Industrial Training at Jaipur Tuffen Glass Industries Pvt. Ltd.

PREPARED BY

Prashant Chaudhary (2018BTECHME006)

Piyush Singh Panwar (2018BTECHME007)

FACULTY GUIDE

Dr.Anish Kumar



Department of Mechanical Engineering

Institute of Engineering and Technology (IET)

JK Lakshmipat University Jaipur

May 2022

Industrial Training at Jaipur Tuffen Glass Industries Pvt. Ltd.

Practice School-2

Submitted in partial fulfillment of the requirementsfor the degree of

Bachelor of Technology in Mechanical Engineering

By:

Prashant Chaudhary (2018BTECHME006)

Piyush Singh Panwar (2018BTECHME007)

Faculty Guide:

Dr.Anish Kumar



Department of Mechanical Engineering

Institute of Engineering and Technology (IET)

JK Lakshmipat University Jaipur

May 2022

CERTIFICATE

This is to certify that the Practice School-2 project work entitled "**Industrial Training at Jaipur Tuffen Glass Industries Pvt. Ltd.**" submitted by **Prashant Chaudhary (2018BTECHME006),Piyush Singh Panwar (2018BTECHME007)**towards the partial fulfillment of the requirements for the degree of **Bachelor of Technology in Mechanical Engineering** of JK Lakshmipat University, Jaipur is the record of work carried out by them under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for Practice School-II examination.

Dr. Anish Kumar
Associate Professor,
Department of Mechanical Engineering
Institute of Engineering & Technology (IET)
JK Lakshmipat University, Jaipur

Dr. Ravi Shankar Prasad
Associate Professor & Head,
Department of Mechanical Engineering
Institute of Engineering & Technology (IET)
JK Lakshmipat University, Jaipur

Date of Submission 27/5/22

Prof. Dr. – Sanjay Goel
Director,
Institute of Engineering & Technology
JK Lakshmipat University, Jaipur

for (PS-2 Coordinator)

ACKNOWLEDGEMENTS

We would like to express our heartfelt gratitude toMr. Satyaprakash Pandey, Quality check Department Head, at "Jaipur Tuffen Industries Pvt Ltd" for his valuable time and guidance that made the training a success.

Our heartfelt thanks toMr. Devendra Singh, C.E.O. at "Jaipur Tuffen Industries Pvt Ltd" for his support in providing us the guidance during our training.Thanking all our friends and all those who have helped us carrying out this work directly or indirectly without whom completion of this training and project work was not possible.

We would also like to thank sincerely to Prof. Dr. Ravi Shankar Prasad, Head of Mechanical Department, JK Lakshmipat University for giving us a platform to carry out the learning's.

We also thank our faculty supervisor Dr. Anish Kumarfor guiding us throughout the PS-2 process and keeping us on track with everything.

Sincerely yours,

Prashant Chaudhary (2018BTECHME006)

Piyush Singh Panwar (2018BtechME007)

ABSTRACT

Glass is an amorphous solid and transparent material that is used in numerous applications in our daily lives. Glass is made from natural and abundant raw materials (sand, soda ash and limestone) that are melted at very high temperature. The Jaipur Tuff industry is a processing unit not a manufacturing unit.The primary raw materials in glass are sand, soda, limestone, clarifying agents, coloring and glistening glass. Glass sand is about ¾th of the entire glass composition. (72% Silica sand, 13% Soda Ash, 12% Limestone)

- Silica (sand) – is the major ingredient in glass.
- Soda Ash – acts as a flux and is added to help melting.
- Limestone – makes the glass durable & insoluble.

So the annealed glass is imported from reputed companies like Gujrat-Guardian (Modiguard), Sisecam and Saint-Gobain. And in this Practice School-2 opportunity we are learning about the working process, technical parameters and maintenance of the following machines: CNC cutting machine, Tempering machine, Lamination line and Double glazed unit (DGU) line which plays a major role in the glass processing industry. Through-out this internship program we will learn, experience and experiment on the bits related to glass and machines based on it.

List of Figures

Figure 1 Company Logo 12
Figure 2 Jaipur Tuff Factory 12
Figure 3 Workers at Jaipur Tuff washing line 13
Figure 4 Bhamashah Technohub 14
Figure 5 Bhamashah State Data Centre 14
Figure 6 Royal Thai Embassy 15
Figure 7 NTPC Ltd. 15
Figure 8 Zee Studio 15
Figure 9 The Rise by Sankalp, Jaipur 16
Figure 10 Shri Ram Cancer and Super Specialty Centre 16
Figure 11 Sawai Vilas, Ranthambore 16
Figure 12 Mall of Jaipur 17
Figure 13 Jewel of India, Jaipur 17
Figure 14 The Crest, Jaipur 17
Figure 15 World Trade Center, New Delhi 18
Figure 16 Float glass manufacturing process 20
Figure 17 Sheet optimized for least glass wastage 23
Figure 18 Glass stations and conveyor tray with hydraulics & suction cup 26
Figure 19 Float glass lifted from a station using suction cup tray 26
Figure 20 Loading Float glass on CNC cutting table 27
Figure 21 Intermac Genius 61 CT-RED 27
Figure 22 Cutting tips 28
Figure 23 Lubrication while cutting 28
Figure 24 Cutting benches 29
Figure 25 Intermac Genius 61 CT-RED configurations 30
Figure 26 Single Edging Machine 30
Figure 27 Four edged glass 31
Figure 28 Four Edger machine 31
Figure 29 Automatic Rough Grinding Machine 32

Figure 30 Beveled Glass 33
Figure 31 Drilling process. 34
Figure 32 Glaston RC 200 35
Figure 33 Glass ready for toughening process 35
Figure 34 Glass heating inside the machine from both sides 36
Figure 35 Glaston RC200 configurations 37
Figure 36 Lamination machine by LiSEC 38
Figure 37 Laminated glass (5mm+PVB+5mm Clear glass) 38
Figure 38 Glass sticked to PVB even after breaking 39
Figure 39 Auto Clave Machine 39
Figure 40 Lami glass before Auto Clave process 40
Figure 41 Lami glass after Auto Clave process 40
Figure 42 Copper mesh sheet for Lamination process 41
Figure 43 Laminated glass with mesh in between 42
Figure 44 PVB & SGP material rolls 42
Figure 45 Small glasses kept in Vacuum bag 43
Figure 46 DGU Line-up 44
Figure 47 Automatic sealing machine 44
Figure 48 DGU Glass before sealing 45
Figure 49 DGU Glass after sealing applied 45
Figure 50 Smart DGU glass Window pane 46
Figure 51 Taping process on glass before frosting 47
Figure 52 Frosting Machine 47
Figure 53 Frosted glass with taping kept in acid for frosting to get smooth 48
Figure 54 Frosted Glass 48
Figure 55 Frames for glass bending 49
Figure 56 Glass after heating process in glass bending machine 49
Figure 57 Bended glass 49
Figure 58 Heat Soak Machine 50
Figure 59 Heat Soak glass racks 50
Figure 60 New machine in packed condition 51
Figure 61 Arranging and leveling the machines with each other 51
Figure 62 Air blower connection and pipe set-up 52
Figure 63 Machine control panel wiring 52
Figure 64 Machine perfectly installed and running successfully 53
Figure 65 Material Loading on the truck 54
Figure 66 Large and Small glasses loaded and packed on the trucks 54
Figure 67 Glass wastage at industry 55
Figure 68 Ball drop test 57
Figure 69 Test setup 58
Figure 70 Markings for the fragmentation test on sample glass 59
Figure 71 5x5cm slit for counting fragmented pieces 59
Figure 72 Fragmented pieces counted 59
Figure 73 Bend checking diagram 61
Figure 74 Pot snap test set-up 62
Figure 75 Butterfly Test 63

Figure 76 Hardness Test Set-up.....64
Figure 77 Desiccant test set-up.....65

List of Acronyms

- SGU- Single Glazed Unit.
- DGU- Double Glazed Unit.
- VLT%- Visible Light Transmission.
- Ext. Ref%- External Reflection.
- Int. Ref%- Internal Reflection.
- CRI- Colour Rendering Index.
- CSD- Customer Satisfaction Department
- PI- Product Information.
- RG- Rough Grinding.
- PG- Polished Grinding.
- PVB- Poly Vinyl Butyral
- SGP- Sentry Glass Plus
- EVA- Ethylene Vinyl Acetate

Contents

CERTIFICATE 3

ACKNOWLEDGEMENTS 4

ABSTRACT 5

LIST OF FIGURES 6

LIST OF ACRONYMS 9

CHAPTER-1: ABOUT THE COMPANY 12

1.1 Company Name 12
1.2 Company Journey & Working 12
1.3 Company Projects 14
1.3.1 Government Projects 14
1.3.2 Commercial Projects 15
1.3.3 Residential Projects 17
1.3.4 Ongoing Projects 17

CHAPTER-2: ABOUT TRAINING 18

2.1 Training Objective 18
2.2 Training Timeline 18
2.3 Expected Output & Learning from Training 19

CHAPTER-3: BASICS OF GLASS 19

3.1 What is Glass? 19
3.2 Annealed/Float Glass 20
3.3 Annealed Glass Manufacturers 20
3.4 Annealed Glass Types 21

CHAPTER-4: GLASS PROCESSING 23

4.1 Order Placing 23
4.2 CNC Cutting 25
4.3 Fabrication 30
4.3.1 Single edge 30
4.3.2 Four edge 31
4.3.3 Rough Grinding 32
4.3.4 Bevelling 32
4.3.5 Drilling & Cutting 33
4.4 Toughening 34
4.5 Lamination line 37
4.6 DGU (Double Glazed Unit) line 43
4.7 Frosting 46
4.8 Glass Bending 48
4.9 Heat Soak Machine 50

CHAPTER-5: PROJECT WORK 51

5.1 Project work-1 51
5.2 Project work-2 53

CHAPTER-6: PACKAGING & WASTAGE **54**

6.1 PACKAGING AND DISPATCH 54
6.2 WASTAGE 55

CHAPTER-7: QUALITY CHECK **56**

7.1 QUALITY CHECK TESTS 56
7.1.1 Ball Drop Test: *57*
7.1.2 Fragmentation Test: *58*
7.1.3 Stress Measure Test: *60*
7.1.4 Bend Checking Test: *60*
7.1.5 Pot Snap Time Test: *61*
7.1.6 Butterfly Test: *62*
7.1.7 Hardness test for Sealent: *63*
7.1.8 Boil Test: *64*
7.1.9 Desiccant Test: *65*

CHAPTER-8: LEARNING & REFERENCES **66**

8.1 LEARNING OUTCOMES 66
8.2 REFERENCES 66

CHAPTER-9: PS-2 CERTIFICATE **67**

9.1 PRASHANT CHAUDHARY (2018BTECHME006) 67
9.2 PIYUSH SINGH PANWAR (2018BTECHME007) 68

Chapter-1: About the Company

1.1 Company Name

Jaipur Tuffen Industries Pvt Ltd

JAIPUR TUFF
Glass! Changing the Perception

Figure 1 Company Logo

1.2 Company Journey & Working

Jaipur Tuffen Glass Industries Private Limited is a Privateindustry incorporated on 23 November 2013. It is classified as Non-government Company and is registered at Registrar of Companies, Jaipur. Its authorized share capital is Rs. 50,000,000 and its paid up capital is Rs. 46,550,000. It is involved in manu acture of glass and glass products. The annual turnover of the company is around 10 crores.

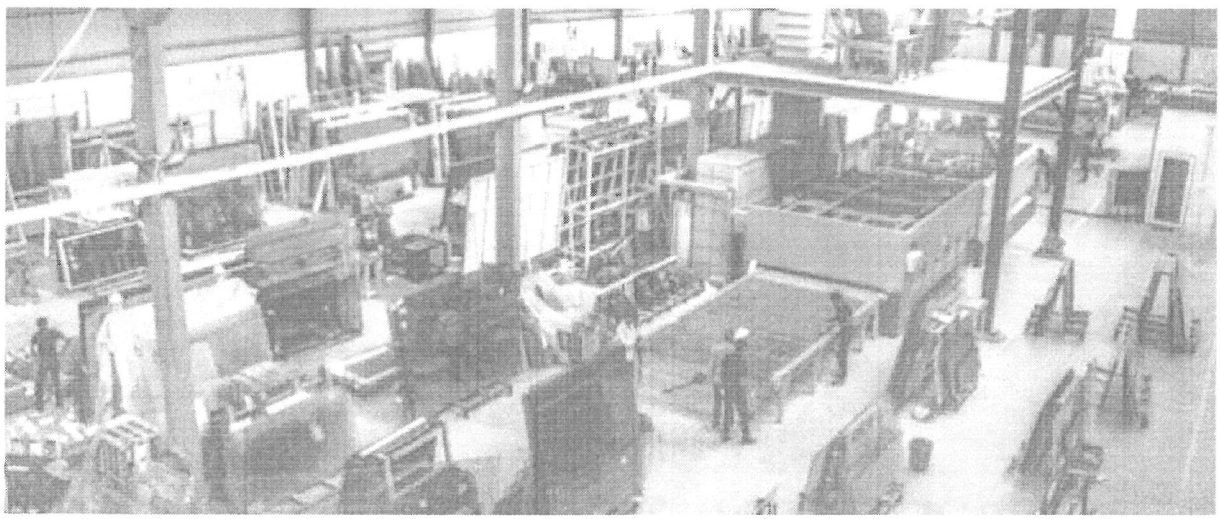


Figure 2 Jaipur Tuff Factory

Experience spanning of 4 decades, **JAIPUR TUFF** is well recognized for its excellence in the Architectural Glass Industry and meeting the demands of the modern construction. The

integrated team work, the best of engineering practices and the technological advancements have helped to develop a wide range of superior glasses that energize growing customers. They strongly believe that serving the best quality product which consistently exceeds customer's expectations is the only guaranteed methodology to deliver continued growth.

Their journey began in 1974. Back then they were a retailer and trader of different types of architectural glass of that time. In 2000 the journey of glass trading converted into the glass processing and setup first unit with Beveling and molding machines. Being with time they have started adding machines in their unit.
2003: Bending Machine (Became first bend glass manufacturer in Jaipur)
2007: Fully Automatic Beveling Machine.
2008: Fully Automatic Edge Polishing Machine.
2011: Installed Toughened Furnace and CNC Glass Cutting Machine.



Figure 3 Workers at Jaipur Tuff washing line

The biggest step of the journey was in 2017, company replaced the complete unit with the world's best technology and machinery. Today, **JAIPUR TUFF** is the only processor of North India with fully automatic European machinery having brands like Lisec, Glaston, and Intermac. Now, they are privileged to serve thousands of customers in India and abroad every year with exceptional products like Smart Glass (Switchable Glass), Smart Insulating glass and a verity of very high-performance nano-material coated reflective glass.

1.3 Company Projects

Jaipur Tuff industry has completed a numerous recognizable projects in all Government, Commercial & Residential sectors in India and also have ongoing Mega projects in pan India.

1.3.1 Government Projects



Figure 4Bhamashah Technohub

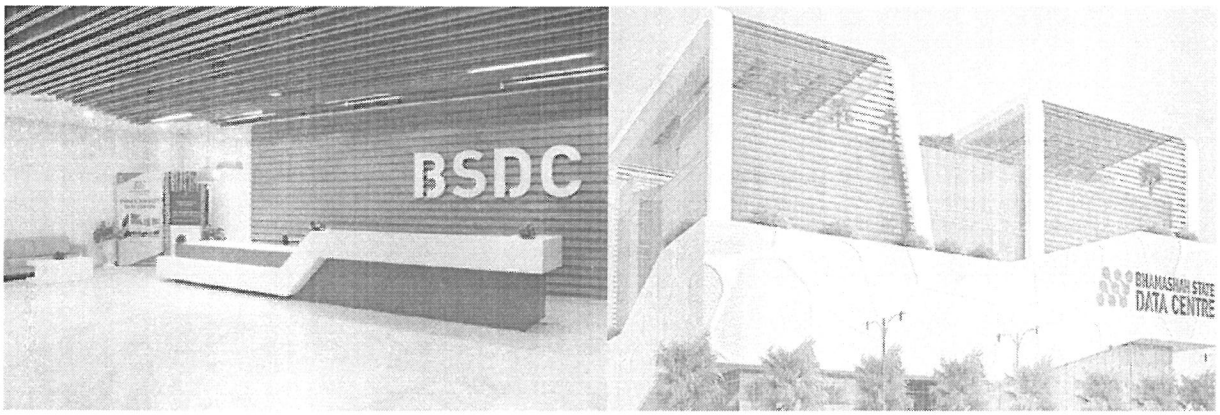


Figure 5Bhamashah State Data Centre

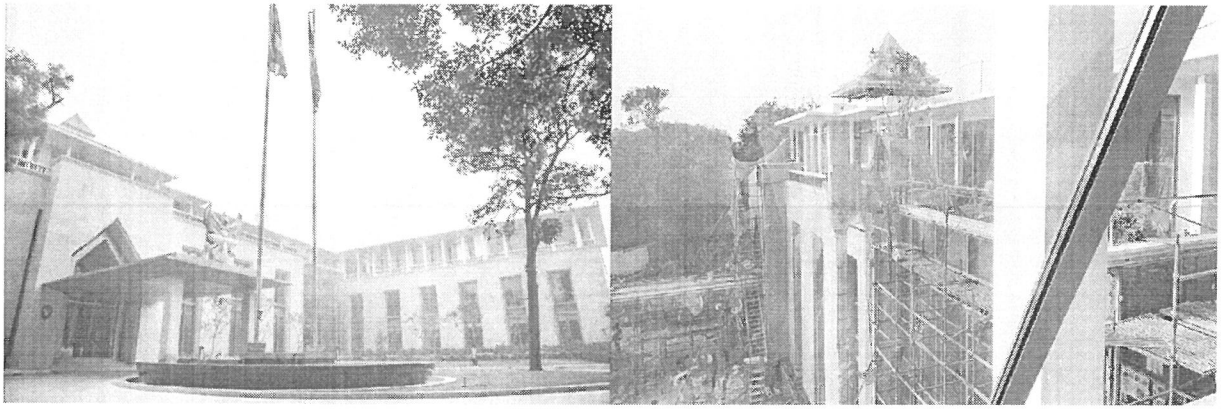


Figure 6 Royal Thai Embassy



Figure 7 NTPC Ltd.

1.3.2 Commercial Projects

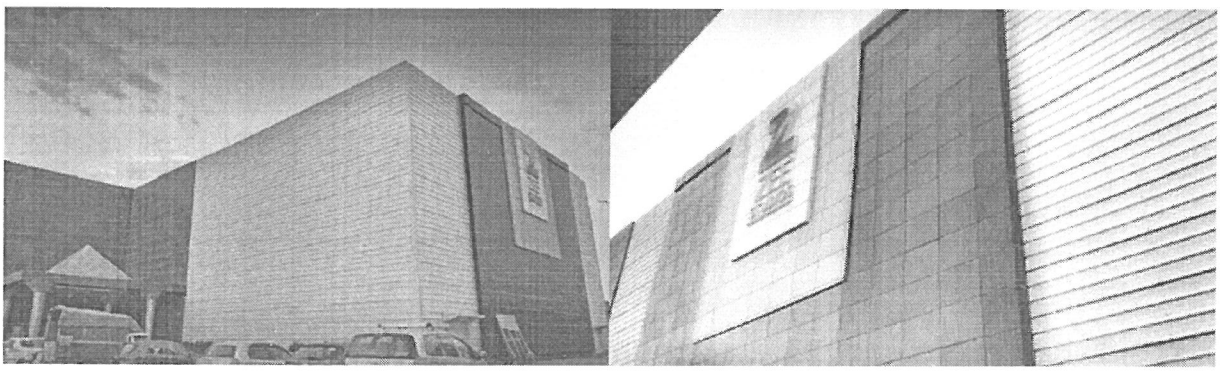


Figure 8 Zee Studio

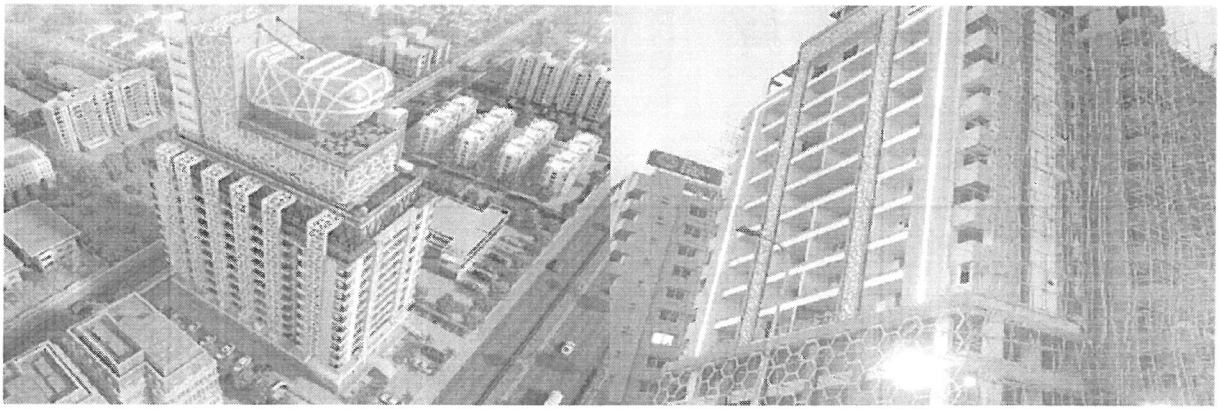


Figure 9The Rise by Sankalp, Jaipur

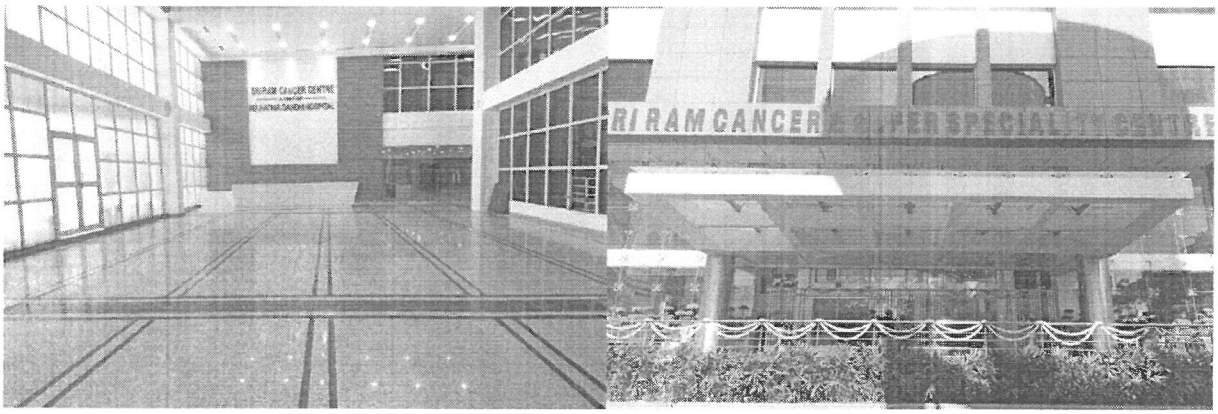


Figure 10 Shri Ram Cancer and Super Specialty Centre

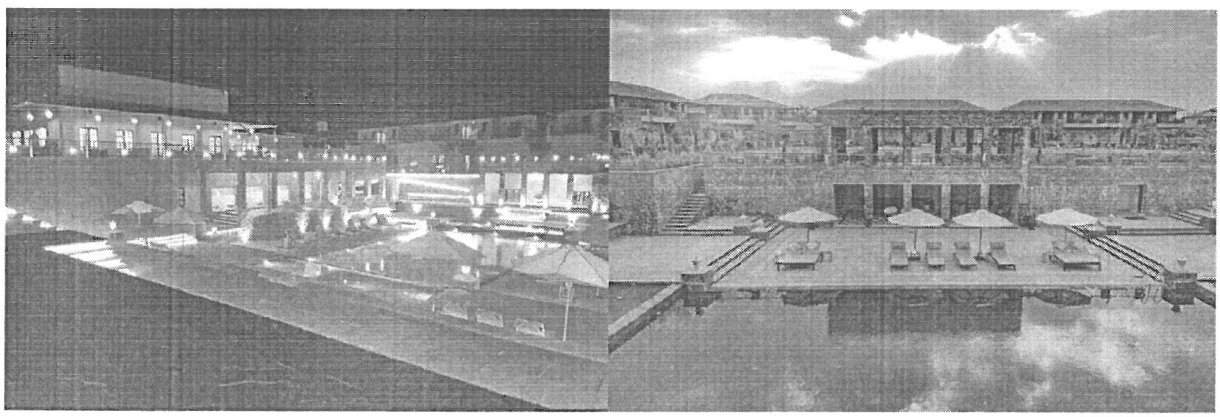


Figure 11 Sawai Vilas, Ranthambore

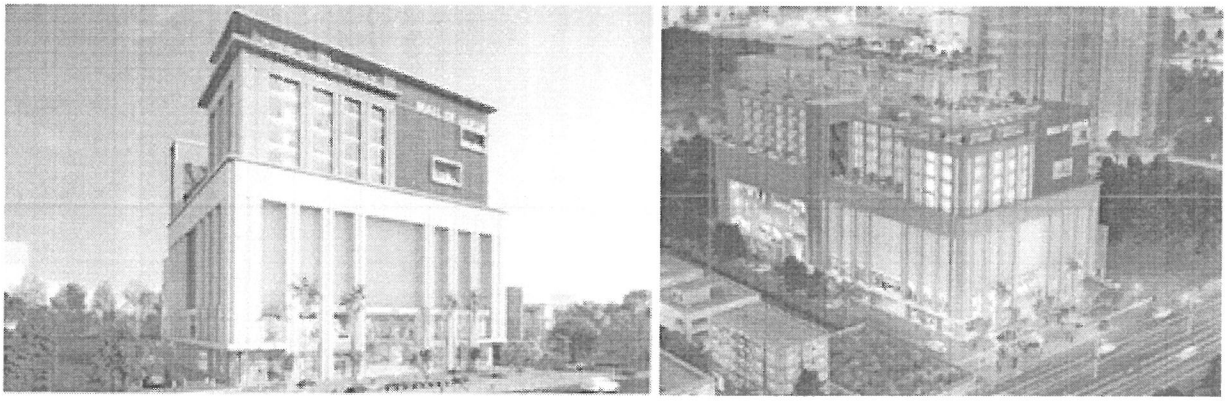


Figure 12 Mall of Jaipur

1.3.3 Residential Projects

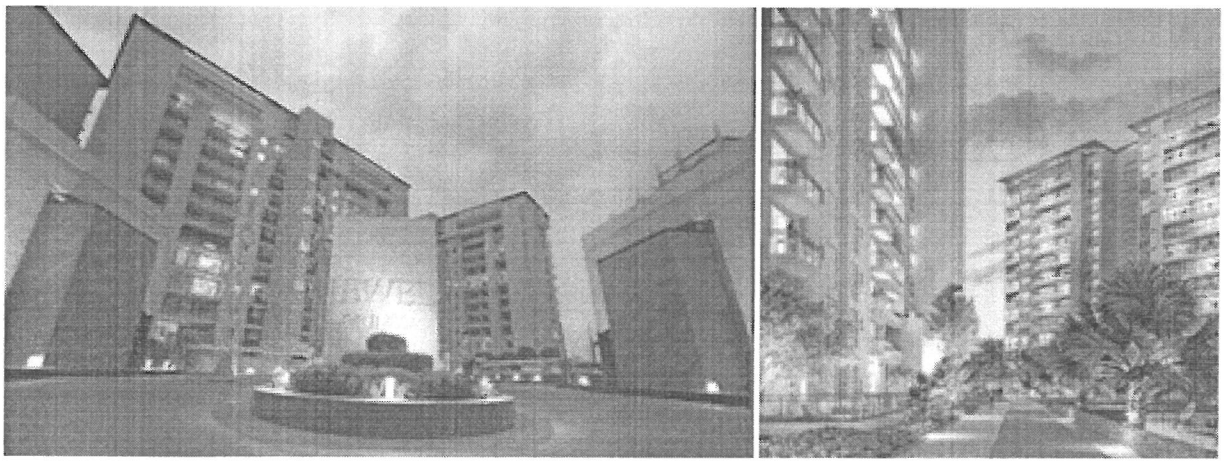


Figure 13 Jewel of India, Jaipur

1.3.4 Ongoing Projects

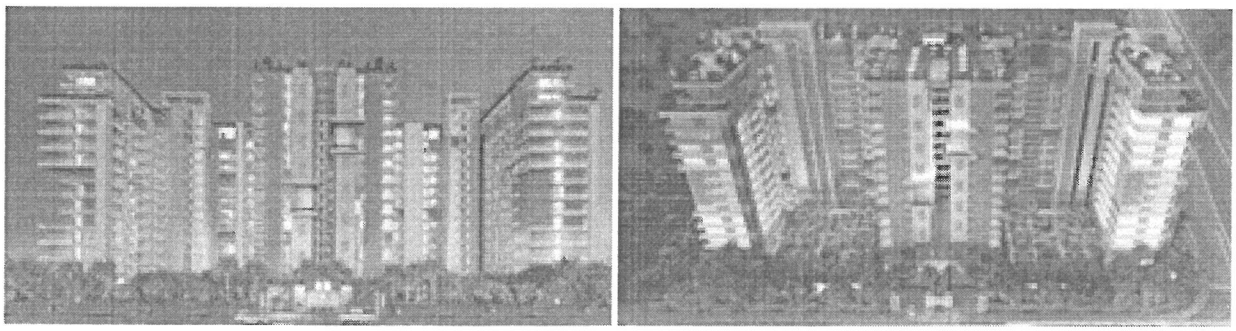


Figure 14 The Crest, Jaipur



Figure 15 World Trade Center, New Delhi

Chapter-2: About Training

2.1 Training Objective

The main objective of this training is to understand the working process, technical parameters and maintenance of the following machines:

- CNC cutting machine
- Tempering machine
- Lamination line
- Double glazed unit (DGU) line.

2.2 Training Timeline

The training is divided into 4-time slots of 26 days as follows:

- In the first slot we have to understand basic properties of glass, material handling, working of CNC machines and various robots, and submit a complete report including the general working procedure of the machines along with Standard Operating Procedure (SOP).
- In the second slot we will be train for a specific task that will depend upon the company's requirement or our field of interest.
- In the third and fourth slot, a mainstream work will be assigned to us along with a project, based on our second slot training.
- Date of final viva voce and report submission - Tuesday, 27 May 2022.

Our training will be accomplished under the supervision of operators of various machines and the final assessment will be done by the chief engineer of the company.

2.3 Expected Output & Learning from Training

We will learn about the operating procedure, technical characteristics, and maintenance of the following machines during this training session:

CNC Cutting Machine.

Line of lamination

Machine for tempering.

DGU (Double Glazed Unit) Line

We'll also learn about different sorts of glasses, how to test them, and how to evaluate them for quality. It's also about how an industry is run, managed, and how it responds with all internal and external influences.

Chapter-3: Basics of Glass

3.1 What is Glass?

Glass is an amorphous solid that is both transparent and solid, and it is employed in a wide variety of applications in our daily lives. Glass is created by melting natural and abundant raw materials (sand, soda ash, and limestone) at a very high temperature.

Glass is made up of...

The primary raw materials in glass are sand, soda, limestone, clarifying agents, coloring and glistening glass. Glass sand is about ¾th of the entire glass composition.

(72% Silica sand, 13% Soda Ash, 12% Limestone)

- Silica (sand) – is the major ingredient in glass.
- Soda Ash – acts as a flux and is added to help melting.
- Limestone – makes the glass durable & insoluble.

3.2 Annealed/Float Glass

Ordinary "float glass" (also kno· n as "flat" glass) that has not been heat-strengthened or tempered is referred to as annealed glass. The technique of controlled cooling used to prevent residual stress in float glass is called annealing. It is an integral part of the float glass manufacturing process. The hot gl: ss is slowly cooled in the annealing lehr durir g the float glass manufacturing process, releasing any internal tensions and allowing the glas to be cut and further processed after fabrication. Cut, machined, drilled, edged, and polishec annealed glass are all options. When annealed gla: s is broken, it produces huge shards with sharp edges, making it unsuitable for use as a "safety" g ass.

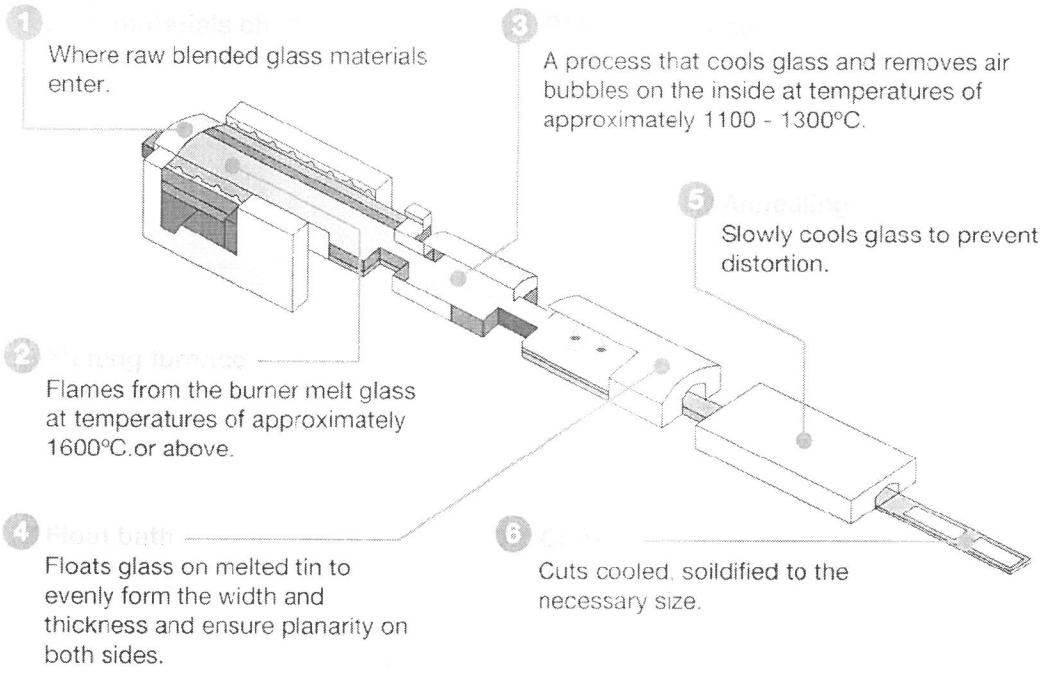


Figure 16 Float glass manufacturing process

3.3 Annealed Glass Manufacturers

Some known Annealed glass manufacturers in INDIA:

- Saint-Gobain India Pvt. Ltc .
- Asahi India Glass Ltd.
- Sisecam (HNG glass) Pvt. l td.
- Gujarat Guardian (Modigu: rd) Pvt. Ltd.

3.4 Annealed Glass Types

Annealed glass comes in a series based on the coating, quality, reflection and performance.
Annealed glass series offered by Gujarat Guardian Pvt. Ltd. Are:

- Clear
- Solar plus
- High performance
- Double silver
- HD colors

Clear Glass:

Clear Glass is a glass manufactured in the float line without any tint, allowing it to be transparent in nature. This transparent and clear finish ensures clarity of vision with true colors of the objects.

Solar plus Glass:

Solar control glass is a hi-tech product developed by the glass industry to allow sunlight to pass through a window or façade while radiating and reflecting away a large degree of the sun's heat. The indoor space stays bright and much cooler than would be the case if normal glass were used.

Solar plus glasses are colourcoated glass which comes with variety of coatings as follows:

Blue 27

	VLT%	Ext. Ref.%	Int. Ref.%	CRI (Ra)
SGU	27	12	4	93
DGU	24	13	12	91

Grey 27

	VLT%	Ext. Ref.%	Int. Ref.%	CRI (Ra)
SGU	27	11	4	94
DGU	24	11	11	92

Neutral 27

	VLT%	Ext. Ref.%	Int. Ref.%	CRI (Ra)
SGU	27	14	9	95
DGU	24	15	15	94

Green 27

	VLT%	Ext. Ref.%	Int. Ref.%	CRI (Ra)

SGU	27	13	4	88
DGU	24	14	12	86

High performance Glass:

High performance glazing is one which can contribute to optimizing energy efficiency and at the same time enhance light penetration. High performance glazing has low U-value, low Shading Coefficient and High VLT (Visual Light Transmittance) and is the ideal choice for today's energy stressed buildings.

HD Glass:

High-definition (HD) glasses are made with a modern manufacturing technique that involves scanning the eye to produce a pair of lenses ideal for the user. Created with a level or precision and customization not previously possible, HD glasses are usually at least marginally better than conventional lenses.

HD glasses are colour coated glass which comes with variety of coatings as follows:

HD Blue

	VLT%	Ext. Ref.%	Int. Ref.%	CRI (Ra)
SGU	27	19	25	99
DGU	24	20	28	97

HD Green

	VLT%	Ext. Ref.%	Int. Ref.%	CRI (Ra)
SGU	35	27	12	95
DGU	31	28	18	94

HD Bronze

	VLT%	Ext. Ref.%	Int. Ref.%	CRI (Ra)
SGU	23	13	2	95
DGU	20	13	10	95

HD Grey

	VLT%	Ext. Ref.%	Int. Ref.%	CRI (Ra)
SGU	19	11	7	96
DGU	17	11	13	97

Note: Colour coated glasses are formed by spraying metal oxides in form of thin coatings (0.01μm to 0.8μm).

Chapter-4: Glass Processing

4.1 Order Placing

The CSD work must be completed before moving on to the Glass processing. After receiving the order via mail, the PI is generated based on the customer's requirements, and a copy of the PI is sent to the customer for cross-checking. After the PI, glass size requirement, and rough sketch for any hole cutting or other fabrication changes (if any) are confirmed, the information is forwarded to Production Planner.

The job of the production planner is to design the sheet to the customer's specifications and to minimise wastage caused by cutting huge sheets. Once the work is over, keep in mind the extra pre-cut sheet portions that might be used in future projects. The current software used for optimization of sheet is "Edit-way 6.5". It shows the different-different sheets arrangements from which we can select the best optimized sheet cut-out with least total wastage.

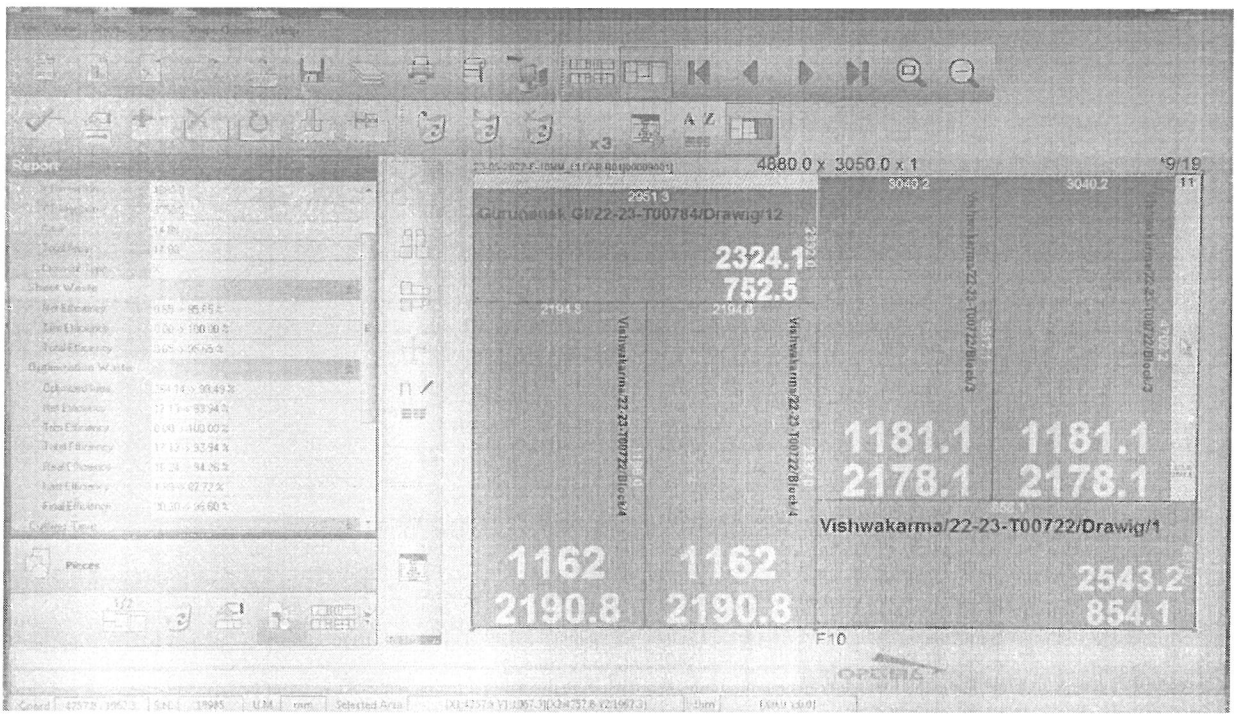


Figure 17 Sheet optimized for least glass wastage

The clear float glass comes in formof large sheets of various thickness and sizes which are as follows:

Sr. No.	Item Description	Size (mm)
1	4 MM Clear	2440*1830
		3210*2250
		3050*2140
		2440*3660
2	5 MM Clear	2440*1830
		3210*2250
		3050*2140
		2440*3660
3	6 MM Clear	3660*2440
		2250*3210
		3050*2550
		3050*2140
		2250*3660
4	8 MM Clear	4880*3050
		4270*3050
		2440*3660
		2800*3050
		2770*3660
		2800*3050
5	10 MM Clear	4880*3050
		4270*3050
		2440*3660
		2250*3210
6	12 MM Clear	4880*3050
		3660*2770
		3660*2600
		3660*2440

The colour float glass comes in form of large sheets of various thickness and sizes which are as follows:

Sr. No.	Item Description	Sizes (mm)
1	5 MM HD BLACK	2440*3660
2	5 MM HD BLUE	2440*3660
3	5 MM HD GREEN	2440*3660
4	5 MM NEUTRAL 67	2440*3660
5	5 MM SOLAR SILVER 20	2440*3660
6	5 MM SOLAR AQUA MARINE	2440*3660
7	5 MM ROYAL BLUE 20	2440*3660
8	6 MM HD BLUE	2440*3660
9	6 MM HD BRONZE	2440*3660

10	6 MM DS BLUE 50	
11	6 MM DS GREEN 40	2440*3660
12	6 MM DS NEUTRAL 40	2440*3660
13	6 MM NEUTRAL 50	2440*3660
		2400*3210
		2440*3050
14	6 MM NEUTRAL 34	2440*3210
15	6 MM NEUTRAL 40	
16	6 MM NEUTRAL 67	2440*3660
17	6 MM HP NEUTRAL 70	2000*3660
18	6 MM SOLAR GREEN 30	
19	6 MM SOLAR SILVER 20	2440*3660
20	6 MM SOLAR GREY 33	2440*3660
21	6 MM SOLAR PLUS GREEN 27	2440*3660
22	6 MM GREEN 20	2250*3210
23	6 MM ROYAL BLUE 40	2400*3660
24	6 MM ROYAL BLUE 20	2440*3660
25	6 MM HP NEUTRAL 40	
26	8 MM HD BRONZE	2000*3050
		2440*3050
27	8 MM HP NEUTRAL 70	2000*3050
		2440*3050
28	8 MM NEUTRAL PLUS 70	
29	8 MM NEUTRAL PLUS 50	3050*2440
30	8 MM SOLAR GREY 33	2440*3660
31	8 MM SOLAR GREY 32	2440*3660
32	10 MM HP NEUTRAL 70	2250*3660
33	10 MM SOLAR PLUS NEUTRAL 27	
34	12 MM NEUTRAL 67	2440*3660
35	5 MM HD BRONZE	2440*3660
36	6 MM NEUTRAL PLUS 27	2440*3660

4.2 CNC Cutting

Once the annealed glass is received, it is assembled on the 6-stations according to the size and thickness differences, and then lifted by an automated tray with suction cups and a conveyor roller attached to it, which can move up to these dedicated 6-stations to select and collect the glass for CNC cutting. As soon as the glass is loaded onto the CNC machine, it is cut with the diamond tip tool according to the operator's pre-feed instructions.

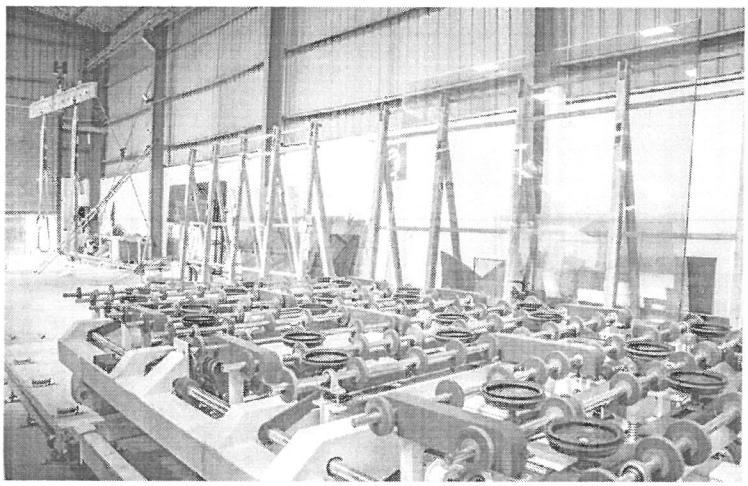


Figure 18 Glass stations and conveyor tray with hydraulics & suction cup

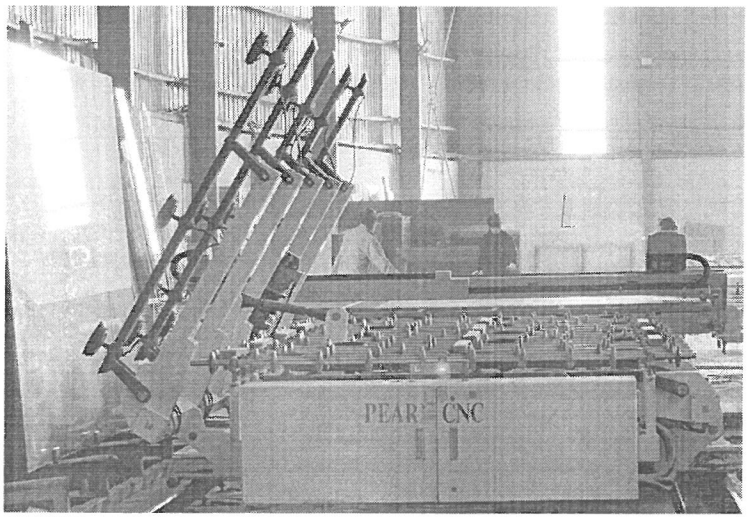


Figure 19 Float glass lifted from a station using suction cup tray

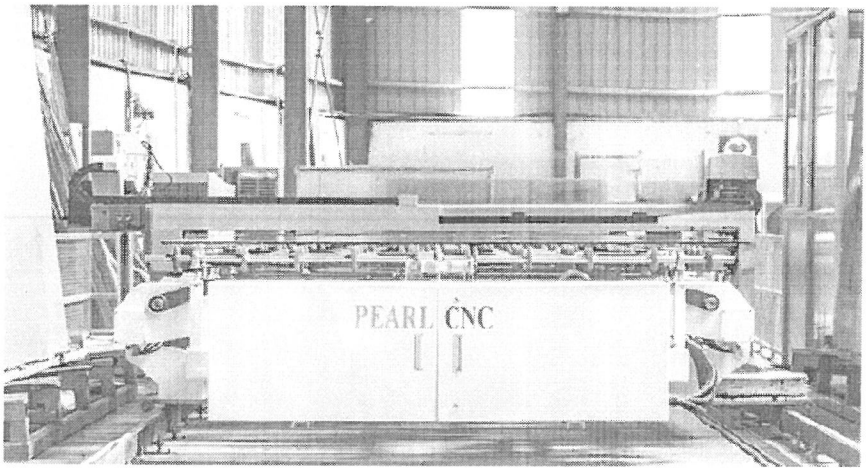


Figure 20 Loading Float glass on CNC cutting table

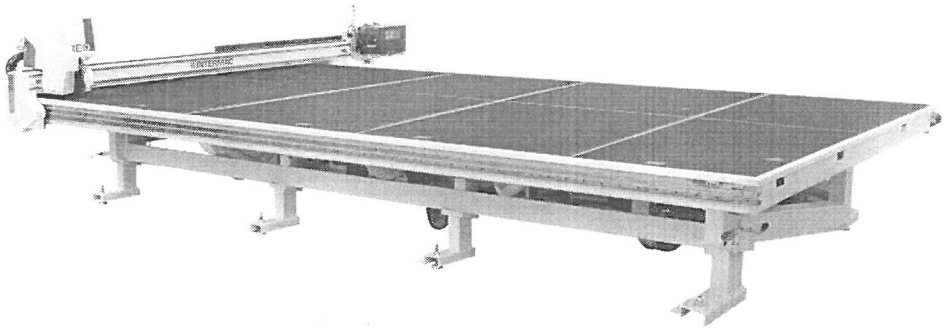


Figure 21Intermac Genius 61 CT-RED

The current CNC machine in the plant is a "Intermac accuracy genius 61 ct-red" with the following features: • Acceleration 10 m/sec2.

• 200 m/min speed

• 0.15 mm precision

The machine's base is constructed up of a strong, rectangular structure to which ground wood panels are mounted, ensuring optimum planarity of the working area, which is necessary for optimal glass grooving and breaking-out operations.

The Intermac 6-position automatic tool magazine is a unique technology that allows you to perform many cuts on a single sheet, considerably improving the quality of the final product. The cutting tools can be changed automatically thanks to the roller-holder cones.

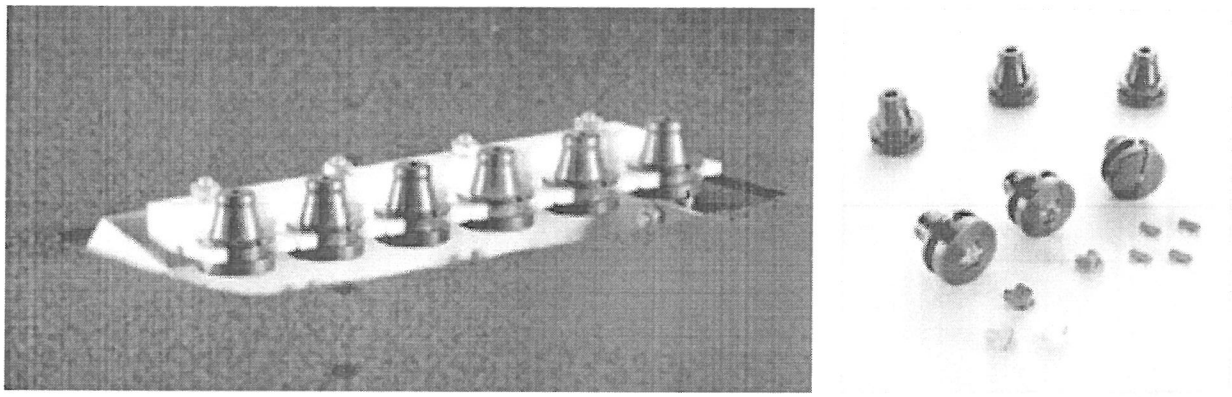


Figure 22 Cutting tips

Cutting Lubrication: The delivery of lubrication oil is controlled electronically and is timed to match the pace at which the form is executed and the precise straight cutting needs, reducing waste and enhancing machining results at the same time. While cutting the float glass, precise oil stream dosage with no "drop" effect is used. As required, pressurised oil lubrication is also available. The refractive index of the cutting lubricant is the same as that of the glass (1.46 or lower).

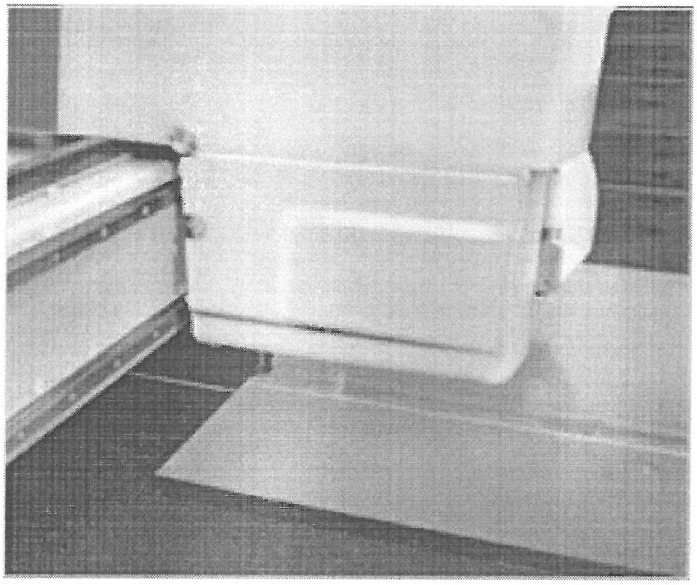


Figure 23 Lubrication while cutting

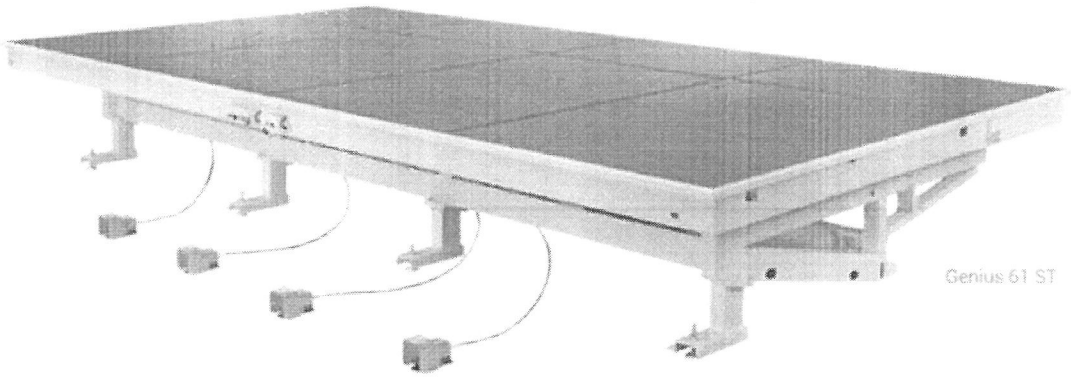


Figure 24 Cutting benches

Break-out Bars: The transverse and longitudinal pneumatic bars allow for glass break-out operations.

The numerical control system for the Intermac CNC machine is based on a PC WNC-based numerical control system (IWNC - Intermac Windows Numerical Control)

• Suitable for both newcomers to CNC machines and those with previous programming knowledge.

• Controlling the machine's operating parameters.

• Designing and modifying cutting patterns as well as geometric and non-geometric shapes.

• Production report management modules

Optimizer for straight and curved cuts, allowing for the following benefits:

• Minimizes waste

• Meets the needs of glassworks firms in terms of production.

• Improves the machine's performance.

STAND ALONE CONFIGURATION

		GENIUS 37 CT-RED	GENIUS 61 CT-RED
Machinable dimensions	mm	3710 x 2750 3810 x 2750 (opt.)	6100 x 3350
Machinable thickness	mm	2-19 (25 opt)	2-19 (25 opz / max 3000 kg)
Max axle movement speed	m/min	200	200
Max acceleration	m/sec2	10	10
Positioning precision of the working head	mm	± 0,15	± 0,15
Straight and shaped optimisation (optional)		yes	yes
Shearing bars (optional)		2 + 1	3 + 1/3 + 2 (opt.)
Table tilting time (optional)	sec	30 (1 stroke)	30 (1 stroke)
Work table height	mm	900 (-15 / +40)	900 (-15 / +40)
Installed power: fixed table/ tilting table (opt.)	kW	8.6 / 9.57	10.4
Overall weight	Kg	2400	3800

Figure 25Intermac Genius 61 CT-RED configurations

4.3 Fabrication

After the cutting of glass as per requirement it is now sent for the fabrication processes which are as follows:

4.3.1 Single edge

A PG process is single edging. The glass sides are grinded by 1mm from a specific side of the glass at a specific moment in single edge machining. The glass is manually turned or settled for the side that has to be ground in this method. This method is useful for polishing small glass pieces and specific edges.

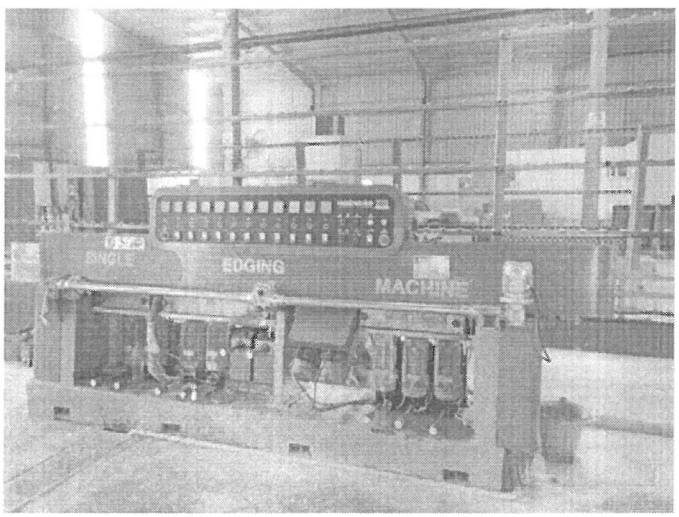


Figure 26 Single Edging Machine

4.3.2 Four edge

The procedure of four edging is PG. The glass edges are ground by 1mm on all four sides in the Four Edging machine, giving the glass an extremely smooth finish and shape from the edges. Two edges are ground simultaneously using this machine. However, because there is material waste in this process, it costs more than the RG process. This procedure is typically used on glass doors, table tops, and glass partitions where the glass edges are clearly visible and in close contact with naked hands.

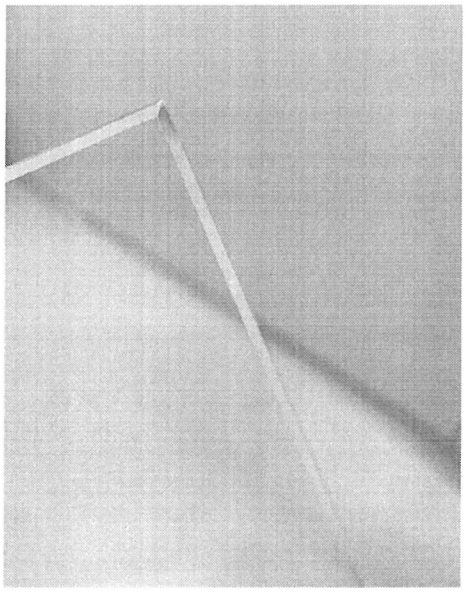


Figure 27Four edged glass

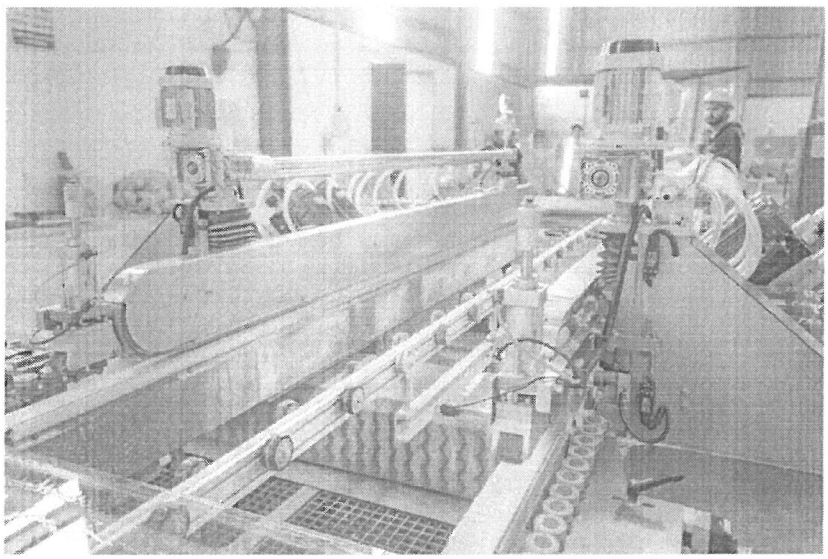


Figure 28Four Edger machine

4.3.3 Rough Grinding

It's the RG procedure, which can be carried out manually or mechanically. There is no size loss in this procedure, unlike a PG technique, because rough grinding only minimally smooths the edges, so it does not hurt when you contact the glass from the edges. In this technique, irregularities from the edges can be plainly seen, but it is a very cost-effective process that is usually used on glass panels that go within metal frames or places where the glass edges are covered and cannot be seen or directly touched.

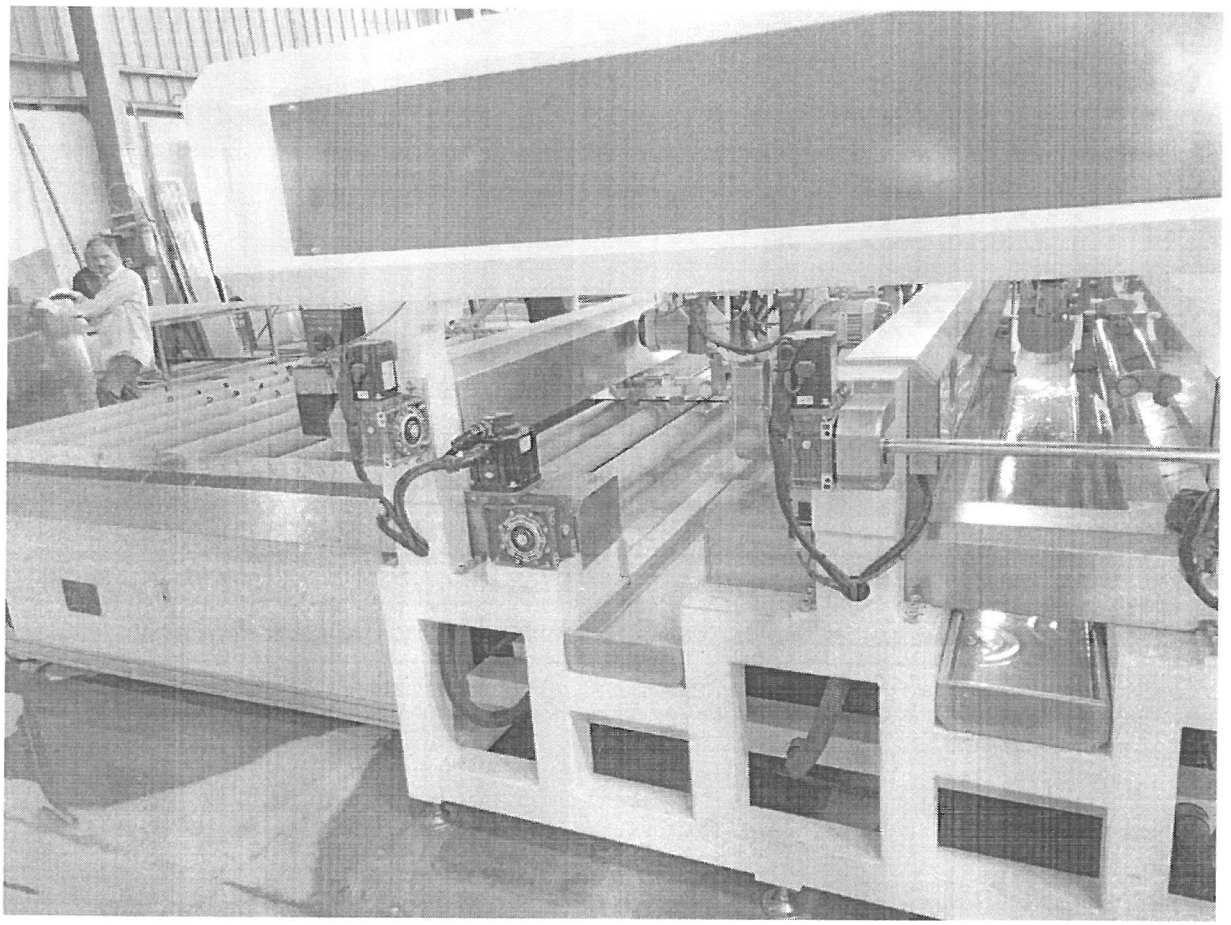


Figure 29 Automatic Rough Grinding Machine

4.3.4 Bevelling

The PG processing includes the bevelling procedure. It is carried out in accordance with the needs of the customer. The edges of the glass are given a small slant from all sides during the Bevelling process, which increases the glass edge smoothness and provides an attractive finish. Because of the prism effect created by the processing, bevelled glass also produces appealing colour patterns.

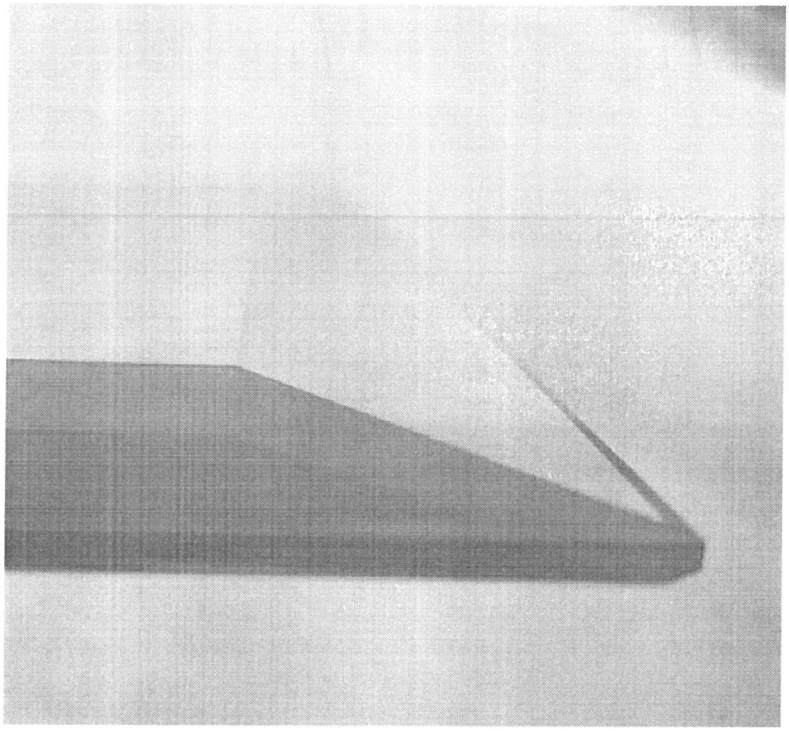


Figure 30 Beveled Glass

4.3.5 Drilling & Cutting

The use of a cross-byte and drilling machine is another step in fabrication, however it is dependent on the use of glass and order needs such as door fitting cuttings or cutting holes in glass for air circulation or sales-counter use. So that the glass does not break during the cutting process, an equal supporting pressure is applied around the surrounding of the hole region that had to be cut-out during the drilling operation.

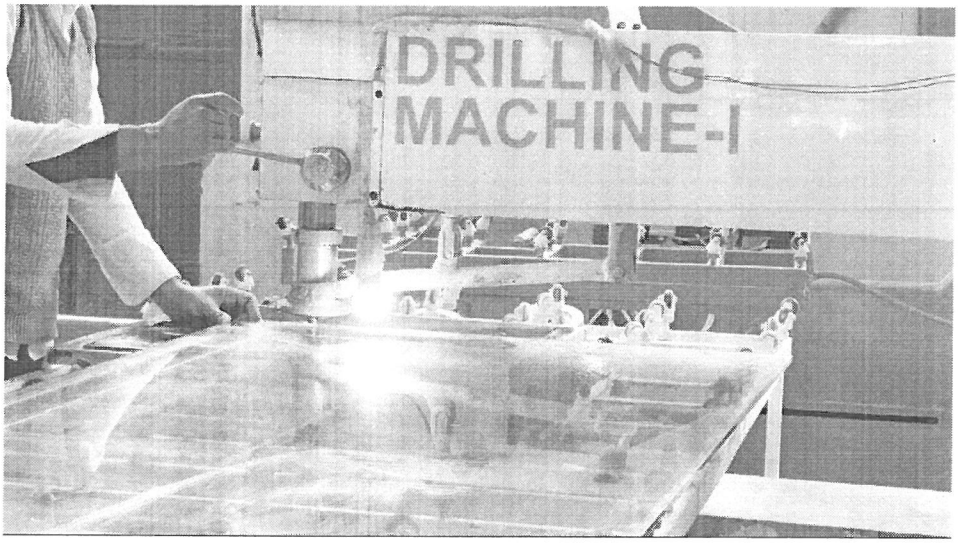


Figure 31 Drilling process.

4.4 Toughening

Toughened glass, often known as tempered glass, is resistant to breakage. When glass breaks, little granular chunks, such as square bits, occur, which are dangerous and can injure people. Facades, glass doors, windows, and fire-resistant doors are all examples of where it's employed.

A thermal tempering procedure can be used to create tempered glass from annealed glass. The glass is placed on a roller table and passed through a furnace, which heats it to roughly 620 °C (1,148 °F), much over its transition temperature of 564 °C (1,047 °F). The glass is then swiftly chilled using forced air draughts, with the inner portion of the glass remaining free to flow for a brief period of time.

Tempered glass is approximately four times as strong as annealed glass. Compressive stresses in the surface of the glass are balanced by tensile stresses in the body of the glass due to the higher contraction of the inner layer during manufacturing. A minimum surface compression of 69 MPa (10 000 psi) or an edge compression of not less than 67 MPa is required for fully tempered 6-mm thick glass (9 700 psi). The surface compressive stress must be greater than 100 megapascals to be considered safety glass (15,000 psi). Because of the increased surface stress, the glass fractures into little spherical chunks rather than sharp jagged shards when broken.

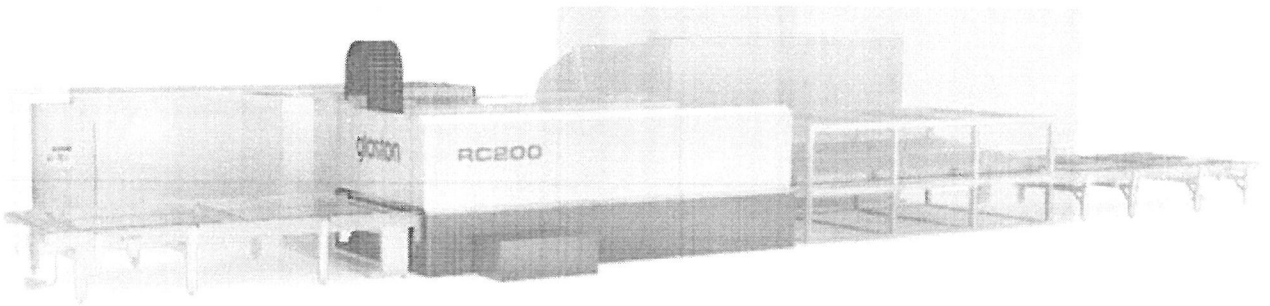


Figure 32Glaston RC 200

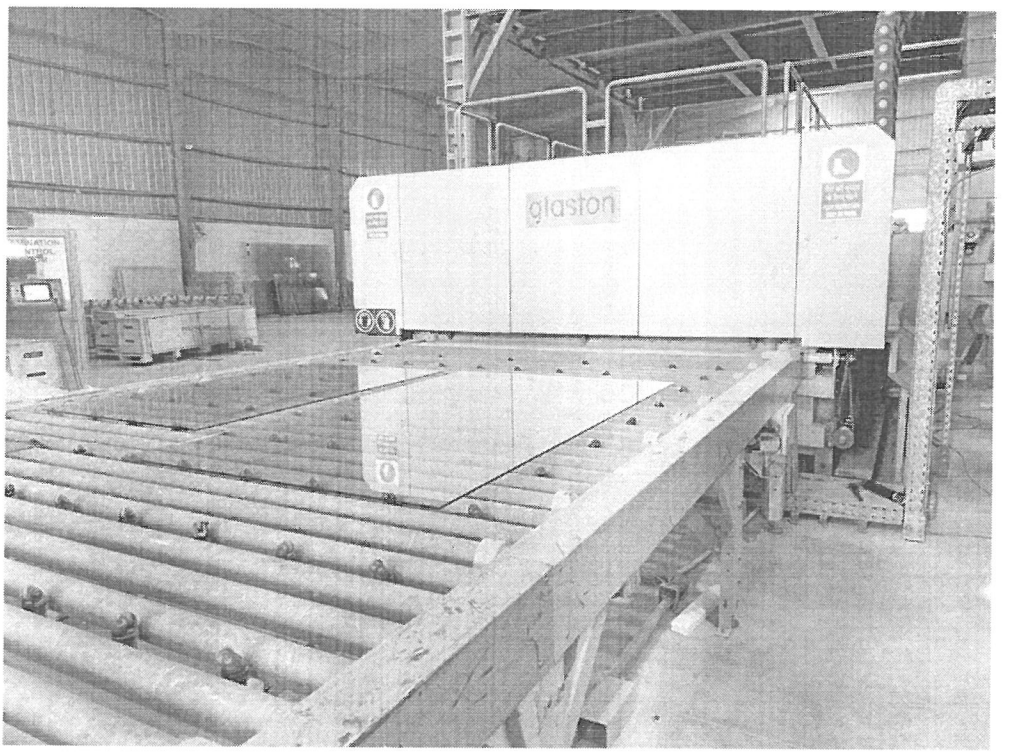


Figure 33 Glass ready for toughening process

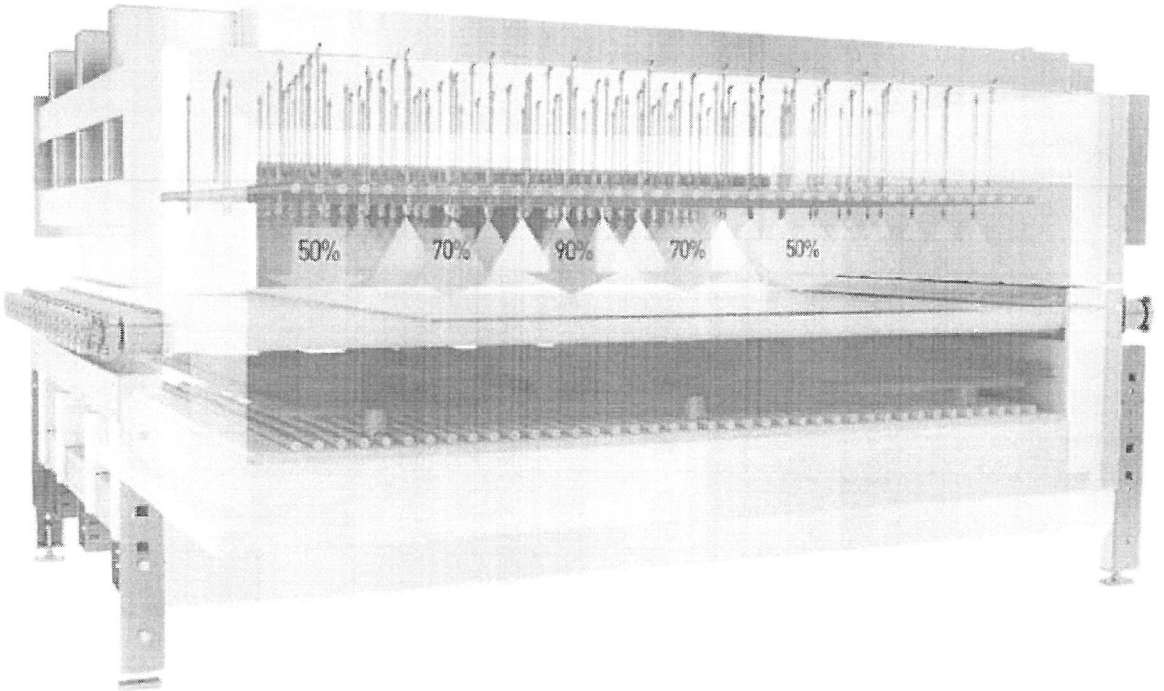


Figure 34 Glass heating inside the machine from both sides

Before tempering, any cutting or grinding must be completed. After tempering, cutting, grinding, and sharp impacts will fracture the glass.

By looking through an optical polarizer, such as a pair of polarising sunglasses, you may see the strain pattern caused by tempering.

When strength, temperature resistance, and safety are key considerations, tempered glass is employed. Passenger vehicles, for example, must meet all three criteria. They are subjected to frequent heating and cooling, as well as extreme temperature variations throughout the year, because they are stored outside.

Depending on the thickness and qualities of the glass, different heating times and temperatures are required; for example, coated glass takes longer heating time than clear glass. (Note: During the toughening process, the coated side should always be up and the reflecting side should always be down, as the bottom temperature is always higher than the top temperature.)

Following table shows the heating time and temperature for the different-different glass types:

S. No.	Glass Type	Heating Time (in sec.)	Heating Temp. Top (in °C)	Heating Temp. Bottom (in °C)
1	5 MM Clear	212	678	690
2	6 MM Clear	274	672	690
3	8 MM Clear	382	672	690
4	12 MM Clear	661	672	678

(Note: Cooling pressure remains same for all types ranging between 1000Pa to 2250Pa.)

Technical capabilities of the Glaston RC200™

GLASTON RC200™	Capacity (loads / h) per glass thickness, clear float									Installed power (kW)			Average process power
Type	3[1] mm	4 mm	5 mm	6 mm	8 mm	10 mm	12 mm	15 mm	19 mm	Heating and drives	Blowers[2]	Total	kW[2]
1830 - Vortex™		18	14	12	9	7	6	5	4	321	200	521	208
1530 - Vortex Plus™	25	20	16	13	10	8	6	5	4	321	200	521	230
2136 - Vortex™	-	18	14	12	9	7	6	5	4	421	250	671	263
2136 - Vortex Plus™	25	20	16	13	10	8	6	5	4	421	250	671	290
2448 - Vortex™	-	18	14	12	9	7	6	5	4	704	315	1019	430
2448 - Vortex Plus™	25	20	16	13	10	8	6	5	4	704	315	1019	464

Note. All capacities during one hour of operation at constant production. Capacities shown above are based on 65% loading efficiency and with glass size 865 x 1930 mm according to EN 12150 and ANSI Z97.1 standards. Final capacity depends on glass size, shape and edgework quality. Capacities for double chamber furnaces to be given separately.

[1] 3 mm capacity depends on the blower/compressor combination.

[2] Blower powers are based on 3.8 mm tempering capability according to ANSI Z97.1-2009, GB 15763.2-2005 and EN 12150-1:2000 standards. 5 mm or 6 mm blower configuration will decrease the installed power and average process power.

Figure 35Glaston RC200 configurations

4.5 Lamination line

In the lamination process, toughened glass is placed on the conveyor bed, PVB material sheet layers are applied as required by the order, and then another glass is placed on top of it and sent into the furnace for slight heating, causing the PVB sheet to adhere to the glasses. After that, the laminated glass is sent to the Auto Clave machine for pressure heating (Pressure boiling), where it is kept for around 4 hours at 130°C, which makes the laminated glass transparent and increases its holding strength by absorbing all the moisture present in it, and pressurise heating also permanently adheres the PVB sheet to the glass.

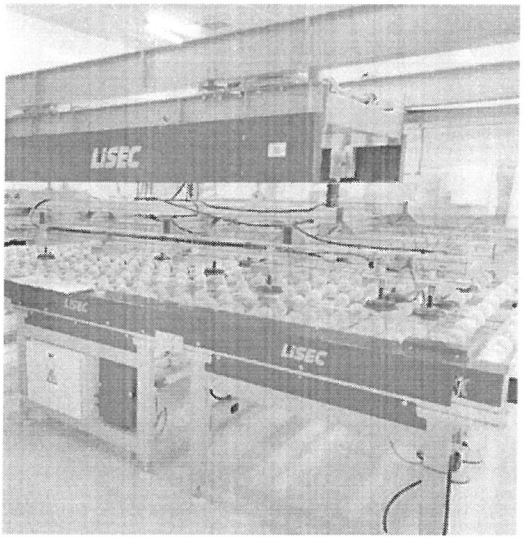


Figure 36 Lamination machine by LiSEC

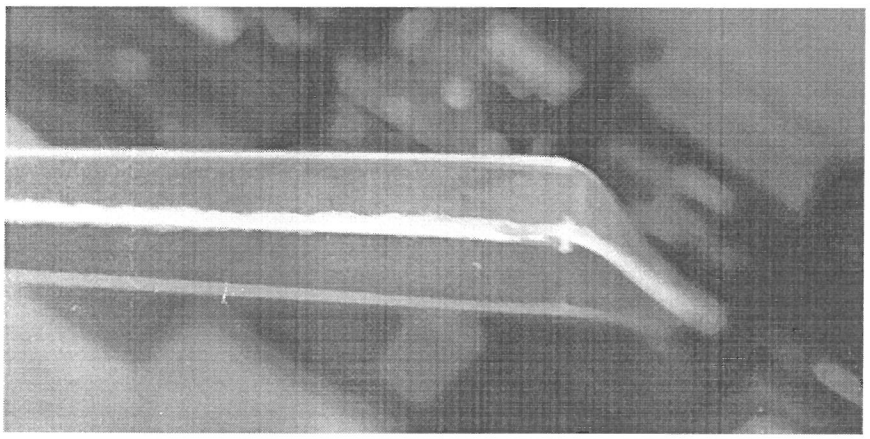


Figure 37 Laminated glass (5mm+PVB+5mm Clear glass)

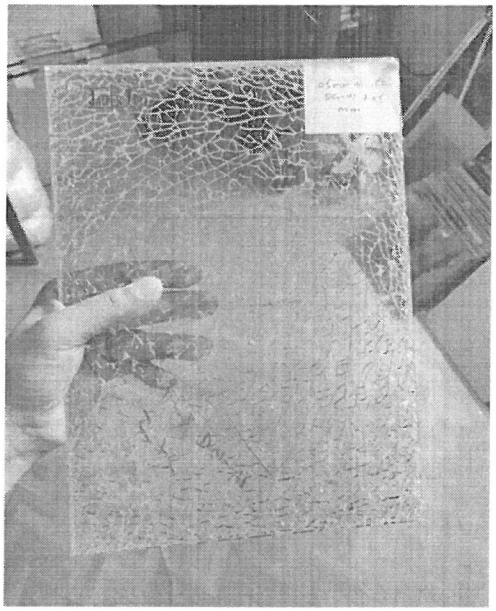


Figure 38 Glass sticked to PVB even after breaking

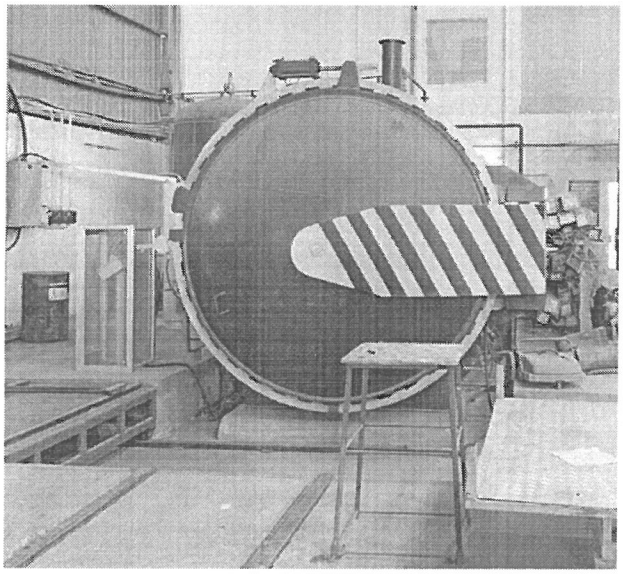


Figure 39 Auto Clave Machine

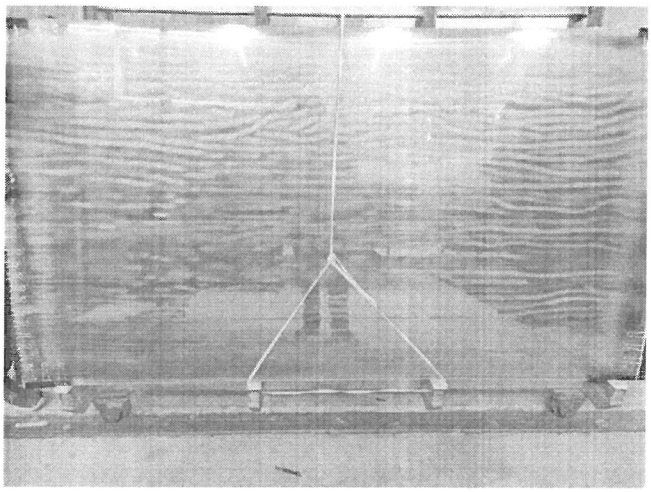


Figure 40 Lami glass before Auto Clave process

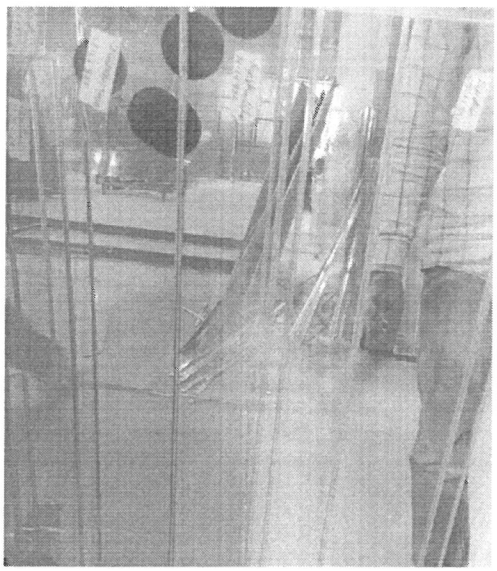


Figure 41 Lami glass after Auto Clave process

For the Laminating process there are basically three type of sheets used which are as follows:

S. No.	Laminating Sheets Type	Usage and Benefits
1	PVB (Poly Vinyl Butyral)	Mostly used material in industry for Lamination, cost effective.
2	SGP (Sentry Glass Plus)	Very good quality lamination, more strength than PVB, harder than PVB and costly.
3	EVA (Ethylene Vinyl Acetate)	Used for smart glasses, very costly.

PVB sheets roll are also available in a variety of thicknesses: DG-38 (thin), DG-41 (1.5 mm thick), and DG-76 (1.6 mm thick) (thickest). In the lamination process, copper mesh is occasionally placed in between the PVB and the glass for ornamental purposes, depending on the customer's needs.

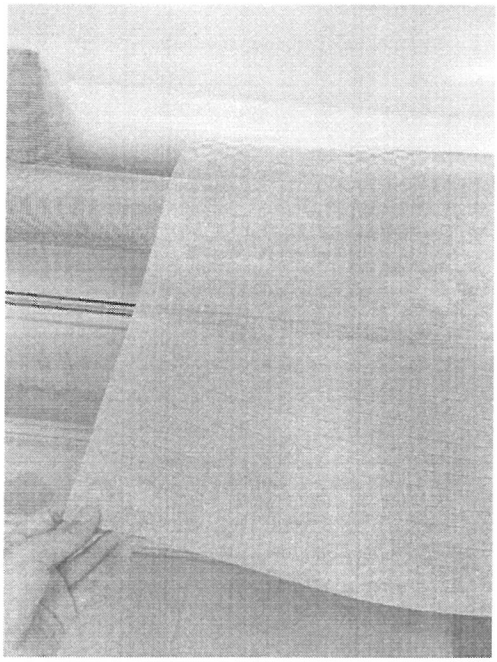


Figure 42 Copper mesh sheet for Lamination process

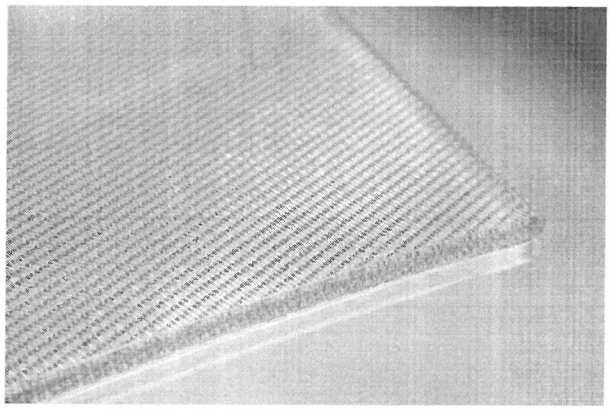


Figure 43 Laminated glass with mesh in between



Figure 44 PVB & SGP material rolls

Because it is difficult to apply pressure to small glass sizes in the Lamination process, they are first placed in a vacuum bag before proceeding to the Auto Clave process.

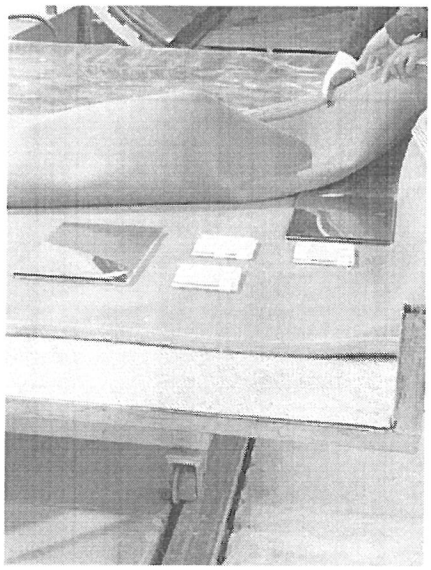


Figure 45 Small glasses kept in Vacuum bag

4.6 DGU (Double Glazed Unit) line

The DGU (Double Glazed Unit) method involves sandwiching an aluminium spacer between two pieces of glass and sealing it using Butyl glue. After that, noble gases such as argon and krypton are used to fill the empty space between the glasses, making them soundproof and providing a thermal break (This is done as per the customer requirement else normal air is trapped in it). The aluminium frame is also loaded with Molecular Sieves, which help to absorb heat. After that, the glass is pushed with the pressing machine to ensure that both glasses are perfectly adhered to the aluminium spacer.

Silicon gel, a silicon and hardener mixture, is used to fill the area between the glasses (in 10:1 ratio). A perfect solution is made by mixing 10 litres of silicon with 1 litre of hardener. After being applied on the glass for 20-40 minutes, the silicon must settle down.

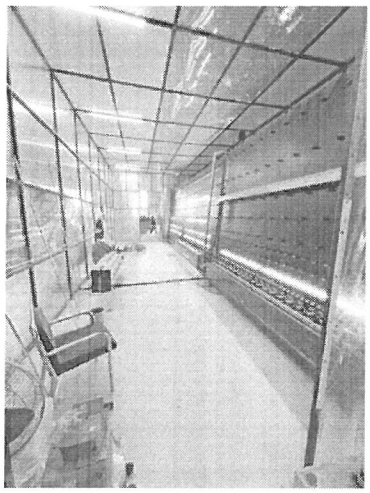


Figure 46 DGU Line-up

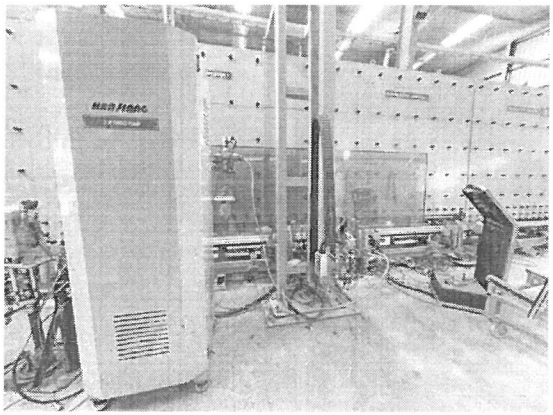


Figure 47 Automatic sealing machine

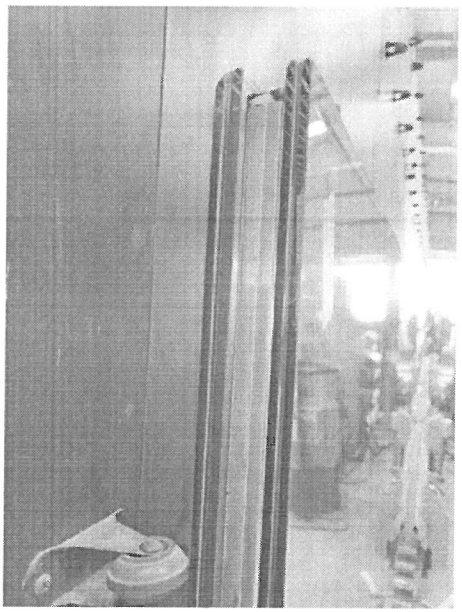


Figure 48 DGU Glass before sealing

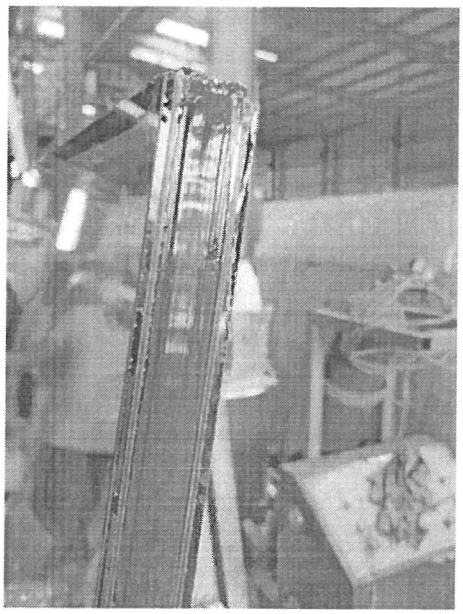


Figure 49 DGU Glass after sealing applied

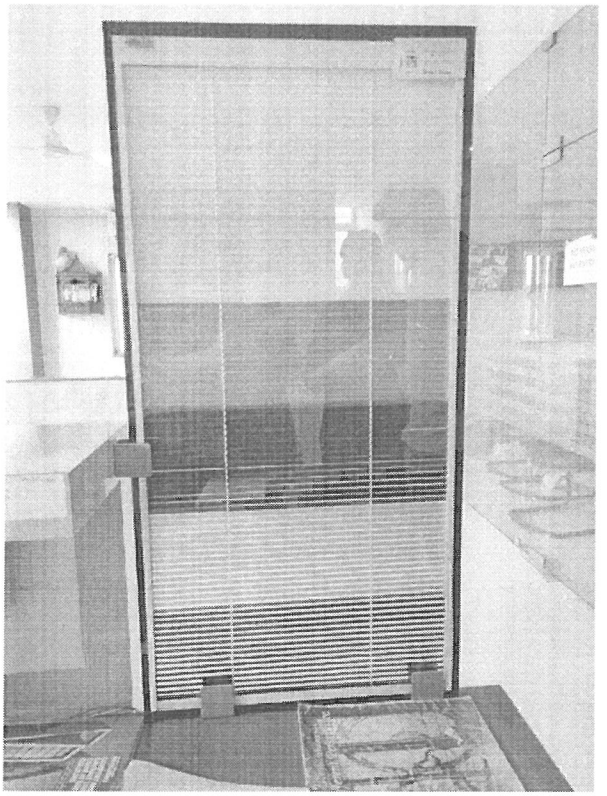


Figure 50 Smart DGU glass Window pane

Smart DGU glasses also have a window pane in the middle that can be electrically operated with a remote controller, and LED lights are put between the glass with an aluminium spacer as needed.

4.7 Frosting

The glass is covered with green tape where we don't want it to be frosted, and the uncovered part of the glass gets a translucent frosted effect after passing through the frosting machine, which rubs silica sand particles against the glass surface to provide the frosted effect and roughness on the glass uncovered surface. After the frosting process, the frosted glasses are dipped in acid for about 1 hour to get a smooth touch and finish on the frosted part. If the entire glass is to be frosted, no tape is required.

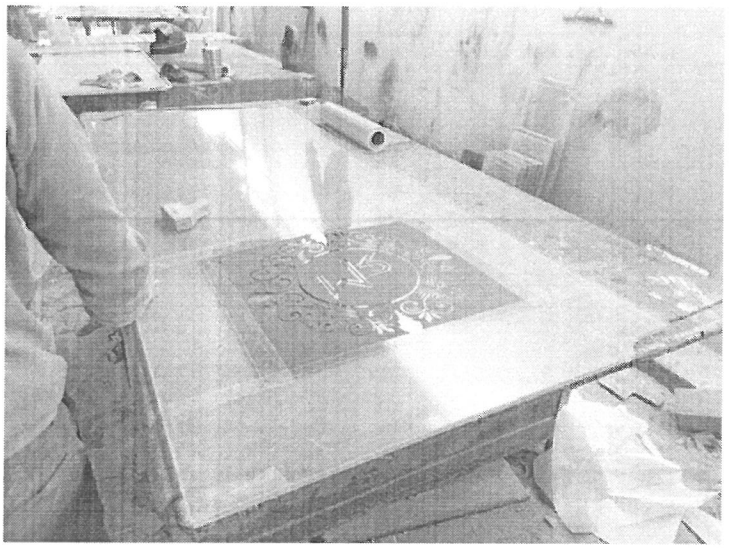


Figure 51 Taping process on glass before frosting

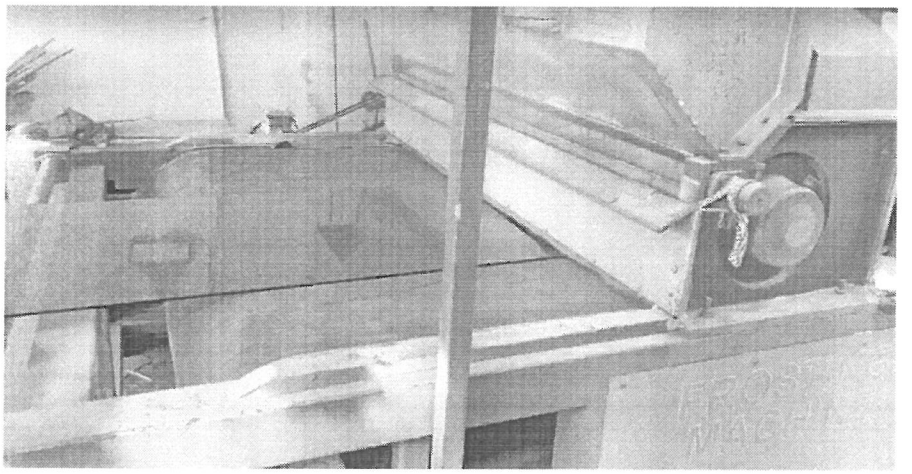


Figure 52 Frosting Machine



Figure 53 Frosted glass with taping kept in acid for frosting to get smooth

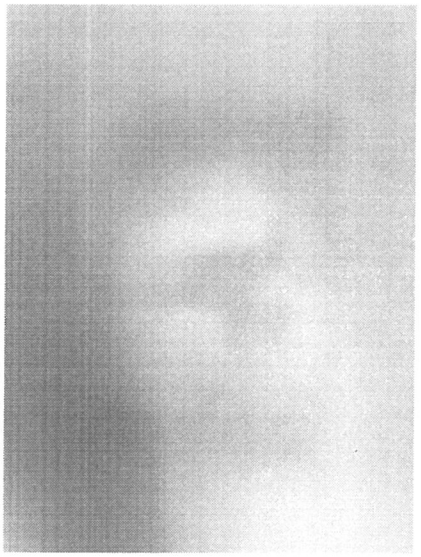


Figure 54 Frosted Glass

4.8 Glass Bending

The Glass Bending process involves keeping annealed glass on a wire frame structure of the required bend shape and heating it up to 600°C to 642°C temperature while keeping it on the frame and allowing it to gradually cool at room temperature, acquiring the shape of the frame it is kept on during this cooling process.

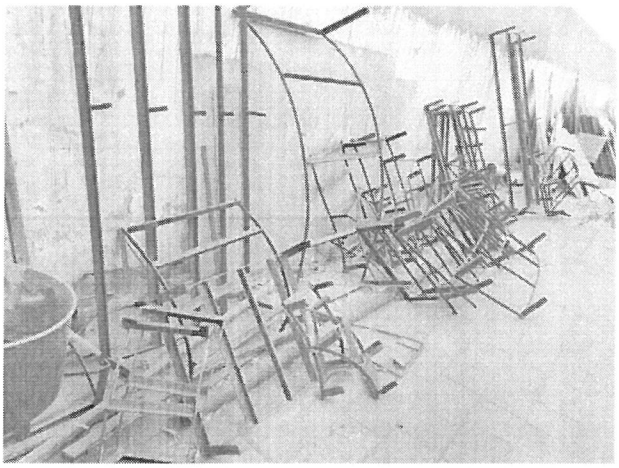


Figure 55 Frames for glass bending

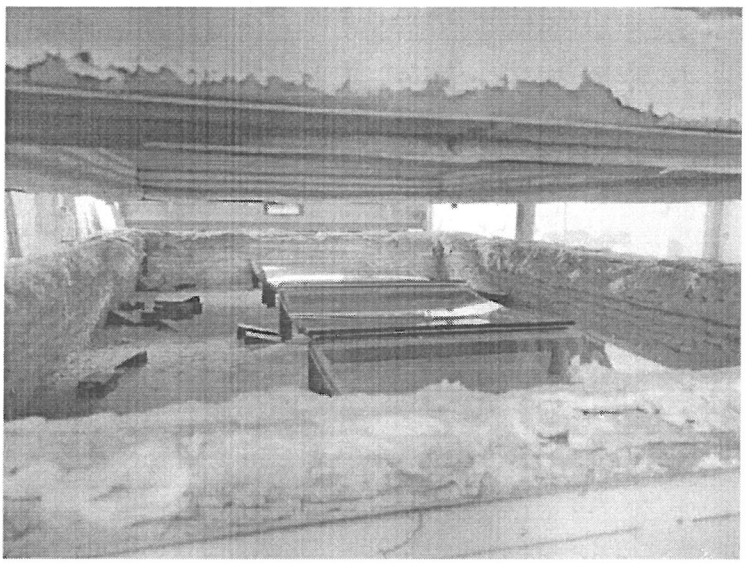


Figure 56 Glass after heating process in glass bending machine

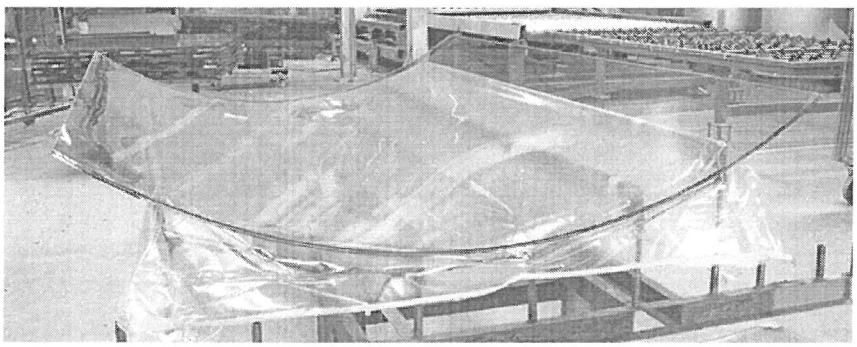


Figure 57 Bended glass

4.9 Heat Soak Machine

The toughened glasses are kept and rapidly heated and cooled from temperatures between 400 °C and 110 °C for 8 hours continuously in the Heat Soak process to strengthen the glass. The glass that passes this process is very least prone to environmental damage, and the life of the glass is increased by about 5-10 years. This technique is incredibly expensive, and it is not uncommon for an entire lot to be broken in the middle of the process. This process has a fundamental flaw in that there is currently no test that can verify whether or not the glass has been heat soaked.



Figure 58 Heat Soak Machine



Figure 59 Heat Soak glass racks

Chapter-5: Project Work

5.1 Project work-1

The task at hand was to install a new automatic rough grinding equipment and connect it to a new washing unit. The rough grinding machine was partially dismantled, while the washing machine was completely dismantled, requiring us to first find a suitable location for the entire machine unit, and then align both the machine and conveyor units in the same plane and level. Following the directions of the company maintenance engineering head, we must connect all of the conveyor gears to one another and configure the fundamental wiring of the washing system's motors and heat coils with the control panel. Once the entire machine was assembled, new three-phase wiring was installed and connected to the main panel box in order to start the machinery. All of this setup took us about a week from the time we brought the machine into the plant until the machine worked flawlessly.

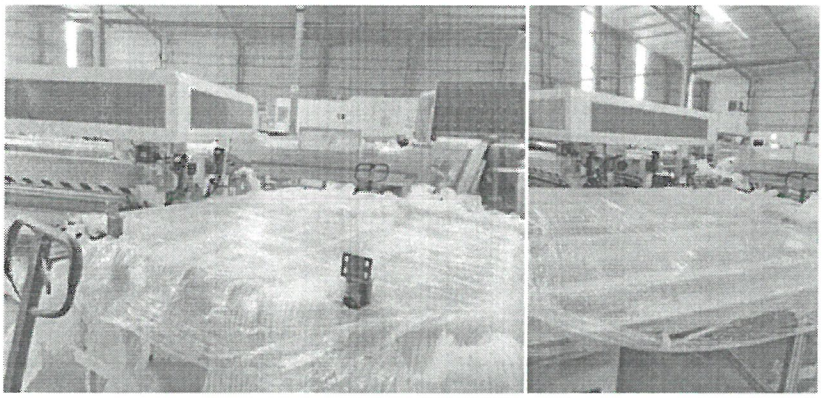


Figure 60 New machine in packed condition

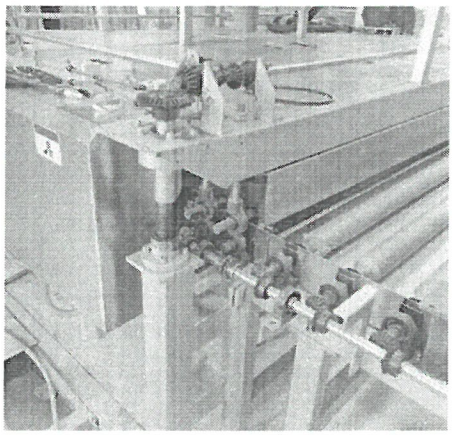


Figure 61 Arranging and leveling the machines with each other

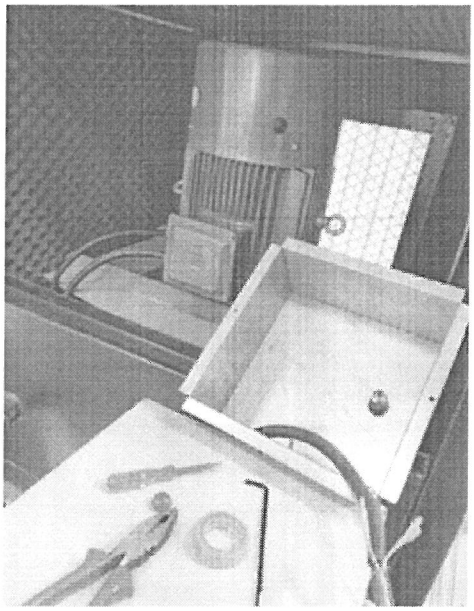


Figure 62 Air blower connection and pipe set-up

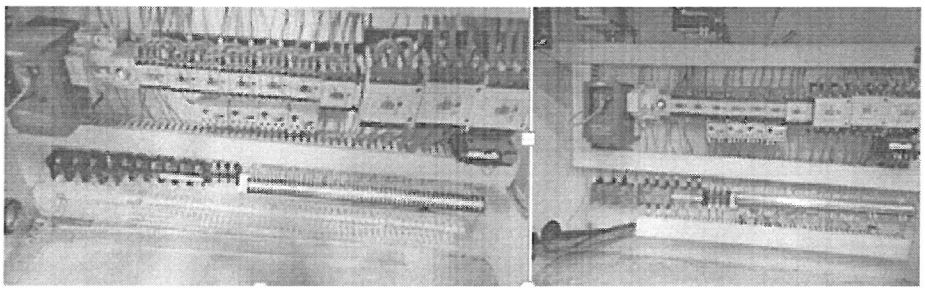


Figure 63 Machine control panel wiring

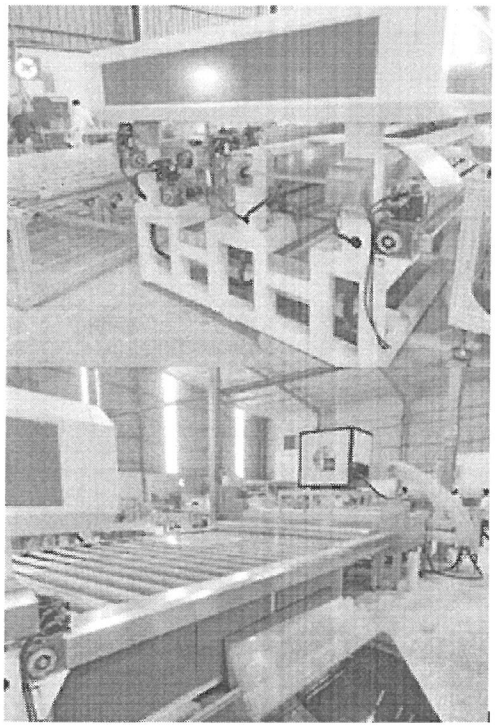


Figure 64 Machine perfectly installed and running successfully

5.2 Project work-2

We were recently given another responsibility to work on, which was to quality check the entire lot/batch of glass that was going to be dispatched for the ongoing World Trade Center project. The purpose of this study was to gather glass samples at random from various machining processes and test them according to industry standards.

The initial batch of toughened steel had a lower strength value than the needed value, but the test results were forwarded to the toughening department, and the problem was quickly resolved. Also, some of the glasses had a slight bending issue as a result of not allowing enough time for them to cool down, which was remedied later.We also performed other test related to silicon hardening time and Molecular Sieves quality which results were up to mark.

Chapter-6: Packagin & Wastage

6.1 Packaging and dispatch

Large glasses are wrapped in plastic wrap and placed on a wooden rack that is supported on the truck and fastened with ropes. Small glasses and glasses that are transported locally are supported by a wooden rack and thermocoldistances, and are linked to the pick-up body.

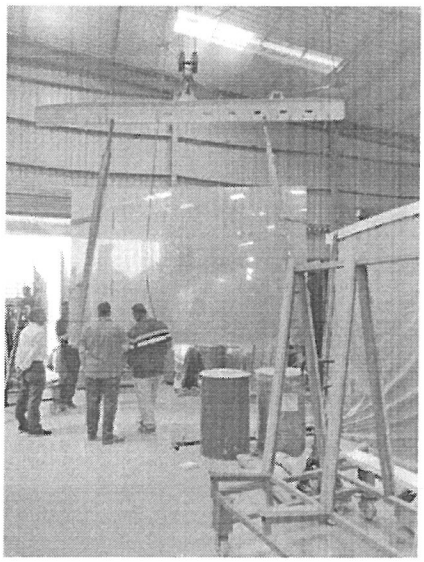


Figure 65 Material Loading on the truck

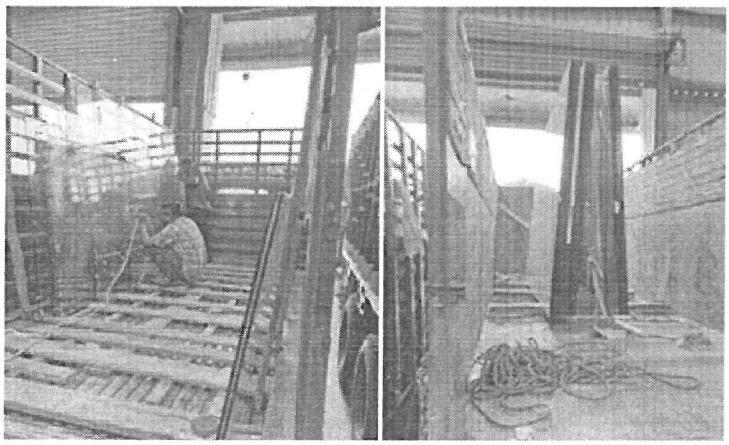


Figure 66 Large and Small glasses loaded and packed on the trucks

6.2 Wastage

There are different-different types of material wastages occurred at the industry:

1. Extra total wasted glass from CNC cutting.
2. Glasses with scratch and water marks.
3. Bended glasses with uneven bending.
4. Toughened glass breaks while processing.
5. Glass breaking while packaging & dispatch time.
6. Glass breaking and wastage while putting from one assembly to another due to human error.

Glass wastage is estimated to be 1 tonne per day, or 10% of total daily production. For 1 kg of waste glass, it costs around Rs. 8-10. These broken glasses are going to be recycled.

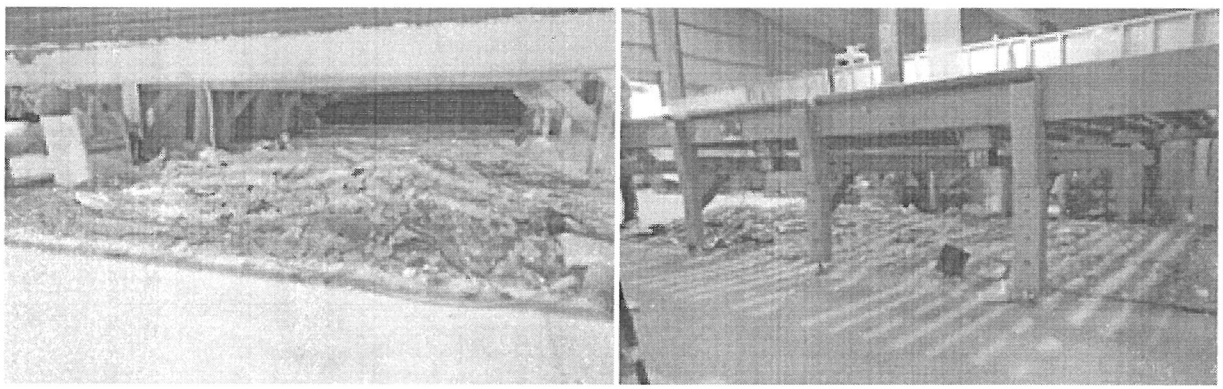


Figure 67 Glass wastage at industry

Chapter-7: Quality Check

7.1 Quality check tests

There are around 9tests for testing the quality of the glass and other bits used in the processwhich are as follows:

1. Ball Drop Test
2. Fragmentation Test
3. Stress Measure Test
4. Bend Checking Test
5. Pot Snap Time Test
6. Butterfly Test
7. Hardness Test for Sealent
8. Boil Test
9. Desiccant Test

7.1.1 Ball Drop Test:

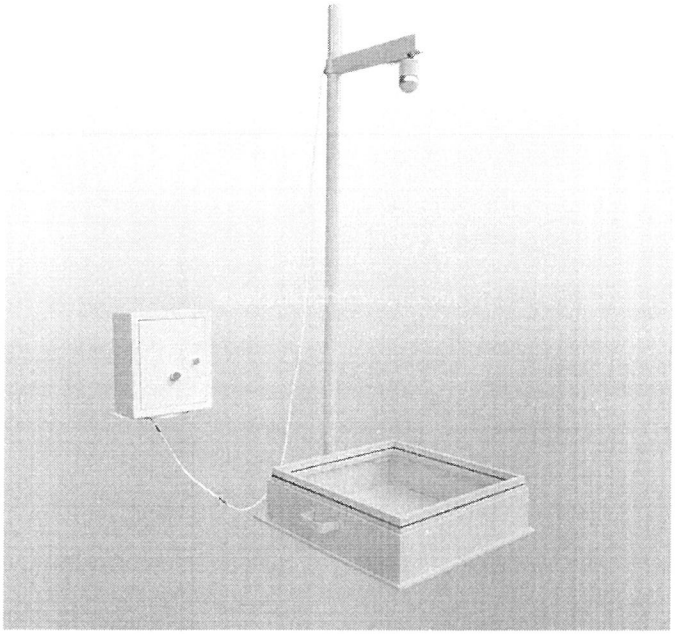


Figure 68 Ball drop test

Procedure:

- Take 5 nos. of Tempered samples of size 610 x 610 mm.
- Place the Steel ball of 1040+2 gm. Weight & Diameter of 63.5 mm in holder placed at a height of 1 meter.
- Clean the frame first for any dust or glass particles & place the sample on Frame as shown in figure.
- Drop the Ball on the sample. (Use hand gloves while doing the Tests)
- The number of Impact per Test Specimen shall be limited to ONE Time and the Test should be carried out at ordinary Temperature.
- Repeat the steps until all the 5 samples of one lot are Tested.
- Finally out of 5 samples interpret the Result as follows:
  a) The Test is PASS, If One sample is Broken out of 5 samples.
  b) The Test is FAIL, If 3 samples or more samples are broken out of 5 samples.
  c) If 2 samples are Broken, Then another 5 samples to be taken for Testing.

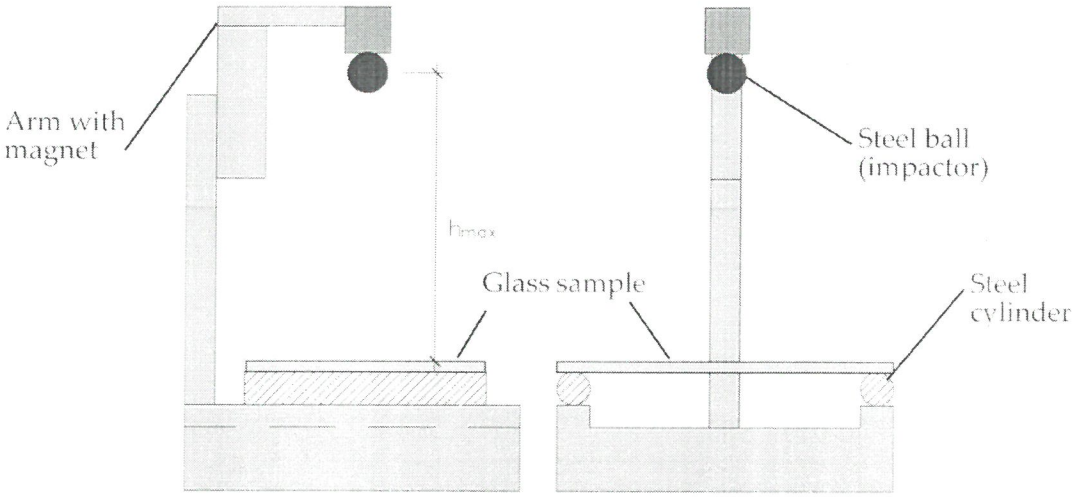


Figure 69 Test setup

Key Points:

- Ensure the Glass and Spacer surface is cleaned from Dust and Dirt particles.
- Ensure that at least 50.0 mm of the Sealant should be applied over the Polyethene sheet.
- Ensure that the curing is done in Normal Room Temperature.
- This same Test can be done Online on the Insulated Glass at the site or in Factory premises also, But insure that the peeled out area must be Repaired again properly (i.e. Resealing the cut part).

7.1.2Fragmentation Test:

Procedure:

- Take the sample glass of size 360 x 1100 mm without holes & Notches & cut outs.
- Wrap the test sample in white cotton cloth or mask the glass at the edges with masking tape & punch it at a position 13 mm from the longest edge of the specimen at the midpoint of that edge until breakage occurs using a pointed steel tool/Hammer.
- The particle count shall be made within 3 minutes after the breakage of the glass.
- First count the fragments that lie across the marked area & divide it by 2 & then those fragments that are completely inside the marked area. Add both the numbers. Example: Fragment count that lie across the marked area = 30 pieces. Fragment that lie inside the marked area = 50 pieces.
  Therefore total fragment count is = (30/2) +50= 65 pieces (Refer figure 3 for minimum particle count)
- Repeat the 5 & 6 for counting the maximum count.
- The longest particle shall be chosen from the body of the test sample & it shall not be excluded area. In order to classify the glass thermally toughened soda lime silicate safety glass, the length of the longest particle shall not exceed 100 mm length.
- Fill the result in check sheet. If the result is not satisfactory then inform the production in charge & identify the lot.

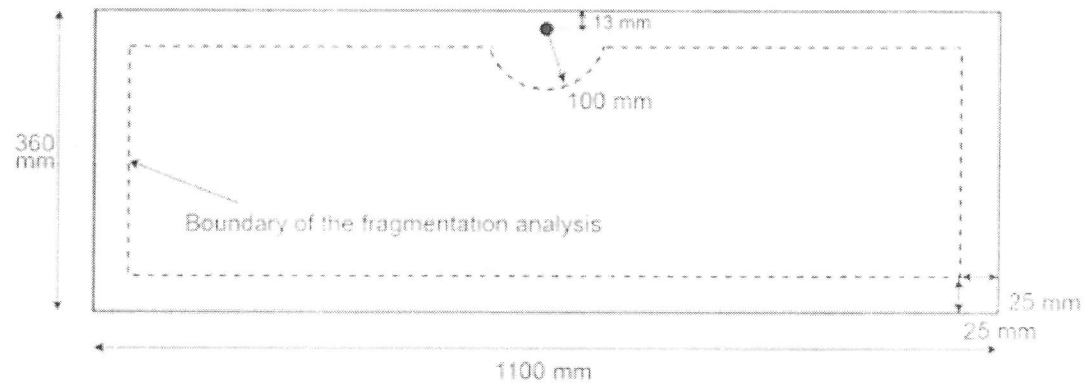


Figure 70 Markings for the fragmentation test on sample glass

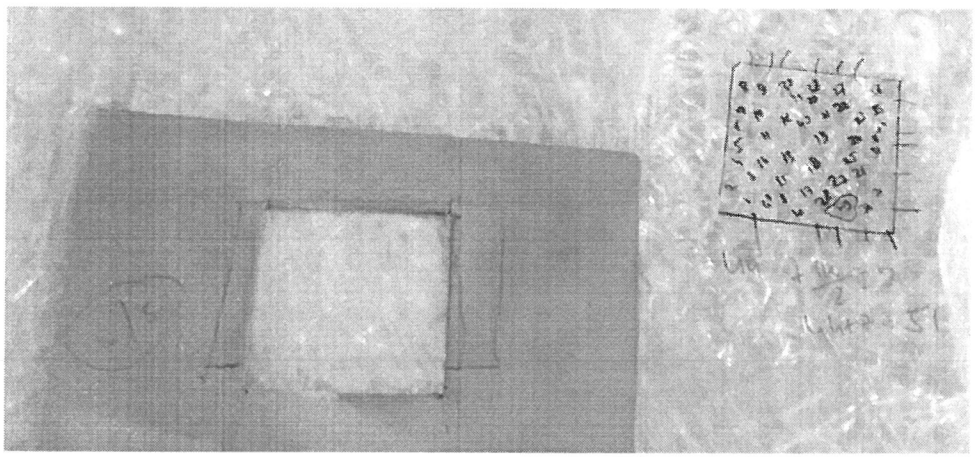


Figure 71 5x5cm slit for counting fragmented pieces

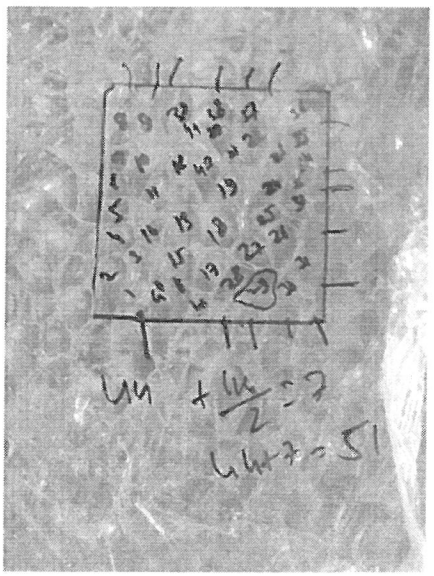


Figure 72 Fragmented pieces counted

Key Points:

- Samples of all thickness and tint produced in shifts needs to be covered in test.
- Test sample should be tightly wrapped with cloth. If cloth is used, Hammer details 75 gms mass, Radius of the curvature of the center punch / striking point approx 0.2mm
- Note: The Fragmentation characteristics of glass are unaffected by temperatures between -50 degree Celsius to +100degree Celsius.
- The particle count and measuring the dimensions of largest particles shall be made within 4 to 5 minutes after the fracture. The particle count shall be made by placing the 50 mm x 50 mm template on the coarsest fracture.

7.1.3Stress Measure Test:

Procedure:

- Take the 5 no. of samples glass of size 360mm x 1100 mm without holes& notches.
- Mark the 5 points as shown in figure 1 on the selected sample.
- Apply a drop of fluid provided along with the meter, Place the Stress meter on the tin side surface of the glass on the fluid surface
- Stress pattern as shown in fig. Will be seen & adjust the master black lines parallel to the stress pattern lines.
- Check the stress in vertical & horizontal position at each point, such that 10 observations are made.
- Then check the pointer position on the graduated round scale. Record the angle, from the angle to stress conversion chart, calculate the stress and judge the glass whether it is tempered heat strengthen.
- Calculate the average of 10 readings & it must be within the limits.

Key Points:

- Ensure the Glass and Spacer surface is cleaned from Dust and Dirt particles
- Ensure that the curing is done in Normal Room Temperature.
- Surface using for stress measurement should be plane.

7.1.4Bend Checking Test:

Procedure:

- Select the glass to check the warp/ bend in the glass.
- keep the glass vertically on stand such thatit rest at 2 point edges (Refer figure 1 for resting points) Hold a ruler scale or a string at the edges of the glass leaving about 50 mm from the top edge. As shown in figure 2
- Tighten the string & measure the maximum gap at the center of arc as shown in figure 2 & record it.

- Interpret the Result as follows.
  Calculate the percentage ratio of bend as follows:
  Height of the chord x 100 /Height of the arc
- The percentage ratio must exceed 0.5 % of the arc ie a bend of 5 mm is permitted for a length of 1 meter glass.

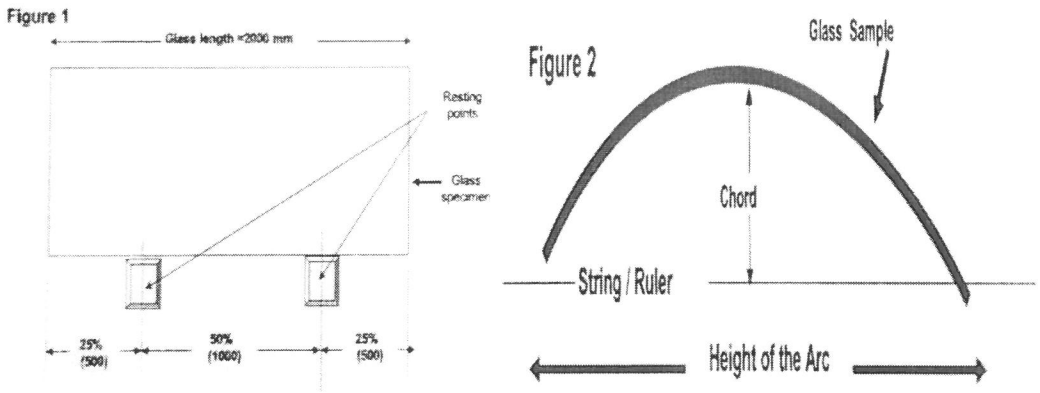


Figure 73 Bend checking diagram

Key Points:

- Always keep the Equipment in "ON" Condition.
- Always keep the equipment clean and do not allow the dust to accumulate on the lens.

7.1.5Pot Snap Time Test:

Provedure:

- Take a small container and fill it half with the Sealant which is to be tested.
- Place a Stick, Pencil in to the Sealant as shown in Figure.1 and Note the Time in Record book.
- Every 5 10 minutes, Pull on the Stick as shown in the Figure.2.
- If the Sealant does not tear itself (Cohesively) when the stick is pulled out, the Sealant has Not Snapped. The Time at which the sealant Tears Cohesively when the stick is pulled out, the Sealant is Snap and this termed known as "The SNAP Time" (Figure 3).
- The Snap Time will vary Depending upon Atmospheric condition, Temperature, Humidity and the Individual doing Test.
- A Snap Time varying more than 45 minutes from what is Expected may Indicate an Equipment or Sealant Problem.

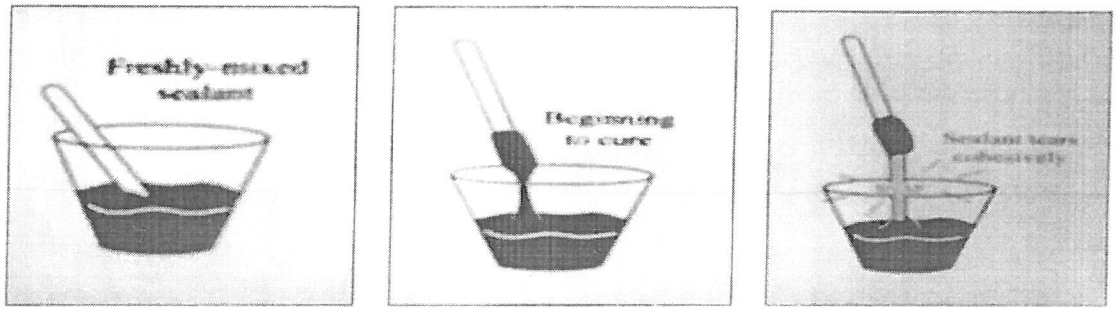


Figure 1 Figure 2 Figure 3

Figure 74 Pot snap test set-up

Key Points:

- Ensure that this Test is Performed on Daily basis. It relates to the Base to Catalyst Mixing Ratio to the Cure rate of the Sealant.
- Do not stir the sealant or incorporate air into the mixed sealant.
- Note down the Time of snap in record book.

7.1.6Butterfly Test:

Procedure:

- Take a Test format paper fold it as shown in Figure.1.
- Apply a minimum 150.0 mm bead of sealant to the Crease of the folded paper as shown in Figure.2.
- Press the paper together, smearing the sealant bead to a thin film.
- Next pull the paper apart and Visually inspect the sealant smear formed. As in Figure.3
- Asses the correctness of the test as follows:
- Properly mixed sealant should have no white steaks (refer figure 4) of unmixed base. If steaks are present then more material must be pumped through the line to improve the mixing quality
- If Sealant smear is a consistent black color (refer figure3), the sealant is properly mixed and is ready to use.

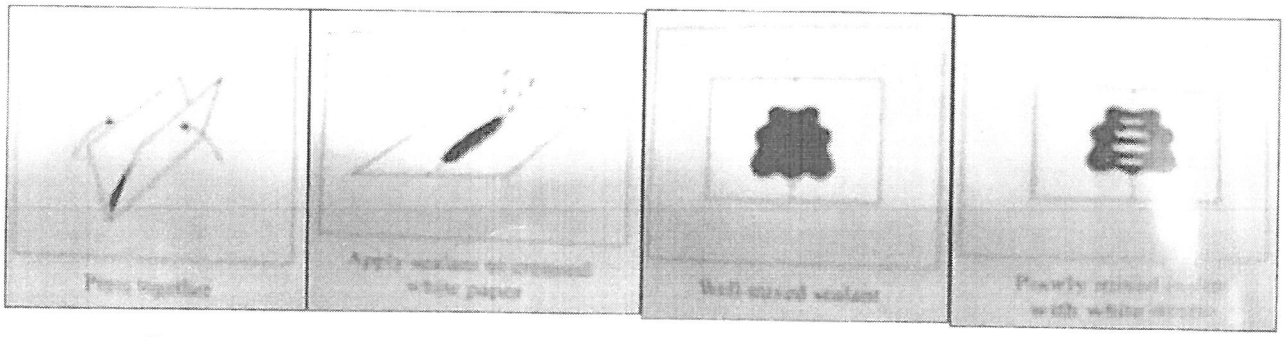


Figure 1 Figure 2 Figure 3 Figure 4

Figure 75 Butterfly Test

Key Points:

- Ensure that the test is performed every time the pump is started.
- If Grey or White streaks continue, Equipment maintanance may be needed. Cleaning or Changing the mixing system, Dispensing the hose, Dispensing Gun or Ratio system ball check valve can often correct this Problem.

7.1.7Hardness test for Sealent:

Procedure:

- Take the hardness master sample & check the correctness by taking readings of 25 Shore A master block.
- Take the hardness master sample & check the correctness by taking readings of 50 Shore A master block.
- Take the hardness master sample & check the correctness by taking readings of 75 Shore A master block.
- Check the correctness & confirm the same.
- Next Put the Hardness Meter on the dried sealant area or on the dried sealant of the glass & press it as shown in figure.
- Take the reading & Asses the correctness of the Test as follows:
- The cured Sealant must have the hardness between (35 to 60 Shore A Hardness For Silicon)

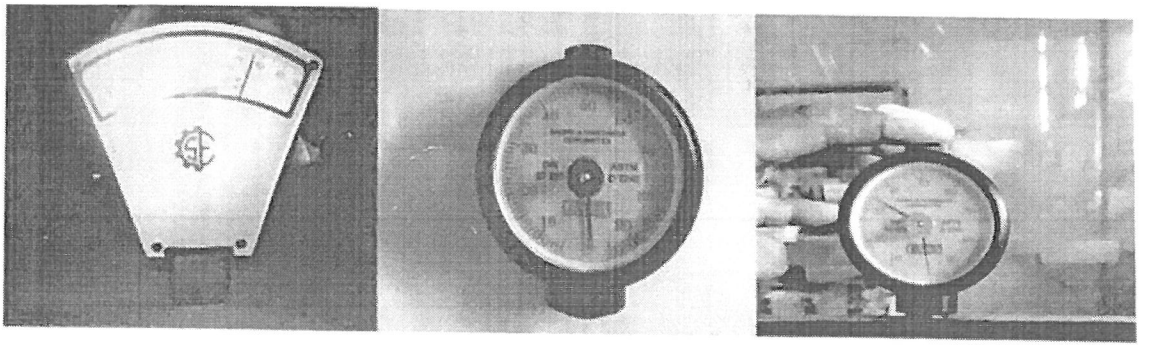


Figure 1 Figure 2 Figure 3

Figure 76 Hardness Test Set-up

Key Points:

- Ensure the meter edge do not rests on the glass surfaces during inspection, the pointer must completely touch the rubber part
- Same Test can be done Online on the Insulated Glass at the site or in Factory premises also.

7.1.8Boil Test:

Procedure:

- Cut the 3 nos laminate samples of size 300 x 300 mm.
- Put samples vertically into the test camber conatining water heated to a tempertaure of 100c
- Maintain this temperature for a period of 2 hours, then allow the test specimen s to c0ol to the room tenmperature.
- Identify the samples for work order number, combination of laminate.
- After the 2 hours remove the samples and interpert the result as follows.
- Inspect the test sample at a distance of 30 cm & 50 cm infromt of a white back ground. Record the number and extent of all the faults occuring in the interlayer such as bubbles, delamination & cloudiness. While inspection exclude all the falutswith in 15 mm from uncut edge. 25 mm from cut edge and samples showing cracks will be disregarded and another test sample shall be tested
- Test procedure as per standard, type/ combination of laminated glass, type of edge, number of 8u8bles and size of bubbles, delamination & cloudiness occuring.
- In case of abnormality indentify the lot and report to the production.

Key Points:

- The samples size must not be less than 300 mm x 100 mm.
- To avoid the extreme thermal stresses leading to the crack formation the samples should be heated up in two steps by first immersing it into a water bath of about 60 °c fors minutes (or gradually increase the temperature up to 100°c.
- Ensure that before placing the samples in to the envinronment chamber write the order number, combination of the glass on the glass surface with marker pen
- Use safety cotton hand gloves

7.1.9 Desiccant Test:

Procedure:

- Take 100ml water & 100gm desiccant in a test tube/ beaker
- Insert a thermometer ranging from 0" to 100" Centigrade in to the test tube / beaker
- Take 100 ml of water in a separate Test Tube/ Beaker & add this water in to the desiccant
- Check the initial water temperature & note down in deg. Centigrade.
- Add the water in desiccant & note the water temperature of water.
- Measure the temperature difference of intial reading & risen temperature reading , the difference must be not less than 32°c.
- If the Temperature rise is less ,then inform the QA in charge & materials in charge for the abnormality.

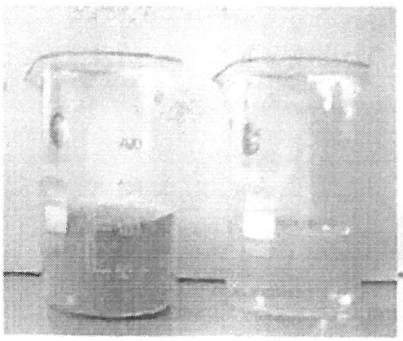


Figure 1

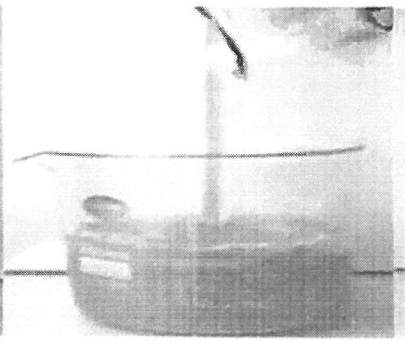


Figure 2

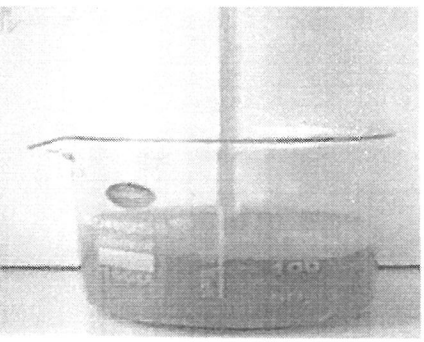


Figure 3

Figure 77 Desiccant test set-up

Key Points:

- Note down the supplier name, date of receipt of desiccant lot, Diameter of granules before each test.
- Keep record copy of the test certificate received from supplier for each lot.
- Ensure Secondary sealant is applied after confirming the correctness of Butterfly test only

- Keep a check whether the drum of desiccant is properly sealed all the time during production.

Chapter-8: Learning & References

8.1 Learning Outcomes

Throughout this training session we learned about the working process, technical parameters, maintenance of the following machines:

- CNC Cutting Machine.
- Lamination Line.
- Tempering Machine.
- Double Glazed Unit (DGU) Line.
- Rough Grinding.
- Frosting Machine.

We also learn about the different types of glasses, how to test them, and how to evaluate them for quality. It's also about how an industry is run, managed, and how it responds with all internal and external influences. In this whole internship period of 4 months we as an mechanical engineer have learned and experienced all the important bits about an industry in depth which experience will help us in our future journey in the core field.

8.2 References

https://www.jaipurtuff.in/about-us/about/

https://economictimes.indiatimes.com/company/jaipur-tuffen-glass-industries-private-limited/U26100RJ2013PTC044366

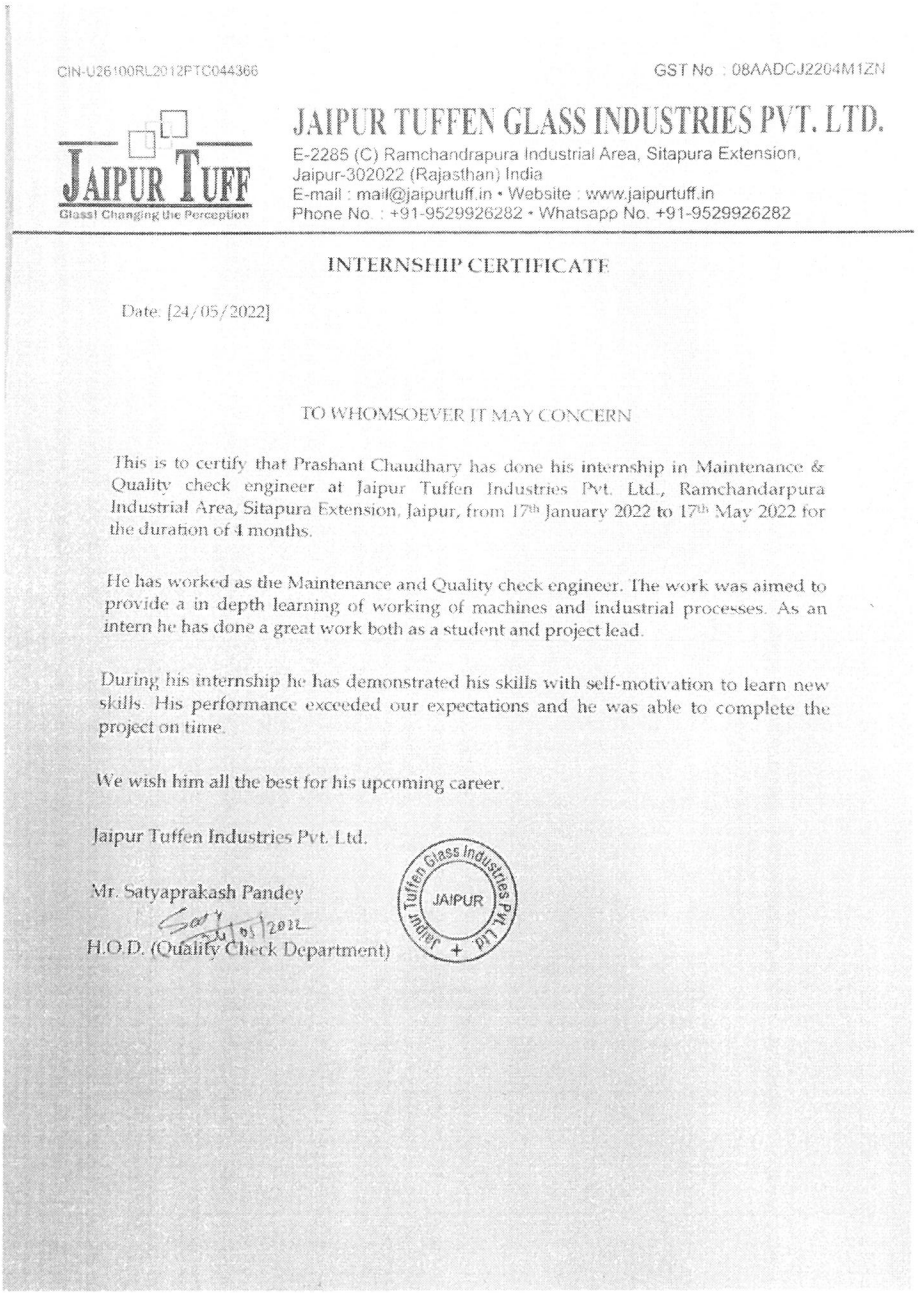
https://www.zaubacorp.com/company/JAIPUR-TUFFEN-GLASS-INDUSTRIES-PRIVATE-LIMITED/U26100RJ2013PTC044366

https://www.exfactory.com/Literature/GLASTON/RC200-PDFa.pdf

https://www.intermac.com/downloads/4602/190/LYQK500018_IntGL_Cat_Genius%20CT-RED_apr21_ENG_Lr.pdf

Chapter-9: PS-2 Certificate

9.1 Prashant Chaudhary (2018BtechME006)



CIN-U26100RL2012PTC044366 GST No : 08AADCJ2204M1ZN

JAIPUR TUFF
Glass! Changing the Perception

JAIPUR TUFFEN GLASS INDUSTRIES PVT. LTD.

E-2285 (C) Ramchandrapura Industrial Area, Sitapura Extension,
Jaipur-302022 (Rajasthan) India
E-mail : mail@jaipurtuff.in • Website : www.jaipurtuff.in
Phone No. : +91-9529926282 • Whatsapp No. +91-9529926282

INTERNSHIP CERTIFICATE

Date: [24/05/2022]

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Prashant Chaudhary has done his internship in Maintenance & Quality check engineer at Jaipur Tuffen Industries Pvt. Ltd., Ramchandarpura Industrial Area, Sitapura Extension, Jaipur, from 17th January 2022 to 17th May 2022 for the duration of 4 months.

He has worked as the Maintenance and Quality check engineer. The work was aimed to provide a in depth learning of working of machines and industrial processes. As an intern he has done a great work both as a student and project lead.

During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

Jaipur Tuffen Industries Pvt. Ltd.

Mr. Satyaprakash Pandey
H.O.D. (Quality Check Department)

Jaipur Tuffen Glass Industries Pvt. Ltd. JAIPUR

9.2 Piyush Singh Panwar (2018BtechME007)

CIN U26100RL2012PTC044366

GST No. : 08AADCJ2204M1ZN

JAIPUR TUFF
Glass! Changing the Perception

JAIPUR TUFFEN GLASS INDUSTRIES PVT. LTD.

E-2285 (C) Ramchandrapura Industrial Area, Sitapura Extension,
Jaipur-302022 (Rajasthan) India
E-mail : mail@jaipurtuff.in • Website : www.jaipurtuff.in
Phone No. : +91-9529926282 • Whatsapp No. +91-9529926282

INTERNSHIP CERTIFICATE

Date: [24/05/2022]

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Piyush Singh Panwar has done his internship in Maintenance & Quality check engineer at Jaipur Tuffen Industries Pvt. Ltd., Ramchandarpura Industrial Area, Sitapura Extension, Jaipur, from 17th January 2022 to 17th May 2022 for the duration of 4 months.

He has worked as the Maintenance and Quality check engineer. The work was aimed to provide a in depth learning of working of machines and industrial processes. As an intern he has done a great work both as a student and project lead.

During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

Jaipur Tuffen Industries Pvt. Ltd.

Jaipur Tuffen Glass Industries Pvt. Ltd. JAIPUR

Mr. Satyaprakash Pandey

H.O.D. (Quality Check Department)