENSITY

PLYWOOD: LONG CUTTING TIME TRY TO AVOID

ACRYLICS: LONG CUTTING TIME TRY TO AVOID

MDF: LONG CUTTING TIME TRY TO AVOID



NOT ALLOWED MATERIALS

STYROFOAM, FOAMBOARD (TOXIC)

GLASS

PVC (CONTAIN TOXIC SUBSTANCE)

ANY MATERIAL THICKER THAN 4 MM



3. PREPARING THE DRAWING

THE CUTTING PATTERN FOR THE LASER CUTTER IS BASED ON A 2D DRAWING. ESSENTIALLY THIS CAN BE DRAWN IN ANY VECTOR-DRAWING APPLICATION, SUCH AS AUTOCAD, MICROSTATION, ILLUSTRATOR OR VECTORWORKS (FROM VECTORWORKS EXPORT AS DXF). EXCEPTIONALLY, ETCHING CAN BE DONE FROM AN IMAGE. THE WAY THE DRAWING IS INTERPRETED WILL VARY FROM ONE APPLICATION TO ANOTHER. IT IS THEREFORE ESSENTIAL TO STRUCTURE YOUR DRAWING IN A SYSTEMATIC WAY.

THE CUTTING ORDER IS VERY IMPORTANT, FOR EXAMPLE, IF A SHAPE IS TO BE CUT AND THAT SHAPE HAS A HOLE IN IT, THE HOLE SHOULD BE CUT BEFORE THE OUTLINE OF THE SHAPE, THAT IS BECAUSE ONCE CUT THE SHAPE BECOMES LOOSE AND MIGHT MOVE SLIGHTLY AND IF THAT HAPPENS THE HOLE WOULD NOT BE CUT ON THE CORRECT POSITION. SMALL PIECES CAN MOVE INSIDE THE LASER CUT AND THAT IS BECAUSE OF THE FUME EXTRACTOR AS WELL AS THE HIGH PRESSURE PUMP BLOWING THE SMOKE OUT OF THE LASER CUTTING LINE.

IF YOU WANT TO ETCH USE BLACK (FOR TEXT), IF YOU WANT TO SCORE THE MATERIAL USE RED, FOR CUTTING USE BLUE, PRUSSIAN, CYAN AND GREEN. (PLEASE SEE DIAGRAM 01).

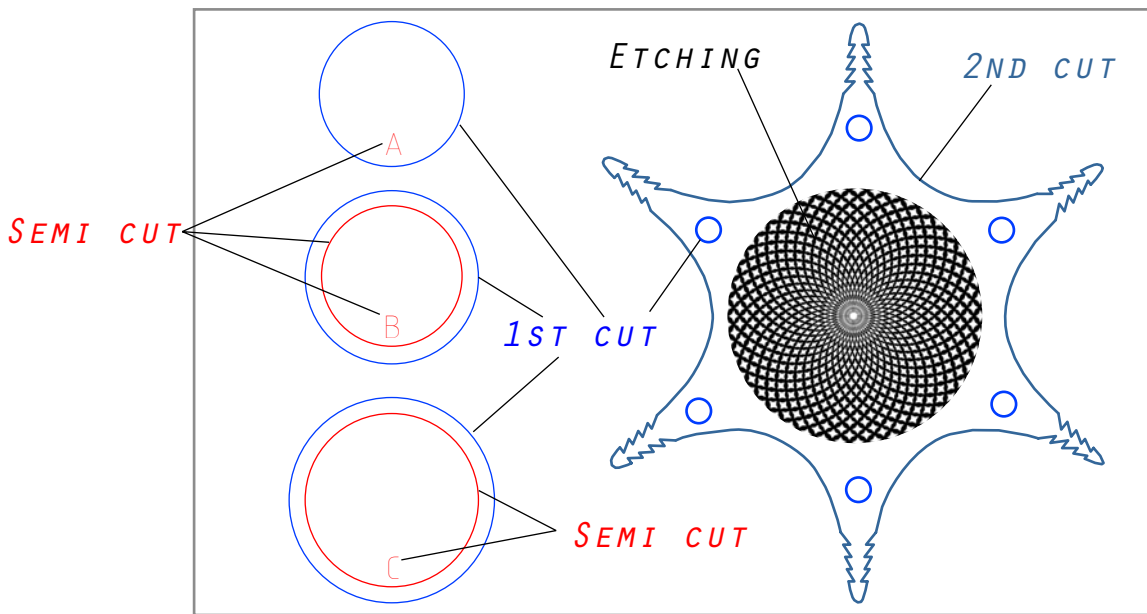
IN ANY CASE ETCHING IS VERY SLOW, VERY TIME CONSUMING, TRY TO ETCH TO A MINIMUM, IF POSSIBLE; DON'T USE ETCHING AT ALL. IF YOU HAVE TO MARK YOUR CUTTING PIECES WITH NUMBERS/LETTERS OR IF YOU NEED TO ADD LINES TO GUIDE THE ASSEMBLING PROCESS OF YOUR MODEL, PLEASE USE SEMI-CUT. (FOR SEMI-CUT TEXT USE ISO FONT ONLY)

THERE ARE TWO MANDATORY STEPS ON THE PROCESS OF PREPARING YOUR DRAWING:

1. TO USE LAYERS TO SEPARATE ETCHING, SEMI-CUTTING AND CUTTING ORDER. THE LASER CUTTER WORKS WITH THE LAYER/COLOR SYSTEM AND WILL FOLLOW THE CUTTING ORDER AS SHOWN BELOW:

2. THE MOST IMPORTANT THING IS TO HAVE A "NEAT AND CLEAN" DRAWING. IF YOU FOR EXAMPLE, HAVE LINES ON THE TOP OF EACH OTHER THE MACHINE WILL RUN OVER AND OVER THOSE LINES, AND THAT WILL NOT ONLY BURN YOUR MATERIAL MAKING IT USELESS BUT WILL ALSO INCREASE THE CUTTING TIME QUITE A LOT. IS VERY IMPORTANT TO HAVE JUST ONE CUTTING LINE.

3. PREPARING THE DRAWING

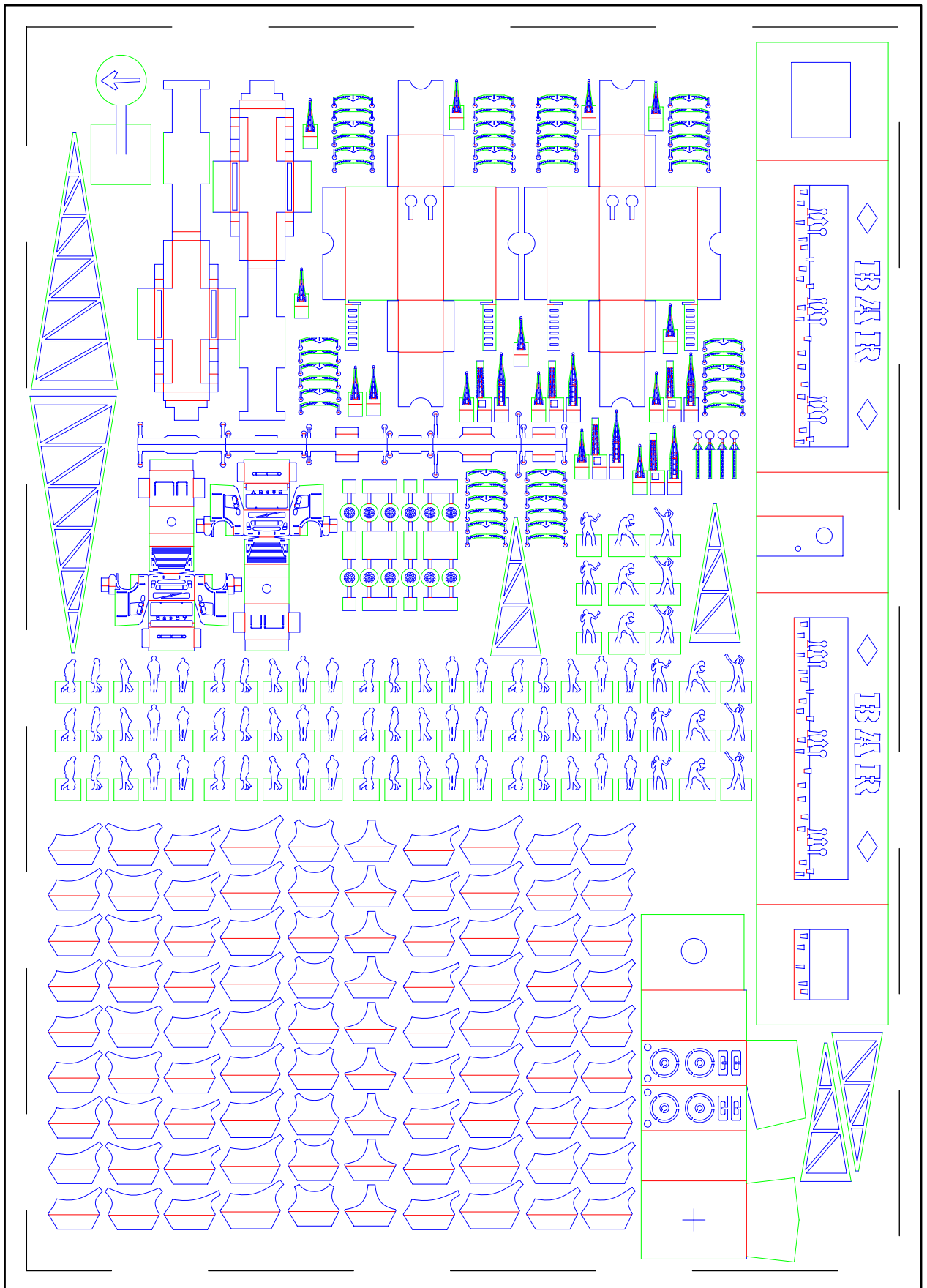


CUTTING ORDER	LAYER	COLOR	RGB	CUTTING TYPE
1	LAYER 1	BLACK	RGB 255/255/255	RASTER/ETCH
2	LAYER 2	RED	RGB 255/0/0	SEMI-CUT/SCORE
3	LAYER 3	BLUE	RGB 0/0/255	1ST CUT
4	LAYER 4	PRUSSIAN	RGB 51/102/153	2ND CUT
5	LAYER 5	CYAN	RGB 0/255/255	3RD CUT
6	LAYER 6	GREEN	RGB 0/255/0	4TH CUT

DIAGRAM 01

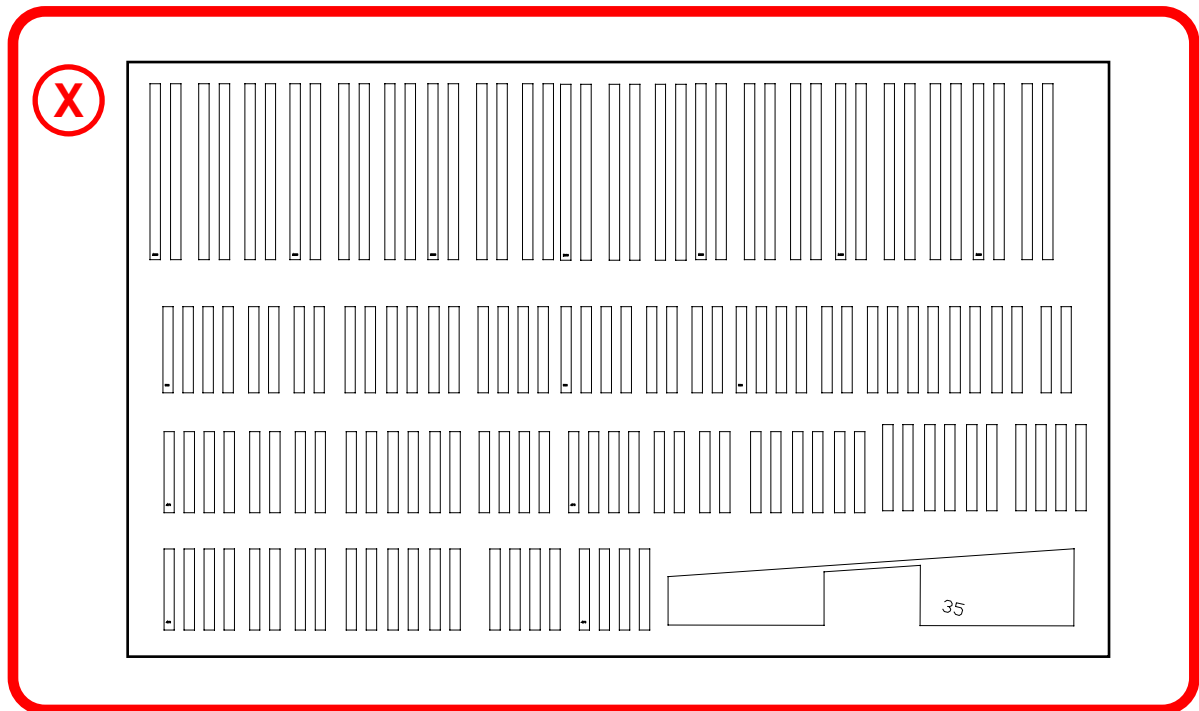
IMPORTANT NOTE : IT IS RESPONSIBILITY OF THE STUDENTS TO MAKE SURE THEIR DRAWINGS ARE READY FOR LASER CUTTING. ADVICE ON HOW TO SETUP THE DRAWINGS CAN AND WILL BE GIVEN OUT OF THE LASER CUTTING SESSION HOURS. THE TECHNICIAN HAS THE RIGHTS TO REFUSE ANY DRAWINGS THAT ARE NOT READY FOR LASER CUTTING, AS WELL AS STOP THE MACHINE IF THE DRAWING HAS DUPLICATE LINES, THIS IS BECAUSE IT IS IMPOSSIBLE TO ESTIMATE HOW MANY LINES ARE DUPLICATE AND THE LASER CUTTER COULD TAKE TWICE THE TIME TO LASER CUT A SIMPLE TASK.

4. EXAMPLES OF DRAWINGS

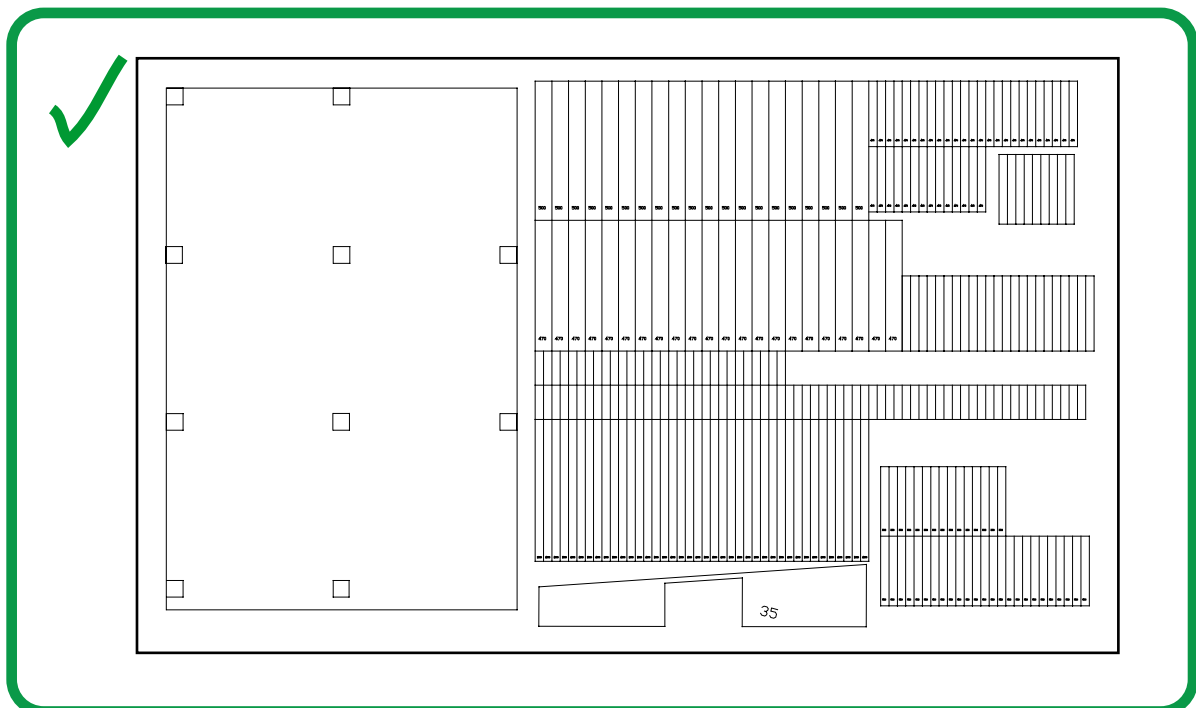


GOOD- All cutting pieces in correct layers and drawing size correspond to cutting material

4. EXAMPLES OF DRAWINGS



THE DRAWING ABOVE SHOWS HOW YOU SHOULD NOT SETUP YOUR DRAWINGS, NOT ONLY HAS A LOT OF MATERIAL WASTAGE BUT ALSO INCREASES THE CUTTING TIME BY ALMOST 2X, BY CUTTING UNNECESSARY LINES.



THIS DRAWING IS A VERY GOOD EXAMPLE HOW YOUR SHOULD SETUP YOUR DRAWINGS. IT MAKES MORE USE OF THE SHEET MATERIAL AND SHARES A LOT OF CUTTING LINES BETWEEN PIECES. COMPARING THE TWO DRAWINGS ABOVE, THIS SECOND ONE WAS CUT FASTER THAN THE TOP ONE, EVEN WITH QUITE A LOT OF MORE PIECES ON IT.

5. SUPPLIERS LIST

TIMBER:

1. UNIVERSITY'S WORKSHOP
2. 4D MODELSHOP
THE ARCHES
120 LEMAN STREET, LONDON, E1 8EU
020 7264 1288 WWW.MODELSHOP.CO.UK

ACRYLIC:

1. HAMARACRYLIC
238-240 BETHNAL GREEN ROAD
LONDON, E2 0AA
020 77398563 WWW.HAMARACRYLIC.CO.UK
2. 4D MODELSHOP

CARDBOARD / PAPER

1. UNIVERSITY'S BOOKSHOP
2. LONDON GRAPHIC CENTRE
16-18 SHELTON STREET,
COVENT GARDEN, LONDON. WC2H 9JL
TEL: 020 7759 4500 WWW.LONDONGRAPHICS.CO.UK
3. 4D MODELSHOP
4. ATLANTIS ARTSHOP
7-9 PLUMBERS ROW
SHADWELL, LONDON, E1 1EQ
020 73778855 WWW.ATLANTISART.CO.UK

6. GENERAL NOTES

- *CUTTING IS FREE TO STUDENTS AS LONG AS THEY ARE REGISTERED AND USES THE CORRECT LAYERS AND TEMPLATES.*
- *STUDENTS WILL NEED TO SIGN UP ON THE WEBSITE. THE SYSTEM WILL CREATE A LIST AND STUDENTS WILL RECEIVE A EMAIL WITH THEIR SESSION DATE. THERE ARE NO PRIOR APPOINTMENTS/ARRANGEMENTS FOR THE USE OF THE LASER CUTTER.*
- *ON THE DAY OF YOUR SESSION YOU WILL NEED TO BRING YOUR FILES AND MATERIALS READY TO LASER CUT NO LATER THAN 10:00 AM.*
- *STUDENTS NEED TO DOWNLOAD AND USE THE LASER CUTTING TEMPLATE FILES PROVIDED WITH THE CORRECT LAYER SYSTEM, NO FILES WILL BE ACCEPTED IF THEY ARE NOT CORRECTLY SET UP.*
- *STUDENTS WILL NEED TO CUT THEIR MATERIALS TO MATCH THE SIZES ON THE DRAWING.*
- *IF YOU ARE NOT READY TO LASER CUT, FOR ANY REASON, PLEASE DON'T SIGN UP ON THE WEBSITE, YOUR NAME WILL NOT BE TRANSFERRED TO THE FOLLOWING SESSION'S LIST.*
- *PLEASE BE SENSIBLE AND RESPECTFUL TO YOUR COLLEAGUES, IF YOU ARE JUST TESTING SOMETHING ON THE LASER CUTTER TRY TO KEEP TO A MINIMUM, DON'T FILL MANY SHEETS OF MATERIAL IF YOU ARE NOT SURE IF YOU WILL END UP USING IT.*
- *IF POSSIBLE TRY TO USE FAST CUTTING MATERIALS SUCH AS CARD AND AVOID USING ANY MATERIAL THICKER THAN 3MM.*
- *FILES NEED TO BE READY FOR LASER CUTTING AS PER INSTRUCTIONS GIVEN, IF YOU ARE NOT SURE ABOUT SOMETHING PLEASE COME AND GET ADVICE PRIOR TO THE SESSION, WE CAN'T BLOCK THE LASER CUTTER TO SORT DRAWING ISSUES DURING THE SESSIONS.*
- *DUE TO A HIGH DEMAND ON LASER CUTTING, NO FILES OR CUTTING MATERIALS WILL BE STORED IN ADVANCE, YOU WILL HAVE TO BRING IN YOUR FILES AND MATERIALS ONLY ON THE DAY OF THE SESSION.*

7. EXTERNAL LINKS

WWW.DWORKSHOP.ORG

WWW.OPENSTUDIOWESTMINSTER.ORG

WWW.THEVERYMANY.NE

WWW.INTERACTIVEARCHITECTURE.ORG

WWW.TAMASOFT.CO.JP/PEPAKURA-EN/

WWW.IAAC.NET

WWW.FLICKR.COM/GROUPS/DIGITALFABRICATION/

WWW.GENERATORX.NO/CATEGORY/DIGITAL-FABRICATION/

WWW.I-M-A-D-E.ORG/

8. HEALTH & SAFETY

IN THE CASE OF AN EMERGENCY PLEASE CALL 5555.

REPORT ANY ACCIDENTS, SPILLAGES OR BREAKAGES TO THE TECHNICIAN ASAP.

MODEL MAKING IS AN ENJOYABLE HOBBY BUT, LIKE ANY ACTIVITY THAT INVOLVES TOOLS AND CHEMICALS, IT CAN PRESENT DANGERS IF PRECAUTIONARY ADVICE IS IGNORED. ALWAYS FOLLOW DIRECTIONS, INSTRUCTIONS AND HEALTH AND SAFETY ADVICE GIVEN.

PROTECT YOUR EYES WITH SAFETY GOGGLES IF NECESSARY.

DUST FROM CUT MATERIALS AND FUMES CAN BE HARMFUL IF INHALED. WORK IN WELL VENTILATED AREAS AND USE A PROTECTIVE MASK.

WHEN USING CUTTING TOOLS ALWAYS CUT AWAY FROM THE BODY, KEEP FINGERS CLEAR OF CUTTING LINE AND STORE OLD BLADES SAFELY.

MANY MATERIALS ARE FLAMMABLE. DO NOT USE OR STORE THEM BY A HEAT SOURCE.

DO NOT USE ANY TOOLS OR MACHINERY IF YOU HAVE NOT PREVIOUSLY BEEN TRAINED BY THE TECHNICIAN TO DO SO.

IN GENERAL ACCIDENTS ARE MORE LIKELY TO HAPPEN WHEN YOU ARE DISTRACTED OR IN A RUSH, SO PLEASE TRY TO CONCENTRATE ON THE WORK YOU ARE DOING AND DON'T LEAVE YOUR WORK FOR THE LAST MINUTE.

DON'T DISPOSE ANY TOXIC SUBSTANCE OR MATERIAL IN THE TOILETS OR SINKS, THAT COULD HARM THE ENVIRONMENT, CAUSE PIPE BLOCKAGE, AS WELL AS HURT SOMEBODY.