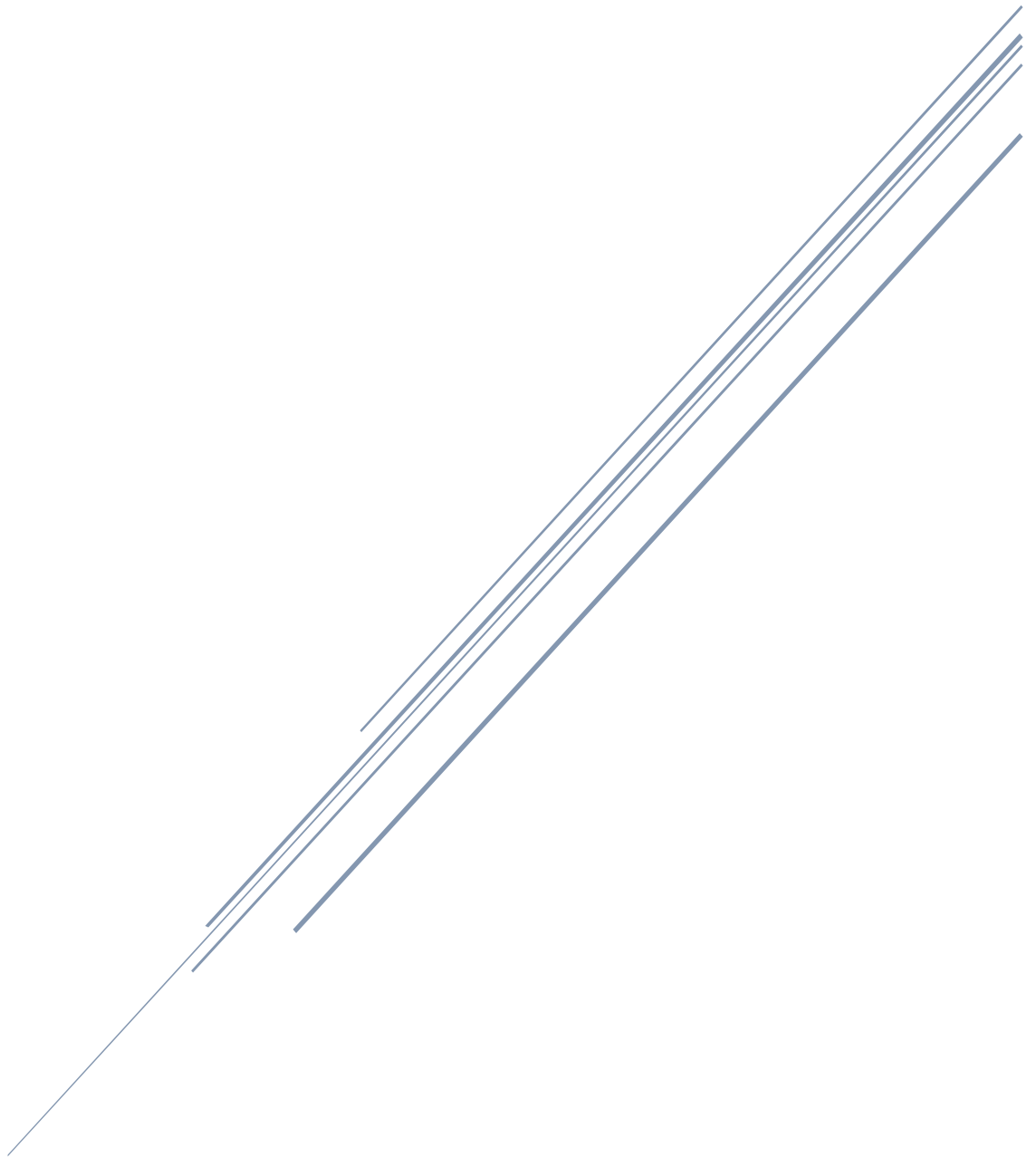


MANUFACTURING, DESIGN AND TECHNOLOGY

Precious Plastics Design Report



Michael Cheeseman (1707473)

1 Executive Summary

In this design report about the precious plastic project, the author starts with an introduction about the precious plastic project. As Precious plastic is that it is a community of people that expands the world their aim is to work within their community to “work towards a solution to plastic pollution” (Hakkins, 2013). The report will then look at the original design for the layout and the process flow, and critic it about the design and the author will look at the industrial process for a recycling plant and make a comparison between the precious plastic design and an industrial process. Once that has been completed the author will create a design specification that the design should meet. This specification will highlight what the design must be able to achieve, as well as what areas the design has to comply with. In the case of this project the health and safety of the container must take into account the BS 4163 which is the British Standards for health and safety for design and technology in educational and similar establishments. This is import as this centre should not be used if the standards are not followed. The author will then look at some concept designs for the container layouts as well as the process flow for the workspace. To ensure that the each layout is looked at properly the author will make the look at different aspects of the containers to see where they are lacking and where they are succeeding in the designs. From this point the author will look at the final design and explain in detail each part of the design. The design should be able to meet all the specification that is stated in task 2. The author will then look into the final design and critic it against the design specification. The author will then conclude this report and make suitable recommendations about this project.

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2 Introduction

As part of the Manufacturing, Design and technology module the group undertaking the module have been asked by a Local Town Council to develop a section of the open source design form an online group called Precious Plastics. On the website there are designs for four machines these are the Shredder, Extrusion, Injection moulding and Compression machine. On the website there are designs for the layout in a large shipping container (40ft x 8ft x 8.5ft).

Precious plastic is that it is a community of people that expands the world their aim is to work within their community to “work towards a solution to plastic pollution” (Hakkins, 2013). This technical report will look into the processes involved to recycle plastic as well as the layout to adapt the original layout into a suitable design for the requirements set out by the customer, in this instant a member of the local town council. The design will be based on the original open source container layout.

This report will be trying to adapt the open source design and improve it by looking into the following items.

- Process Productivity
- Process capability
- Health and Safety for the machine operators, end users and any observers for the machine
- Social Engagement and Education
- Energy usage
- Reliability

This report will be looking into the layout of the work environment of the plant in the specified plans that the client has asked for, to ensure that all four of the machines will fit into the work place required by the customer. This report will also look at the improvements that could be made to the containers if required and are suitable to the customer.

3 Findings

3.1 Task 1 Research and critically appraise the existing, open source design.

From the open source design on from the website Precious Plastics the current design does not suit the customer's needs in a few ways, this is because the customer has specific needs that the open source design will not be able to achieve. These needs are the customer needs which is what the customer wants from their design. The open source design has all the basic needs that the customer wants. The open source design consists of the following things:

- The entire process is contained within in a 40ft container.
- There is an area to do each of the actions involved within a small-scale manufacturing plant such as collecting, washing, sorting, and storing.
- There is adequate space for each of the machines including using a means of ventilation
- There is a small area to display the products when finished.
- There is means of putting power through the container.

The customer's needs are the following:

- To be able to fit all machines into Two 20ft Containers.
- For there to be a suitable process that is easy to follow.
- To allow space for notice boards behind each machine.
- Needs to be able to accommodate children within the containers and follow the Health and Safety legislations included with that.
- Needs to be as efficient as possible.
- Needs to be Safe to people to come and use.

As from the customer's needs as shown above the current precious plastics design is a good platform to build on, as it can be adapted to be used within the UK and would then be able to go through the BSI Legislations. The design can then be adapted to be able to fit into two containers.

This container can be made more efficient by changing out the 230v lights and replacing them with a set of L.E.D. light strip the reason for using LED over the standard blub is that use at least 75% less energy than standard blubs, they can last 25 times longer than standard blubs. (Department of Energy, 2014). Most LED use between 5 and 24v these would provide suitable lights for the container.

The one thing that the open source design doesn't is a safety circuit for the machines. The reason for the safety circuit is to ensure that the machines can be switched off or stop their current operation and enter a safe state this is to ensure that people are safe when operating the machine. As part of the BS 4163. Emergency stop switches should be put into rooms that house machines that run and should only be reset with a "key-operated spring return". This safety circuit shouldn't affect any critical circuits that is designed to remove hazards. (BSI, 2014)

The precious plastics layout design has all the tools required for their process to be able to fit into a 40ft container, where the customer needs to fit the contents of the 40ft container into two 20ft containers.

From the original design it is not suitable for use for an education outreach program in the UK as it wasn't designed to conform to the BS 4163 which is the Health and safety for design and technology in education and similar establishment. This British Standard is to ensure the safety of all participants is adhered to. It also doesn't have a form of LEV which is Local Exhaust Ventilation, near the end of the machine.

The original design does incorporate the basic template of the simplistic process need to be performed, to recycle waste plastic into a finished product.

If this was an industrial recycling centre, then most of the process would be automated to ensure high productivity but the automated process would only account for shredding of the plastics then into one machine only. As shown in the picture below.



Fig 1. This is a picture of an industrial process of a recycling centre. Taken from (Kingtiger, 2018)

According to (Mechanical Solutions, 2018) Recycling plants consist process flow consist of the following processes:

Process start off with the delivery of the waste material

The plastic waste is first washed to ensure the removal of contaminants from the waste material to ensure that there is no contaminates further down the process.

Then the process moves the plastic from the wash station on to a conveyer belt to the sorting tank.

The belt drops the material into a sink float tanks, this is to sort two types of plastics via a sink float tank. As one type of plastic that floats on water, the second type sinks in water. This tank sorts the types and the waste is removed by conveyor systems.

Once the plastic has been sorted the plastic is then sorted and then it's shredded to make the plastic more manageable to use within the process. As shown in the image below.



Fig 2 this is a picture of an industrial shredder picture found at (mechanical solutions, 2018)

The shredded plastic is then put into a granulator to produce plastic pellets for use in injection moulders and extrusion machines.

Once the plastic waste has been peltised they are then packed and can be sent off to customers.

This process is very similar to the precious plastic flow as shown in the table below:

Process Order	Precious Plastic	Industrial Method
1	Collection	Collection
2	Washing	Washing
3	Sorting	Sorting
4	Shredding	Shredding
5	Storing	Storing
6	Using on machines	Using on machines
7	Displaying and selling product	selling product

As shown in table 1, both industrial process match the precious plastic method as it is the logical steps of how to progress with turning waste material into a reusable item. The only difference is that precious plastic uses the collected plastic and turn it into a saleable item where industrial method is to sell the plastic on to other companies that use injection moulding and extrusion machines. (Mechanical Solutions, 2018) and (Hakkins, 2013)

3.2 Task 2 Develop a design specification

The Design Specification for the layout of the container is as follows:

1. Ensure everything fits into the Two 20ft Containers.
 - a. This point has been specified by the customer to accommodate for the safe manoeuvrability of the work space when transporting between sites of work. (HSE, 2018)
2. Ensure that each melting machine has an extraction unit near the machine.
 - a. This is to ensure that the BSI 4163 section 6.2 is followed as well as COSHH regulations 2012 are followed. (BSI, 2014) and (HSE, 2018)
3. Ensure that there is a suitable` flow through the containers to allow unidirectional flow through the containers.
4. Ensure there is a place to collect material
5. Ensure there is a method to wash the material
6. Ensure there is a place to wash material
7. Ensure there is a place to sort the material
8. Ensure there is a place to store the sorted material
9. Ensure there is a place to store the shredded material
10. Ensure there is a place to store the tools need for each machine if the machines need tools to change or set the machines to be able to operate.
11. Ensure there is a place to inspect and possibly clean and deburr the finished product
12. Ensure there is a place to display product.
13. Ensure that there has suitable lighting for the container.
 - a. This is part of BS 4163. (BSI, 2014)
14. Ensure enough there is enough space for displays to be put up for each part of the process of the recycling.
 - a. This is also a customer requirement for the layout.
15. The BS 4163 latest edition should be adhered to.
 - a. The reason for this, is that this is the British Standers for health and safety for design and technology in educational and similar establishments. (BSI,2014)

For the concept design the author needs to ensure that there is adequate space for the use of the machines, as well as other aspects that need to be added to the container to ensure that it is able to function correctly and fit the process. Create a process flow to map out the order of events that specific operations must be completed before moving on. Once the process flow has been created, the layout can be created to ensure the flow moves through the area linearly to ensure a high productivity without the operators being able to work backwards through the area. The layout also need to ensure that operators do not have their back to another operator working on a machine. Once the Layout for each container has been accepted the author will look at the layout of both containers. The drawing can be found on the appendix two.

3.3 Task 3 Appraise your concept design solutions.

Using the previous plastics layout design as a foundation from which to start off the author decided to map out the sequence of events to try and map out a flow for the process to ensure that the operations can get done in a logical and simplistic order. The order that came out was to ask the logical questions such as the following and try to answer them, the questions and answers the author came up with are the following:

What is needed to start the process?

Waste plastic material without it nothing can be accomplished.

Are there different types of plastic that shouldn't be mixed?

Yes, there are different plastic materials that shouldn't be mixed so the plastic will need to be sorted into the 7 types. (Hakkens, 2013) as supported by (Mechanical solutions, 2018).

Does the plastics need to be cleaned before shredding?

Yes, this is to ensure as little contaminants get into the shredded plastics.

Could the washing of the plastics take place before sorting?

Yes,

Does the plastic need to be shredded before going into the machines?

Yes, as plastic cannot be put into any of the machines not shredded.

Will the parts need to have a finishing process?

It depends on the moulds that are used and the machine being used on.

From these questions the author mapped out a logical proposal of the process flow that had been developed by the author as shown in the appendix 1, it shows the flow through the process. The flow is as shown below:

1. Collection of the material.
2. Wash the plastic material.
3. Sort the plastic into the types.
4. Place the plastic items into containers.
5. Shred the plastic.
6. Store the shredded plastics.
7. Use the shredded material on one of the machines.
 - a. Injection Moulder.
 - b. Heated Press.
 - c. Extrusion Machine.
8. Complete any finishing processes that may need to be completed.
9. Put the part on the display.

Once the Process flow had been agreed by the client the author drafted up the layout by using the process flow, this was to ensure that the layout could accommodate the process flow. The layout needs to be able to flow the process from the start through to the split of the two containers and then back through the second to the end of the container, with limitations of moving the opposite direction to the flow. Because this is an education outreach program, the author has added a safety

line to both containers to ensure that there is a safe passage through container one and in container two the safety line is either end of the container to ensure that no student should be allowed to go into container two without a responsible adult supervising them.

In the Appendix 2 sheet 1 is the option for the layout of the first container is to have one large container bag on the door mounted on a metal fork like the one that is currently as part of the Precious Plastics design. This will allow a common place for passers-by to drop of their plastic waste to be recycled. This will also allow one easy place to pick the waste to clean and sort. The issue is that if the bag is left to get to full there will be a lot of plastic that will remain unsorted at the bottom of the bag.

In the Appendix 2 Sheet 2 is the second option for the layout this option uses small bags down the side the length of the container so that the bag can be removed when it is full and placed on the floor or hung up next to the wash station. This will stop the repetitive movement of washing one plastic item then turning around to pick up the next one from the collection point. The advantage about this design is that it can utilise the currently unused spaced against the side of the container as well as the door. This will also allow the ease to be able to remove the bags on the side and store them in the container for transportation.

The options for the layouts is in appendix 2 sheet 5 to sheet 9, these are different layouts depending on the land available to the client it depends on the orientation and layout of the containers in relation to each other. With the four proposal designs show four different variations that the containers can be set in.

Proposal 1

This container layout aims to use the most amount of natural light by being 45 degrees from the either side of north this forms an alcove that could be used to talk to educational groups before they go through the container. This also allows the natural light to be able to get into both windows of the containers, as the arc that has been created from the container positioning will aid in having large amounts of sunlight in the educational space as possible. While keeping it enclosed. The space between the containers could have benches put in it for educational talks. This method will make connecting the containers electrical supply a little tricky but not impossible.

Proposal 2

This container layout uses at least a 2m gap between the containers to create a void. This void could be used for storage of any unwashed waste material, as an extra storage option. The author suggest that this option could be used to create a water reservoir above the container to be used to wash the material. This option also could have an alternative power source in case of loss of power by the main 240v mains supply into the container. This option doesn't make the most of any natural light on the second container but it does allow for extra space and options which most others cannot allow for.

Proposal 3

This container layout is to stack the containers end to end, there is importance to have at least a 2m gap between the containers to allow for a fire escape from the containers. This layout makes the

most of the natural light to be used as the containers best place is to ensure that the windows of the both containers face south this will enable the most natural light to enter both containers.

Proposal 4

This is uses the smallest footprint possible as each container should be in line to each other with a 30cm gap between the containers. This gap is to ensure that the ventilation of the extraction unit is working correctly to connect the mains in to the container this is the simplest option but this does not work to put any extras on to the unit.

Below is a design matrix to compare the differences between each containers:

<i>Category</i>	<i>Weighting</i>	<i>Concept 1</i>	<i>Concept 2</i>	<i>Concept 3</i>	<i>Concept 4</i>
<i>Cost</i>	3	2	2	2	2
<i>Weight</i>	1	2	2	2	2
<i>Footprint</i>	2	1	2	3	3
<i>Ascetics</i>	2	2	2	2	1
<i>Sustainable</i>	2	1	3	1	1
<i>Efficiency</i>	3	2	2	2	2
<i>Designer's Preference</i>	2	2	3	2	1
<i>Total</i>		26	34	30	26
<i>Rating</i>		2	1	2	3

The matrix is split down into categories to show what each concept can be able to achieve the higher the score the better that concept is at that particular category. Points are awarded to each category with 3 points as the maximum points which represents a good part to 1 point that represents where the concept doesn't quite meet as well, and two points are awarded if the concept is average. In the design matrix the categories are Cost, Weight, footprint, ascetics, sustainable, efficiency and designer's preference. Each category has a weighing to show the importance of that category below is the justification of the points awarded to each concept.

Cost: Cost is a factor that many people adhere to the client has specified a budget of £16,000 but to create any of these layouts wouldn't be any difference in cost between the layouts.

Weight: As the containers are all the same in the designs the weight should not change.

Footprint: this is the area that the container takes up the areas are as follows.

Container	Area (m ²)
Concept 1	85.0084
Concept 2	49.368
Concept 3	38.7684
concept 4	36.312

Table 2 shows the area of the footprint for each design.

As shown in the table above the smallest footprint is concept 4 and the largest footprint is concept 1

Sustainability: this is more of a question could something be added to the containers to make them more sustainable points were award if they could had added extras or if it could not be.

Efficiency: this looked at the process through the container as all four designs are based of the one process flow then they all scored a 2.

Designers Preference: this is the preference of the designer to see which one they preferred that the client should use or would not recommend using.

3.4 Task 4 Fully document your final design solution.

It is depending on the space of land of that the client has been able to achieve depends on the configuration of the two containers. The author would suggest that the better layout for the two containers is the layout 2 which this layout will accommodate the installation of a water container between the containers and it can house a safe location for a form of emergency power if required. The water container can be mounted on the roof between the containers with a flexible pipe down to the wash station, this will keep the water to wash the plastic waste and provide a gravity feed to the wash station. When it raining the water container would be open so that it can collect rain water to be used to wash the waste plastic this will make the container slightly sustainable as it will be using rain water to clean the plastic waste.

Each container will need to accommodate a 900 x 600 x 250 electrical cabinet, this is to house the electrical systems for the E-Stop and the mains power into the container plus any Trips switches or contactors that have to be included in the panel, the panel will need to have a 24v power supply that will be able to run the LED strips used to light the container each panel can be mounted high above the bench this will allow any children not to be able to reach the box and try to open it exposing themselves to the risk of electric shock.

The Wash Station has been placed onto the door just like the original design due to that it uses the space correctly and efficiently. If the client uses the second layout there can be a pipe from the water tank to the wash station for the use of cleaning the waste to ensure little contaminants get in the final product.

The sorting bench is to have space underneath to store the sorted plastic waste into their specific groups, so that once the storage bin is full it can be shredded, only when a bin is full should it be shredded this will cut down on energy consumption of the due to the motor on the shredder being on less frequently but on for a longer period rather shredder being on frequently and for a few items to shred.

The material will then go through the shredder in each material code so it can be placed into smaller bins once shredded. The shredder has been allocating 1500 x 1000 mm on the layout design, this is to ensure there will be room.

The bins will then be taken from container 1 and placed on the rack in container 2. This rack is the one from the precious plastics design just extended to allow for more material. The author suggests to have at least 7 columns of containers to allow a better choice of material to choose from and sort the plastic by colour when shredding to allow for choice of colour when producing the parts on the machine.

Each machine the injection moulder, extrusion machine and the heated press has been allocated the same footprint to allow for equal spacing. This footprint is 1500 x 1000 per machine. All three machines are to have a fan assisted extraction unit above each machine to aid in the removal of any dangerous vapours from the area. To ensure there are little amount of vapours that could be exposed to the operator the extrusion machine and the injection moulder will need a fan assisted local exhaust ventilation which will be connected to the main ventilation system above each machine this requirement comes from the BS 2492 (BSI, 2014). The machines have been put in order so that the extrusion machine is put facing the door. This is due to if there is tooling needed to be added to the machine for a small amount of time it can be placed outside of the container next to

the extrusion machine, this will allow for different tools to be used to make different parts of any creation made using this machine.

Once the product has been taken off the machine it can be placed on the work bench. This will enable it to be cleaned off and deburred. The work bench is underneath the window so that it can make the best use of natural light. To ensure that every machine has the tools they need to be maintained and operated on the author suggests to either make or find a workbench that has drawers, in it the bench should be adequate to have storage underneath to keep any dies that the machines requires.

The display area has been moved onto the double doors this is so that it uses the space efficiently and that it also is able to remove taking up space next to the machines.

In both containers are e-stops buttons these should be key-spring return switches with the key being held by a responsible person this e-stop should kill the 240v power supply to the machines in that container that they are in. The e-stop cannot kill the power to the fans on the ventilation system. This is so the design can to be compliant with BS 4163 (BSI, 2014)

3.5 Task 5: appraisal of the final design along with any further work carried out.

The Final design fits the design specification as it ensures that there is an extraction unit above with a Local Exhaust Ventilation system near the end of the machines so that it can comply with the BS 4163. The final design has been designed to follow the process flow that has been created for the process flow of the container. This is to ensure that the container is efficient and that should be suitable for groups of students. To make it suitable for groups of students it has to be set to the standard to the BS 4163. As a part of the British Standards the containers must have sufficient lighting for the work space, in order to ensure that the containers lights are efficient as possible the containers will need to use LED light strips. If the lights use a 24v power supply, this will ensure that there is a safe power supply for the lights as well as it can be used to power the fans for the ventilation. Behind every machine footprint there is a 50mm gap so that the client can put up display boards to show information about the process happening at that particular point, this was a requirement from the client. This design can also accommodate the BS 4163 which is the Health and Safety for Design and Technology in Education and Similar Establishment. The design follows the process flow that the design is based on. The process is as follows:

1. Collection of the material.
2. Wash the plastic material.
3. Sort the plastic into the types.
4. Place the plastic items into containers.
5. Shred the plastic.
6. Store the shredded plastics.
7. Use the shredded material on one of the machines.
 - a. Injection Moulder.
 - b. Heated Press.
 - c. Extrusion Machine.
8. Complete any finishing processes that may need to be completed.
9. Put the part on the display.

The full detailed process flow can be found in the Appendix 1.

It is the author's opinion that the designs have been met in according to the specification layout out in task 1 which was to try to adapt the open source design and improve it by looking into the following items.

1. Process Productivity
2. Process capability
3. Health and Safety for the machine operators, end users and any observers for the machine
4. Social Engagement and Education
5. Energy usage
6. Reliability

The way the author looks in to the process productivity of the layout is to make the layout so that each operation has its own area to work in and to make the layout flow the process flow. Go through the container which should make the lives of the operator easier.

During the design the author investigates incorporating the regulations set by the British Standards Institute to ensure the design can work in the UK for young people to use.

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To ensure that people can learn the designer ensured there is a gap behind every machine and every process for the client to put up display boards for the use of describing what is happening to young children.

To ensure little energy is used the designer has specified LED lights to be used for the light source and has specified that they be stepped down to 24v DC to ensure little energy is used.

4 Conclusion

To conclude this report the current design from the open source document does not fit the needs for the client had a set of certain criteria for the container to include to ensure that the design will be suitable for the needs of the client. The basic needs of the client was the following items:

- To be able to fit all machines into Two 20ft Containers.
- For there to be a suitable process that is easy to follow.
- To allow space for notice boards behind each machine.
- Needs to be able to accommodate children within the containers and follow the Health and Safety legislations included with that.
- Needs to be as efficient as possible.
- Needs to be Safe to people to come and use.

The design meet all the requirement of the client's needs by ensuring that every machine was able to fit inside the container while making the assumption that the footprint of the machine is a maximum size of 1000 x 1500 mm.

The Full process flow can be found in the Appendix 1 the basic flow is as flows:

1. Collection of the material.
2. Wash the plastic material.
3. Sort the plastic into the types.
4. Place the plastic items into containers.
5. Shred the plastic.
6. Store the shredded plastics.
7. Use the shredded material on one of the machines.
 - a. Injection Moulder.
 - b. Heated Press.
 - c. Extrusion Machine.
8. Complete any finishing processes that may need to be completed.
9. Put the part on the display.

This process was developed by looking at both the open source design on the precious plastic, as well as the process flow designs from industrial recycling centres.

After the designs had been worked out the author created a matrix diagram to show the aspects of each design to show what was good about the four designs, the category's for the matrix was; cost, Weight, Footprint, Ascetics, Sustainability and Efficient. The recommend design was the proposal design two. The second container has the most available space for extra objects to be able to add to the container. The first container is to be the container to have all the process up the shredder, this container could either have a large collection bag or smaller bags that run down the side of the container. In container two the process start from the storage of the shredder through to the final product and display. All in all the final design can be found in appendix 2.

5 Recommendation

The Author recommend that if possible more money could be invested into these two containers so that they can have up to date technology in the containers such as a system run off a PLC a Programmable Logic Control and a GOT a Graphic Operation Terminal for the use for the PLC. If a PLC system was induced the PLC could look at the state of the machines from both containers and be able to ensure the extraction unit was working when the Machine is switched on. With a PLC it would be easy to have a counter for how many people have gone through the containers which could be important as it could be used to prove that the space works as the approach that the clients wants to use it for. To ensure that the machines health states are shown the PLC system could be monitoring the temperature of each machine as well as the levels of the hoppers if the machines use hoppers. As this is an education centre the GOT could be used to run a set of Screens that could tell the audience about the machines there looking at instead of using display boards. With a PLC it could be used to put the machines into a display mode so that they could tick over and restrict the heating elements on the machines. It is under the author's recommendation that the client will need to be able to make some form of income to keep the container running and not cause the funding to be an issue in the future as without a form of income and funding, there will be no money to advance the project. The

6 Reference List

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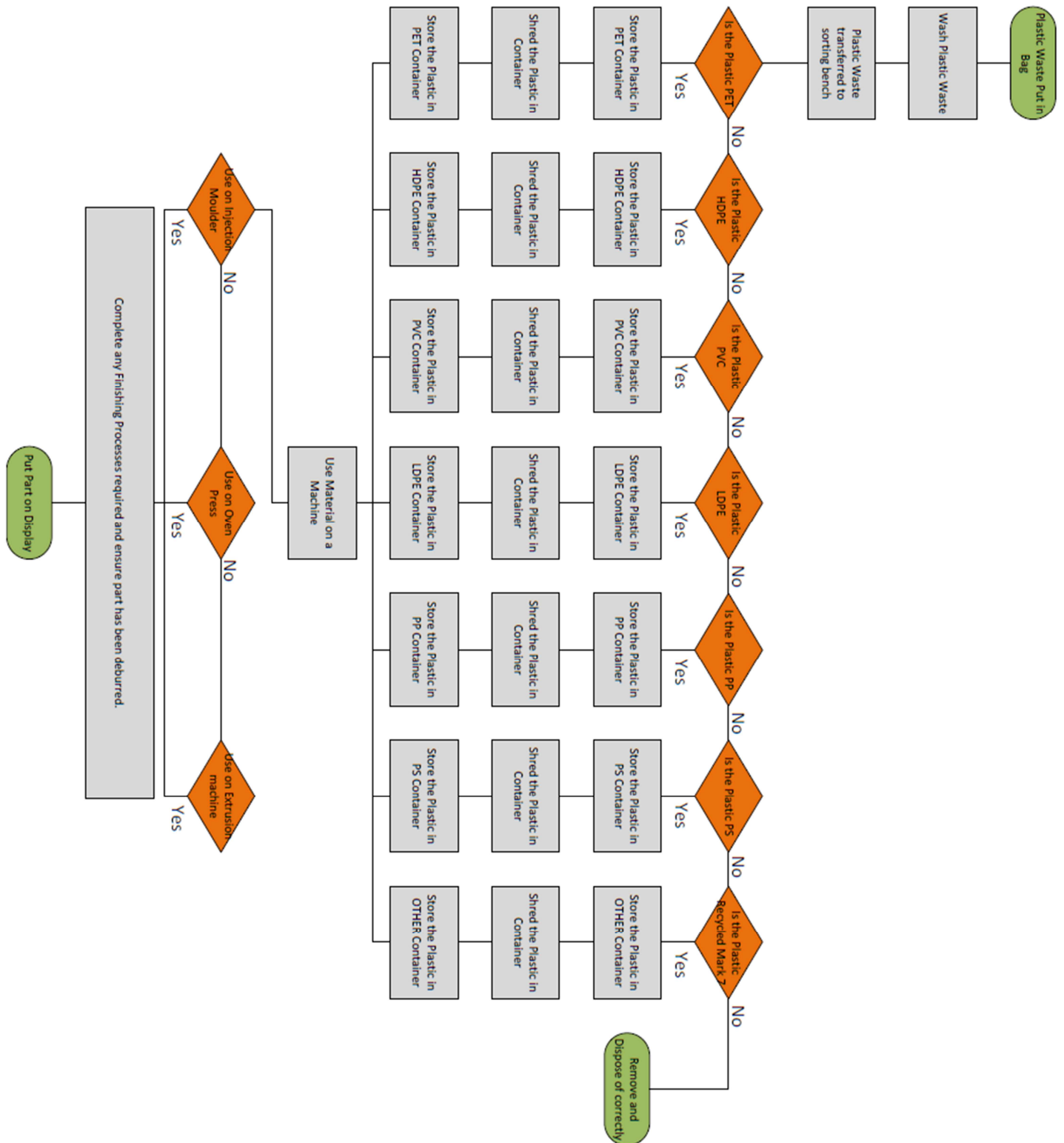
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7 Appendix 1



8 Appendix 2

Drawing Documentation.

Precious Plastic

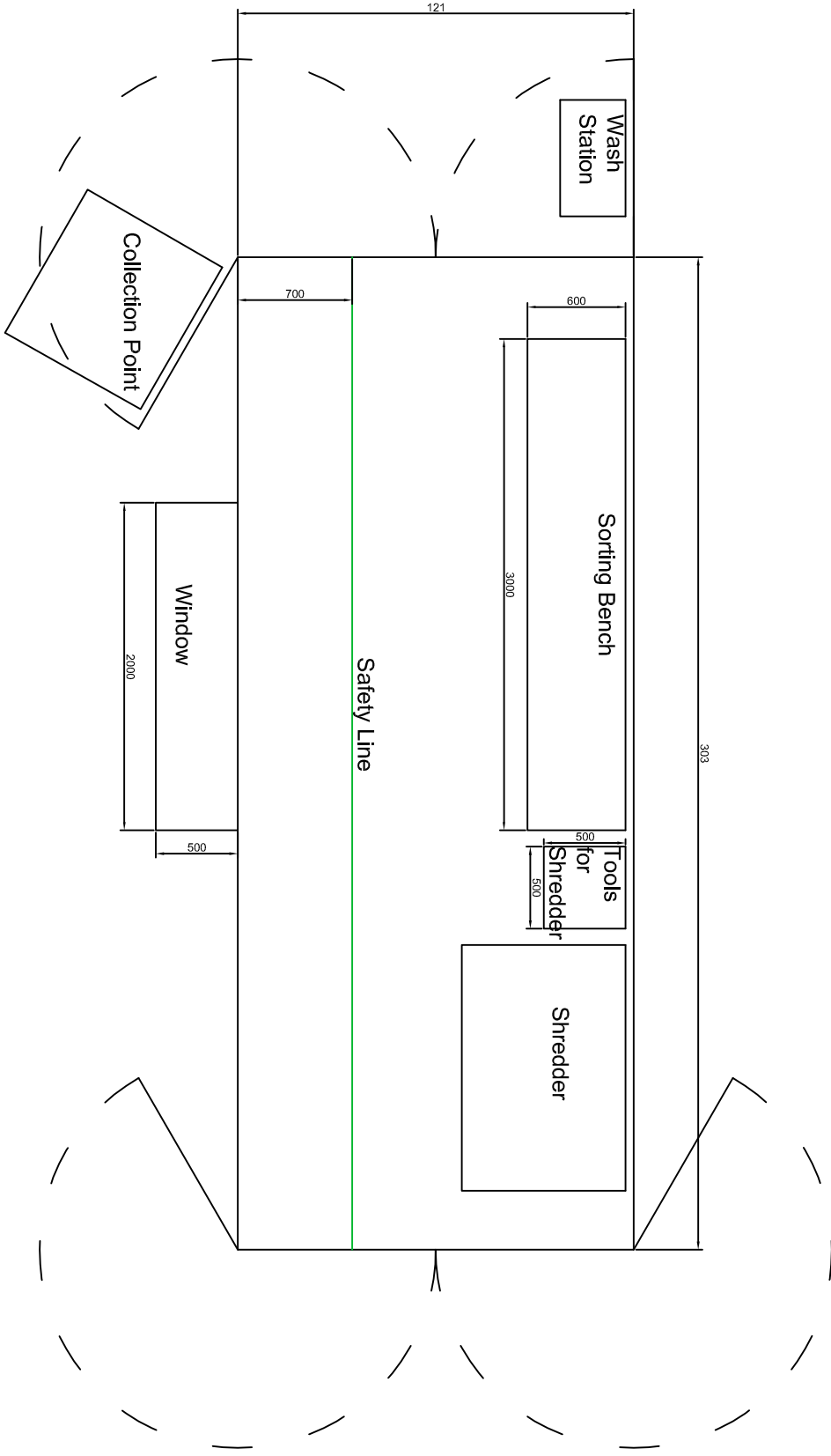
Cover Sheet

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BEng in Mechanical and Manufacturing (P/T)

SEE PROCESS STANDARD P80010 FOR DEFINITION OF  SYMBOL.			3rd ANGLE PROJECTION		TITLE		DESIGN ISSUE No		DRAWN BY		DRAWN DATE	
ALL DIMENSIONS IN MILLIMETRES. TOL. ± 0.25 ANGLES $\pm 2^\circ$					Precious Plastic		1		MC		30/05/18	
REMOVE SHARP CORNERS - CHAMFER OR R0.5 MAX.			DO NOT SCALE		MATERIAL TYPE CODE		SHEET		CHECKED		ISSUE DATE	
INTERNAL RADIi 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$			R/ N/A		MATERIAL		A		**		29/06/18	
THREADS TO BS 3643 Gd/6H. DRAWING PRACTICE TO BS 8898					N/A		OF					
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					N/A		U.O.S.		N/A			

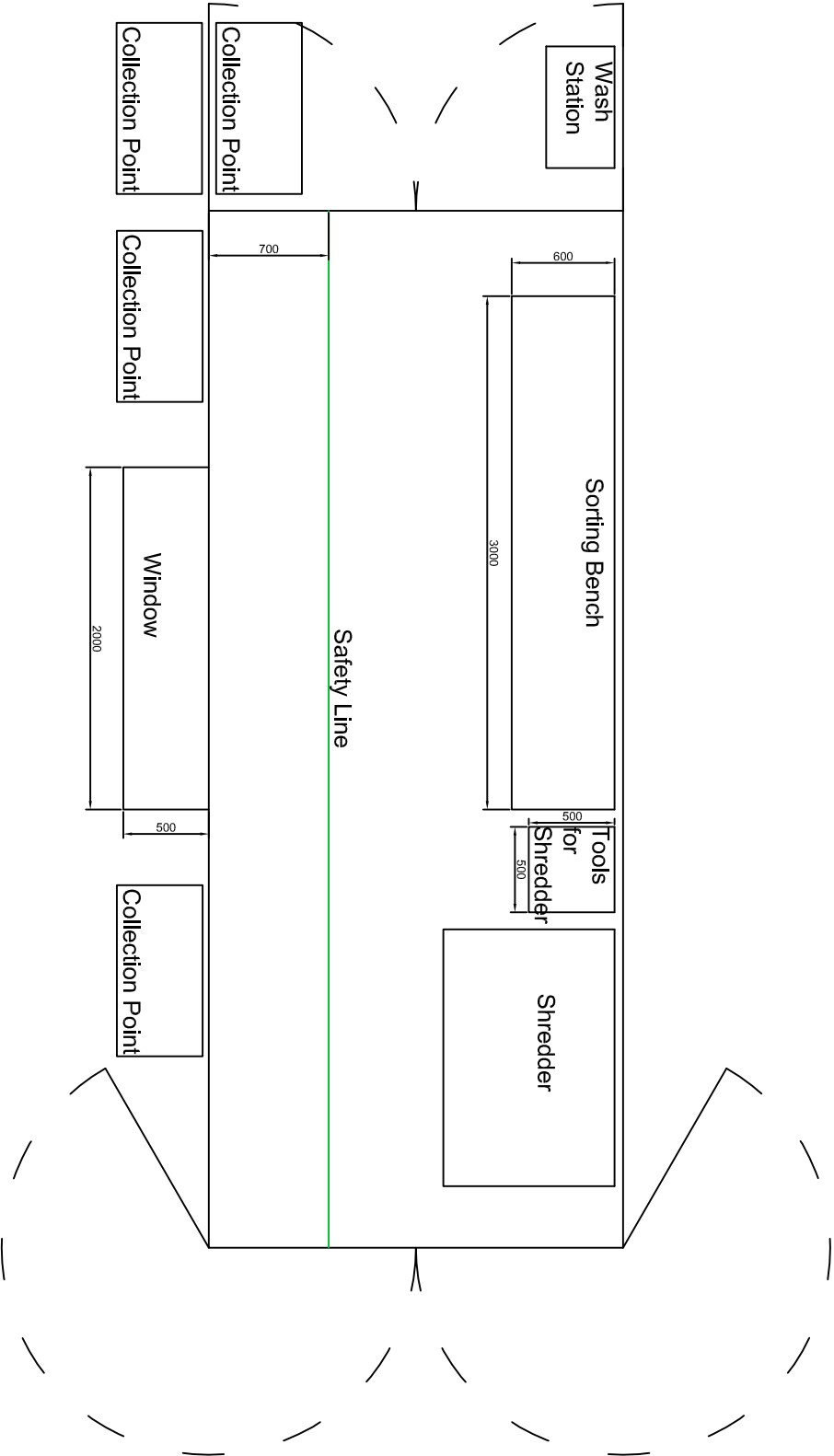
Sheet	Description	Date Drawn	Drawn By	Document Type
A	Cover Page	30/05/18	MC	
B	Content Page	30/05/18	MC	
1	Container 1 Mechanical Layout Proposal	30/05/18	MC	Layout
2	Container 1 Mechanical Layout Proposal	23/06/18	MC	Layout
3	Container 2 Mechanical Layout	30/05/18	MC	Layout
4	Container 1 Electrical Layout	30/05/18	MC	Layout
5	Container 2 Electrical Layout	07/06/18	MC	Layout
6	Proposal Ground Layout 1	07/06/18	MC	Layout
7	Proposal Ground Layout 2	07/06/18	MC	Layout
8	Proposal Ground Layout 3	07/06/18	MC	Layout
9	Proposal Ground Layout 4	07/06/18	MC	Layout
10	Final Container 1 Mechanical Layout	07/06/18	MC	Layout
11	Final Container 2 Mechanical Layout	07/06/18	MC	Layout
12	Final Ground Layout	07/06/18	MC	Layout



Note:

- Collection Point to be a bag 1000 mm³.
- Machines have been given a footprint of 1500 x 1000 mm.
- Storage for sorted plastic under sorting bench.
- Safety Line 700mm from container wall Student shouldn't cross the line if they have not told to.

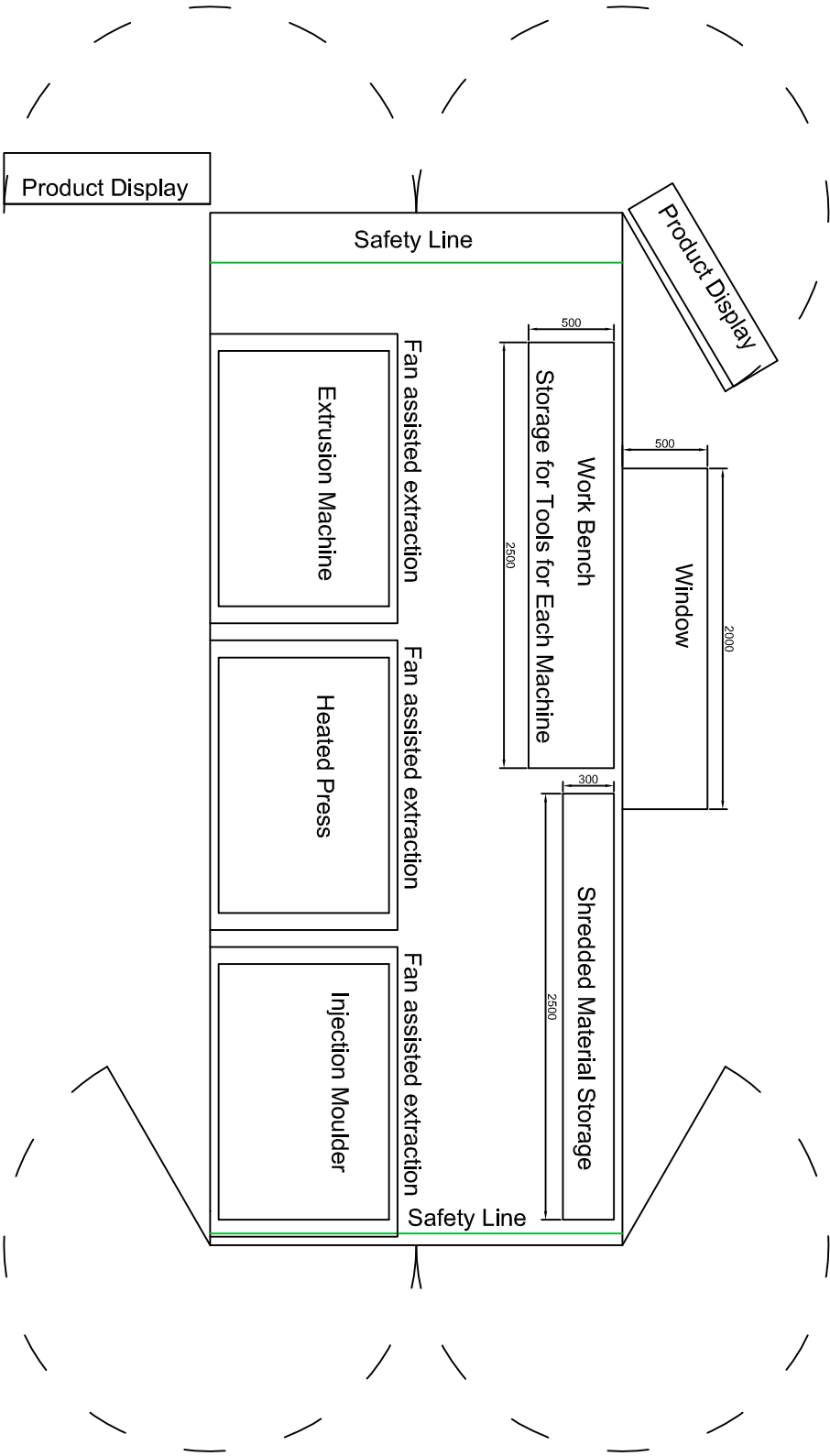
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REMOVE SHARP CORNERS – CHAMFER OR R0.5 MAX.			DO NOT SCALE		R / N/A				1 OF 12		CHECKED	
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE – 3.2											29/06/18	
THREADS TO BS 3643 Gd/BH. DRAWING PRACTICE TO BS 8898												
CONFIDENTIAL. THIS DRAWING IS THE PROPERTY OF © RENISHAW Plc							Wotton – under – Edge		SCALE		DRAWING No.	
AND MAY NOT BE COPIED OR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED, WITHOUT THE EXPRESS WRITTEN AUTHORITY OF RENISHAW Plc.									1:20		N/A	



Note:

Collection Point to be four bags 500 x 1000 x 500 mm spaced down the side of the container to allow more storage for collection of the material.
Machines have been given a footprint of 1500 x 1000 mm.
Storage for sorted plastic under sorting bench.
Safety Line 700mm from container wall Student shouldn't cross the line if they have not told to.

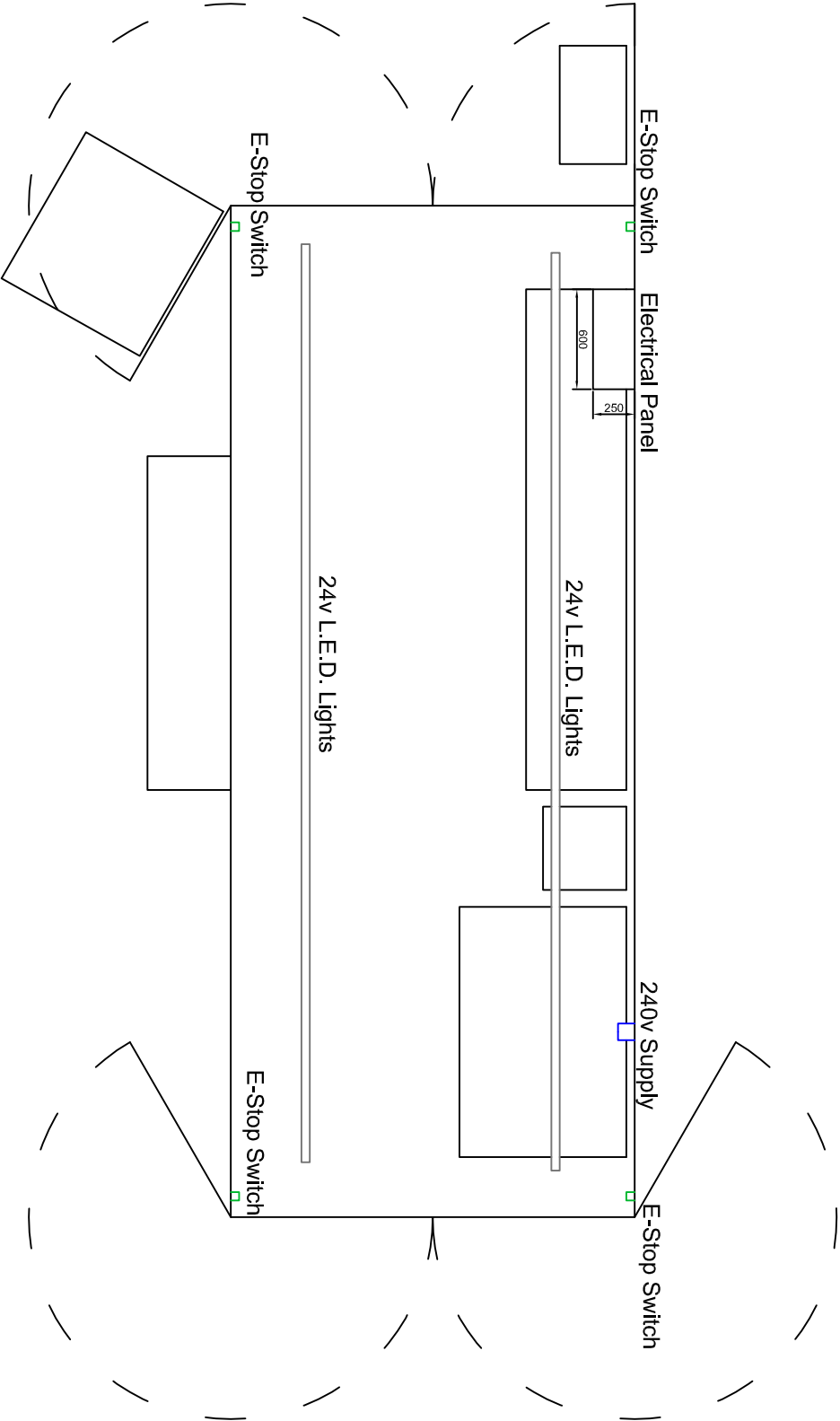
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REMOVE SHARP CORNERS – CHAMFER OR R0.5 MAX.			DO NOT SCALE			MATERIAL TYPE CODE		2		CHECKED		29/06/18	
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE – $3.2 \sqrt{R}$			R/ N/A			MATERIAL		2 OF 12		**			
THREADS TO BS 3643 Gd/BH. DRAWING PRACTICE TO BS 8898			N/A			SCALE		DRAWING No.					
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						wotton – under – Edge							
			Glos. England.										



Note:

Machines have been given a footprint of 1500 x 1000 mm.
Storage for tools used on each machine to be stored under bench.
Safety line for students and public not to go past unless told to.
Product display has been put onto the doors to try and make use of the space this will allow more natural light to enter the container and it will allow the display products to.
Fan Assisted Extraction units above all machines to aid in the removal of dangerous airborne chemicals from the production of the plastic material.
Fans should be powered of the 24v circuit with there own on/off switch to reduce power consumption when not in use.

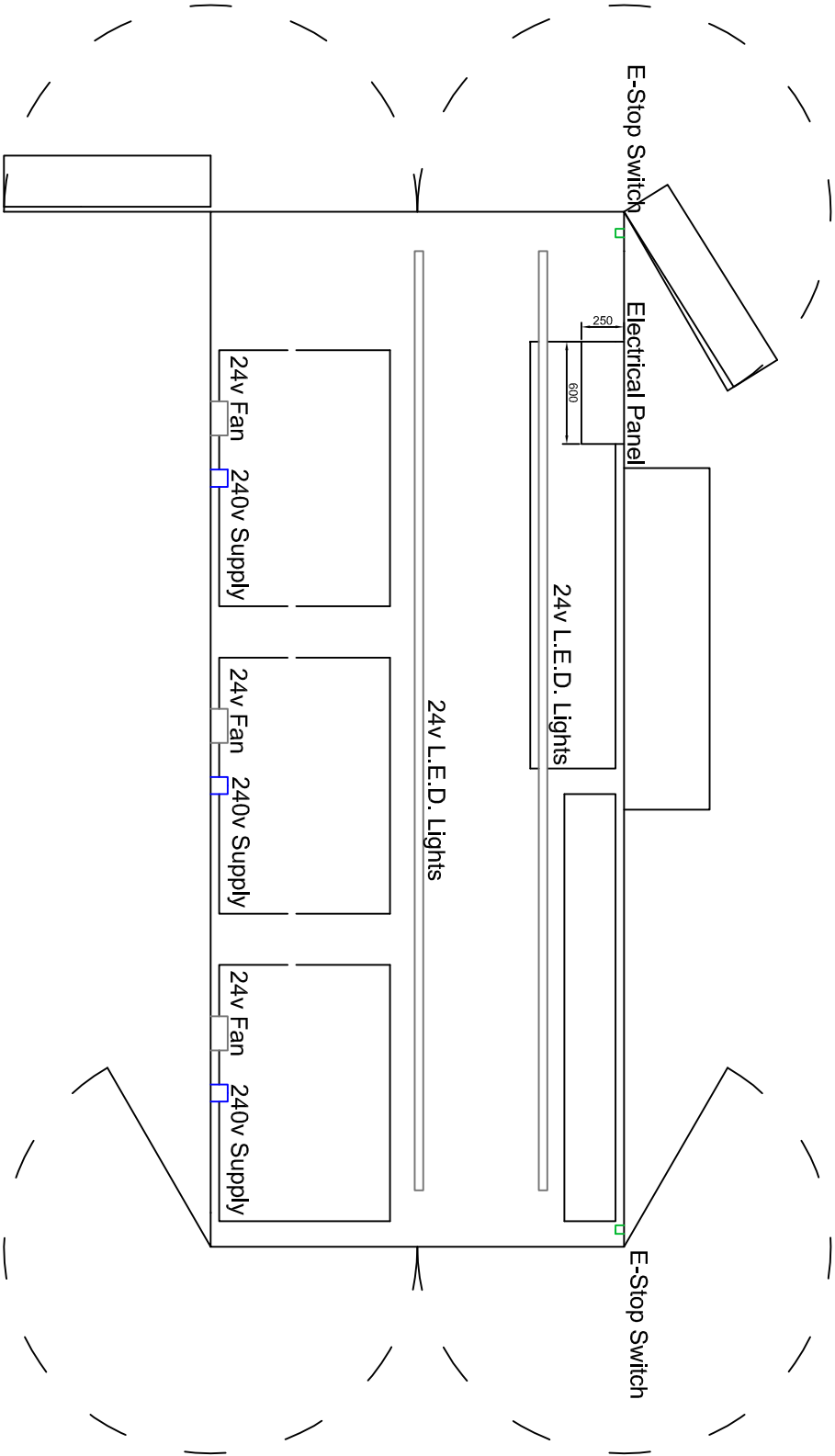
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INTERNAL RADIi 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$			R / N/A		MATERIAL		5		ISSUE DATE	
THREADS TO BS 3643 Gd/BH. DRAWING PRACTICE TO BS 8898			R / N/A		N/A		12		29/06/18	
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							1:20		N/A	



Note:

- Size of the Electrical Panel modeled 900x600x250.
- E-Stop to kill power to Shredder if pressed.
- Cables to run in trunking through the container.
- Incoming power to be split off and connected to Container 2.
- Panel to have Isolator that switch power off to whole Container.

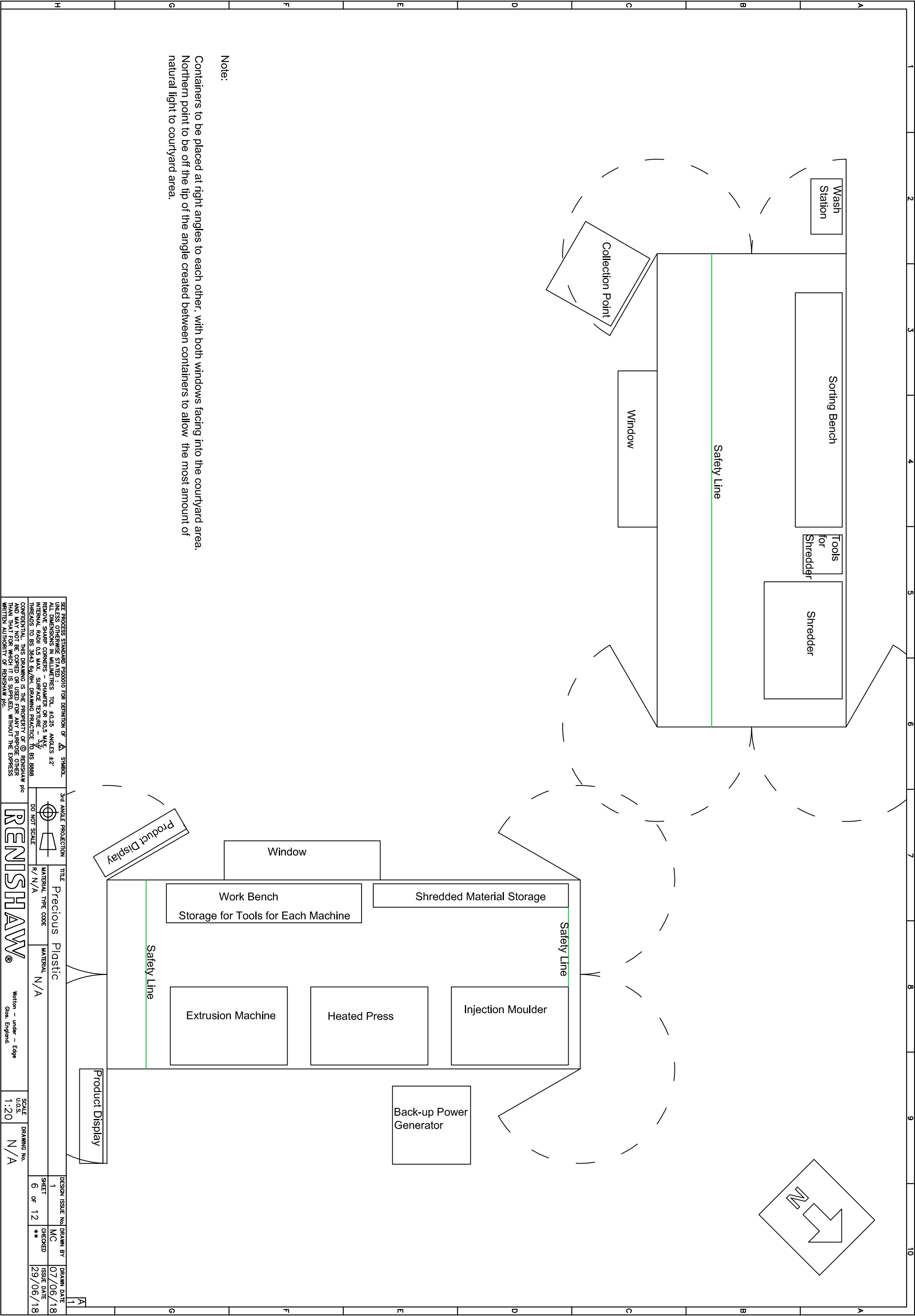
SEE PROCESS STANDARD PROLOGO FOR DEFINITION OF  SYMBOL.													
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REMOVE SHARP CORNERS - CHAMFER OR R0.5 MAX.													
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$													
THREADS TO BS 3643 Gd/6H. DRAWING PRACTICE TO BS 8898													
CONFIDENTIAL. THIS DRAWING IS THE PROPERTY OF © RENISHAW plc AND MAY NOT BE COPIED OR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED. WITHOUT THE EXPRESS WRITTEN AUTHORITY OF RENISHAW plc.													
		Wotton - under - Edge Glos. England.		SCALE 1:20		DRAWING No. N/A							
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		R / N/A		N/A		N/A		PRECIOUS PLASTIC		1		MC	
													



Note:

- Electrical Panel modeled is 900 x 600 x 250.
- E-Stop to kill 240v power to machines if pressed.
- Cables to run in trunking through the Container.
- Power to Container 2 is to be taken from the incoming power from Container 1.
- Panel to have isolator that switches power off for the whole Container.

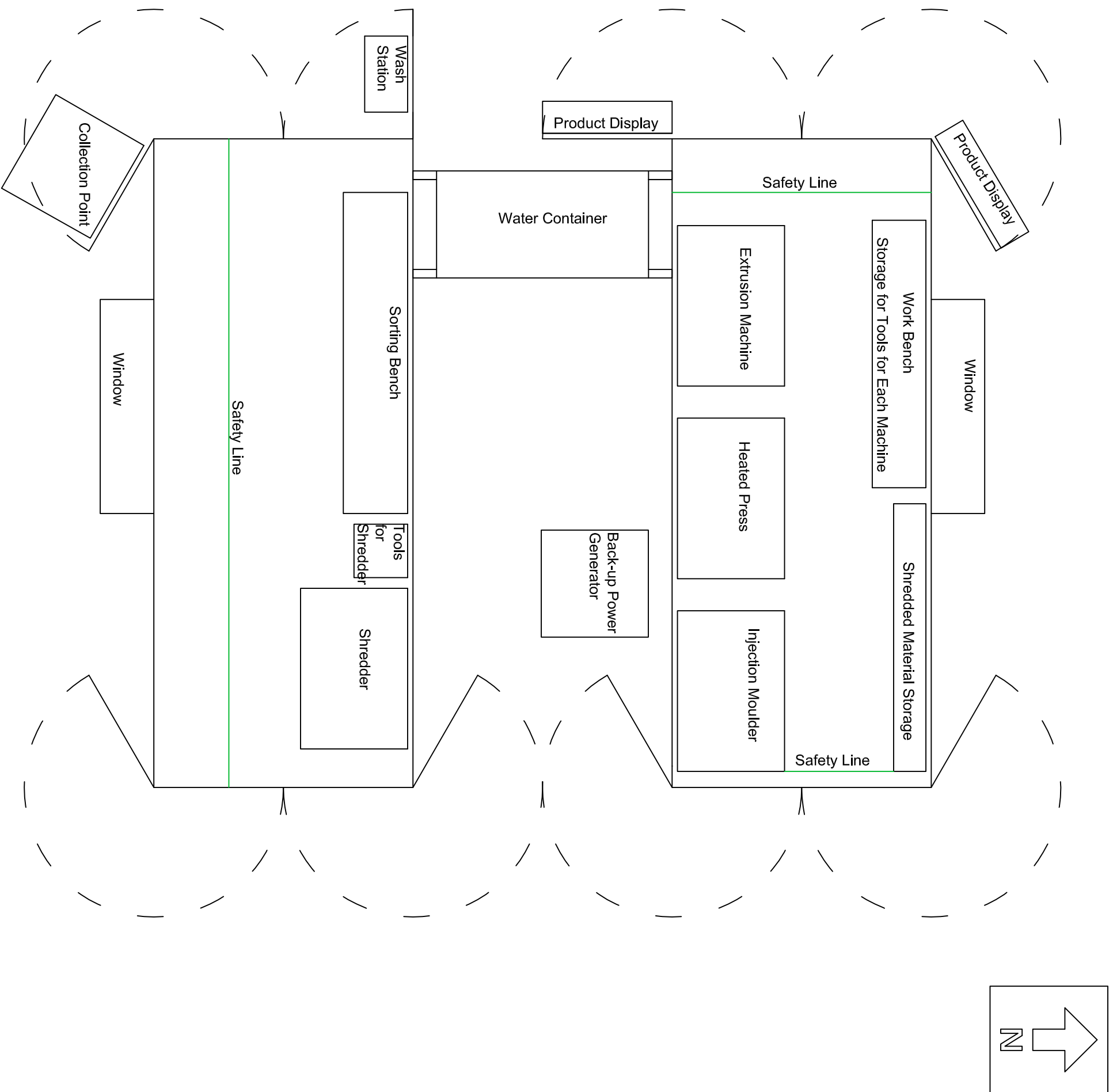
SEE PROCESS STANDARD PROLOGO FOR DEFINITION OF  SYMBOL.			3rd ANGLE PROJECTION			TITLE			DESIGN ISSUE No.			DRAWN BY		
ALL DIMENSIONS IN MILLIMETRES. TOL. ± 0.25 ANGLES $\pm 2^\circ$						Precious Plastic			1			MC		
REMOVE SHARP CORNERS - CHAMFER OR R0.5 MAX.			DO NOT SCALE			MATERIAL TYPE CODE			5 of 12			CHECKED		
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$			R / N / A			MATERIAL			**			ISSUE DATE		
THREADS TO BS 3643 Gd / 6H. DRAWING PRACTICE TO BS 8898			N / A			wotton - under - Edge			1:20			N / A		
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Note:

Containers to be placed at right angles to each other, with both windows facing into the courtyard area.
Northern point to be off the tip of the angle created between containers to allow the most amount of natural light to courtyard area.

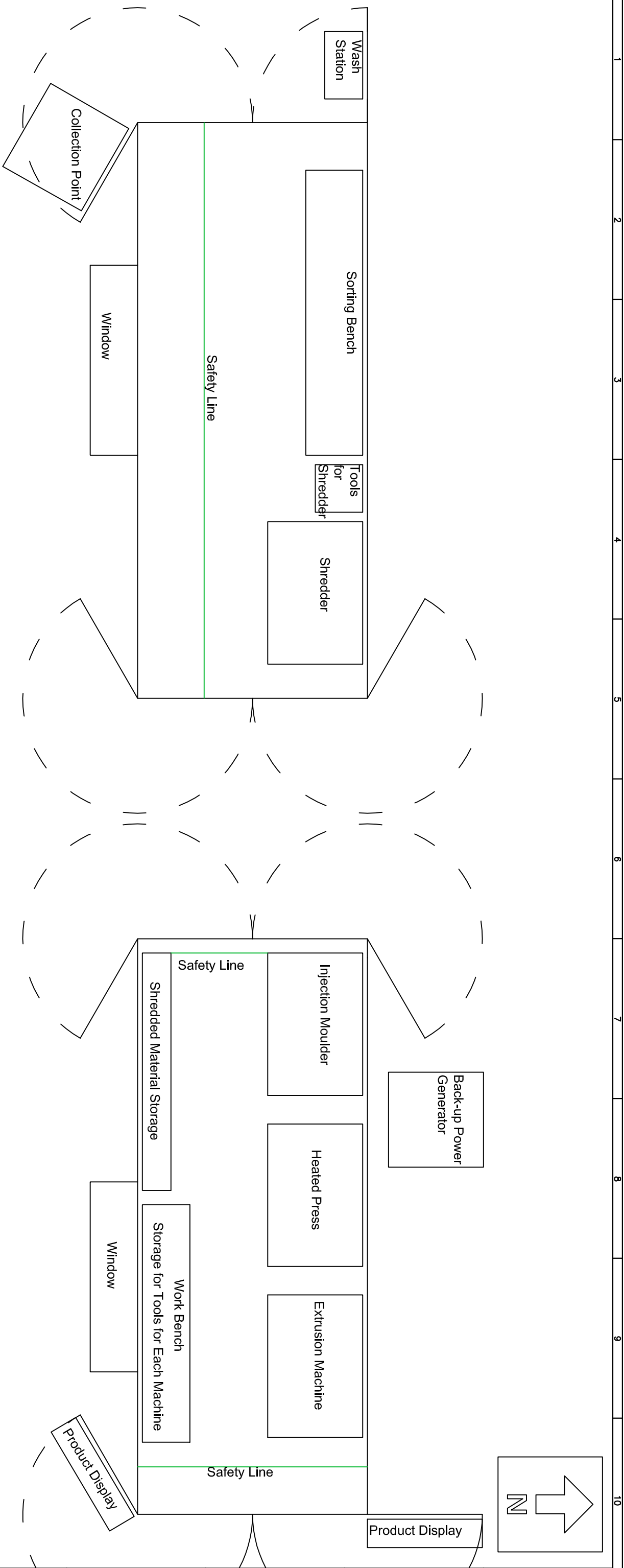
SEE PROCESS STANDARD PROSODIO FOR DEFINITION OF  SYMBOL.			3rd ANGLE PROJECTION		TITLE		DESIGN ISSUE No		DRAWN BY		DRAWN DATE	
ALL DIMENSIONS IN MILLIMETRES. TOL. ± 0.25 ANGLES $\pm 2^\circ$					Precious Plastic		1		MC		07/06/18	
REMOVE SHARP CORNERS - CHAMFER OR R0.5 MAX.			DO NOT SCALE		MATERIAL TYPE CODE		SHEET		CHECKED		ISSUE DATE	
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$			R / N / A		MATERIAL		6 of 12		**		29/06/18	
THREADS TO BS 3643 Gd/BH. DRAWING PRACTICE TO BS 8898					N/A		SCALE		DRAWING No.			
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			Glos. England.									



Note:

Containers to have a void of at least 2m between them. The Void could be used to hold up a water container preferably above the height of the container, this feature will allow the container to collect rain water to be used to wash the plastic waste. This void can also be used to store a backup generator incase of loss of power.

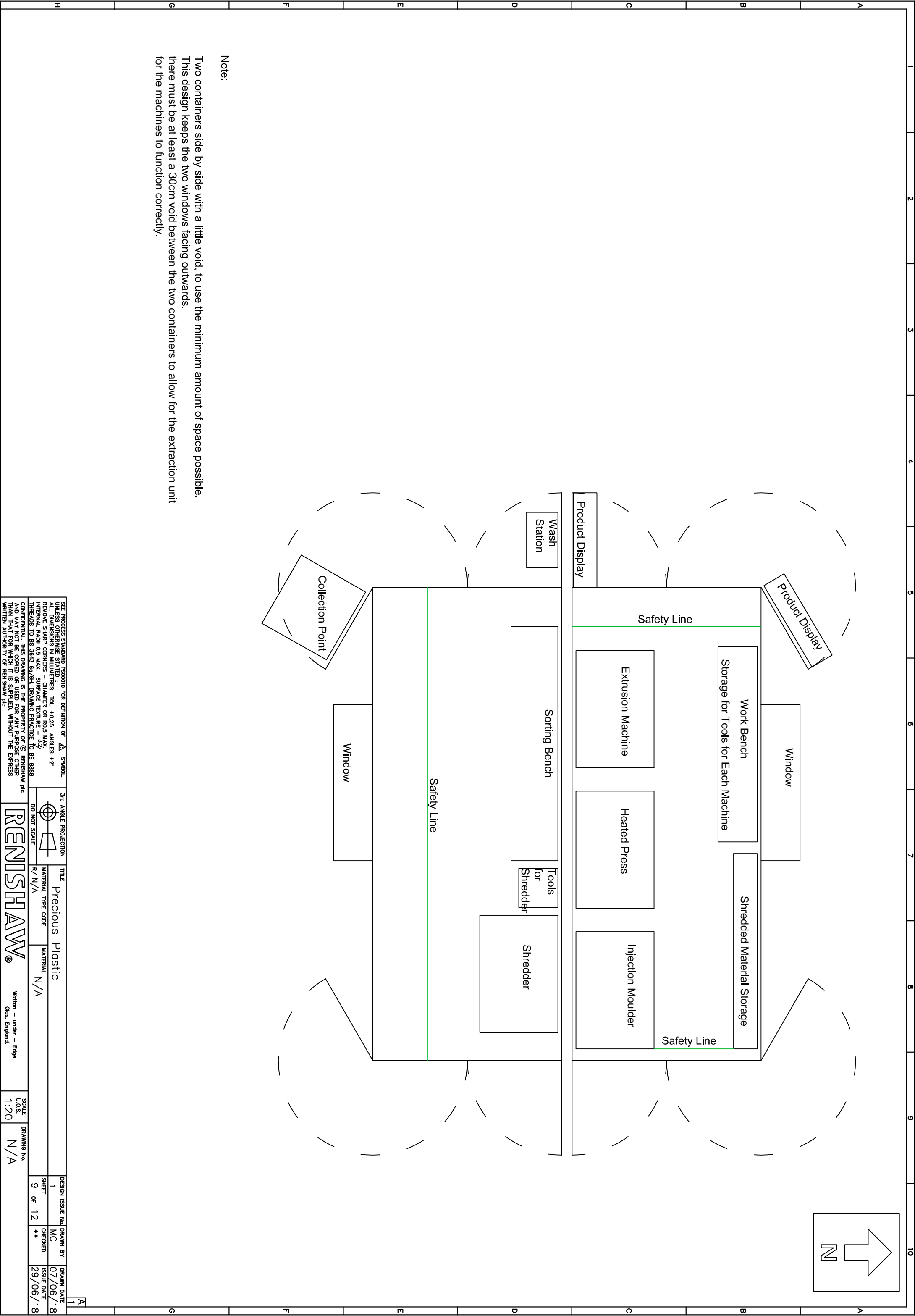
USE PROCESS STANDARD P50000 FOR DEFINITION OF A SYMBOL					
UNLESS OTHERWISE STATED: TOL. ±0.25 ANGLES ±2°					
REMOVE SHARP CORNERS CHAMFER OR R0.5 MAX.					
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE - 3.2					
THREADS TO BS 3643 9H/8H, DRAWING PRACTICE TO BS 8888					
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		3rd ANGLE PROJECTION	TITLE	SCALE	DRAWING NO.
		FIRST ANGLE PROJECTION	Precious Plastic	U.S.C. 1:20	N/A
		MATERIAL TYPE CODE	MATERIAL	Wetion – under – Edge Glee, England.	
		R/N/A	N/A		
		SHEET	CHECKED	ISSUE DATE	DESIGN ISSUE No.
		7 OF 12	**	29/06/18	MC
					DRAWN DATE
					07/06/18



Note:

Two containers end to end reduces the distance to move and allows a laminar flow. windows to preferably face south to ensure the maximum amount of light into the containers.

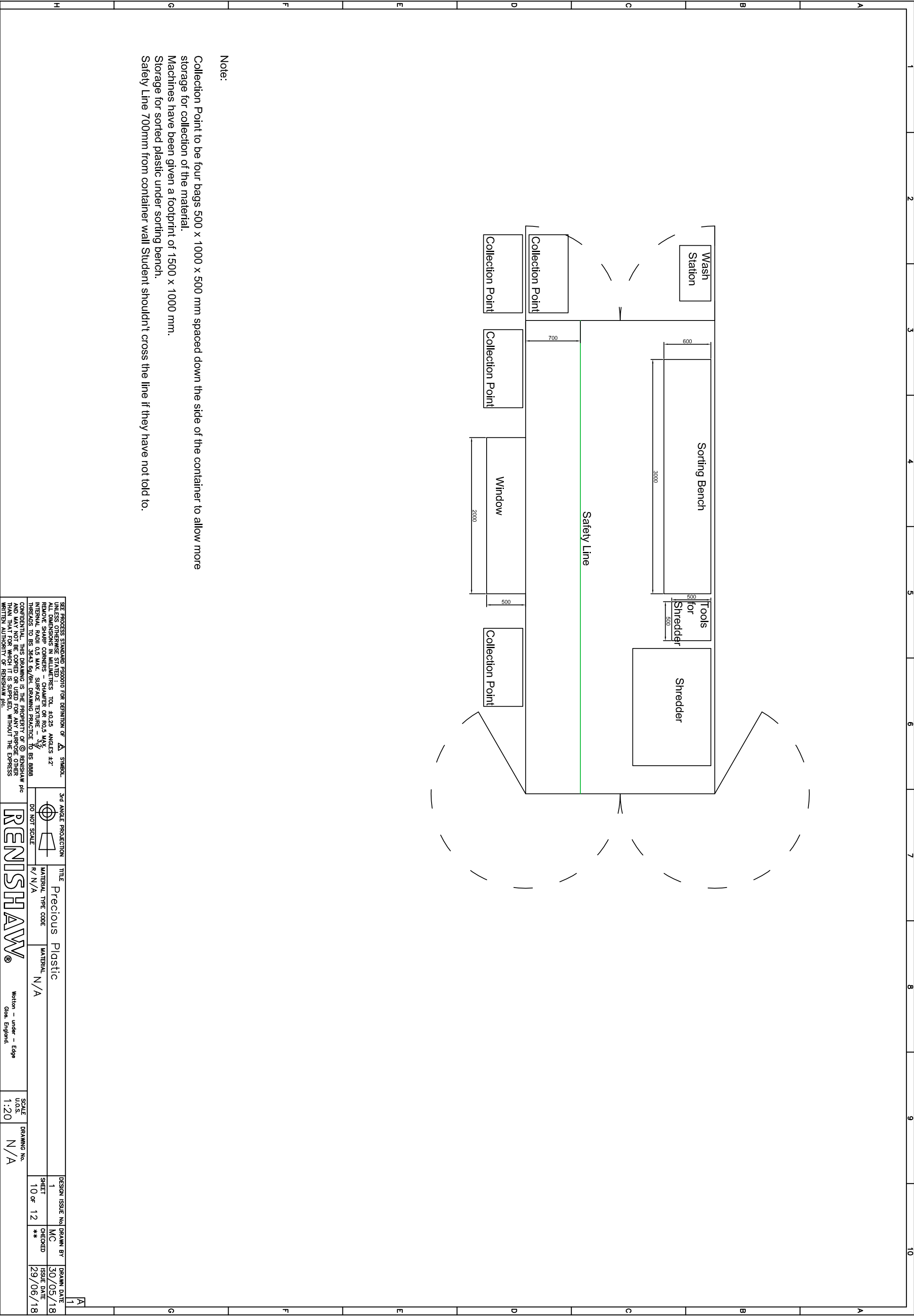
SEE PROCESS STANDARD P50010 FOR DEFINITION OF  SYMBOL. UNLESS OTHERWISE STATED, DIMENSIONS ARE IN MILLIMETERS. DIMENSIONS IN ± 0.25 ANGLES $\pm 2^\circ$. REMOVED SHARP CORNERS – CHAMFER OR R.O.5 MAX. INTERNAL RADI 0.5 MAX. SURFACE TEXTURE – $3.2 \mu m$. THREADS TO BS 3643 59/6H. DRAWING PRACTICE TO BS 8888		3rd ANGLE PROJECTION	TITLE		PRECIOUS Plastic	DESIGN ISSUE NO.	1	DRAWN BY	MC	CHECKED	**	ISSUE DATE	29/06/18
		DO NOT SCALE	MATERIAL TYPE CODE	MATERIAL									
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Note:

Two containers side by side with a little void, to use the minimum amount of space possible.
This design keeps the two windows facing outwards.
there must be at least a 30cm void between the two containers to allow for the extraction unit
for the machines to function correctly.

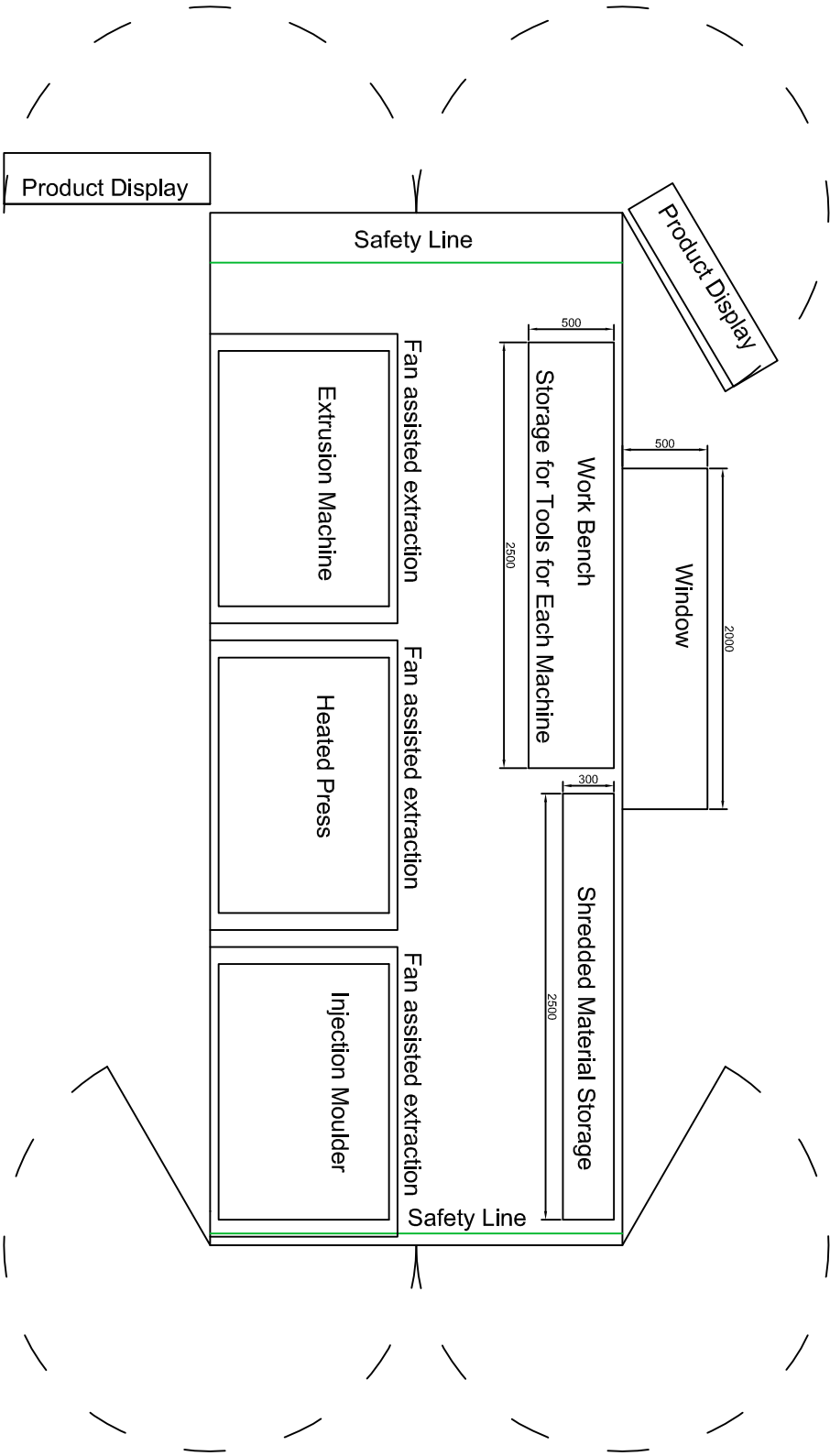
SEE PROCESS STANDARD P80010 FOR DEFINITION OF  SYMBOL.		3rd ANGLE PROJECTION		TITLE		DESIGN ISSUE No.		DRAWN BY		DRAWN DATE	
ALL DIMENSIONS IN MILLIMETRES. TOL. ± 0.25 ANGLES $\pm 2^\circ$				Precious Plastic		1		MC		07/06/18	
REMOVE SHARP CORNERS - CHAMFER OR R0.5 MAX.				MATERIAL TYPE CODE		9		SHEET		CHECKED	
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$				N/A		OF 12		***		29/06/18	
THREADS TO BS 3643 Gd/BH. DRAWING PRACTICE TO BS 8898											
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RENISHAW®				Wotton - under - Edge Glos. England.		SCALE 1:20		DRAWING No. N/A			



Note:

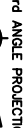
Collection Point to be four bags 500 x 1000 x 500 mm spaced down the side of the container to allow more storage for collection of the material.
Machines have been given a footprint of 1500 x 1000 mm.
Storage for sorted plastic under sorting bench.
Safety Line 700mm from container wall Student shouldn't cross the line if they have not told to.

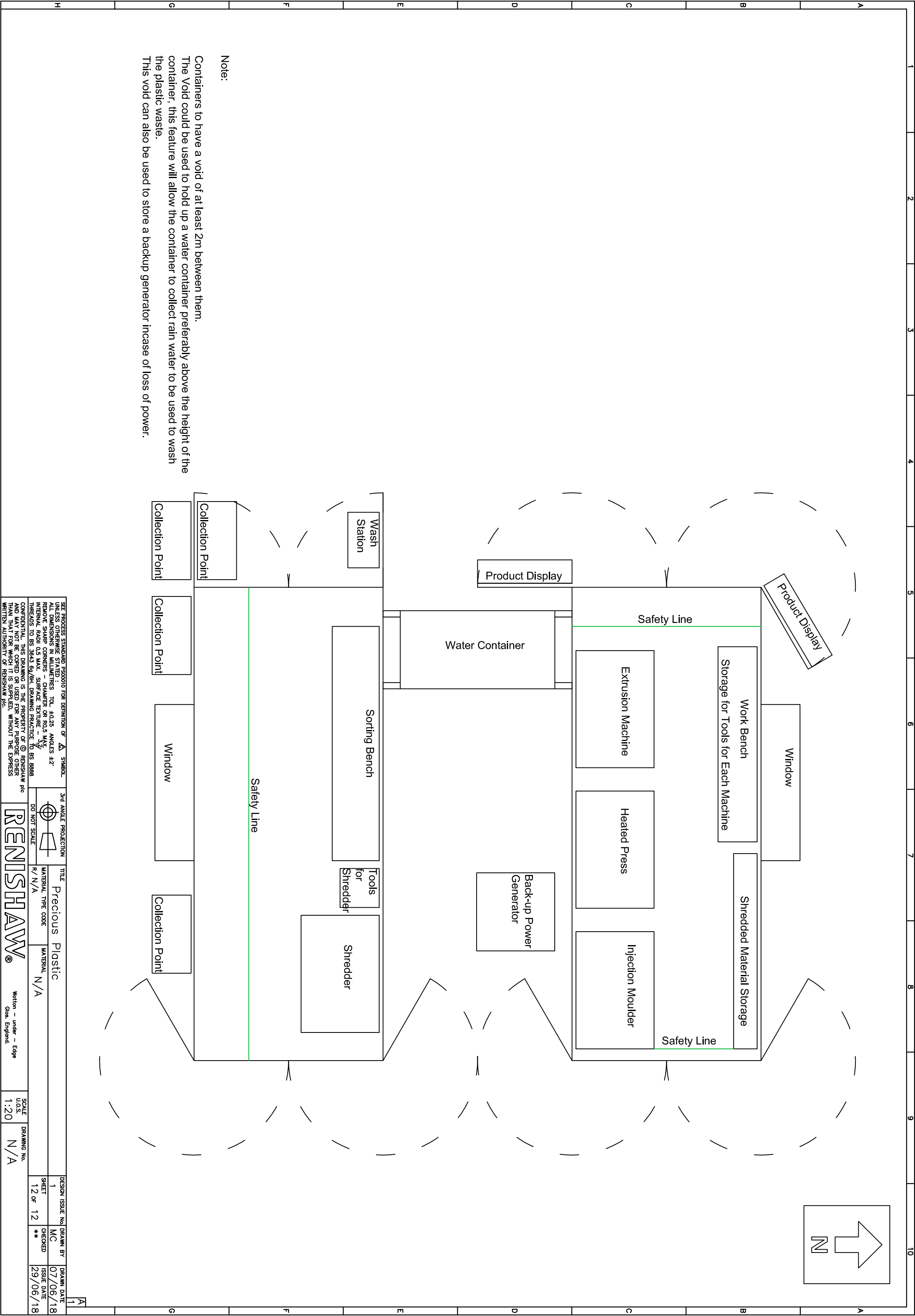
SEE PROCESS STANDARD P80010 FOR DEFINITION OF  SYMBOL.			3rd ANGLE PROJECTION		TITLE		DESIGN		ISSUE No.		DRAWN BY		DRAWN DATE	
ALL DIMENSIONS IN MILLIMETRES. TOL. ± 0.25 ANGLES $\pm 2^\circ$					Precious Plastic		1		MC		30/05/18			
REMOVE SHARP CORNERS - CHAMFER OR R0.5 MAX.			DO NOT SCALE		MATERIAL TYPE CODE		10 of		12		CHECKED		29/06/18	
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$			R/ N/A		MATERIAL		SCALE		DRAWING No.					
THREADS TO BS 3643 Gd/6H. DRAWING PRACTICE TO BS 8898			N/A		N/A		1:20		N/A					
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					Glos. England.									



Note:

Machines have been given a footprint of 1500 x 1000 mm.
Storage for tools used on each machine to be stored under bench.
Safety line for students and public not to go past unless told to.
Product display has been put onto the doors to try and make use of the space this will allow more natural light to enter the container and it will allow the display products to.
Fan Assisted Extraction units above all machines to aid in the removal of dangerous airborne chemicals from the production of the plastic material.
Fans should be powered of the 24v circuit with there own on/off switch to reduce power consumption when not in use.

SEE PROCESS STANDARD P80010 FOR DEFINITION OF  SYMBOL.										3rd ANGLE PROJECTION									
ALL DIMENSIONS IN MILLIMETRES. TOL. ± 0.25 ANGLES $\pm 2^\circ$										TITLE									
REMOVE SHARP CORNERS - CHAMFER OR R0.5 MAX.										Precious Plastic									
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$										MATERIAL TYPE CODE									
THREADS TO BS 3643 Gd/BH. DRAWING PRACTICE TO BS 8898										R / N/A									
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										DO NOT SCALE		N/A							
										SCALE		DRAWING No.							
Wotton - under - Edge Glos. England.										1:20		N/A							
										DESIGN		ISSUE		NO.		DRAWN		DATE	
										1		MC		30/05/18		30/05/18			
										11 of		12		**		29/06/18			



Note:

Containers to have a void of at least 2m between them.

The Void could be used to hold up a water container preferably above the height of the container, this feature will allow the container to collect rain water to be used to wash the plastic waste.

This void can also be used to store a backup generator incase of loss of power.

SEE PROCESS STANDARD P80010 FOR DEFINITION OF  SYMBOL.		3rd ANGLE PROJECTION		TITLE		DESIGN		ISSUE No		DRAWN BY		DRAWN DATE	
ALL DIMENSIONS IN MILLIMETRES TOL. ± 0.25 ANGLES $\pm 2^\circ$				Precious Plastic		1		MC		07/06/18		07/06/18	
REMOVE SHARP CORNERS - CHAMFER OR R0.5 MAX.				MATERIAL TYPE CODE		12 of		CHECKED		ISSUE DATE			
INTERNAL RADI 0.5 MAX. SURFACE TEXTURE - $3.2 \sqrt{R}$				R/ N/A		MATERIAL		12 of		**		29/06/18	
THREADS TO BS 3643 Gd/6H. DRAWING PRACTICE TO BS 8898				N/A									
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		Wotton - under - Edge		SCALE		DRAWING No.							
		Glos. England.		1:20		N/A							