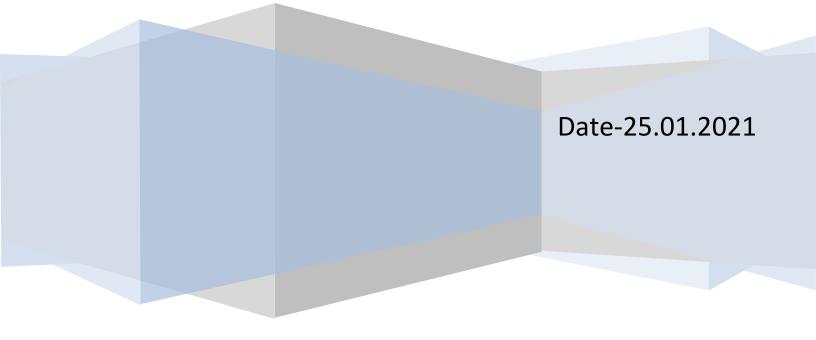


ACTION RESEARCH PROJECT

Practical Problems in Plywood Manufacturing

Nishant Parasar Scientist-C DLBO-II PRTD/R/5:2/AR-0030 Unique Number- AR/0030





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INTRODUCTION



Manufacturing process of plywood

Plywood is a construction material made from different species of trees. It consists of thin wood layers or piles known as veneers bonded with an adhesive. With the use of resin, veneers are glued together with the adjacent layers causing each of its wood grain to be rotated up to a maximum angle of 90 degrees. The purpose of this is to improve the strength of the finished product and to reduce shrinkage.



There are two kinds of plywood: the hardwood and the softwood. In manufacturing plywood, the commonly used hardwoods are those fall in with the deciduous species such as larch, maple, oak, cherry, and poplar.





On the other hand, softwood falls in with the family of coniferous. Firs and pines are softwoods used in manufacturing plywood. By bonding several layers of dry softwood veneers together with a resin, softwood plywood is being made.. The most common application of softwood plywood is those in construction. It is used as construction materials such as roof decking, sheathing, wall sliding, floors, concrete form boards, and containers.

Manufacturing hardwood or softwood plywood undergo different processes to ensure the quality of the product produced. These methods include selecting the log, debarking, cutting the logs, peeling the log, making a continuous ribbon of wood, cutting and stacking, gluing the wood, pressing the wood, trimming, sanding, and finishing.

Selecting the log



The initial step in manufacturing plywood is selecting the logs. Logs are chosen according to its physical properties. Maturity, straightness, and roundness are the most critical factors to be considered in selecting raw logs. Plywood manufacturers also ensure that all raw logs used in plywood come from a legal source and sustainable forest concession.

Submerging logs in water over a period helps to peel and cut down logs into various sizes easily. Some other mills, especially in cold places use heat as a way to improve the quality of peeling. These methods are known as hydrothermal processing.

Debarking



The second step is the debarking process. Logs are feed into a debarking machine. Just like shown in the picture. As the logs rotate from the ridged wheels, the cutting head on the track is reversely rotating with the log from end to end, causing the bark to be removed. The purpose of this is to peel the bark without damaging the wood.

Cutting the logs

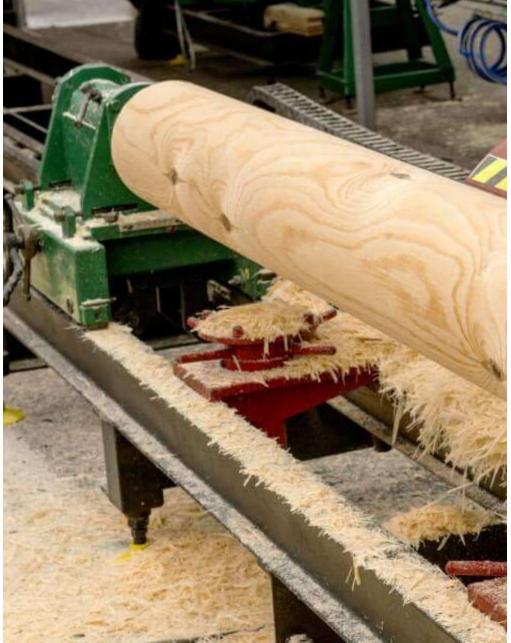




After the debarking process, the logs are cut into desired lengths in step known as bucking. This process is done so that the next operation which is peeling the bark can be efficiently executed.

Peeling the logs





The next step is the peeling process. The markings in the log made by the debarking knives during the debarking process are removed using a substantial rotary lathe. The log revolves on the machine against a long blade cutter. The cutting process is like sharpening a pencil except that the blade is parallel with the log at the time of cutting.

Making a continuous ribbon of wood





After peeling, the next method to be done is creating a continuous ribbon of wood. The log rotates and feeds towards the cutting edge of the lathe creating continuous and unwounded thin layers of wood. The thickness of the veneer depends upon how it is used.

Cutting and stacking





The piece of wood is cut to a standard size of 4' x 8'. The ideal thickness of plywood range from 1/4'' to $3\frac{1}{4}$, but the actual thickness of the plywood after production is determined after the sheets are pressed and glued together. The sheets are automatically scanned as it comes up in the peeler. After scanning, it is stack in preparation for transferring and drying using drying ovens.

Gluing the wood



After cutting and stacking, the next step is sticking the sheets of veneer together. This is done to determine the desired thickness of the plywood sheets. The commonly used adhesive in manufacturing plywood are those synthetic plastics such as phenol – formaldehyde or urea resins. The thin sheets of wood run through the gluing machine. As the sheet pass through, the glue is spread evenly on the back and face of the veneer. The glued veneer is placed on top of unglued veneer, then followed by glued veneer. The process is alternating: glued, unglued, glued, unglued and so on.

Pressing the wood





After doing he glued and unglued alternating process, the sheets which are glued together is pressed using a hot press machine to attain the desired thickness of plywood. An example of this pressing machine is the hydraulic or pneumatic pressing machine wherein pressure, or sometimes heat and pressure are applied to the plies. When heat is applied, the glue hardens quickly and then solidifies as the combined veneer is pressed together. The plywood is considered dry once the pressure is released. Trimming, Sanding, and Finishing





The sheet will undergo processes to make it presentable and saleable in the market. These methods include trimming, sanding, and finishing. Because of these processes, the sheets takes down into standard sizes which meet the needs of the customers. Also, these processes are the reason why plywood seen in the market has smooth edges and texture. The finished plywood products are divided into two categories indicating whether it is for exterior or interior used.

Market Situation in India:



While working as a dealing officer for plywood product in GZBO-Certification, I

always experienced one common concern from the local manufacturers that the face veneer availability as per standard is too difficult. The cost of obtaining and using that thickness of face veneer was also very high. Thus, in India all the manufacturers are bound to use face veneers for thickness in the ranges of 0.25-0.30 mm and even less.

The Action Research Proposal:

The actual Market situation led me to take up the matter in my Action Research Project which was approved by the committee. The proposal outlined why many manufacturers find it difficult to enter/retain into BIS Licensing system because of face veneer scarcity in India.

The Action: (Phase-I)

As the concern was obtained from local manufacturers, hence it was important to find the relevance from manufacturers all around the country.

Initially a meeting was held in Hapur, Ghaziabad on 27.10.2020, with the local manufacturers. The conclusion of the meeting was that the firms are finding it difficult to obtain face veneers as per ISS. They expressed their inability due to high cost factor involved in getting face veneers from other countries due to lack of face veneer availability in India. The firms also mentioned that they are using face veneer thicknesses in the range of 0.22-0.30 mm, confirming that the practice is followed all across India.

After this, the matter was discussed with Federation of Indian Plywood and Panel Industry (FIPPI). It was decided to conduct a Webinar from manufacturers all across the country and with Principal technical Advisor- Shri CN Pandey.

The Webinar was held on 08.12.2020 in the presence of Sh CN Pandey and other manufacturers namely:

Mr Ambuj Mishra – Sukhna Plywood Hapur

- Mr Anup Daruka-Top Ply Patna
- Mr Devinder Kumar- Pasand plywood-Ghaziabad
- Mr Hardeep Singh- Rampur
- Mr Mayank Jain- Jain Doors Haryana
- Mr Muhammad Sha- Kerela

- MrJaved CP- Kannur Kerela
- NaasPlywoodIndustry- Bijnor
- •Mr Naval Kishor-Amba Plywood Ghaziabad
- •Mr Sanjay Kripal Garg- Navrang Venners Ghaziabad.
- •Mr Ravi Bhushan-Ghaziabad
- •Mr Sunil Kumar-Lucknow
- •Mr Surya Verma-Lucknow
- •Mr VaibhavBatra-Rampur
- •Mr Vinay Batra-Rampur
- •MrJaideep Singh- Bilaspur, Rudrapur.



Conclusion of Webinar:

In the webinar, the problem of face veneer was discussed with all the manufacturers by seeking comments from all of them. Most of the manufacturers in India, being MSME, expressed that the face veneer requirement as per Indian Standards are not being met considering the scenario for the availability of face veneers in India and the cost associated with importing face veneers is also very high, leading to loss in sales. Also, all manufactures including the giants like Century plywood ,SRG and even Greenply, agreed that the face veneers is not available like before and the cost they inculcate to bring required sizes of face veneers as per ISS is too much to survive in the market as plywood comes under voluntary certification. Also, they emphasized on the fact the strength requirements in the Indian Standards for MOR/MOE is too high, as mostly General plywood is used in household furniture. The plywood associations also said that many manufacturers still do not take a BIS License due to their inability to get desired face veneer thickness as per ISS.

It was then mutually agreed that a study may be conducted to see the variation of the strength values obtained from lower face veneer thickness at any Licensee premises having complete facility.

The BIS View:

From BIS point of view, while scrutinizing the test reports, it is observed that most failures occurring in samples are either in MOR or MOE or both.



Basically, while applying for BIS License for IS 303, all the manufacturers arrange min. 0.5 mm face veneers and get it tested in BIS/BIS Approved Laboratories. After getting the license, they again find it difficult to import such 0.5mm thickness face veneers on regular basis, thus leading to the usage of a lesser thickness face veneer (generally 0.25mm and even below) being a regular and most common practice all across the country. This is why mostly Market samples drawn are found failing in MOR/MOE requirements.

The question is when manufacturers know that the strength would be affected by using lower thickness face veneers and at the same time, it is not feasible for them to use BIS required thickness face veneers, then why not we study and understand how to deal with such situation as availability of raw materials like face veneers and core veneers would always be on the decline and also that plywood manufacturing technology has become more advanced in comparison to when standards were initially developed. Thus, an amendment in the standard is pretty much there in the likelihood.

The Action: (Phase-II)

As decided in the webinar, about a study to be conducted for analyzing outcomes of Bending strength with different face veneer thickness, the matter was proposed to my Head-BO, Mrs. Rosy Dhawan-Scientist-F, who was kind enough to give me approval for the same.

The Action plan Phase-II was a series of visits at Century Plywood, Kandla, Gujarat as it had peeling facilities as well.

First visit was conducted on 21st Dec 2020 at Century Plywood Kandla, in which, peeling process was verified and imported peeled face veneers were checked for its thickness and the values were recorded. The details are explained further in the observations.

Second visit at Century Plywood Kandla unit was held during 06-08th Jan 2021. The plywood prepared from the inspected face veneers during last visit were cut into required specimens as per IS 1734(Part 11) and kept for conditioning. It was further tested by Central Loading method for obtaining MOR,MOE values which has been studied and explained in detail in the observations.

Observations at Century Plywood, Kandla visit (21st Dec 2020)



The plywood was prepared for thicknesses 6mm, 12mm and 19 mm from face veneer of Gurjan and Okume varieties.

During visit at Kandla unit on 21st Dec 2020, face veneers were inspected for its thickness and moisture content. The face veneers of two different and most common varieties i.e Okume and Gurjan were inspected. For each veneer, 4 readings of thickness were measured.



The face veneer was then coded with unique code and signed and also counter sign was obtained from firm, to ensure traceability of that veneer.





Example:

Variety- Gurjan , Thickness of Face veneer-0.25

In this case, a face veneer (say No. 7) was selected from the measured face veneers and was then coded to G/25-7

The coding was done as below: G/25-7 Gurjan Thickness of face veneer (0.25 mm)

Accordingly face veneers were coded for different varieties and different face veneer thicknesses.

The above face veneers were then left with the firm for manufacturing plywood.

Firm informed that the plywood manufacturing process will be completed by 02.01.2021.

Accordingly subsequent inspection was planned for testing of plywood at Kandla Unit.



1. The plywood was manufactured using the same face veneers and it was ensured by the presence of the unique codes on them along with signatures of BIS official and firm's representative.

NOTE: As I was not present during the manufacturing process of plywood, the entire manufacturing process is as per declaration of Century Plywood, Kandla.

2. Firm prepared plywood and also declared its manufacturing details which are as follows:

(a) The In process controls used while manufacturing all offered plywood of thicknesses 6mm, 12mm & 19 mm.

1	Chemical Checking on receipt : Phenol Purity = 93% & Formaldehyde = 37%
2	Resin & Glue Properties check & 24hrs conditioning of Resin prior to use
3	Raw Material Quality Check-Face /Core Veneer & 5days conditioning of Veneer post drying
5	Grading , Moisture , Margin , Chopping Edge
	Hot Press – Assembly
	Straight Assembly & Core+Panel Sizing
4	Proper Gap Filling & No over/gap
4	As per system Assembled Load Load Pack shifting = Max 30mints
	Prepress time = 25 Mints & S.Pressure = 14kg/cm2
	Hot Press Check- Temperature , Pressure & Time
	Finishing Section
	24 hrs Conditionoing of Plywood stacks prior to cutting
_	DD Saw - cutting quality
5	WBS - Paper grit & quality = 60no for Base ply & 220no for Faced ply
	ACC Preservative Spread quality & Finishing
	Finished Products quality check & Testing as per norms

(b) The type and quality of resin used.



Resin Type/grade	Phenol Formaldehyde Resin (Acid- alkali)/BWR grade as per IS848
рН	10.5
Water tolerance	1:17
Resin Flow (B4 Cup)	68 Sec
Solid content (%)	46.68
Adhesive Viscosity (B6 Cup)	64 Sec
Resin Coverage (Sqm/Kg)	3.35
RH %	40%
Ambient temperature	28 deg C

(c) The Type/Grade of plywood manufactured.

Type AA / BWR grade plywood

(d) The pressure/temperature used.

HP Specific Pressure = 12Kg/cm2 & Platen temp = 130C

(e) The Core veneer Treatment done (if any)

Raw Material treatment not done, as we have mixed preservative chemical "Chlorpyrifos 50% EC" in the glue used.

(f) The type core veneer used.

Hardwood timber = Eucalyptus Core

(g) Moisture Content of core veneer and face veneer being used for testing.

Core Veneer Species = Eucalyptus			Face Veneer Spe	ecies	Okume Gurjan		Gurjan	1	
Thickness (in	CL	LCL	Thickness Norm		0.25	0.28	0.25	0.28	
•	CL	202			mm	mm	mm	mm	
mm)	1.80	1.75		LCL	0.25	0.27	0.24	0.26	
Moisture content 6% to 10%		Thickness(drv)	CL	0.26	0.29	0.26	0.27		
OD Density 580 kg/m3			Min	0.24	0.25	0.24	0.24		
			Max	0.28	0.32	0.29	0.3		
			Moisture %	Avg	6%	8%	8%	10%	
			OD Density	Avg	360 Kg/r	n3	690	/m3	



The construction of plywood for its different thickness and different varieties is also detailed below:

(a) Okume Variety

06 mm Ply with 0.25 mm Okume face				
Cross core	1.80 mm X 2 Layers		3.60	
Panel core	2.40 mm X 1 Layer		2.35	
Face veneer	0.25 mm X 2 Layers		0.50	
Total construction			6.45	
Final Thickness observed			5.70	
Compression loss %			11.6	

06 mm Ply with 0.30 mm Okume face			
Cross core	1.80 mm X 2 Layers		3.60
Panel core	2.35 mm X 1 Layer		2.35
Face veneer	0.30 mm X 2 Layers		0.60
Total constru		6.55	
Final Thickne		5.80	
Compression	11.5		

12 mm Ply with 0.25 mm Okume face			
Cross core	1.80 mm X 4 layers		7.20
Panel core	1.80 mm X 3 layers		5.40
Face	0.25 mm X 2 layers		0.50
Total construction			13.10
Final Thickness observed			12.14
Compression loss %			7.3

12 mm Ply with 0.30 mm Okume face				
Cross core	1.80 mm X 4 layers		7.20	
Panel core	1.80 mm X 3 layers		5.40	
Face	0.30 mm X 2 Layers		0.60	
Total constru		13.20		
Final Thickne		12.33		
Compression		6.6		

19 mm Ply with 0.25 mm Okume face			
Cross core	1.80 mm X 6 layers		10.80
Panel core	1.80 mm X 5 layers		9.00
Face	0.25 mm X 2 layers		0.50
Total construction			20.30
Final Thickness observed			19.32
Compression loss %			4.8

19 mm Ply with 0.30 mm Okume face			
Cross core	1.80 mm X 6 layers		10.80
Panel core	1.80 mm X 5 layers		9.00
Face	0.30 mm X 2 Layers		0.60
Total construction			20.40
Final Thickness observed			19.38
Compression loss %			5.0

(b) Gurjan variety

06 mm Ply with 0.25 mm Gurajan face				
Cross	1.80 mm X 2			
core	Layers	3.60		
Panel	2.35 mm X 1			
core	Layer	2.35		
Face	0.25 mm X 2			
veneer	Layers	0.50		
Total const	6.45			
Final Thick	5.70			
Compressio	11.6			

Final Thick Compressi	5.85 10.7			
Total cons	6.55			
veneer	Layers	0.60		
Face	0.30 mm X 2			
core	Layer	2.35		
Panel	2.35 mm X 1			
core	Layers	3.60		
Cross	1.80 mm X 2			
06 mm Ply with 0.28 mm Gurajan face				



12 mm Ply	with 0.25 mm Guraj	an face
Cross	1.80 mm X 4	
core	layers	7.20
Panel	1.80 mm X 3	
core	layers	5.40
	0.25 mm X 2	
Face	layers	0.50
		13.1
Total const	ruction	0
		12.1
Final Thick	ness observed	6
Compressio	on loss %	7.2

with 0.28 mm Guraja	n face
1.80 mm X 4	
layers	7.20
1.80 mm X 3	
layers	5.40
0.30 mm X 2	
Layers	0.60
	13.2
truction	0
	12.1
ness observed	1
on loss %	8.3
	layers1.80 mm X 3layers0.30 mm X 2

19 mm Ply	with 0.25 mm Guraja	n face
Cross	1.80 mm X 6	10.8
core	layers	0
Panel	1.80 mm X 5	
core	layers	9.00
	0.25 mm X 2	
Face	layers	0.50
		20.3
Total const	ruction	0
		19.4
Final Thick	ness observed	3
Compressio	on loss %	4.3

19 mm Ply	with 0.28 mm Guraja	n face
Cross	1.80 mm X 6	10.8
core	layers	0
Panel	1.80 mm X 5	
core	layers	9.00
	0.30 mm X 2	
Face	Layers	0.60
		20.4
Total const	ruction	0
		19.4
Final Thick	ness observed	5
Compressi	on loss %	4.7

3. The plywood were cut into required dimensions, both along the grain and across the grain, according to IS 1734 (Part 11). The prepared specimens were then coded with a unique code. The coding was done as below:



Suppose face veneer no. 7 and face veneer no. 8 were used to manufacture plywood of Gurjan variety and its thickness is 0.25 mm and also the final plywood thickness is 19 mm, then the specimen which has been cut ALONG the grain and let it be the 1st of the 3 specimens prepared along the grain then, it will be coded as

19/G-25-7,8/ALONG/1

Similarly its 2nd of 3 specimen would be coded as **19/G-25-7,8/ALONG/2.**

Sample Code for 6mm plywood with 0.30mm gurjan face veneer in ALONG the grain direction



4. The specimen was then preconditioned to a constant mass at a relative humidity of 65 ± 5 percent and at a temperature of 27 ± 2°C and then taken up for testing of Modulus of Rupture (MOR) and Modulus of Elasticity (MOE) by Central Loading Method.

5. As the plywood made is of BWR grade as per IS 303:1989, hence the requirement of MOR and MOE is as per Amendment No.04 of IS 303:1989.



Another important parameter to keep in mind is the minimum requirement of face veneer thickness for different types of plywood as per ISS. Hence, the details of face veneer thickness requirement are as below:

- a) IS 303- 0.5 mm (min)- regular practice
- b) IS 4990- 1.2 mm (min)
- c) IS 2202(P-1)- 0.5 mm (min)
- d) IS 1659- 0.5 mm

Now as this study is pertaining to IS 303, as it being the most widely type of plywood, hence we analyzed the results of the above plywood specimens prepared from BWR plywood as per IS 303:1989.

The requirements of MOR/MOR for BWR grade are as below:

S.No	BWR Grade	MOE (N/mm	²)	MOR (N/mm ²)	
1	Along (direction parallel to the grain direction of the face	Average	Min. individual	Average	Min. Individual
	veneer)	5000	4500	40	36
2	Across (direction perpendicular to the grain direction of the	Average	Min. individual	Average	Min. individual
	face veneer)	2500	2200	20	18

Few important details: Thickness of Plywood S.No Face Veneer Thickness Variety of मानकः पथप्रदर्शव & corresponding Quantity of speciments Face 6 mm 12 mm 19 mm Veneer (mm) Along Across Along Across Along Across 1 Gurjan 0.25 3 3 3 3 3 3 3 0.28 3 3 3 3 3 2 0.25 3 3 3 3 3 3 Ockume 0.30 3 3 3 3 3 3

Hence $6 \times 4 \times 3 = 72$ samples were tested for MOR and MOE. Also one piece each of each variety and each thickness of face veneer and plywood was cut and kept as counter sample. It is kept sealed, coded and signed.

Bending Test Results:

S.no	Batch/Count	Sample Code	MOE(N/mm ²)	MOR(N/mm ²)
3.110	Batch/Count	Sample Code		
1	1	19/O-30-1,2/ALONG/3	6709.07-Р	57.38-P मानकः पथप्रदर्शकः
2	2	19/O-30-1,2/ALONG/2	6522.97-Р	39.83-P
3	3	19/0-30-1,2/ALONG/1	5771.08-P	68.97-P
		Average	6334.37-Р	55.39-P
4	4	19/G-25-7,8/ALONG/1	6932.84-P	72.24-P
5	5	19/G-25-7,8/ALONG/2	7285.56-P	73.43-Р
6	6	19/G-25-7,8/ALONG/3	5253.69-P	63.25-P
		Average	6490.69-P	69.64-P
7	7	12/0-30-9,10/ALONG/1	4214.52-F (by -6.34%)	35.42-F (by -1.61%)
8	8	12/O-30-9,10/ALONG/2	3838.01-F (by -14.71%)	23.65-F (by -34.30%)
9	9	12/O-30-9,10/ALONG/3	4713.52-P	50.36-P
		Average	4255.35-F (by -14.89%)	36.47-P
10	10	12/0-25-9,10/ALONG/1	3055.49-F	33.53-F (by -6.86%)
11	11	12/0-25-9,10/ALONG/2	2388.18-F	27.30-F (by -24.16%)
12	12	12/0-25-9,10/ALONG/3	2725.01-F	29.42-F (by -18.27%)
		Average	2722.89-F	30.08-F (by -24.80%)
13	13	12/G-28-9,10/ALONG/1	5616.80-P	41.89-P
14	14	12/G-28-9,10/ALONG/2	6489.68-P	43.30-P
15	15	12/G-28-9,10/ALONG/3	Test pc did not break	Test pc did not break
		Average	6053.24-P	42.59-P
16	16	19/G-28-7,8/ALONG/1	7825.21-P	47.71-P
17	17	19/G-28-7,8/ALONG/2	6759.3-P	61.91-P

18	18	19/G-28-7,8/ALONG/3	5976.58-P	65.77-P
		Average	6853.69-P	58.46-P
19	19	19/0-25-7,8/ALONG/1	6057.59-P	45.04-P
20	20	19/0-25-7,8/ALONG/2	4658.12-P	55.59-P
21	21	19/0-25-7,8/ALONG/3	5950.90-P	49.50-P
		Average	5555.53-P	50.04-P
22	22	12/G-25-9,10/ALONG/1	3686.66-F	39.65-P
23	23	12/G-25-9,10/ALONG/2	4041.73-F	41.77-P
24	24	12/G-25-9,10/ALONG/3	3929.26-F	48.48-P
		Average	3885.88-F	43.30-Р
25	25	19/0-30-1,2/ACROSS/1	4011.08-P	32.96-P
26	26	19/O-30-1,2/ACROSS/2	3463.89-P	37.08-P
27	27	19/O-30-1,2/ACROSS/3	3851.88-P	44.55-P
		Average	3775.56-P	38.19-P
28	28	19/G-25-7,8/ACROSS/1	4613.02-P	51.69-P
29	29	19/G-25-7,8/ACROSS/2	3636.76-P	38.50-P
30	30	19/G-25-7,8/ACROSS/3	4103.61-P	55.18-P
		Average	4117.79-P	48.45-P
31	31	12/G-28-9,10/ACROSS/1	4706.10-P	38.48-P
32	32	12/G-28-9,10/ACROSS/2	2814.58-P	37.89-Р
33	33	12/G-28-9,10/ACROSS/3	4747.97-P	37.83-Р
		Average	4089.55-P	38.06-P

34	34	12/O-25-9,10/ACROSS/1	4404.46-P	64.07-P
35	35	12/O-25-9,10/ACROSS/2	4210-P	52.36-P मानकः पथप्रदर्शकः
36	36	12/O-25-9,10/ACROSS/3	702.77-F	20.79-P
		Average	3105.48-P	45.74-P
37	37	6/O-30-7,8/ALONG/1	1295.86-F	21.65-F (by -39.86%)
38	38	6/O-30-7,8/ALONG/2	1136.09-F	23.77 (by -33.97%)
39	39	6/O-30-7,8/ALONG/3	965.16-F	20.24 (by -43.77%)
		Average	770.39-F	20.63 (by -48.42%)
40	40	6/O-30-7,8/ACROSS/1	3513.47-P	58.25-P
41	41	6/O-30-7,8/ACROSS/2	2863.36-P	54.03-P
42	42	6/O-30-7,8/ACROSS/3	3389.24-P	67.07-P
		Average	3255.35-P	59.78-P
43	43	19/G-28-7,8/ACROSS/1	1923.9-F	24.71-P
44	44	19/G-28-7,8/ACROSS/2	4535.34-P	31.03-P
45	45	19/G-28-7,8/ACROSS/3	2506.07-P	36.01-P
		Average	2988.16-P	30.58-P
46	46	19/0-25-7,8/ACROSS/1	4478.32-P	53.10-P
47	47	19/0-25-7,8/ACROSS/2	4398.81-P	43.96-P
48	48	19/0-25-7,8/ACROSS/3	4694.86-P	47.30-P
		Average	4523.99-P	48.12-P
49	49	12/G-25-9,10/ACROSS/1	2770.85-P	36.77-P
50	50	12/G-25-9,10/ACROSS/2	3079.82-P	36.30-P

51	51	12/G-25-9,10/ACROSS/3	3435.34-P	28.53-P
		Average	3095.33-P	33.86-Р मानकः पथप्रदर्शकः
52	52	12/O-30-9,10/ACROSS/1	4273.14-P	67.13-P
53	53	12/O-30-9,10/ACROSS/2	3595.30-P	48.78-P
54	54	12/O-30-9,10/ACROSS/3	3934.37-P	51.60-P
		Average	3934.27-Р	55.83-P
55	55	6/O-25-5,6/ALONG/1	1379.89-F	36.95-P
56	56	6/O-25-5,6/ALONG/2	1460.09-F	31.77-Р
57		6/O-25-5,6/ALONG/3	Not tested	Not tested
		Average	1419.99-F	34.36-P
58	57	6/O-25-5,6/ACROSS/1	4374.76-P	45.19-P
59	58	6/O-25-5,6/ACROSS/2	3361.10-P	35.06-P
60	59	6/O-25-5,6/ACROSS/3	2895.55-P	57.42-P
		Average	3444.80-P	45.89-P
61	60	6/G-25-5,6/ACROSS/1	3142.24-P	47.89-P
62	61	6/G-25-5,6/ACROSS/2	2542.74-P	48.60-P
63	62	6/G-25-5,6/ACROSS/3	3088.68-P	30.83-Р
		Average	2924.55-P	42.44-P
64	63	6/G-28-5,6/ACROSS/1	3062.79-P	39.18-P
65	64	6/G-28-5,6/ACROSS/2	3709.78-P	44.95-P
66	65	6/G-28-5,6/ACROSS/3	3908.67-P	42.95-P
		Average	3560.41-P	42.36-F

67	66	6/G-28-5,6/ALONG/2	5312.42-P	47.54-P
68	67	6/G-28-5,6/ALONG/3	4747.91-P	43.54-P मानकः पथप्रदर्शकः
69	68	6/G-28-5,6/ALONG/1	DID NOT BREAK	DID NOT BREAK
		Average	5030.16-P	45.54-P
70	69	6/G-25-5,6/ALONG/2	3516.98-F	32.01-F (by -11.08%)
71	70	6/G-25-5,6/ALONG/3	1902.76-F	35.30-F (by -1.94%)
72	71	6/G-25-5,6/ALONG/1	1791.82-F	32.01-F (by -11.08%)
		Average	2403.85-F	33.10- F (by -17.25%)

The graphs for above samples are attached below

Specimen Xio 0 Specimen Xio 0 With form 30 With form 91 With form 91 Theores (min) 91 Theorem (min) 91	Date 07-Jan-21		Group 19MM	Group 19MM PF PLYWOOD	Batch 1			Operator 19/0-30-1,2/ALONG/3	ALONG/3		Specimen PLYWOOD	n DOD	
min 30 1 (min) 912 (min) 912 (min) 912 (min) 912 (min) (min) 912 (min) (min) 912 (min) (min) 912 (min) (min) 7571 (min) (min) 7574 (min) (min) (min)	Specimen No.	0									X		
(mil) 912 (mil) ss (mil) 19 (mil) ss (mil) 19 (mil) ss (mil) 19 (mil) ss (mil) 7571 (mil) odd (N) 7571 (mil) sa (N) 7571 (mil) add (N) 757 (mil) add (N) 757 (mil) add (N) 757 (mil) add (N) 757 (mil) add (N) 753 (mil)	Width (mm)	20											
ss (mu) 19 19 10 ss (mu) 7571 000 000 3 Reak 2151 000 2 Reak 1000 1000 2 Reak 1000 000 2 Reak 1000 000 2 Reak 1000 000 2 Reak 1000 000 2 Reak 1000 000 <td>Length (mm)</td> <td>912</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>/</td> <td></td> <td></td> <td></td>	Length (mm)	912								/			
ood(N) 7571 ood(N) 3 Brack 2:51 0 3 Brack 2:51 0 3 Brack 2:51 0 3 Brack 2:51 0 3 Brack 0:03 0 3 Brack 0:1 0 3 Brack 0:1 0 3 Brack 0:1 0 1 Dotation 0:1 0	Thickness (nm)	19								X			
Break 2151 1 2 Peak 62.03 Peak 2 Peak 62.03 Peak 3 Peak 62.04 Peak 3 Peak 62.03 Peak 3 Static 62.14 Peak 3 Static 62.14 Peak 1351 Peak 571.38 Peak 1351 Peak 571.38 Peak 1351 Peak 71.36 Peak 1351 Peak 71.36 Peak 1351 Peak 71.38 Peak 1351 Peak 71.38 Peak	Peak Load (N)	757.1				+++++++++++++++++++++++++++++++++++++++		the second second second					
Peak 6.103 Composition Compos	Load @ Break	24.51							/				
Break (2.3 1 eak Force (N) 357.1 1 eak Force (N) 357.1 1 control (N) 373.1 1 (Numir) 5936/2 571.2.8 1 (Numir) 5936/2 571.2.8 1 (Numir) 5936/2 571.2.8 1 (Numir) 5936/2 571.3.8 1 (Numir) 5936/2 571.3.8 1 (Numir) 5936/2 571.3.8 1 (Numir) (Numir) (Numir) (Numir) (Numir) (Numir) (Numir) (Numir) (Numir) (Numir) (Numir) (Numir)	Elong @ Peak	62.03				156							
eak Force (N) 737.1 (N: mair) 3-326°: 571-38 (N: mair) 5-326°: 571-3	Elong 3 Break	62.4				(N)							
Ximui) 57.38 Ximui (510) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510) (201) (510) (510)	Avg. Peak Force (N)	757.1											
gation 7 90 igation 7 1 igation 1 1 <td>M O R (N muit)</td> <td></td> <td>57.38</td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td>6.3</td> <td></td> <td></td> <td></td>	M O R (N muit)		57.38					1		6.3			
	MOE	6709.07				305	-						1
	% Elongation	1 -					/						101
	Test Time (car)	3.6.5						-	1		The second		
	Test Speed (nun'min)	10.94					1	2.5			Co's mer	25 200	

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Date	Group			Batch		0 =	Operator 10/0_20_1 2/AI ONG/2	U.C.D	Spec	Specimen PIXWOOD	
07-Jan-21	19MP	19MM PF PLY WOOD		ч Г	530000000000000000000000000000000000000			7.045			
Specimen No. 0											
Width (mm) 50					477						
Length (mm) 912											
Thickness (mm) 19					424						
Peak Load (N) 525.65					371						
Load @ Break 307.93											
Elong @ Peak 44.12					318						
Elong @ Break 44.56				(N)							
Avg. Peak Force (N) 525.65				αvα	26		X				
M O R (N/mm ²) 3983.87	39.838			r			X				
M O E 6522.97	L				212						
% Elongation 5											
-	-	~	-		61	X					
					10K						
					<u></u>						
					53						
Test Time (sec) 249.2			•								
Test Speed (mm/min) 10.94					0 Mary						
		×			0	5 10	15 20		30		40 50
		14					DE	DEFLECTION (mm)		1.20	

190-30-1;2ALONGI	Date	Ē	Group	Batch		Operator		Specimen	а Ф
minit 0 minit 0 minit 50 10 10 minit 912 10 10 as (min) 912 10 10 as (min) 912 10 10 as (min) 910 10 10 as (min) 10 10 10 as (min) 10 10 10 as kence (p) 910.8 10.41 10 as kence (p) 10 10 10 10 as kence (p) 10.41 10 10 10 10	07-Jan-21	19.	MM PF PLYWOOD	m		19/0-30-1,2/ALO	NG/1	CIOOMYIA	
multiple 50 10 10 10 (mil) 912 1 1 1 ss (mil) 912 1 1 1 ss (mil) 912 1 1 1 ss (mil) 912 1 1 1 ost (N) 910/8 1 1 1 ost (N) 87/2 1 1 1 Break 87/2 1 1 1 Break 87/2 1 1 1 1 State 10 1 1 1 1 1 State 10 1 <t< th=""><th>Specimen No.</th><th>0</th><th></th><th></th><th>915</th><th></th><th></th><th></th><th></th></t<>	Specimen No.	0			915				
(mil) 912 (mil) 912 (mil) 912 ss (mil) 19 1 1 1 1 1 ss (mil) 19 1 1 1 1 1 1 ss (mil) 19 910.8 1	Width (mm)	50							
ss (mu) 19 19 108 19 109 19 109 19 19 19	Length (mm)	912							
odd(N) 910.08 00	Thickness (mm)	19			732				
ood (N) 910.08 010.08 010.08 010.08 Break 87.4.78 0		-					X		
Bleak 874.78 874.78 814.78 814.73 2) Park 87.02 1 1 1 2) Back 87.12 1 1 1 3) Back 87.12 1 1 1 3) Back 87.12 1 1 1 3) Back 87.13 1 1 1 3) Back 5371.108 10 1 1 201 10 1 1 1 1 201 10 1 1 1 1 1 201 10 1		910.08							
B Feak 87.02 87.02 1 1 3 Break 87.2 9.0 9.0 9.0 3 Break 87.2 10.08 10.08 10.04 ask Force (N) 9.01.08 10.04 10.04 10.04 ask Force (N) 9.01.05 10.04 10.04 10.04 getion 10 10 10 10.04 10.04 me (sec) 555 10.04 10.04 10.04 10.04 oed (mmrini) 10.94 0 0 0 0 0 0		874.78		-					
Bleek 87.2 1 ak Face (N) 91.08 ak Face (S) 91.08 (Numb) 687.45 5771.08 68.47 10 10 217 21.45 26 10.04 10 10 11 10 12 10 13 10 14 10 15 10 16 10 17.5 10 18 10 19 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	Elong @ Peak	87.02			549				
ak Force (N) 9108 (Numur) 6897.45 (S.471 5771.08 5771.08 915 915 915 915 915 915 915 915	Elong @ Break	87.2		(N)		X			
QYamuri) 6897.45 (S471 Indext (S471) Indext (S471) 5771.08 5771.08 10 10 10 gation 10 214.5 10 113.5 me (sec) 555 113.5 113.5 113.5 occd (am/min) 10.94 0 20 20 20		910.08		QAC	57.5				
str1108 10 366 gation 10 366 me (sec) 555 3145 me (sec) 555 915 occd (runvini) 10.94 0 Deck (runvini) 10.94 0				rd					
10 10 110 10 111 <td></td> <td>5771.08</td> <td></td> <td></td> <td>366</td> <td>/</td> <td></td> <td></td> <td></td>		5771.08			366	/			
	% Elongation	10							
555 91.5 10.94 0 10.94 0 0 10 20 30 40 50 50 30 10.94 10					C-1/2				
555 91.5 10.94 0 10.94 0 0 10 20 30 20 50 20 20 20 20 20 20 20 20 20 20									
10.94 0 10 20 30 40 50 60 80 80 80 10.94 DEFINITION (mm)	Tart Time (car)	445							
10 20 30 40 50 60 30 80 30 80 30 50 50 50 50 50 50 50 50 50 50 50 50 50	Test Speed (mm/min)	10.94							
					10	30		REAL	001

DIVIDENT TESTING MACHINE						
Date		Group	Batch		Operator	Specimen
07-Jan-21		19MM PF PLYWOOD	4		19/G-25-7,8/ALONG/1	PLYWOOD
Specimen No.	0			955		
Width (mm)	50				Ź	
Length (mm)	912			C.608		
Thickness (mm)	19			FILE		
					X	
Peak Load (N)	953.24			668.5	X	
Load @ Break	373.64					
Elong @ Peak	68.53			573		
Elong @ Break	76.03			(N	X	
Avg. Peak Force (N)	953.24			E 4775		
M O R (N/mm²)	7224.56 72.24	-		ro		
MOE	6932.84			382		
% Elongation	8				X	
		-		286.5		
				191		
E				955		
Test Seed (mm/min)	456.2					
(IIIII AIIIII) DODDG VCV	10.24			0	10 20 30 40 50 60	
			3		DEFLECTION (mm)	
Checked By : . T. J. J. M. J. J. C. L. C. U. Lev 1	+ chaulan				Verified By:	
- cymmys						CENTUS

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Date								
07-Jan-21		uroup 19MM PF PLYWOOD	Batch 5			Operator 19/G/25-7 ₋ 8/-ALONG/2	NG/2	Specimen PLYWOOD
Specimen No.	0			⊞006				
Width (mm)	50							
Length (mm)	912			810 810			X	
Thickness (mm)	19			<u>+++</u> 0(1		$\sum_{i=1}^{n}$		
				+++++ 2				
Peak Load (N)	898.32			630		1		
Load @ Break	0					\sim		
Elong @ Peak	70.98			540				
Elong @ Break	81.15			(N				
Avg. Peak Force (N)	898.32			ېD() 25 10)				
M O R (N/mm ²)	6808.32	80-39		IIII I I I I I I I I I I I I I I I I I				
MOE	6121.2			360				
% Elongation	6							
		-		270				
				130				
				+++++-				
Test Time (sec)	465.6			8				
Test Speed (mm/min)	10.94			The second secon				
				0	10	20 30 40	50 . 60	80
						DEFI	DEFLECTION (mm)	ы) (И Ы
Checked By : Flehit Cheruluy	(Level	5	(*				Wortfad Bu-	
Remarks :						h	Kaman ni	A CEN
						,	/	

05-lan-21 6 min testing sample 5 0 min testing sample 5 Specimen Nu. 0 0 0 0 Writh (mm) 50 0 0 Writh (mm) 50 0 0 Writh (mm) 50 0 0 Theoleuse (mm) 19 0 0 Dask Load (N) 98 0 0 Theoleuse (mm) 19 0 0 Dask Load (N) 98 0 0 Most Reack 73.54 0 0 Brong @ Prenk 73.54 0 0 Most Reack 73.54 0 0 Most Reversory 28.8 0 0 Most Reversory 28.8 0 0 Most Reversory 28.3 0 0 Most Reversory 28.8 0 0 Most Reversory 28.8 0 0 Most Reversory 28.3 0 0 Most Reversory 28.3 0 0 Most Reversory 1 1 0 Most Reversory 1 1 0 Most Reversory 1 1 0 Most Reversory	Operator
Image: constraint of the state of	7,8/ALONG/2
(mi) 50 1 (mi) 912 0 ess (min) 19 0 Break 334 0 Break 7353 0 Break 7353 0 Break 7343 0 Miner) 7343.48 0 east Force (N) 8 0 east Force (N) 8 0 east force (N) 8 0 east force (N) 1235.56 0 east force (N) 8 0 east force (N) 8 0 east force (N) 9 0 east force (N) 9 0 east force (N) 9 0 east force (N) 0	
(imi) 912 (imi) 913 (imi) 913 (imi) 913 (imi) 913 (imi) 913 (imi) 914 (imi) 914 (imi) 914 (imi) 914 (imi) 914	
css (mui) 19 19 19 10	
oad (N) 98.8 oad (N) 3 Break 3.4 0 3 Break 3.4 0 3 Break 73.5 0 0 Peak 73.54 0 0 Break 73.53 0 0 Break 72.85.56 0 0 Break 1285.56 0 0 Break 1285.56 0 0 Break 13.93 0 0 Break 10.94 0 0 Break 10.94 0	
Break 3.4 Image: Constraint of the state of the stat	
③ Peak 72.52 O ③ Break 73.54 O ③ Break 73.54 O ④ Break 73.54 O ● Break 7285.56 O ● Break 0 0 ● Break 0 0 <td></td>	
Break 73.54 1 ak Force (N) 98.8 eak Force (N) 98.8 IcoAD 0 formuly 7343.48 Numuly 8 Numuly 8 Numuly 9 Numuly 10.94 Numuly Numuly Numuly	
eak Force (N) 98.8 (Nimur ³) 7343.48 (Nimur	
(Ninue?) 7343.48 1 01 1285.56 1 10 8 1 11 8 1 12 1285.56 1 11 8 1 11 1 1 11 1 1 12 1 1 13 1 1 14 1 1 15 1 1 16 1 1 17 1 1 18 1 1 19 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10 1 1 10<	
285.56 1285.56 gation 8 0 0 0 0 0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
429.3 10.94 10 10 10.94 0 75 15	
7.5 1.5	
	DEFLECTION (mm)

1

100 8 COLAI Specimen PLYWOOD 20 0.62 (1) Verified By : 3 DEFLECTION (mm) 20 Operator 19/G/25-7,8/-ALONG/3 0 30 20 10 751.5 584.5 668 250.5 \$3.5 501 LOAD (N) 334 167 Batch 6 • **19MM PF PLYWOOD** Group 6325.16 63.25 Checked By: Makit Laubery 5253.69 834.57 823.78 834.57 87.26 87.84 506.2 10.94 912 50 19 10 0 UNIVESAL TESTING MACHINE Test Speed (mm/min) Avg. Peak Force (N) Thickness (mm) Elong @ Break MOR (N/mm²) Peak Load (N) Test Time (sec) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) 07-Jan-21 Remarks : MOE Date

50 (DIA) Specimen PLYWOOD 01 CALES Currentied By : 30 DEFLECTION (mm) 12/0-30-9,10/ALONG/1 25 20 Operator 5 10 270 5 0 000 180 210 د TOAD (N) Batch 7 1 12mm testing sample Group 3542 Checked By ... I to hat a check ber 3542.28 4214.52 295.19 157.89 295.19 38.73 38.51 356.7 576 6.91 20 12 0 5 UNIVESAL TESTING MACHINE Test Speed (mm/min) Avg. Peak Force (N) Elong @ Break Thickness (mm) Peak Load (N) Load @ Break MOR (N/mm²) Test Time (sec) Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Date 07-Jan-21 Remarks : MOE

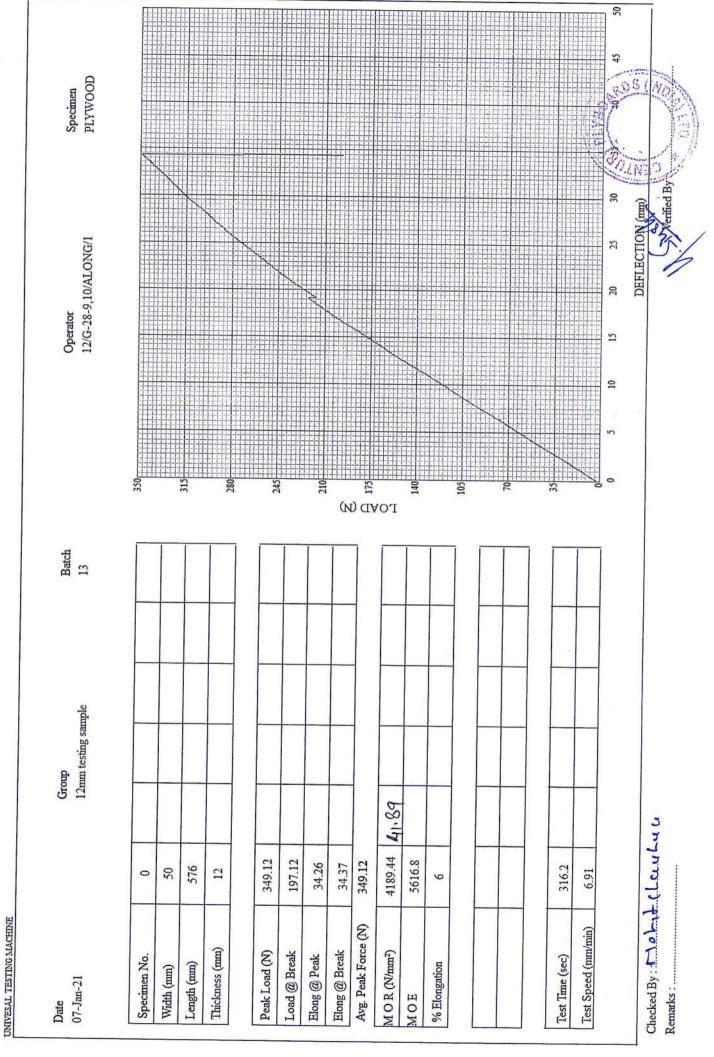
50 \$ NND. Specimen PLYWOOD 0 0 (8n) C. W. Verified By 30 DEFLECTION (mm) 12/0-30-9,10/ALONG/2 52 50 Operator 15 10 00 20 LOAD (N) Batch 8 12mm testing sample Group 23.65 Checked By : Mohi + (Laybu u 2365.44 3838.01 197.12 137.29 197.12 26.86 258.2 28.4 576 6.91 50 12 0 s'n UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Elong @ Break Thickness (mm) Peak Load (N) MOR (N/mm²) Test Time (sec) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Date 07-Jan-21 Remarks : MOE

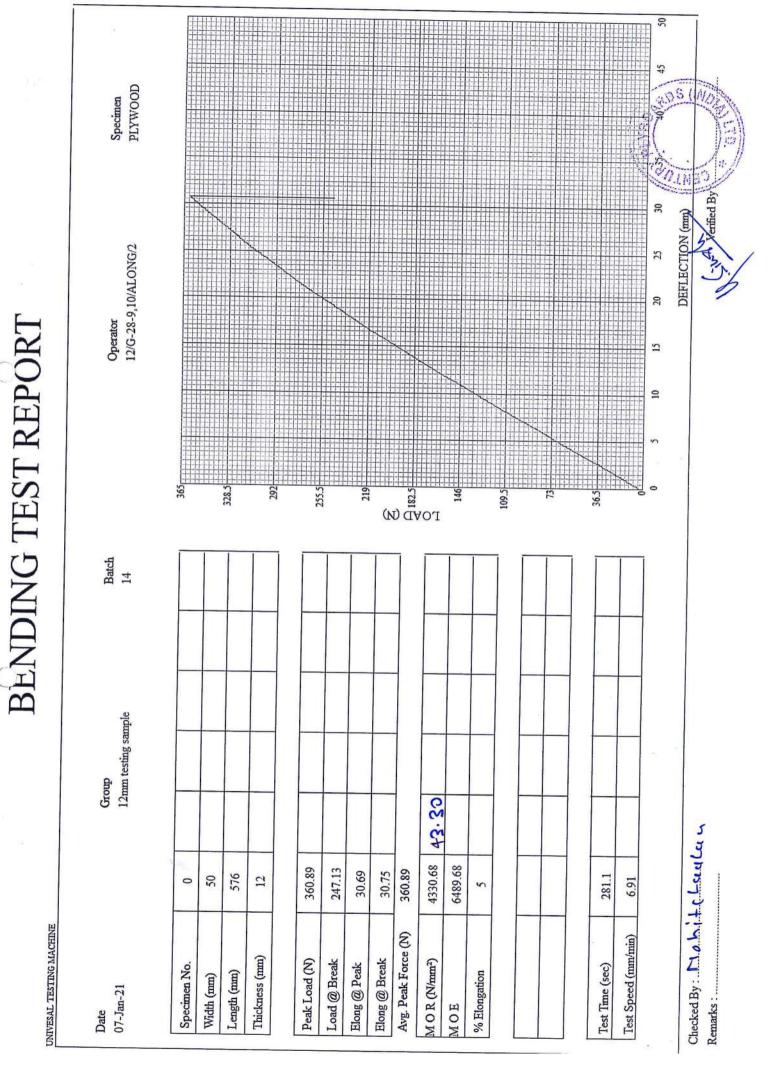
20 S illy Specimen PLYWOOD 9 PINE Verified By : 30 DEFLECTION (mm) 52 12/0-30-9,10/ALONG/3 50 Operator 5 10 S LOAD (N) 336 378 294 252 168 126 5 4 Batch 9 12mm testing sample Group 5036.76 50.36 Checked By : M. hit Check her 4 4713.52 419.73 419.73 116.7 48.12 49.24 6.91 576 444 50 12 0 6 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Elong @ Break Peak Load (N) MOR (N/mm²) Test Time (sec) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) 07-Jan-21 Remarks : MOE Date

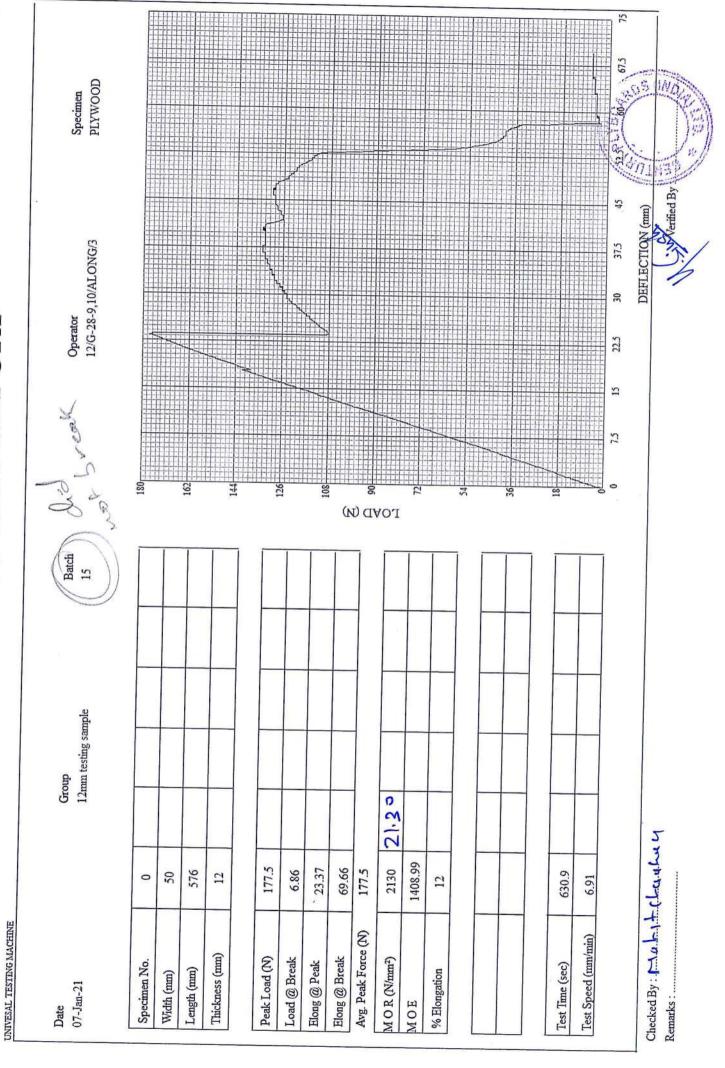
75 L'RDS Specimen PLYWOOD 09 A/30 Conferined By \$ DEFLECTION (mm) Ħ 37.5 12/0-25-9,10/ALONG/1 30 Operator 225 15 75 196 168 0 252 224 28 LOAD (N) Batch 10 12mm testing sample Group 3353.88 33.53 Checked By: Mehi + Chauleu 4 3055.49 279.49 279.49 80.41 50.35 50.58 461.2 6.91 576 50 12 0 6 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Elong @ Break Thickness (mm) Peak Load (N) MOR (N/mm²) Test Time (sec) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) 07-Jan-21 Remarks : MOE Date

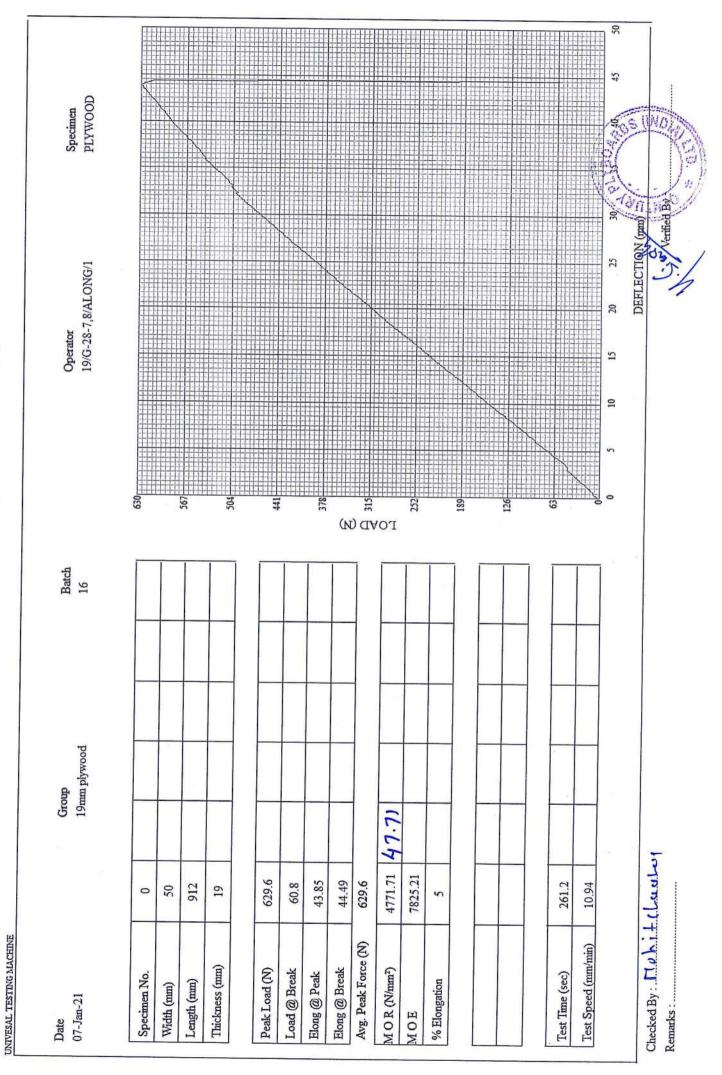
Date		mon	ſ		Datch			ځ	and the			Continued		
07-Jan-21		12mr	uroup 12mm testing sample		batch 11			ð ä	00012/020-9,10/ALONG/2	ONG/2		PLYWOOD	do Go	
Specimen No.	0					230								
Width (mm)	50					TUC								
Length (mm)	576									X				
Thickness (mm)	12					184								
				-		1111			2					
Peak Load (N)	227.52					161			//					
Load @ Break	94.14													
Elong @ Peak	46.13					138			/					
Elong @ Break	52.68													
Avg. Peak Force (N)	227.52			-		115								
M O R (N/mm²)	2730.24 2	27.30												
MOE	2388.18					92								
% Elongation	6													
						69								
							\searrow							
			-			97								
Test Time (sec)	476.7													
Test Speed (mm/min)	6.91					×,								
						0	<u>ז</u> .ז	15 2	22.5 30	37.5	45 // 5325	12.5 60	0 . 012	. 75
									DE	DEFLECTION (mm)			U.	-
Checked By : M. O. M. A. C. La Cu. Lel 9 Remarks :	t Checale	5							1	Veri	Verified By	N	Chille State	
										/				

Batch Operator Specimen 52001225-9,10/ALONG/3 PLYWOOD	I TOYD WILL BUT
Date Group 07-Jan-21 12mm testing sample	Specimen No. 0 0 0 0 Width (mm) 50 50 1 1 Length (mm) 576 12 1 1 Thickness (mm) 376 12 1 1 Thickness (mm) 12 245.17 1 1 Peak Load (N) 245.17 1 1 1 Peak Load (N) 245.17 1 1 1 Peak Elong @ Break 42.4 1 1 1 Blong @ Break 49.75 1 1 1 Avg. Peak Force (N) 245.17 1 1 1 Avg. Peak Force (N) 245.17 1 1 1 MO R (N/mm [*]) 2942.04 294.42 1 1 MO E 2725.01 294.42 1 1 1 % Elonguition 9 1 9 1 1 1 % Elonguition 9 1 1 1 1 1

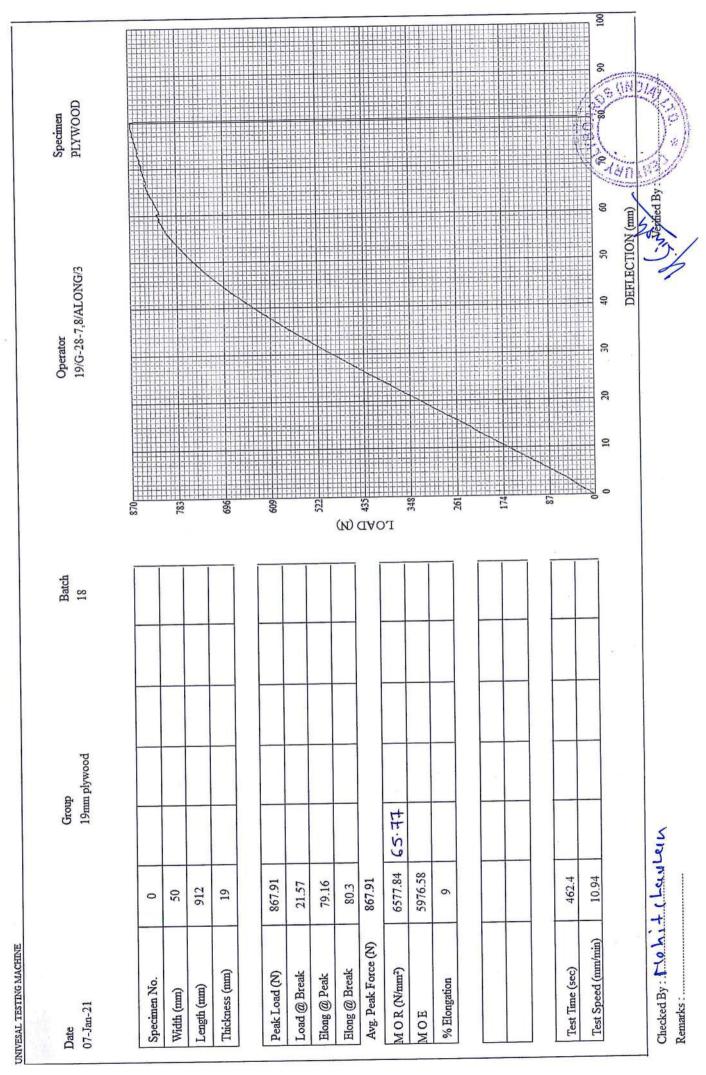








UNIVESAL TESTING MACHINE				
Date 07-Jan-21	Group 19mm plywood	Batch 17	Operator 19/G-28-7,8/ALONG/2	Specimen PLYWOOD
Specimen No.	0		820	
Width (mm)	50		738	
Length (mm)	912			
Thickness (mm)	19		656	
Peak Load (N)	816.92		374	
Load @ Break	505.06			
Elong @ Peak	58.48		492	
Elong @ Break	66.83		æ	
Avg. Peak Force (N)	816.92			
M O R (N/mm ²)	6191.39 61.91			
MOE	6759.3		338	
% Elongation	7			
			82	
Test Time (sec)	386.4			
Test Speed (mm/min)	10.94		30	31.5 45 (45.5) 61.5 75
				DEFLECTION (mp)
Checked By . Mohit Cheuve	it chaulan			
Remarks :			5	NO. A



Special (unit) 0 0 Neth (mun) 30 0 0 With (mun) 30 0 0 With (mun) 19 2 0 Thickness (mun) 19 0 0 Pask Load (N) 594.3 0 0 Pask Load (R) 594.3 0 0 Exercic (mun) 19 0 0 0 Pask Load (R) 594.3 0 0 0 Arg Pask Texee (R) 543.3 0 0 0 Arg Pask Texee (R) 543.1 1 0 0 0 Arg Pask Texee (R) 543.1 0 <t< th=""><th>07-Jan-21</th><th></th><th>Group 19mm plywood</th><th>Batch 19</th><th></th><th>19/0-25-7,8/ALONG/</th><th>1/9N</th><th>DOOMAId</th><th>Q</th></t<>	07-Jan-21		Group 19mm plywood	Batch 19		19/0-25-7,8/ALONG/	1/9N	DOOMAId	Q
min 50 min 50 min 315 (min) 912 19 10 11 11 (min) 912 19 10 11 11 (min) 912 10 10 10 10 (min) 912 10 10 10 10 10 (min) 913 10 </th <th>pecimen No.</th> <th>0</th> <th></th> <th></th> <th>595</th> <th></th> <th></th> <th></th> <th></th>	pecimen No.	0			595				
(mi) 912 1 1 st (mi) 19 1 10 st (mi) 19 1 10 st (mi) 3913 1 10 odd (N) 3913 1 10 odd (N) 3913 1 10 g Break 33536 1 10 g Break 33536 1 10 g Break 53339 1 10 g Break 53359 1 10 g Break 5339 1 10 g Break 54.23 1 10 at Force (N) 39.41 10 10 at Force (Minitia) 6077.59 11 10 at Force (Minitia) 6077.54 1 10 at Force (Minitia) 1094 10 10	Adth (mm)	50			135.5		X		
ss (mu) 19 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ength (mm)	912							
od (N) 3913 1 0 Break 233.36 1 0 Break 233.36 1 0 Break 233.36 1 0 Break 38.9 1 0 Break 31.0 1 0 Break 34.25 1 0 Break 34.35 1 0 Break 34.25 1 0 Break 54.25 1 0 Break 54.25 1 0 Break 54.25 1 0 Break 6057.59 1 0 Break 133.2 1 0 Break 133.2 1 0 Break 133.2 0 0 Break 10.94 1	hickness (mm)	19			476				
Break 235.36 Image: Second Se	eak Load (N)	594.3			116.5				
3 Peak 53.89 1 1 3 Break 54.25 1 1 3 Break 54.25 1 1 ak Facee (N) 54.25 1 1 ak Facee (N) 54.25 1 1 ak Facee (N) 54.3 1 1 ak Facee (N) 54.3 1 1 ak Facee (N) 59.4 1 1 affinance 6057.59 1 1 gation 6 1 1 1 gation 6 1 1 1 1 ace (annimin) 10.94 1 1 1 1 oeed (annimin) 10.94 1 1 1 1 1 1		235.36							
Break 54.25 1 1 1 ak Force (N) 59.3 54.3 1 1 ak Force (N) 59.3 1 1 1 Ohmur) 4504.17 4504.17 1 1 (Numur) 607.59 1 1 1 gation 6 1 1 1 gation 6 1 1 1 me (sec) 313.2 1 1 1 me (sec) 313.2 0 313 3 3	llong @ Peak	53.89			357				
ak Force (N) 594.3 Numuri) 4504.17 45.04 00000 6057.59 10 10 gation 6 057.59 10 10 113.5	llong @ Break	54.25		(X)					
Nhamity 4504.17 4504.17 4504.17 gation 6057.59 1 gation 6 mile 1 135 1 136 1 137 1 138 1 139 1 133 1 133 1 134 1 135 1 136 1 137 1 138 1 139 1 130 1 133 1 133 1 134 1 135 1 136 1 137 1 138 1 139 1 139 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 133 1 <td>lvg. Peak Force (N)</td> <td>594.3</td> <td></td> <td>(TAC</td> <td>297.5</td> <td></td> <td></td> <td></td> <td></td>	lvg. Peak Force (N)	594.3		(TAC	297.5				
6057.59 057.59 133 gation 6 133 met (sec) 313.2 133 met (sec) 313.2 0 oed (mm/min) 1094 0 0 13 13			40.	rc					
6 133 0 313.2 0 13 0 13		6057.59			238				
	6 Elongation	6							
		-							
	(est Time (sec)	313.2			39.2				
	Fest Speed (mm/min)	10.94						55 V 80 ale	615
DEFLECTION (mm))	16		2 ^{- 1}]	LECTION (mm)	New York	611

100 NDIA Specimen 80 4 E 18 Live Defined By : 09 DEFLECTION (mm) 50 19/0-25-7,8/ALONG/2 40 Operator 30 50 10 514.5 0 111 LOAD (X) 220.5 147 73.5 588 661.5 294 Batch 20 19mm plywood Group 55.51 Checked By: Mehid. L. Checked By: Merid of 5559.61 4658.12 10.94 733.56 110.81 81.08 733.56 86.24 520 912 19 10 50 0 Test Speed (mm/min) UNIVESAL TESTING MACHINE Avg. Peak Force (N) Elong @ Break MOR (N/mm2) Test Time (sec) Thickness (mm) Peak Load (N) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Remarks : . Date 07-Jan-21 MOE

UNIVESAL TESTING MACHINE				
				1
Date	Group	Batch	Operator	Specimen
07-Jan-21	19mm plywood	21	19/0-25-7,8/ALONG/3	PLYWOOD
Specimen No.	0		655	X
Width (mm)	50		200 V	
Length (mm)	912			
Thickness (mm)	19		324	
	×			
Peak Load (N)	653.14		438.5	
Load @ Break	439.35			
Elong @ Peak	57.84		393	
Elong @ Break	60.69		E Z	
Avg. Peak Force (N)	653.14		A 327.5	
M O R (N/mm ²)	4950.11 4-9.50		rc	
MOE	5950.9		262	
% Elongation	7			
			1965	
			131	
	-			
Test Time (can)	346.4		613	
Test Time (sec)	1.010 F.C.F.C			
(minimi) naade teat	1 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.		0 7.5 15 22.5 30 37.5	45 1 2325 60 3 61.5 75
			DEFLECTION	
Checked By: M. h. + (Lau Lein Remarks:	+ Chaulein			effied By:
			11	Landard Strange

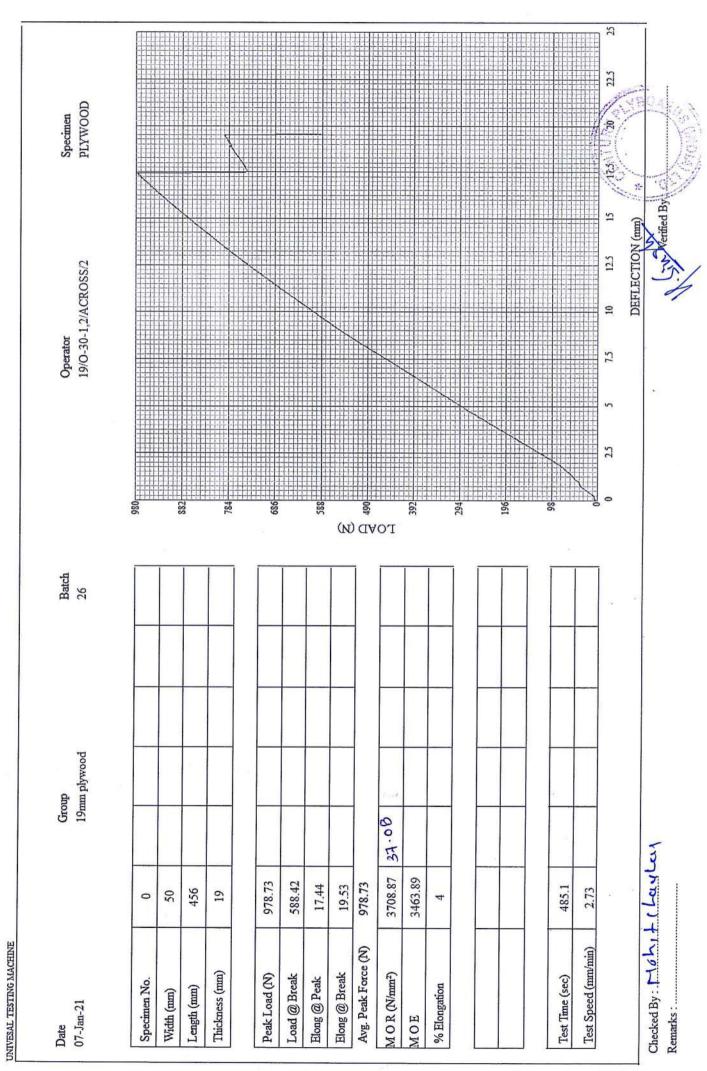
50 CE/ * Specimen PLYWOOD 40 18/50 L'Wedled By ... 30 DEFLECTION (mm) 52 12/G-25-9/10/ALONG/1 20 Operator 15 10 5 201 268 301.5 100.5 0 LOAD (N) 33.5 335r 134 Batch 22 12mm testing sample Group 3965.88 39.65 Checked By: M. hit f Lay Les y 3686.66 330.49 226.54 330.49 508.5 43.32 49.57 6.91 576 50 12 0 6 UNIVESAL TESTING MACHINE Test Speed (mm/min) Avg. Peak Force (N) Elong @ Break MOR (N/mm²) Thickness (mm) Peak Load (N) Load @ Break Test Time (sec) Elong @ Peak Specimen No. % Elongation Width (mm) Length (mm) Date 07-Jan-21 Remarks : . MOE

UNIVESAL TESTING MACHINE

50 ENTU Specimen PLYWOOD 9 ACINI) く い 引 Hed By: 30 DEFLECTION (mm) 3 12/G-25-9/10/ALONG/2 20 Operator 15 10 'n 245 315 280 210 105 LOAD (N) E Batch 23 :* 12mm testing sample Group 44.14 Checked By: Mohit ChayLay 4177.68 4041.73 348.14 434.6 348.14 95.12 46.84 47.63 6.91 576 12 50 8 0 Avg. Peak Force (N) Test Speed (mm/min) Elong @ Break M O R (N/mm²) Test Time (sec) Thickness (mm) Peak Load (N) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Date 07-Jan-21 Remarks : MOE

75 8 TU Specimen 09 a an verified By : ... \$ DEFLECTION (mm) in S.M. 37.5 12/G-25-9/10/ALONG/3 30 Operator 225 12 1.5 283.5 0 LOAD (N) 364.5 121.5 324 243 162 40.5 Batch 24 12mm testing sample Group 4848.48 40.40 Checked By: Mehth (hay hay 3929.26 404.04 166.71 404.04 56.86 516.4 53.4 6.91 576 20 12 10 0 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Elong @ Break Thickness (mm) MOR (N/mm2) Peak Load (N) Test Time (sec) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Date 07-Jan-21 Remarks : ŕ MOE

Date		Group	Ratch			Onerator		Craciman	
07-Jan-21		19mm plywood	25			0.30-1,2/ACROSS/1		PLYWOOD	
Specimen No.	0			870					
Width (mm)	50								
Length (mm)	456			183		/			
Thickness (mm)	19			696					
Peak Load (N)	869.88			609		X			
Load @ Break	555.07								
Elong @ Peak	12.71			522					
Elong @ Break	14.99			(N					
Avg. Peak Force (N)	869.88	-) (TA					
M O R (N/mm²)	3296.39	32.96							
MOE	4011.08			348					
% Elongation	3			196					
				107					
					X				
Test Time (sec)	426.8			87					
Test Speed (mm/min)	÷ 2.73			2					
				0	0 2.5 5	27	15 168	A STATE	22.5 25
Checked By . Ma h 1 + (Faulty					Untritucion (mm)	By	52a.	# 1.



¥5.

1521

07-Jan-21 19mm plywood Specimen No. 0 19mm plywood Width (mm) 50 0 Width (mm) 50 0 Length (mm) 456 0 Thickness (mm) 19 19 Peak Load (N) 1175.85 1175.85	23 Jan		Specimen
		1130 1062 914 826 826 708	
		1002 1002	
		1062 944 836 836 708	
		944 944 836 806 708	
		stoch from the second sec	
		708	
Elong @ Peak 21.06			
Elong @ Break 21.1			
Avg. Peak Force (N) 1175.85		590	
M O R (N/mm ²) 4455.85			
M O E 3851.88		422	
% Elongation 5			
		236	
Test Time (sec) 482.7 482.7			
Test Speed (mm/min) 2.73			
			A 25 25 25 25
Checked By Marth f. Lagher w		DEFLECTION (mm)	(*/):se

	Date		Group	Batch				
	07-Jan-21		19mm plywood	28		19/G/25-7,8/-ACROSS/1	PLYWOOD	
	Specimen No.	0			1365			
	Width (mm)	50						
	Length (mm)	456						
	Thickness (mm)	19					X	
	Peak Load (N)	1364.15				X		
	Load @ Break	213.79						
	Elong @ Peak	20.4			1 1 1 1 1			
	Elong @ Break	20.44			S.			
	Avg. Peak Force (N)	1364.15			D Cl			
	M O R (N/mm ²)	5169.41	51.69		rov			
	MOE	4613.02			546			
	% Elongation	হা						
					409.5			
1365 1375 1375								
1365 1375 1375					+++++++++++++++++++++++++++++++++++++++			
1000 1000 0 25 5 75 10 125 10 113 0 125 15 10 125 10 114 0 10 125 15 10 115 10		-						
0 25 5 75 10 123 15 (1737) 20 DEFLECTION (mm)	Test Time (sec)	470.7						
0 25 5 75 10 125 15 1175 20 DEFLECTION (mm) Verified By	Test Speed (mm/min)	2.73			X			
DEFLECTION (mm).	t ¹		5		2.5	7.5 10	(VELNO)	225 25
In Cash		1 . 1				DEFLECTION (m		
	decked By : 1. 10. A.t.	Transfer 1	5			Live Veri	fed By:	

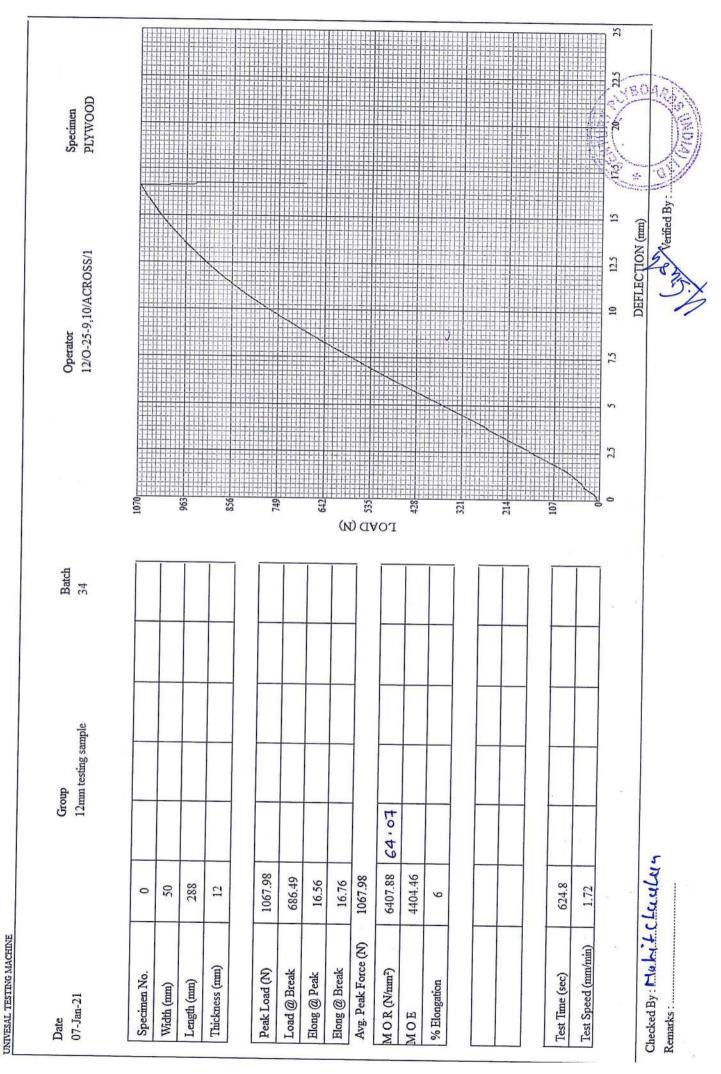
Diama Company Diama							
Jampihood 29 Jaccin Jac	Date		Group	Batch		Operator	Snecimen
	07-Jan-21		19mm plywood	29		19/G/25-7,8/-ACROSS/2	PLYWOOD
	Specimen No.	0					
	Width (mm)	50					
	Length (mm)	456					
	Thickness (mm)	19			111.63.134	X	X
	Peak Load (N)	1016				\sim χ	
	Load @ Break	73.55					
	Etong @ Peak	14.18			612		
	Elong @ Break	19.31					
	Avg. Peak Force (N)	1016			510		
	M O R (N/mm ²)		39.50				
	MOE	3636.76					
	% Elongation	4					
			-		306		
100 100 100 100 100 100 100 100					204		
0 2.5 5 7.5 10 1.2 15 17 00 12 15 17 00 12 15 17 00 12 15 17 00 12 15 17 00 12 15 17 00 10 10 10 10 10 10 10 10 10 10 10 10	Test Time (sec)	444.6					
0 23 5 75 10 125 15 17 DEFLECTION (mm) N Meffed By: 25	Test Speed (mm/min)	2.73					
DEFLECTION (mm) //			2		0	7.5 10 12.5	CENTRA D
The second By :	Til Malather					DEFLECTION (mm)	1 × 1
	demarks :	hy h p- 1	c			Line the section By	10

52 YSDAA WWW Specimen NGIN Verified BM So -15 DEFLECTION (mm) 19/G/25-7,8/-ACROSS/3 12.5 10 Operator 7.5 ŝ 2.5 1168 1314 1022 876 යි TOAD (N) 438 292 1460 584 146 Batch 30 Group 19mm plywood 55.18 Checked By: Mo. Lit. C. Laulay 5518.72 1456.33 1456.33 4103.61 107.87 24.53 24.47 456 582 2.73 0 50 19 5 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Peak Load (N) Elong @ Break MOR (N/mm²) Load @ Break Elong @ Peak Test Time (sec) Specimen No. Length (mm) Width (mm) % Elongation Date 07-Jan-21 Remarks : .. MOE à. - mary

10 Q. Y8 DAK Specimen PLYWOOD AND Verified By : 9 DEFLECNON (mm) 12/G-28-9,10/ACROSS/1 5 家 -1 Operator m 2 -516 580.5 451.5 387 193.5 LOAD (N) 258 129 64.5 Batch 31 12mm testing sample Group 38.48 Checked By: Mahlt Layley 3848.22 641.37 145.14 641.37 4706.1 580.5 9.38 9.42 288 1.72 50 0 12 ŝ UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Peak Load (N) Elong @ Break M O R (N/mm²) Load @ Break Elong @ Peak Test Time (sec) Specimen No. Length (mm) % Elongation Width (mm) Date 07-Jan-21 Remarks : MOE

25 549 22 18043 Specimen PLYWOOD 175 0 × C. d. Werfied By : 15 DEFLECTION (mm) 12.5 12/G-28-9,10/ACROSS/2 10 Operator 7.5 ŝ 25 571.5 63.5 0 LOAD (N) 190.5 508 254 Batch 32 Group 12mm testing sample Checked By: Tlahit Clayler 9 3789.42 2814.58 631.57 339.32 631.57 10.77 15.51 288 1.72 588 50 0 12 Ś UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Elong @ Break Thickness (mm) Peak Load (N) M O R (N/mm²) Test Time (sec) Load @ Break Elong @ Peak Specimen No. Length (mm) % Elongation Width (mm) Date 07-Jan-21 Remarks : MOE

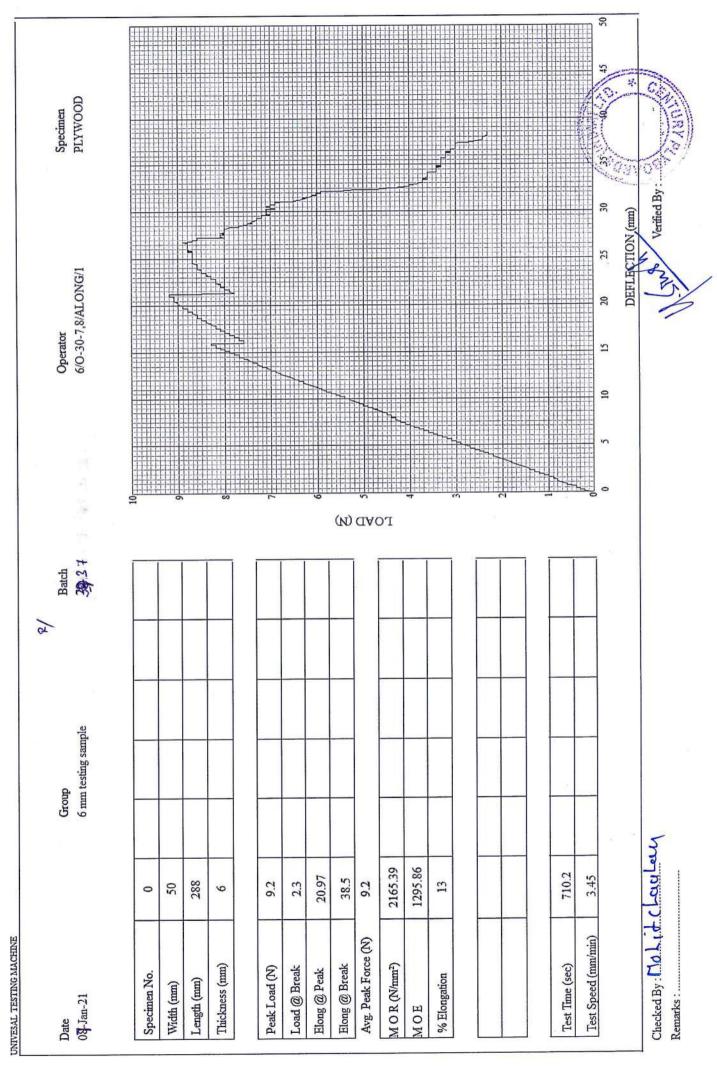
10 0 Specimen PLYWOOD ŝ Verfied By: 0 DEFLECTION (mm) 12/G-28-9,10/ACROSS/3 Operator 5 2 -4455 571.5 LOAD (X) 508 381 254 190.5 127 63.5 Batch 33 12mm testing sample Group 37.83 Checked By : M. chit Charley 3783.54 4747.97 630.59 357.95 630.59 9.16 9.18 288 338.1 1.72 50 12 0 3 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Elong @ Break Peak Load (N) MOR (N/mm²) Load @ Break Elong @ Peak Test Time (sec) Specimen No. % Elongation Length (mm) Width (mm) Date 07-Jan-21 MOE Remarks :

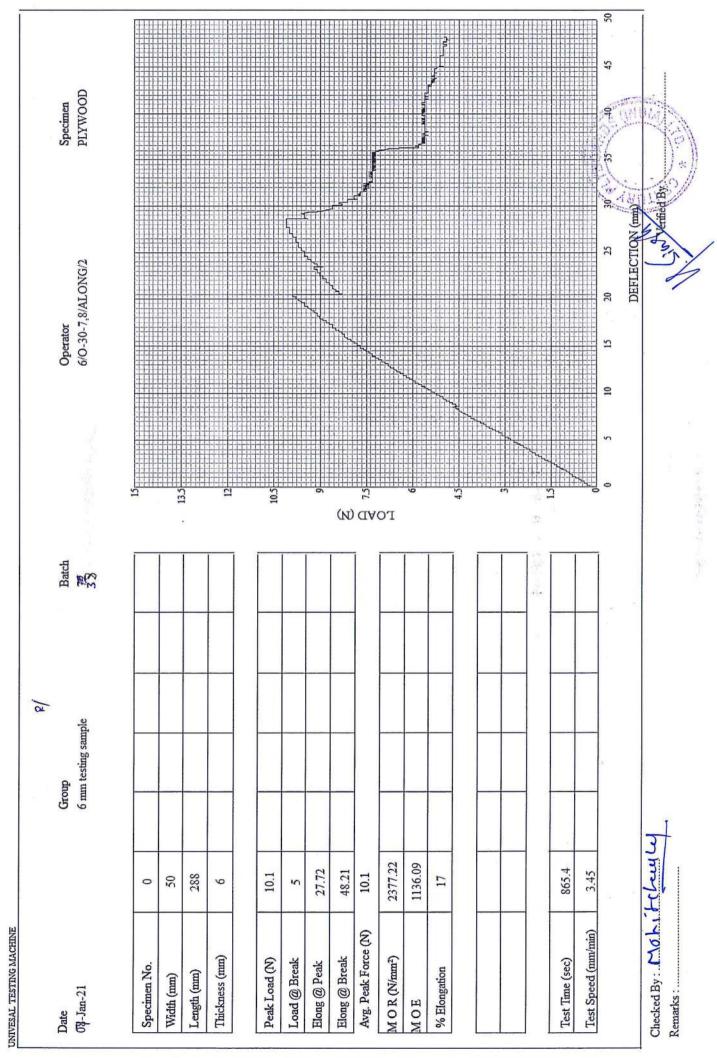


52 22.5 YE 6.4 Specimen PLYWOOD (and the a MDL Verified By 15 DEFLECTION (mm) Part. 12/O-25-9,10/ACROSS/2 12.5 10 Operator 7.5 5 2.5 0 612.5 262.5 525 8751 787.5 20 LOAD (N) 175 350 \$7.5 Batch 35 12mm testing sample Group 52.36 Checked By: Ma hit C La ale 1 5236.92 600.18 872.82 872.82 14.06 14.33 4210 288 1.72 50 0 12 501 5 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Elong @ Break Peak Load (N) Load @ Break M O R (N/mm²) Test Time (sec) Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Date 07-Jan-21 Remarks : MOE

25 22.5 180 RR Specimen PLYWOOD 20 Carlor of the second Verified By 15 DEFLECTION (mm) Operator 12/0-25-9,10/ACROSS/3 Swit !! 12.5 10 7.5 5 2.5 969 783 261 522 LOAD (N) 348 174 Batch 36 12mm testing sample Group 2079.58 20.79 Checked By : Ma hit C Lace Lee 602.14 702.77 868.9 15.22 868.9 21.53 7.67.7 288 1.72 50 19 0 5 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Peak Load (N) Elong @ Break MOR (N/mm²) Load @ Break Test Time (sec) Specimen No. Elong @ Peak Length (mm) % Elongation Width (mm) Date 07-Jan-21 Remarks : MOE

Discrete constrained Discrete constrained <thdiscrete constrained<="" th=""> <thdiscrete constrained<="" th=""></thdiscrete></thdiscrete>	UNIVESAL TESTING MACHINE												
Game Game Bath Contra Space Kan notige series 31 Goats Space Space Kan notige series 31 Goats Space Space Kan notige series 31 Goats Space Space No 91 0 91 0 91 No 91 0 91 91 91 No 91 91 91 91 91													
Manuality 31 Coortination No 0 0 0 0 No 0 0	Date		Group		Batch			Ő	perator			Snecimen	
0 38 0 0 38 0 0 38 0 0 38 0 0 38 0 0 38 0 0 38 0 0 100 0 0	07-Jan-21		12mm ti	esting sample	37			6/	0-30-7,8/ALC	I/9/I		PLYWOOD	
00 50 0 1 288 10 10 1 288 10 10 1 288 10 10 1 288 10 10 1 206 10 10 1 100 10 10 1 100 10 10 1 100 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 1 10 10 10 <td></td> <td></td> <td>\$</td> <td></td> <td></td> <td>001</td> <td>C</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>			\$			001	C						
0 50 10 20 20 10 10 00 28 0 0 28 0 0 28 0 0 20 0 <t< td=""><td>Specimen No.</td><td>0</td><td></td><td></td><td></td><td>101</td><td></td><td></td><td></td><td></td><td></td><td>11</td><td></td></t<>	Specimen No.	0				101						11	
0 288 1 1 min 6 1 1 1 min 6 1 1 1 min 51 1 1 1 mix 73.01 1 1 1 mix 33.1 1 1 1 mix 328.4 23.5 1 1 1 mix 34.5 1 1 1 1 1 mix 34.5 1 1 1 1 1 1 1 mix 14.5 1 1 1 1 1	Width (mm)	50											
multiple 6 1 1 multiple 96.1 1 1 multiple 35.1 1 1 multiple 35.1 1 1 multiple 31.5 1 1 multiple 31.6 1 1 multiple 31.6 1 1 1 multiple 31.6 1 1 1 1 multiple 31.6 1 1 1 1 1 multiple 31.6 1 1 1 1 1 1 1 multiple 31.6 1 <th1< th=""> 1 <th1< th=""> <th1< t<="" td=""><td>Length (mm)</td><td>288</td><td></td><td></td><td></td><td>96</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th1<></th1<></th1<>	Length (mm)	288				96							
(N) 961 csk 7351 csk 7351 csk 7351 csk 7301 csk 23064 cso 96 csk 73 csk 1001 csk 1001 csk 101 csk <td>Thickness (mm)</td> <td>9</td> <td></td> <td></td> <td></td> <td>80</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Thickness (mm)	9				80							
100 361 101 eak 7351 1 eak 7351 1 eak 7351 1 eak 7361 1 eak 7301 1 eak 7301 1 eak 7301 1 eak 7301 1 eak 7304 1 eak 23064 23 - 0 (m 738 1000 m 34 1000 m 10000 1000				_									
resk 7351 Instant Inst	Peak Load (N)	96.1				70							
dk 4842 1 1 resk 7401 0 0 resk 7401 0 0 resk 7401 0 0 resk 7401 0 0 resk 7101 0 0 resk 23064 23:of 0 resk 138 0 0 resk 118 0 0 resk 1462 0 0 0 resk 1462 0 0 0 0 resk 1345 0 0 0 0 resk 1345 0 0 0 0	Load @ Break	75.51											
resk 7401 1 1 Free(R) 961 1 1 mm 738 13-0 (D 0 mm 738 13-0 (D 0 mm 738 13-0 (D 0 mm 76 0 0 0 mm 26 0 0 0 0 mm 36 0 0 0 0 0 mm 36 0 <t< td=""><td>Elong @ Peak</td><td>48.42</td><td></td><td></td><td></td><td>60</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Elong @ Peak	48.42				60							
Face (0) 961 m ¹) 2306.4 230 m ¹) 2306.4 230 m ¹) 2306.4 230 m ¹) 236 230 m ¹) 26 0 m ¹	Elong @ Break	74.01											
mth 23064 23 - 6 (n 718 23 - 6 (n 26 0 n 26 0 n 0 <	Avg. Peak Force (N)	96.1				50							
718 718 n 26 n 26 in 26 in 26 in 26 in 0 in 0 <td< td=""><td>M O R (N/mm²)</td><td>2306.4</td><td>23.06</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	M O R (N/mm ²)	2306.4	23.06										
m 26 1 1 m 26 1 1 m 0 0 0 0 m 0 0 0 0 0 m 0 0 0 0 0 0 0 monimi 3.45 0 13 3 0 13 5 0 <	MOE	718				40							
1462 1 1	% Elongation	26											
Ee 1462 20 (mn/min) 3.45 0 (mn/min) 3.45 0 Tahit file 0 15 13 Ahit file 0 15						30							
e) 1462 (mn/min) 3.45 1 10 10 10 10 10 10 10 10 10 10 10 10 1						1							
sec) 1462 1 10 <th1< td=""><td></td><td></td><td></td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th1<>						3							
Model Model <th< td=""><td>Test Time (cas)</td><td>1460</td><td></td><td></td><td></td><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	Test Time (cas)	1460				10							
Mahi L (Laulay DerLECTION (mm) 213 30 313 45 533 665 613 DerLECTION (mm) 214 132 215 215 215 215 215 215 215 215 215 21	Test Speed (mm/min)	3.45											
Mahit (Lauluy (m))			-	5		5	-			37.5		Non Contraction	67.5
Mahi Le Lauray	•								DEF	TECTION (m			
	Checked By : M. a. h. l. Remarks :	t f hau	Let 1							Res I	By		
										12			





75 67.5 CONT. RV Specimen PLYWOOD 1525 (17) fified By \$ DEFLECTION (mm) 37.5 6/0-30-7,8/ALONG/2 30 Operator 22.5 12 7.5 (N) (IAO (N) Batch 38 Group Mann testing sample 6. 18.53 Checked By: M. O. h. L. Chay Ley 1859.28 1203.6 3.45 628.21 68.19 77.47 77.47 25.91 24 288 50 9 0 0 Test Speed (mm/min) Avg. Peak Force (N) JNIVESAL TESTING MACHINE Test Time (sec) Elong @ Break MOR (N/mm²) Load @ Break Thickness (mm) Peak Load (N) Elong @ Peak % Elongation Specimen No. Length (mm) Width (mm) Remarks : . Date 07-Jan-21 MOE

UNIVESAL TESTING MACHINE

50 TUR Specimen PLYWOOD 40 RIVI L'Weised By ... 30 DEFLECTION.(mm) 25 Operator 6/0-30-7,8/ALONG/2 11 20 15 10 59.5 51 LOAD (N) 25.5 Batch 39 Group Afrium testing sample 6 Checked By: Male 1 + 1 + Leugleun 2024.16 965.16 84.34 84.34 34.63 84.34 48.32 3.45 288 858 50 0 9 17 Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Elong @ Break Peak Load (N) MOR (N/mm2) Test Time (sec) Load @ Break Elong @ Peak Specimen No. Length (mm) % Elongation Width (mm) Date 08-Jan-21 Remarks : MOE

Date	Ŀ	Group	Batch		Omerator		Continued	
08-Jan-21	6 п	6 mm maximaply	40		6/0-30-7,8/ACROSS/	cross/ p	PLYWOOD	Q
Specimen No.	0			490				
Width (mm)	50							
Length (mm)	144							
Thickness (mm)	6			392				
		-						
Peak Load (N)	485.44			343				
Load @ Break	21.57							
Etong @ Peak	9.53			294		X		
Elong @ Break	9.55			(N				
Avg. Peak Force (N)	485.44			SE S		X		
M O R (N/mm ²)	5825.28 58-25			TO		X		
MOE	3513.47			196	X			
% Elongation	7							
				147				
				36				
Test Time (sec)	704.2							
Test Speed (mm/min)	0.864							
		£2		0 1	2 3 4	5 6		6 10 10
	•				D	DEFLECTION (mm)		, TA
Checked By : . CA A. h. t. C. La. a here h Remarks :	-Charter h				1/	Lyw Verified By	A CONTRACTOR	100
						12		

Determine Deter									
Monomial Image: Monomial Image: Monomial	Date		Group	Batch		Omerator		Snermen	
1N0. 0 10. 0 10. 0 11. 0 <th>08-Jan-21</th> <th></th> <th>6 mm maximaply</th> <th>41</th> <th></th> <th>6/0-30-7,8/ACROS</th> <th>S/2</th> <th>PLYWOOD</th> <th></th>	08-Jan-21		6 mm maxima ply	41		6/0-30-7,8/ACROS	S/2	PLYWOOD	
minil 6 14 10 minil 14 14 14 minil 1081 1081 14 Bask 1083 1081 108 Bask 1081 1081 108 Bask 1081 108 108 Bask 1 108 <	Specimen No.	0			545				
mill 144 144 mill 144 144 f(min) 6 9 f(min) 6 9 f(min) 6 9 f(min) 6 9 f(min) 5 93.36 Break 108.35 9 Break 108.45 108.45 Break 108.45 108.45 Break 108.45 108.45	Width (mm)	9							
(min) 6 0 0 0 0 0 d(N) 540.36 0 10.81 0 0 0 Break 108.83 0 10.81 0 0 0 0 Break 108.83 0 0.81 0 0 0 0 0 Break 108.83 0 0.81 0 <td< td=""><td>Length (mm)</td><td>144</td><td></td><td></td><td>490.5</td><td></td><td></td><td></td><td></td></td<>	Length (mm)	144			490.5				
d(n) 5036 103 Back 1083 1083 Back 1083 103 Back 103 10 Back 10 10	Thickness (mm)	6			436	/			
Break 108.85 </td <td>Peak Load (N)</td> <td>540.36</td> <td></td> <td></td> <td>381.5</td> <td>X</td> <td></td> <td></td> <td></td>	Peak Load (N)	540.36			381.5	X			
Peak 1083 1083 1083 1083 Break 1087 1087 1087 1087 Break 1087 1087 1087 1083 Break 1087 1087 1081 1081 Imarching 54036 541 cb3 1083 1083 Imarching 2863361 10 108 108 Imarching 8 108 108 108 Imarching 8 1086 108 108 108 Imarching 0.864 108 108 108 108 108 Imarching 0.864 108 108 109 108	Load @ Break	108.85							
Break 1037 1 1 1 R.Facec (N) 34036 541 v63 1 1 Imm ¹) 1 1 1 1 1 Imm ¹) 8 1 1 1 1 1 Imm ¹ 8 1	Elong @ Peak	10.83			327				
k Force (b) 340.36 formin) 54036 574.02 lowin) 54036 574.02 lowin 2863361 10 lowin 10 10 lowin 10 10 lowin 0.864 10 lowin 0.864 10 10 lowin 0.864 10 10 10 lowin 0.864 10 10 10 10 lowin 0.864 10 10 10 10 10 lowin 0 10 </td <td>Elong @ Break</td> <td>10.87</td> <td></td> <td></td> <td>(X)</td> <td></td> <td></td> <td></td> <td></td>	Elong @ Break	10.87			(X)				
Imary 54036 574 · 0.3 IO 100 2863361 10 10 101 2863361 10 10 101 103 103 103 102 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103 103	Avg. Peak Force (N)	540.36			A 2725				
2363361 135 tion 8 133 143 143 143 143 144 144 145 145 145 145 145 145 145 145 146 147 148 149 149 141	M O R (N/mm²)	54036	54.03		ro				
tion 8	MOE	2863361			218				
1635 1635 (ecc) 833 0 100 0 13 0 13 0 13 0 13 0 13 0 13 0 13 0 13 0 13 0 13 0 13 0 13 0 13 10 13 11 14	% Elongation	8							
(sec) 833 100 00 d(mu/min) 0.864 0 25 5 15 10 15 d(mu/min) 0.864 0 25 5 75 10 15 y: Ma.h.f. Latellat y 0 25 5 75 16 16									
(cc) 833 345 d(mu/min) 0.864 0 0 25 3 7.1 a.h.i.t.c.textlar 0									
(sec) 833 345 d(mm/min) 0.864 0 ad (mm/min) 0.864 0 0 25 5 15 13 0 25 5 15 16 15 16 17 17 16					109				
: (sec) 833 (am/min) 0.864 (am/min) 0.864 (brownin) 0.864 (brownin) 0.864 (brownin) 0.864 (brownin) 0.864 (brownin) 0.864 (brownin) (bro									
ed (mm/min) 0.864 0 125 1 1 1 1 20 20 25 5 7 2 10 12 1 1 20 20 20 20 20 20 20 20 20 20 20 20 20	Test Time (sec)	. 833							
y: Mahit Cleadled of Verified By: Verified By:	Test Speed (mm/min)	0.864							
y: Mahit Clauler of DEFLECTION (mm) //					0	2.7			22. 25
y: Mahit Clearley of	-					DEFLE	(CTION (mm)		01
	Checked By : M.a. hi. f. Remarks :	CLade	2				Verified By :	No.	Roc

25 anos Specimen (CES) 17.5.11 (.... Verified By :.. 15 DEFLECTION (mm) 12.5 Operator 6/0-30-7,8/ACROSS/3 10 7.5 Ś 448 448 392 25 504 ROAD (N) 224 112 Batch 42 6 mm maximaply Group 67.07 Checked By: Mahit (Lay Lay 6707.88 3389.24 558.99 558.99 50.99 11.35 896.8 11.4 0.864 144 50 0 9 8 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Elong @ Break Peak Load (N) MOR (N/mm2) Load @ Break Test Time (sec) Elong @ Peak Specimen No. Length (mm) % Elongation Width (mm) 08-Jan-21 Remarks : MOE Date

ONTREAM LESTING MACHINE					
Date		Group	Ratch		
08-Jan-21		19mm plywood	43	Optrauor 19/G-28-7,8/ACROSS/1 P	Specmen PLYWOOD
Specimen No.	0			635	
Width (mm)	50				
Length (mm)	456			589.5	
Thickness (mm)	19				
		-			
Peak Load (N)	652.16			458.5	
Load @ Break	395.22				
Elong @ Peak	9.85			393	
Elong @ Break	23.43				
Avg. Peak Force (N)	652.16		-		
M O R (N/mm ²)	2471.34	11:48			
MOE	1923.91				
% Elongation	5				
				131	
Test Time (sec)	573	-			
Test Speed (mm/min)	2.736				
		(*		0 25 5 75 10 12.5 15	NA NA
				DEFLECTION (mm)	JAI
Checked By : Ma Ni 4 CLC a Lea y Remarks :	רבמארמ	2		A way verified By	
					Constanting of the second

Date			1						*
08-Jan-21		uroup 19mm plywood	Batch 44		Operator 19/G-28-7	Operator 19/G-28-7,8/ACROSS/2		Specimen PLYWOOD	
Specimen No.	0			820					
Width (mm)	50								
Length (mm)	456			738					
Thickness (mm)	19			656					
		-							
Feak Load (N)	818.88			574					
Load @ Break	400.12								
Elong @ Peak	12.46			492					
Elong @ Break	12.48			(N)					
Avg. Peak Force (N)	818.88		-) (TA					
M O R (N/mm ²)	3103.12 31.03	3		III ot					
MOE	4535.34			328					
% Elongation	3								
				246					
				164					
		-							
Test Time (sec)	292.5			82					
Test Speed (mm/min)	2.73			L/ c					
					2.5 5 7.5	10 12.5	15 17	23	25
						DEFLECTION (mm)	and black and	101- 101	
Checked By : . M. O. N. j. + (Leu y leve y Remarks :	+ (part a					the we	Verified By :		
						/	2	AND AND	

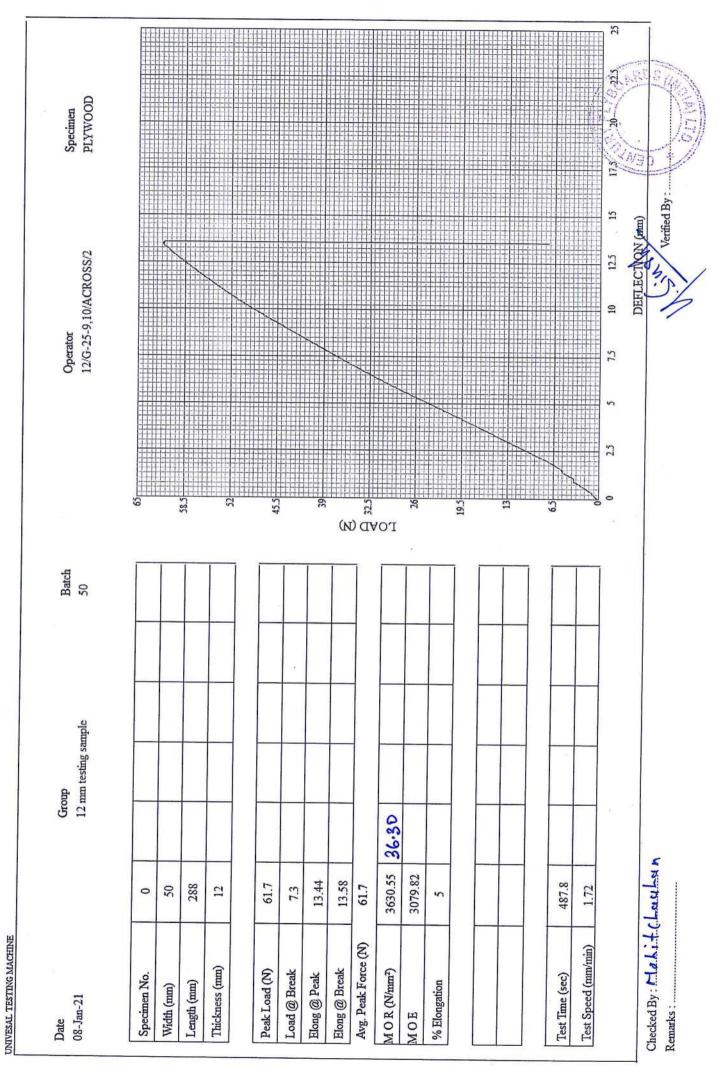
TATIONAL ANTISTI TASTANO						
Date		Group	Batch		Operator	Specimen
08-Jan-21		19mm plywood	45		19/G-28-7,8/ACROSS/3	PLYWOOD
Specimen No.	0			935		
Width (mm)	50					
Length (mm)	456			C.603		
Thickness (mm)	19			764		
				1111		
Peak Load (N)	950.29			668.5		
Load @ Break	542.32					
Elong @ Peak	14.88			573		
Elong @ Break	26.21			E C		
Avg. Peak Force (N)	950.29			A 477.5		
M O R (N/mm ²)	3601.1	36.01		ro		
MOE	2506.07			382		
% Elongation	6					
				286.5		
			1	05 s		
Test Time (sec)	607.2					
Test Speed (mm/min)	2.73					
	2		17	0 5	10 15 20 25 30	AND PLAN
					DEFLECTION (mm)	
Checked By : . M. a. h. i. h. c. h. eu el her A Remarks :	L C Lee u Le	4.7			A Merified By :	
					ンマ	ALL INTER

52 A RED Specimen PLYWOOD - 20 H INC 2430 45 Verified By :.. 15 DEFLECTION (mm) 12.5 19/0-25-7,8/ACROSS/1 Ens. I 10 Operator 1.5 S 25 983.5 1264.5 843 140.5 1405 1124 281 LOAD (N) 421.5 Batch 46 19mm plywood Group 53.10 Checked By : 1 a. h. t. Lauler 5310.64 4478.32 1401.42 1401.42 166.71 21.59 21.63 2.73 456 527 50 19 0 Ś Test Speed (mm/min) UNIVESAL TESTING MACHINE Avg. Peak Force (N) Elong @ Break MOR (N/mm2) Test Time (sec) Thickness (mm) Peak Load (N) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Date 08-Jan-21 Remarks : MOE

3 SUC RE SAN Specimen 0.... Verified By ... 2 DEFLECTION (mm) 12.5 19/0-25-7,8/ACROSS/2 10 Operator 1.5 5 23 932 815.5 699 233 0 1048.5 116.5 LOAD (N) 349.5 Batch 47 Group 19mm plywood 43.96 Checked By: Mahi + (Ley y Ley 4396.4 1160.16 1160.16 4398.81 715.91 18.15 423.4 18.23 2.73 456 50 19 0 4 Test Speed (mm/min) UNIVESAL TESTING MACHINE Avg. Peak Force (N) Elong @ Break MOR (N/mm²) Test Time (sec) Thickness (nm) Peak Load (N) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Date 08-Jan-21 Remarks : MOE

Date		Group	Batch		Operator		Specimen	
08-Jan-21		19mm plywood	48		19/0-25-7	19/0-25-7,8/ACROSS/3	DOOWYIG	
Specimen No.	0			1250				
Width (mm)	50						X	
Length (mm)	456			1125				
Thickness (mm)	19			1000		X		
Peak Load (N)	1248.43			875		X		
Load @ Break	871.84					X		
Elong @ Peak	18.33			750		X		
Elong @ Break	18.38			(N)				
Avg. Peak Force (N)	1248.43			G G				
M O R (N/mm²)	4730.89	47.30		IIII ro				
MOE	4694.86			200				
% Elongation	4			375	X			
				250				
Test Time (sec)	427.4			125				
Test Speed (mm/min)	2.73							
				0	25 5 75		FTT CONTRACTOR	5 25
Checked By : M. Lit (Laghern Remarks	(Leigher	1			S.	Verified By		

UNIVESAL TESTING MACHINE								
Date		Group	Batch		Operator		Specimen	
08-Jan-21		12 mm testing sample	49		12/G-25-9,10/ACROSS/1	I/SS(PLYWOOD	
Specimen No.	0			65				
Width (mm)	50					X		
Length (mm)	288			58.5		X		
Thickness (mm)	12			3		X		
Peak Load (N)	62.5				X			
Load @ Break	43.3				/			
Elong @ Peak	14.5			39	X			
Elong @ Break	15.29		(N					
Avg. Peak Force (N)	62.5			32.5				
M O R (N/mm ²)	3677.62 36.77		ro'		X			
MOE	2770.85			26				
% Elongation	5							
				19.5				
				13				
		_						
Test Time (sec)	2 000			X				
(me) mer ma	0.770							
Test Speed (mm/min)	1.72			0×1				
		20		0 2.5 5	7.5 10	1. 2	472 \$2	25
N N S T S	1 1				DEFLE	I (mm) //	12.1	
Cuecked By :	ר המוחה ש					S.W. Verified by		
					-	1	Pan LT	

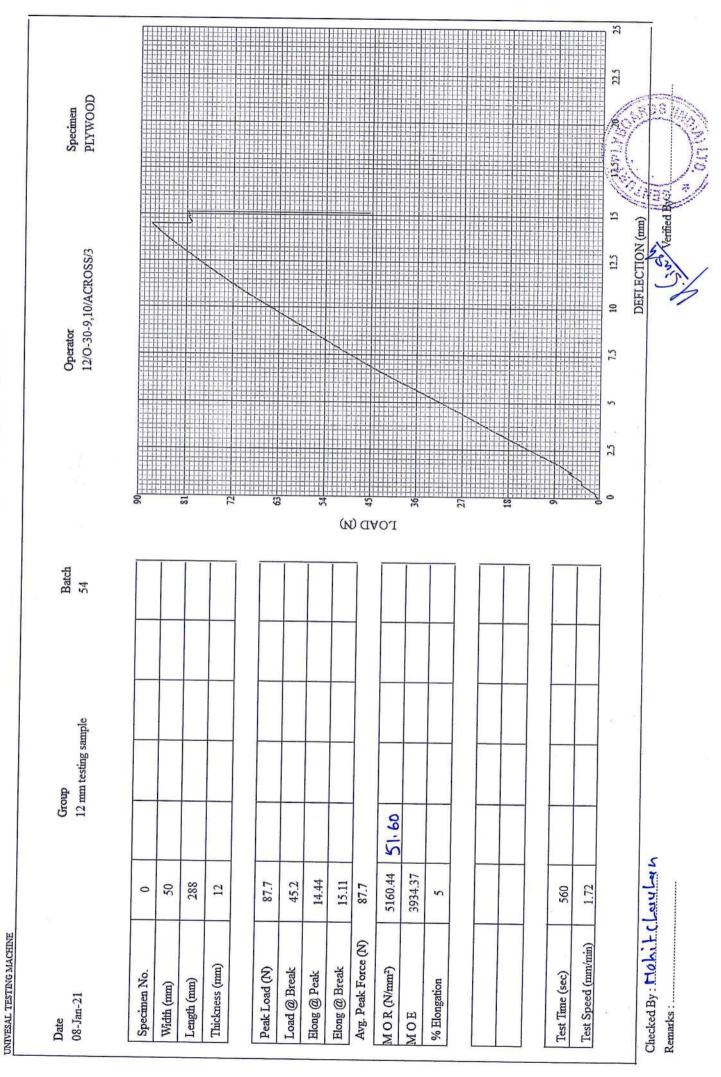


UNIVESAL TESTING MACHINE

10 ORRO S (A) Specimen PLYWOOD QUN3 0 Live Verified By : . . DEFLECTION (mm) 12/G-25-9,10/ACROSS/3 -Operator m 2 45 45 40 35 35 30 (N) (IAO (I Batch 51 12 mm testing sample Group 2853.84 28.53 Checked By: M.O. Lit LCLewer 3435.34 48.5 21.9 9.54 9.57 48.5 354.4 288 50 12 1.72 0 e Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Elong @ Break Peak Load (N) MOR (N/mm²) Load @ Break Test Time (sec) Specimen No. Elong @ Peak Length (mm) % Elongation Width (mm) Date 08-Jan-21 Remarks : MOE

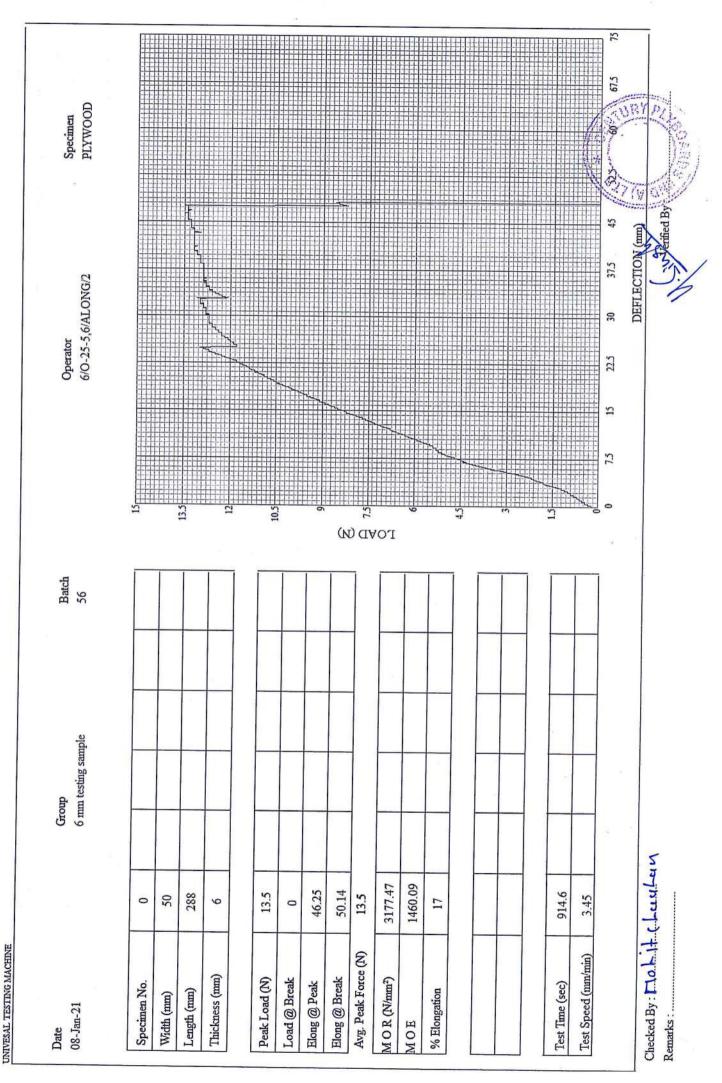
25 - 22.5 THE REAL PROPERTY IN 55 2.0 Specimen PLYWOOD ** I Convertified By :... 15 DEFLECTION (mm) 12.5 Operator 12/0-30-9,10/ACROSS/1 10 7.5 5 25 103.5 S0.5H 34.5 LOAD (N) 52 11.5 Batch 52 12 mm testing sample Group 6713.87 67.13 Checked By : I la hit Cleautry 4273.14 18.07 643.4 114.1 21.5 114.1 1.72 18.1 288 50 12 0 9 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Elong @ Break Thickness (mm) Peak Load (N) MOR (N/mm2) Load @ Break Test Time (sec) Elong @ Peak Specimen No. Width (mm) % Elongation Length (mm) Date 08-Jan-21 Remarks : . MOE

3 22.5 Contraction of the second seco 10 Specimen (Gell QIN; Verified By 5 DEFLECTION (mm) Operator 12/0-30-9,10/ACROSS/2 12.5 10 7.5 in 2.5 76.5 39.5 255 LOAD (N) E 51 Batch 53 12 mm testing sample Group 9L.84 Checked By : Mahit Cleuvleu 1 3595.3 4878 14.17 15.63 558.2 82.9 20.9 82.9 1.72 50 288 12 0 5 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Elong @ Break MOR (N/mm²) Peak Load (N) Load @ Break Test Time (sec) Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) 08-Jan-21 Remarks : MOE Date



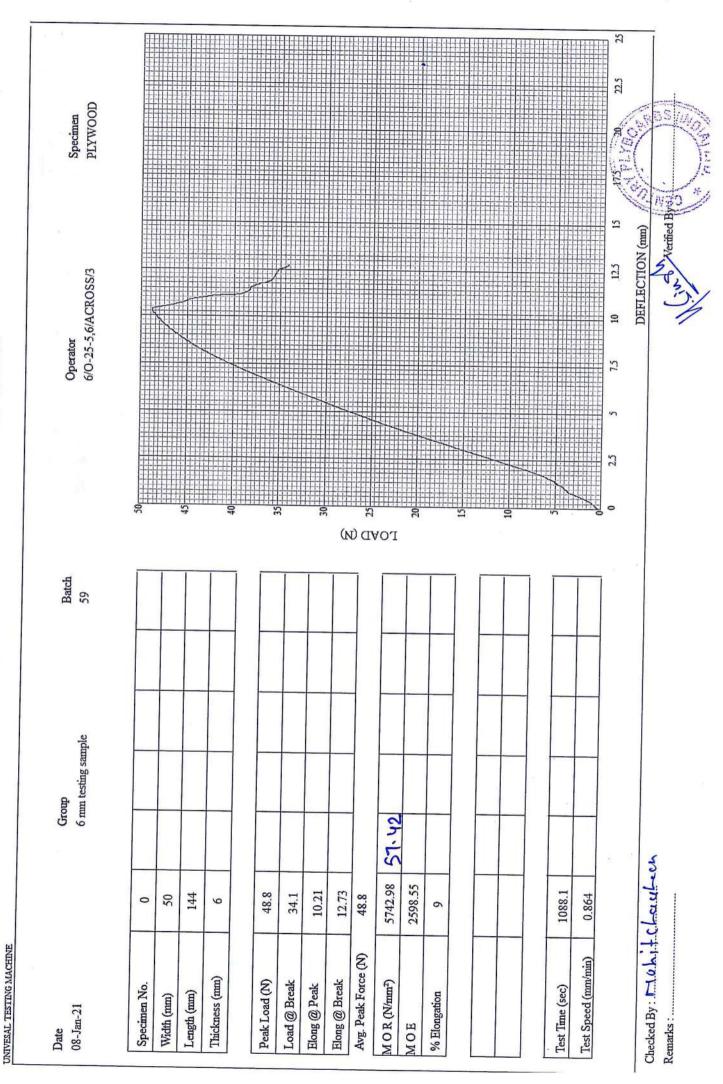
UNIVESAL TESTING MACHINE

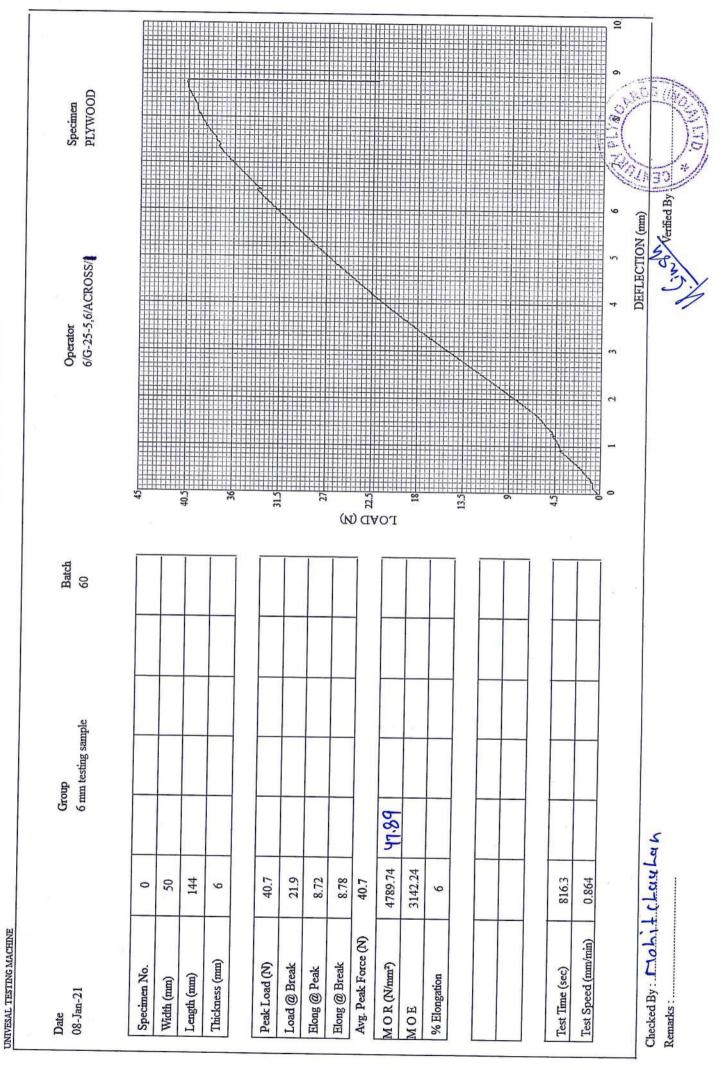
Date 08-Jan-21		Group 6 mm testing sample	Batch 55		Operator 6/0-25-5,6/ALONG/1	Specimen PLYWOOD
Specimen No.	0			20		
Width (mm)	50					
Length (mm)	288			18		
Thickness (mm)	6					
				01		
Peak Load (N)	15.7					
Load @ Break	12.3			111		
Elong @ Peak	57.71			141		
Elong @ Break	61.7					****
Avg. Peak Force (N)	15.7			10		
M O R (N/mm ²)	3695.28			roy		
MOE	1379.89					
% Elongation	21					
				9		
				4		
Test Time (sec)	1255.4					
Test Speed (mm/min)	3.45					
				0 7.5	22.5 30 37.5	210 500 52 5
Checked By: MALALLELULOUN	(Leular				DEFLECTION	N N N
Remarks :					C. Weited By	BY
					/	

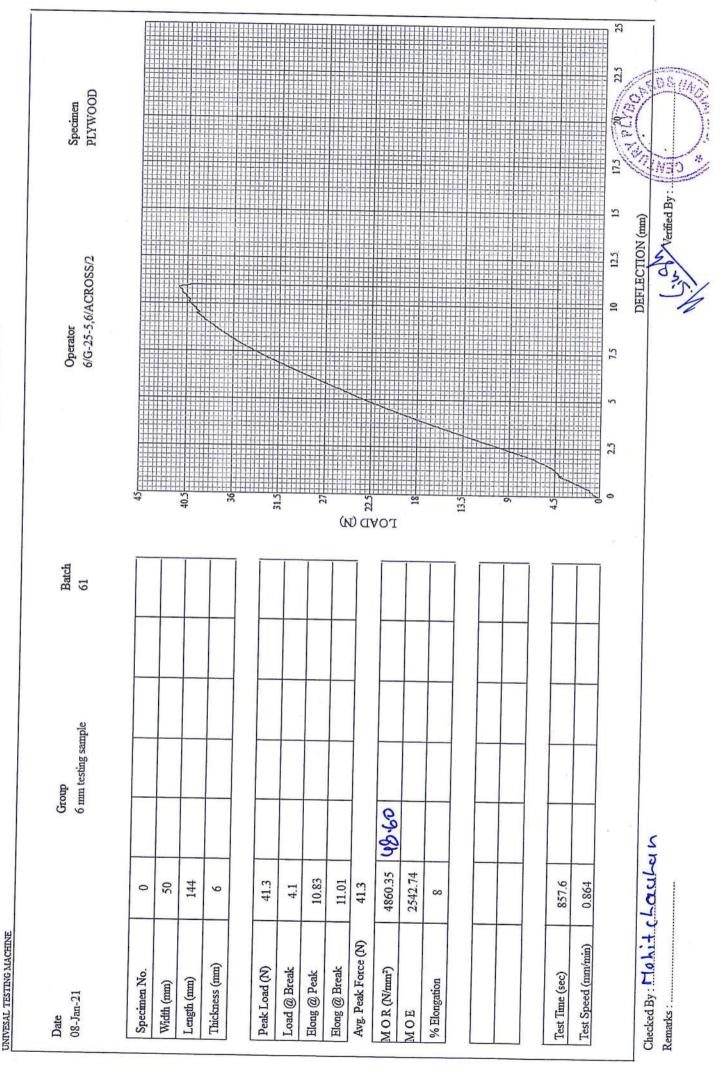


i I											k	
Date		Group	¢.	Batch			Oper	Operator			Specimen	
08-Jan-21		6 mn	6 mm testing sample	57			-0/9	6/0-25-5,6/ACROSS/1	1/5	Ч	PLYWOOD	
Specimen No.	0				40							
Width (mm)	50											
Length (mm)	144				95							
Thickness (mm)	9				62	33						
					1							
Peak Load (N)	38.4				28							
Load @ Break	2.8											
Elong @ Peak	5.94				24							
Elong @ Break	5.95											
Avg. Peak Force (N)	38.4				8 VD (
M O R (N/mm ²)	4519.07	45.19					/					
MOE	4374.76				16							
% Elongation	4											
			-		12							
					60	8						
					v							
Test Time (sec)	474.3				•							
Test Speed (mm/min)	0.864				0							
			A			0 1	2 3	4	5 6	AN H	8	6
	-		100					DEFLEC	DEFLECTION (mm)	V9/		7 (D
Checked By : MO AI + C Lay Ly N Remarks :	רמא	Lan						is h	Verified By :	By:	N. H. C.	1
								3		i.		

10 Specimen 2 K ^rA Cherified By C 9 DEFLECTION (mm) Operator 6/0-25-5,6/ACROSS/2 m 2 21 0 い 20 LOAD (N) Batch 58 6 mm testing sample Group 3506.98 35.06 Checked By: Mulit Cleucican 3361.1 506.8 0.864 29.8 29.8 5.97 6.01 144 8.4 50 0 9 -UNIVESAL TESTING MACHINE Test Speed (mm/min) Avg. Peak Force (N) Thickness (mm) Peak Load (N) Elong @ Break MOR (N/mm²) Load @ Break Test Time (sec) Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) 08-Jan-21 Remarks : MOE Date







10 Contraction of the second seco Specimen I. Surverfied By Half 9 DEFLECTION (mm) 5 6/G-25-5,6/ACROSS/3 Operator m 2 LOAD (N) Batch 62 Group 6 mm testing sample 30.83 Checked By: Mobit Chay Lan 3083.32 3088.68 0.864 5.75 457 26.2 18.2 5.54 26.2 144 50 4 9 0 Test Speed (mm/min) UNIVESAL TESTING MACHINE Avg. Peak Force (N) Elong @ Break MOR (N/mm2) Test Time (sec) Thickness (mm) Peak Load (N) Load @ Break Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) Date 08-Jan-21 Remarks : . MOE

03-lan-21 6 man testing sample 63 6.6-28-5,6ACGOSS1 Specimen No. 0	Date	Group	Batch			Operator		Specimen
mn No. 0 (mu) 50 144 (mu) 144 144 (mu) 144 144 (mu) 133 144 (mu) 133 144 (mu) 10 114 (mu) 10 114 (mu) 10 114 (mu) 10 114 (mu) 133 114 (mu) 133 110 (mu) 133 110 (mu) 133 110 (mu) 131 110 (mu) 130 130 <	-Jan-21	6 mm testing sample	63			6/G-28-5,6/ACROSS/1	_	DOOMATA
(mi) 50 11 (mi) 144 144 14 ess (min) 6 144 14 ess (min) 6 123 12 0 ead (N) 333 1 10 AD (N) 0 Break 3.7 123 10 AD (N) 0 Break 7.37 123 10 AD (N) 0 Break 7.33 10 AD (N) 13 0 Break 7.33 10 AD (N) 13 0 Break 7.37 10 AD (N) 14 0 Break 7.33 10 AD (N) 14 0 Break 7.33 10 AD (N) 10 0 Break 313.88 393.18 10 0 Break 5 10 10 0 Break 5.11.8 10 10 0 Break 5.11.8 10				т т	2			
(mu) 144 144 ess (mu) 6				2			X	
ess (mu) 6				31.			X	
ord (N) 333 ord (N) Break 3.7 3.1 Break 3.7 3.1 Break 3.7 3.1 Break 7.3 3.3 et Frace (N) 33.3 10 ADD (A) Break 3062.79 9.18 gation 5 10 ADD (A) Break 3062.79 1.3 Break 3062.79 1.3 Break 3062.79 1.3 Break 5 1 Break 0.054 1 Break 0.054 1				5	8			
oad (N) 33.3 oad (N) 3 Break 3.7 1 3 Break 3.7 1 3 Break 7.3 1 3 Break 7.37 1 3 Break 7.37 1 3 Break 7.37 1 3 Break 7.37 1 1 Break 7.37 1								
B Reak 3.7 Image: Second Seco				. 24.	5			
@ Feak 7.33 1 1 @ Break 7.37 1 1 eak Force (N) 33.3 1 1 eak Force (N) 33.3 1 1 @ Break 318.88 3 3 1 @ Break 318.88 3 3 1 @ Break 3062.79 1 1 1 @ Break 5 1 1 1 1 @ Break 5 1 1 1 1 1 @ Break 5 1 1 1 1 1 1 @ Break 5 1 1								
Break 7.37 I I I ak Force (N) 33.3 ak Force (N) 33.3 (Numr) 3918.88 39,18 3062.79 gation 5				2				
cask Force (N) 33.3 cask Force (N) 33.3 (Nimur ³) 3918.88 39.1,8 306.0.79 306.2,79 1 gation 5 1 unit 5 1 gation 5 1 unit 5 1 isolowing 5 1 unit 5 1 isolowing 0.864 1 unit 0.864 1 unit 0.864 1 unit 0.864 1				(N				
QVarue?) 3918.88 39-1,8 39-1,8 gation 5 1 10 gation 5 1 10 me (sec) 571.8 10 10 me (sec) 571.8 1 1) (TA				
3062.79 3062.79 gation 5 log -	3918.88	39.18		ΓO				
				-				
				10				
				• ***				
				-				
0 1 2 3 4	-				1111			
					0 1	4	6 7	0.8
DEFLECTION (mm)						DEFLECT	S.	
Checked By: Mohit Chaukan Remarks:	cked By: Mohit Chauke arks:	47			i.	MAN IN	Jund Verlied By : 15	55 (4)

	08-Jan-21		Group 6 mm testing sample	Batch 64		Operator 6/G-28-5,6/ACROSS/2	Specimen PLYWOOD
minor 0 (min) 130 (min) 14 (min) 14 (min) 14 (min) 14 (min) 14 (min) 132 (min) 132 (min) 132 (min) 132 (min) 132 (min) 130 (min) 140 (min) 130 (min) 130 (min) 130 (min) 130 (min) 130 (mino) 130 (mino) 130 (mino) 130 (mino) 130 (mino) 10	, <u>,</u>				40		
mining 144 mining 65 (min) 6 -	Width (mm)	50					
es (mi) 6	Length (mm)	144			36		
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UNIVESAL TESTING MACHINE						2-1
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Width (mm)	50			HH		X
Length (mm)	144			36		
Thickness (mm)	9					
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10 Server Server 08/14 Specimen PLYWOOD Selle. 4. I (I'M Verified By Con DEFLECTION (mm) in Operator 6/G-28-5,6/ACROSS/3 m 2 36 32 28 28 34 LOAD (N) Batch 65 6 mm testing sample Group 4295.47 K12.95 Checked By . M a hit C Lay Lan 3908.67 500.1 0.864 36.5 36.5 36.5 6.33 6.33 144 50 0 9 4 UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Thickness (mm) Elong @ Break Peak Load (N) Load @ Break MOR (N/mm2) Test Time (sec) Elong @ Peak Specimen No. % Elongation Length (mm) Width (mm) 08-Jan-21 Remarks : MOE Date

25 TRANK Y Specimen 100 Verified By : 5 DEFLECTION (mm) ton ... 12.5 6/G-28-5,6/ALONG/2 10 Operator 7.5 Ś 2.5 LOAD (X) 17.5 22.5 13 Batch 66 6 mm testing sample Group Checked By : MO hit & Lau Lan 4754.43 5312.42 20.58 20.62 365.2 12.8 3.45 20.2 20.2 288 50 0 9 -UNIVESAL TESTING MACHINE Avg. Peak Force (N) Test Speed (mm/min) Elong @ Break Thickness (mm) Peak Load (N) MOR (N/mm²) Test Time (sec) Load @ Break Elong @ Peak Specimen No. Width (mm) % Elongation Length (mm) 08-Jan-21 Remarks : MOE Date

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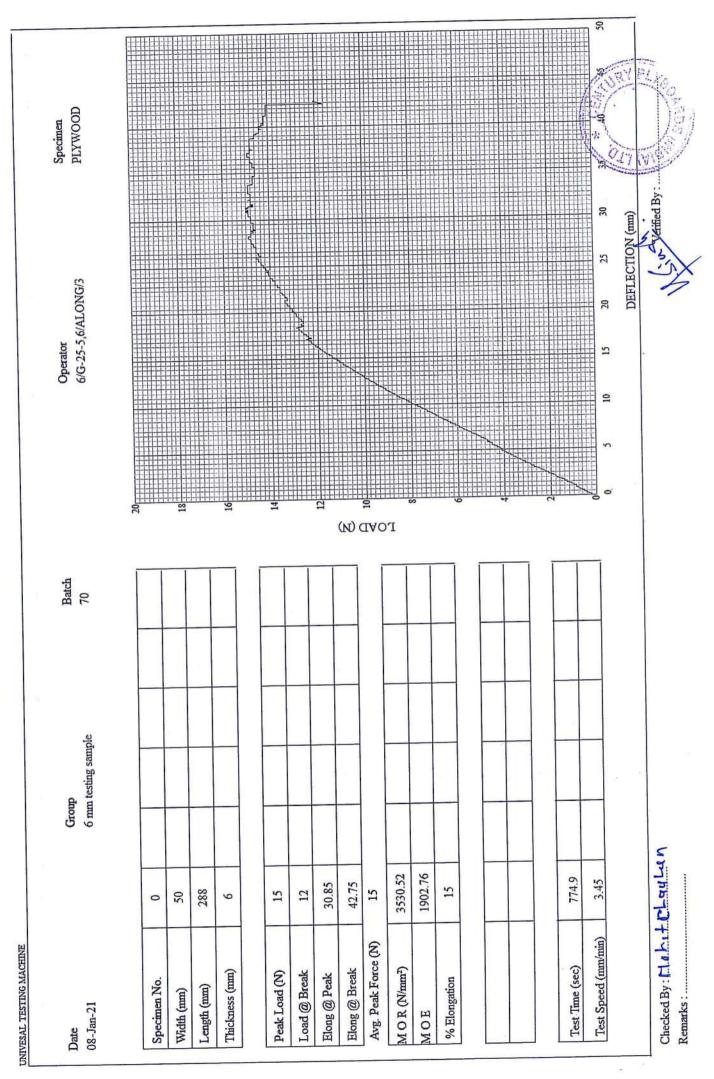
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25 225 CATU . Specimen PLYWOOD * 200 27 2 Verified By : 15 DEFLECTION (mm) 1822 12.5 6/G-25-5,6/ALONG/2 10 Operator 7.5 ŝ 25 10.5 13.5 (N) (TOAD (N) Batch 69 6 mm testing sample Group 32.01 Checked By: Mohit Chuuluy 3516.98 408.4 3.45 3201 20.97 19.95 13.6 13.6 12 5 288 9 50 0 Test Speed (mm/min) Avg. Peak Force (N) UNIVESAL TESTING MACHINE Test Time (sec) MOR (N/mm²) Elong @ Break Load @ Break Thickness (mm) Peak Load (N) Elong @ Peak % Elongation Specimen No. Length (mm) Width (mm) Remarks : Date 08-Jan-21 MOE



50 \$ F1.} Specimen 第三日 Sec. in 17 11 30 DEFLECTION (mm) 52 6/G-25-5,6/ALONG/1 20 Operator 15 10 5 10.5 9 9 7.5 7.5 0 (N) (IAO) Batch 71 1 6 mm testing sample Group Checked By: M. e. h. i. h. C. L. a. L. a. n 1791.82 3.45 41.16 3201 25.28 740 13.6 13.6 11.4 14 288 50 9 0 Test Speed (mm/min) Avg. Peak Force (N) UNIVESAL TESTING MACHINE Test Time (sec) Elong @ Break MOR (N/mm²) Load @ Break Thickness (mm) Peak Load (N) Elong @ Peak % Elongation Specimen No. Length (mm) Width (mm) Remarks : . Date 08-Jan-21 MOE

From the above result, it is reflecting that 6 mm ALONG the grain plywood sample is not meeting the requirements mostly. It is to inform that particularly in case of these samples, the observation of Central loading method was different. When the load was acting at the centre of the specimen, the specimen underwent



deflection, which was the case with all other samples but only upto a point where other samples failed, 6mm plywood samples continued to form an ARC and thus deflection kept on increasing. There came a point where the sample ARC formation touched the base of the platform and thus, no further load could be applied. It can be complemented from the fact that elongation in all such cases is very high in comparison to all other samples, hence to call it a failure may NOT BE TRUE. Another probability is slipping action may have occurred during testing, thereby giving faulty results.

CONCLUSION:

Available Face Veneer Varieties: Gurjan (0.25 mm, 0.28 mm), Okume (0.25 mm, 0.30 mm)

Thickness: 6mm, 12mm & 19 mm

Grain Directions: ALONG, ACROSS

Now with above available options the possible combinations are

- (a) Gurjan-0.25 mm-6 mm-ALONG- MOE-F, MOR-F
- (b) Gurjan-0.25 mm-6 mm-ACROSS- MOE-P, MOR-P
- (c) Gurjan-0.25 mm-12 mm-ALONG- MOE-F, MOR-P
- (d) Gurjan-0.25 mm-12 mm-ACROSS- MOE-P, MOR-P
- (e) Gurjan-0.25 mm-19 mm-ALONG- MOE-P, MOR-P
- (f) Gurjan-0.25 mm-19 mm-ACROSS- MOE-P, MOR-P
- (g) Gurjan-0.28 mm-6 mm-ALONG- MOE-P, MOR-P
- (h) Gurjan-0.28 mm-6 mm-ACROSS- MOE-P, MOR-F
- (i) Gurjan-0.28 mm-12 mm-ALONG- MOE-P, MOR-P
- (j) Gurjan-0.28 mm-12 mm-ACROSS- MOE-P, MOR-P
- (k) Gurjan-0.28 mm-19 mm-ALONG: MOE-P, MOR-P
- (I) Gurjan-0.28 mm-19 mm-ACROSS- MOE-P, MOR-P
- (m) Okume-0.25 mm-6 mm-ALONG- MOE-F, MOR-P
- (n) Okume-0.25 mm-6 mm-ACROSS- MOE-P, MOR-P
- (o) Okume-0.25 mm-12 mm-ALONG- MOE-F, MOR-F
- (p) Okume-0.25 mm-12 mm-ACROSS- MOE-P, MOR-P
- (g) Okume-0.25 mm-19 mm-ALONG- MOE-P, MOR-P
- (r) Okume-0.25 mm-19 mm-ACROSS- MOE-P, MOR-P
- (s) Okume-0.30 mm-6 mm-ALONG- MOE-F, MOR-F
- (t) Okume-0.30 mm-6 mm-ACROSS- MOE-P, MOR-P
- (u) Okume-0.30 mm-12 mm-ALONG- MOE-F, MOR-P
- (v) Okume-0.30 mm-12 mm-ACROSS- MOE-P, MOR-P
- (w) Okume-0.30 mm-19 mm-ALONG: MOE-P, MOR-P
- (x) Okume-0.30 mm-19 mm-ACROSS- MOE-P, MOR-P *P means PASS and F means FAIL



From above, it can be concluded that:

- (i) For 19mm plywood, sample is passing for every combination.
- (ii) For 12 mm plywood, sample passes in 0.28 mm Gurjan completely. Sample fails in Gurjan and Okume 0.25 mm combinations. With Okume 0.30 mm, Sample fails marginally in MOE by 14%.
- (iii) For 6 mm plywood, all samples for all combinations passes ACROSS the grain direction. When we test ALONG the grain direction, sample passes for Gurjan-0.28 mm.
 However in most of the cases with 6mm sample, the specimen did not break even after deformation, thus letting the specimen to form an ARC and touching the base of UTM fixtures. Thus gradually load reduces beyond this so the values obtained are appearing as FAIL, but the material did not fail during testing.

SUMMARY:

With the above observations, it is concluded that the MOR/MOE values can be mostly achieved with the lower face veneer thicknesses provided the manufacturing process and raw material controls are exercised properly.

The above trial was conducted on general plywood, BWR grade as per IS 303 with all amendments assuming market practice of using 0.5mm face veneers, only for getting BIS license and thereby using lesser thickness face veneers during operation of the license.

Similarly, as we know the market practice of using 0.25-0.30mm and even less thickness face veneers for all kinds of plywood, hence, to meet the face veneer thickness requirements as per ISS is difficult. The face veneer requirements as per ISS are as below:

- IS 303- 0.5 mm (min)- regular practice
- IS 4990- 1.2 mm (min)
- IS 2202(P-1)- 0.5 mm (min)
- IS 1659- 0.5 mm

Therefore, such trials shall also be conducted on different plywood for analyzing the strength parameters with lower face veneer thicknesses.

Also some manufacturers are doing double/triple facing to meet the thickness requirements for various ISS of plywood. The manufacturers adopt double/triple facing method so that the samples pass in testing but the normal practice is still questionable. However the method is also no where documented in the standard.

Hence, as per above trial on general plywood, lower face veneer thickness may be permitted and Standard for General Plywood and related products may be amended by the Technical Committee.

References:

• Indian standards for Plywood and related products



• ISO standards

ISO 12465, Plywood- Specifications ISO 1954, Plywood — Tolerances on dimensions ISO 16978, Wood-based panels — Determination of modulus of elasticity in bending and of bending strength ISO 2426-1:2000 Plywood — Classification by surface appearance — Part 1: General ISO 2426-2:2000 Plywood — Classification by surface appearance — Part 2: Hardwood ISO 2426-3:2000 Plywood — Classification by surface appearance — Part 3: Softwood

- Indian Plywood Industries Research and Training Institute (IPIRTI)
- PlyReorter YouTube videos- For understanding Crisis and market Situation of Face veneers