PREPARING & TESTING MATERIAL

Presented by: Ng Shone Fone

Heat Treatment

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Laboratory Furnaces

Production Furnaces

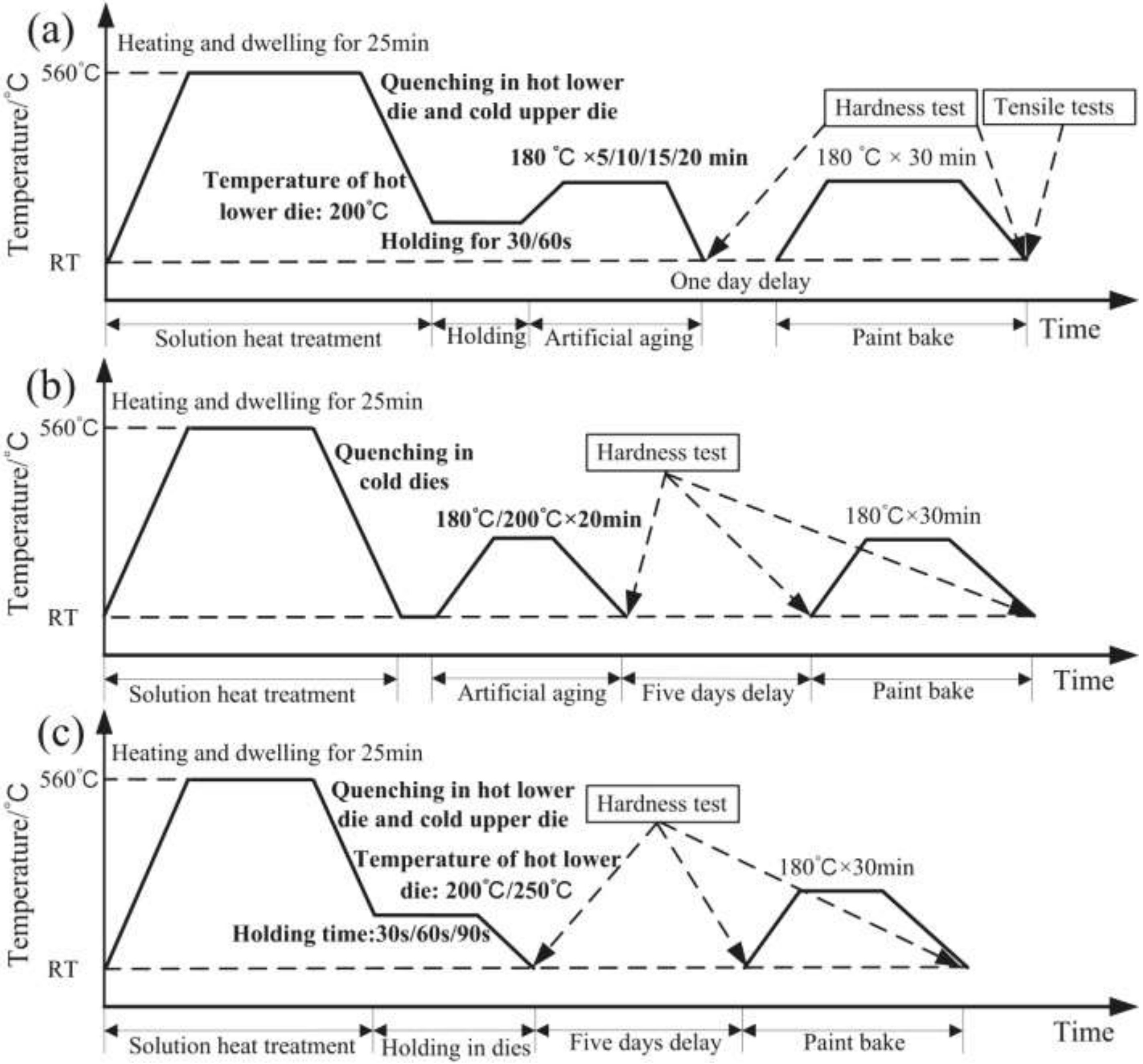
Hardening-Quenching-Tempering https://www.youtube.com/watch?v=dZhsrz757Xs&t=132s

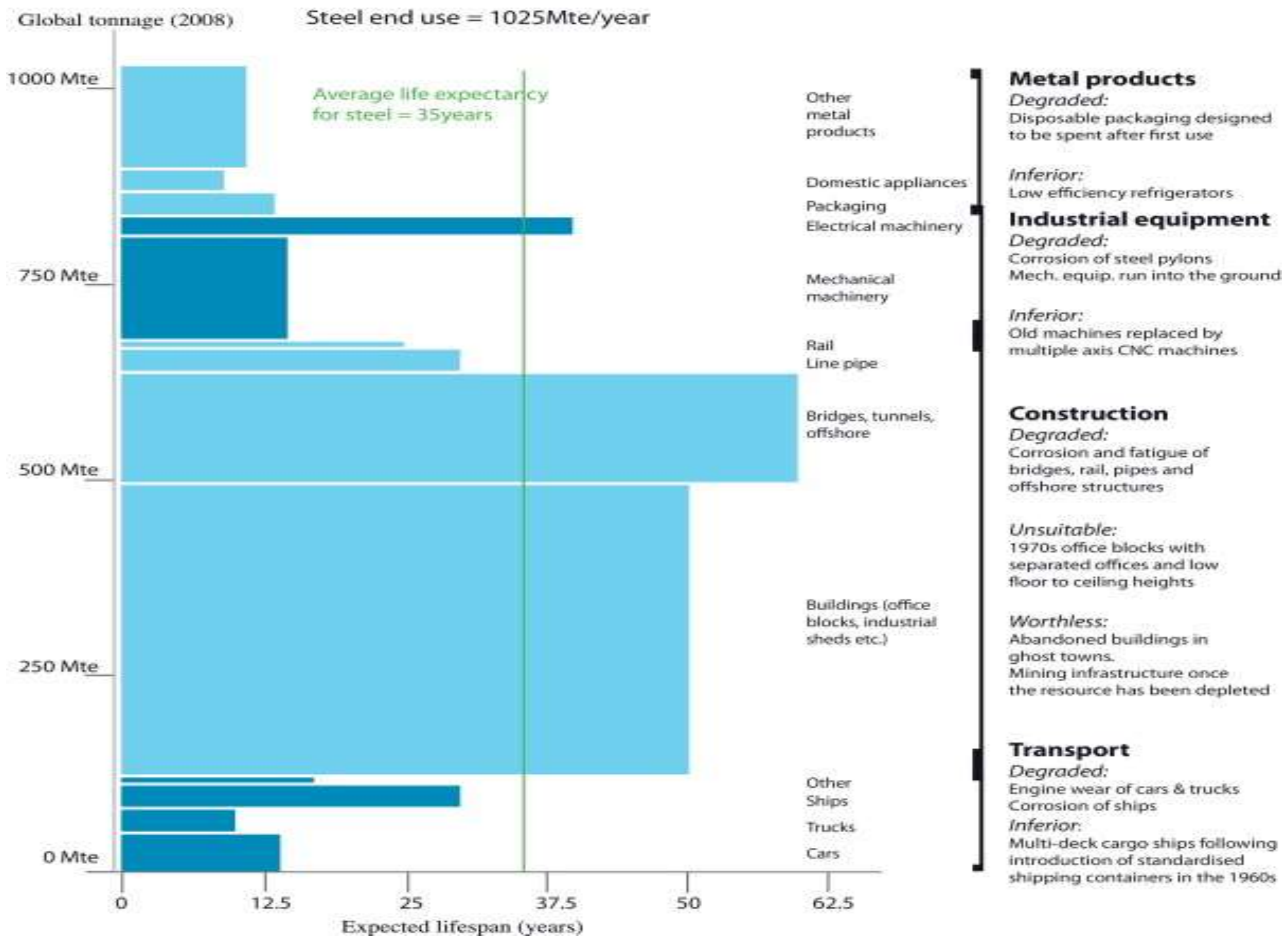
Bogie Hearth https://www.youtube.com/watch?v=U9qyDj1S4-s&t=22s

- Metals can be heat treated to alter the properties of strength, ductility, toughness, hardness or resistance to corrosion. Common heat treatment processes include annealing, precipitation strengthening, quenching, and tempering.
- The annealing process softens the metal by heating it and then allowing it to cool very slowly, which gets rid of stresses in the metal and makes the grain structure large and soft-edged so that when the metal is hit or stressed it dents or perhaps bends, rather than breaking; it is also easier to sand, grind, or cut annealed metal.

- Quenching is the process of cooling a high-carbon steel very quickly after you have heated it, thus "freezing" the steel's molecules in the very hard marten site form, which makes the metal harder. There is a balance between hardness and toughness in any steel, where the harder it is, the less tough or impact-resistant it is, and the more impact-resistant it is, the less hard it is.

- Tempering relieves stresses in the metal that were caused by the hardening process; tempering makes the metal less hard while making it better able to sustain impacts without breaking.


(a)
Heating and dwelling for 25min
560°C
Quenching in hot lower die and cold upper die
Temperature of hot lower die: 200°C
Holding for 30/60s
180 °C ×5/10/15/20 min
Hardness test
Tensile tests
180 °C × 30 min
RT
One day delay
Temperature/°C
Solution heat treatment
Holding
Artificial aging
Paint bake
Time
(b)
Heating and dwelling for 25min
560°C
Quenching in cold dies
Hardness test
180°C/200°C×20min
180°C×30min
RT
Temperature/°C
Solution heat treatment
Artificial aging
Five days delay
Paint bake
Time
(c)
Heating and dwelling for 25min
560°C
Quenching in hot lower die and cold upper die
Hardness test
Temperature of hot lower die: 200°C/250°C
180°C×30min
Holding time:30s/60s/90s
RT
Temperature/°C
Solution heat treatment
Holding in dies
Five days delay
Paint bake
Time



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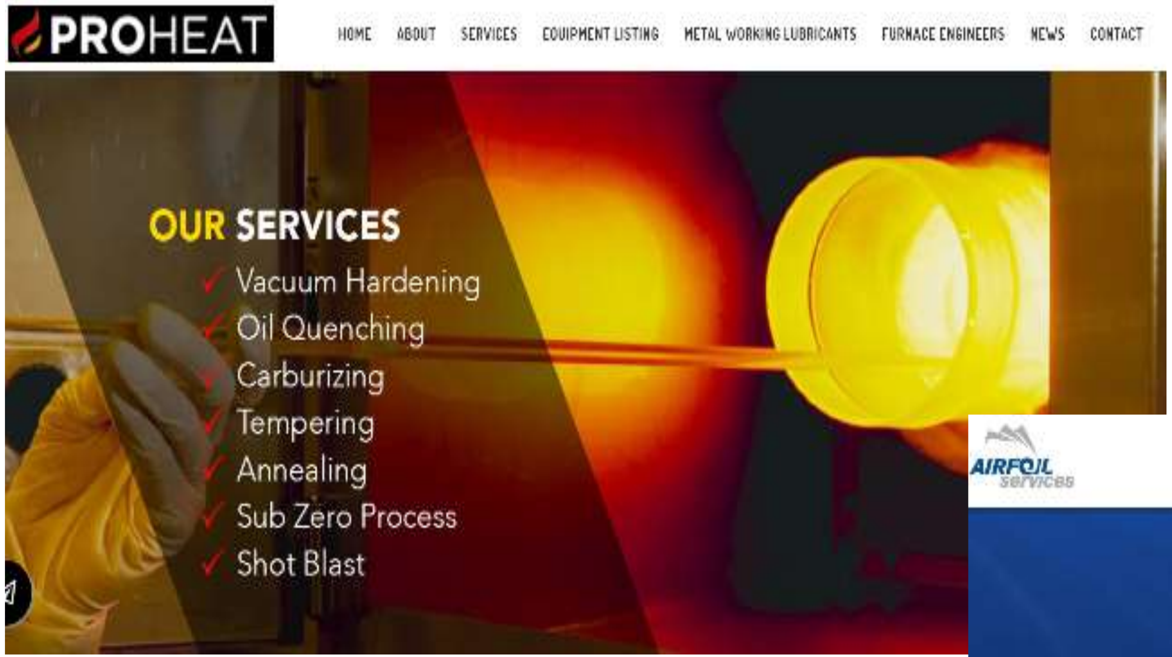
Case Study (Existing Clients)



How do we know that the metals are properly treated?

Bench Hardness Testers

Rockwell Hardness Tester

Rockwell & Rockwell Superficial Hardness Tester

Vickers Hardness Tester

Brinell Hardness Tester

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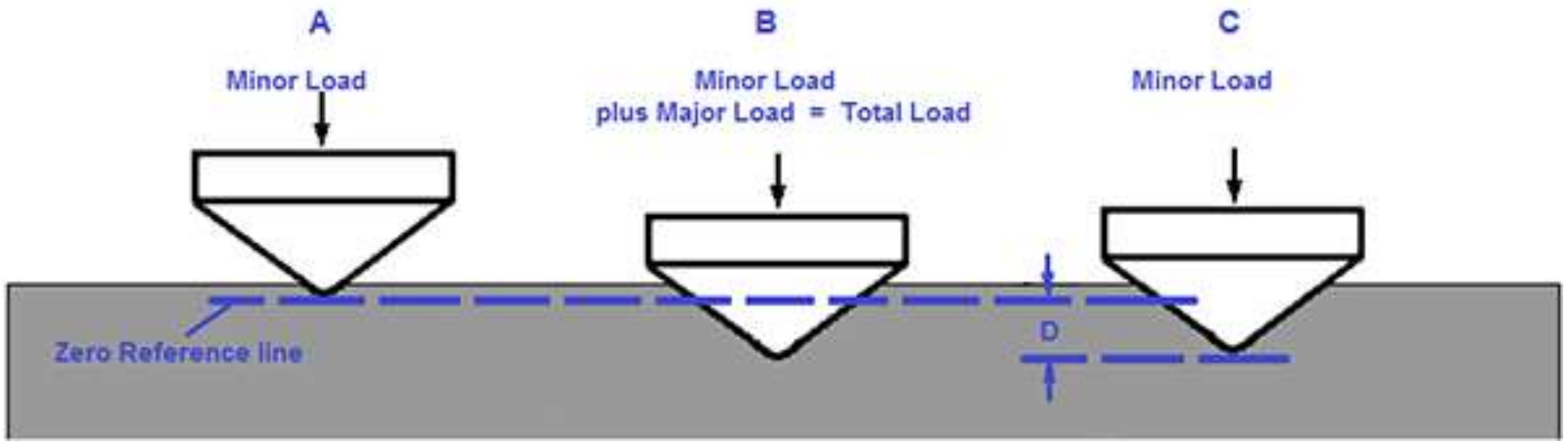
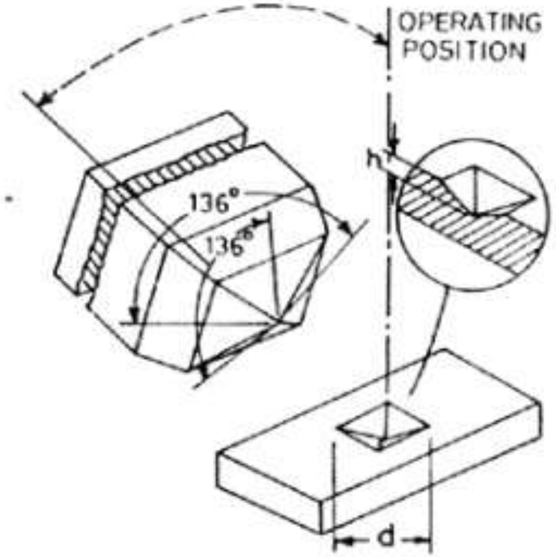
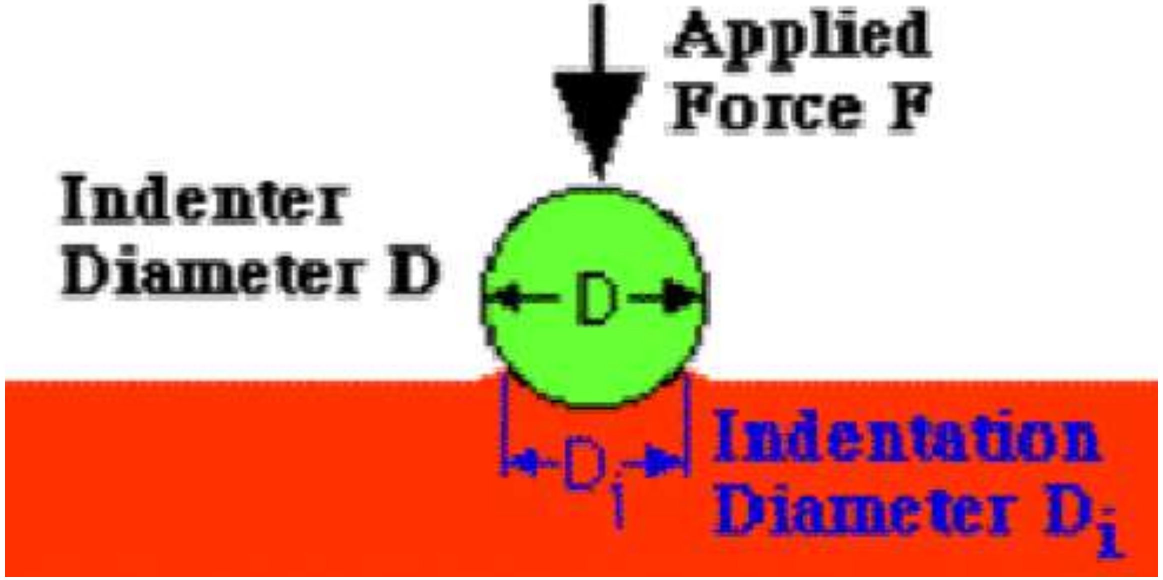


Rockwell & Rockwell Superficial Hardness Tester



Vickers Hardness Tester



Brinell Hardness Tester

Why do we need so many different type of hardness testers?

	Scale Symbol	Indenter Type (Ball dimensions indicate diameter.)	Preliminary Force N (kgf)	Total Force N (kgf)	Typical Applications
Regular Rockwell Scales	A	Spheroconical Diamond	98.07 (10)	588.4 (60)	Cemented carbides, thin steel, and shallow case hardened steel.
	B	Ball - 1.588 mm (1/16 in.)	98.07 (10)	980.7 (100)	Copper alloys, soft steels, aluminum alloys, malleable iron, etc.
	C	Spheroconical Diamond	98.07 (10)	1471 (150)	Steel, hard cast irons, pearlitic malleable iron, titanium, deep case hardened steel, and other materials harder than HRB 100.
	D	Spheroconical Diamond	98.07 (10)	980.7 (100)	Thin steel and medium case hardened steel, and pearlitic malleable iron
	E	Ball - 3.175 mm (1/8 in.)	98.07 (10)	980.7 (100)	Cast iron, aluminum and magnesium alloys, and bearing metals
	F	Ball - 1.588 mm (1/16 in.)	98.07 (10)	588.4 (60)	Annealed copper alloys, and thin soft sheet metals.
	G	Ball - 1.588 mm (1/16 in.)	98.07 (10)	1471 (150)	Malleable irons, copper-nickel-zinc and cupro-nickel alloys.
	H	Ball - 3.175 mm (1/8 in.)	98.07 (10)	588.4 (60)	Aluminum, zinc, and lead.
	K	Ball - 3.175 mm (1/8 in.)	98.07 (10)	1471 (150)	Bearing metals and other very soft or thin materials. Use smallest ball and heaviest load that does not give anvil effect.
	L	Ball - 6.350 mm (1/4 in.)	98.07 (10)	588.4 (60)	
	M	Ball - 6.350 mm (1/4 in.)	98.07 (10)	980.7 (100)	
	P	Ball - 6.350 mm (1/4 in.)	98.07 (10)	1471 (150)	
	R	Ball - 12.70 mm (1/2 in.)	98.07 (10)	588.4 (60)	
	S	Ball - 12.70 mm (1/2 in.)	98.07 (10)	980.7 (100)	
	V	Ball - 12.70 mm (1/2 in.)	98.07 (10)	1471 (150)	
Superficial Rockwell Scales	15N	Spheroconical Diamond	29.42 (3)	147.1 (15)	Similar to A, C and D scales, but for thinner gage material or case depth.
	30N	Spheroconical Diamond	29.42 (3)	294.2 (30)	
	45N	Spheroconical Diamond	29.42 (3)	441.3 (45)	
	15T	Ball - 1.588 mm (1/16 in.)	29.42 (3)	147.1 (15)	Similar to B, F and G scales, but for thinner gage material.
	30T	Ball - 1.588 mm (1/16 in.)	29.42 (3)	294.2 (30)	
	45T	Ball - 1.588 mm (1/16 in.)	29.42 (3)	441.3 (45)	
	15W	Ball - 3.175 mm (1/8 in.)	29.42 (3)	147.1 (15)	Very soft material.
	30W	Ball - 3.175 mm (1/8 in.)	29.42 (3)	294.2 (30)	
	45W	Ball - 3.175 mm (1/8 in.)	29.42 (3)	441.3 (45)	
	15X	Ball - 6.350 mm (1/4 in.)	29.42 (3)	147.1 (15)	
	30X	Ball - 6.350 mm (1/4 in.)	29.42 (3)	294.2 (30)	
	45X	Ball - 6.350 mm (1/4 in.)	29.42 (3)	441.3 (45)	
	15Y	Ball - 12.70 mm (1/2 in.)	29.42 (3)	147.1 (15)	
	30Y	Ball - 12.70 mm (1/2 in.)	29.42 (3)	294.2 (30)	
	45Y	Ball - 12.70 mm (1/2 in.)	29.42 (3)	441.3 (45)	

How do we measure the big structure or parts?

Portable Hardness Testers

Portable Leeb Hardness Tester TIME®5300

Leeb principle, hardness value is derived from the energy loss of a defined impact body after impacting on a metal sample

Ultrasonic Hardness Tester TIME®5620

"Ultrasonic Contact Impedance" is based on a 136 degree diamond at the end of a vibrating rod being depressed into the test surface at a fixed load. The difference in Ultrasonic vibration frequency is then calculated into a hardness value.

Practical Hand-on Sample Hardness Measurement

International Organization for Standardization

ISO

17025

ACCREDITED LABORATORY

Obsnap Calibration

ilac-MRA

STANDARDS MALAYSIA
ACCREDITED LABORATORY

MS ISO/IEC 17025
CALIBRATION
SAMM NO. 861

TO ENSURE MEASUREMENT & TESTING ACCURACY IS MAINTAINED.

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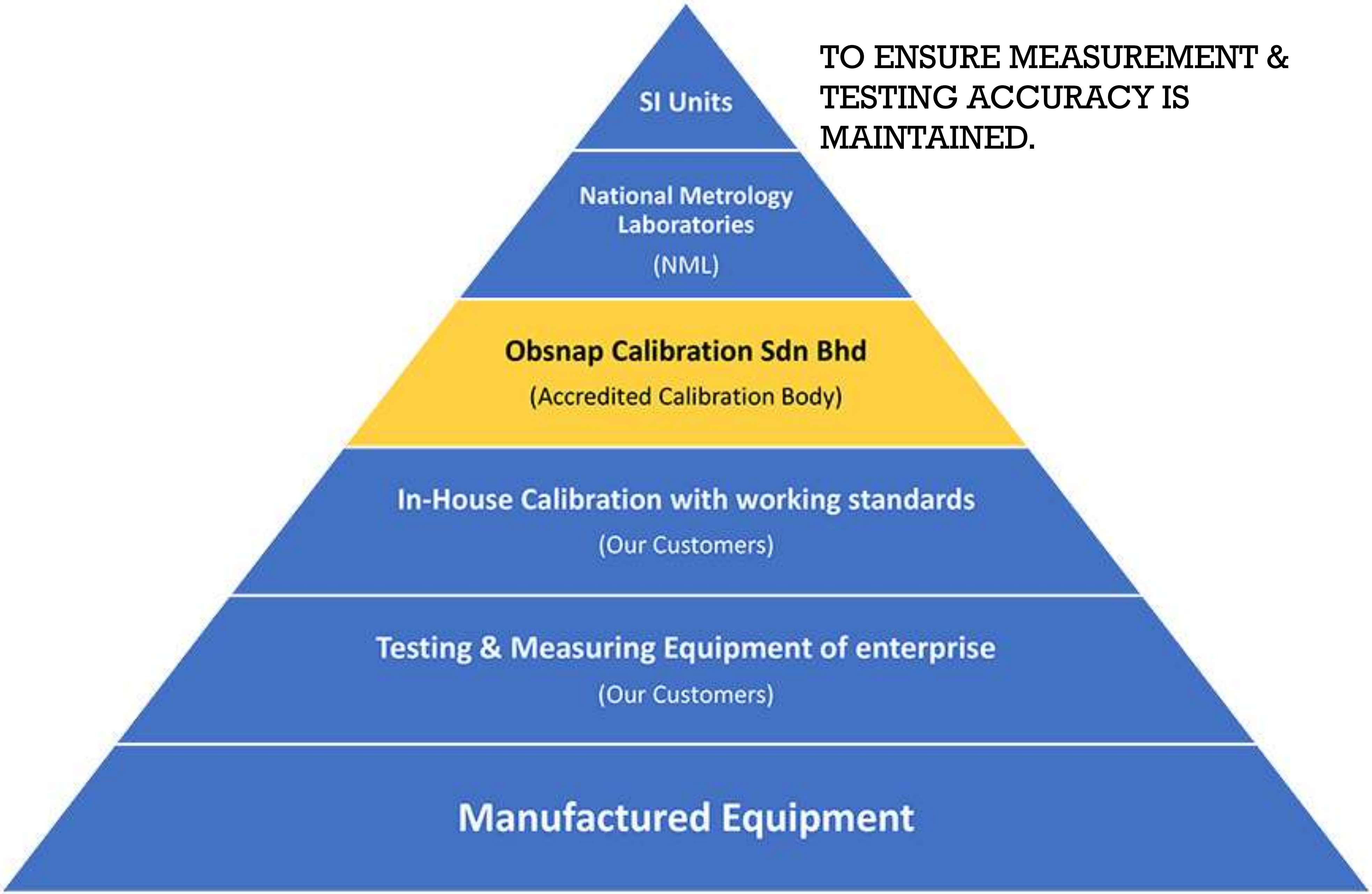

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Why is Calibration Important

- To reduce measuring error while complying to international standards

- Even the most precise measurement instrument and equipment has the possibility of experiencing error during the measurement and some unavoidable uncertainty in the measurement. A calibrated equipment can prevent costly surprise of rejects and rework, which normally due to out of tolerance.

- It is a mandatory requirement of QA standard ISO 9001 to demonstrate control of the measurement and test equipment. Part of this is ensuring that instruments are calibrated on a rational periodic cycle, and that records are maintained and reviewed.

- In a workplace, calibration allows you to use your measuring & testing instrument with confidence.

Why Is It Important to Calibrate your equipment with an accredited Lab

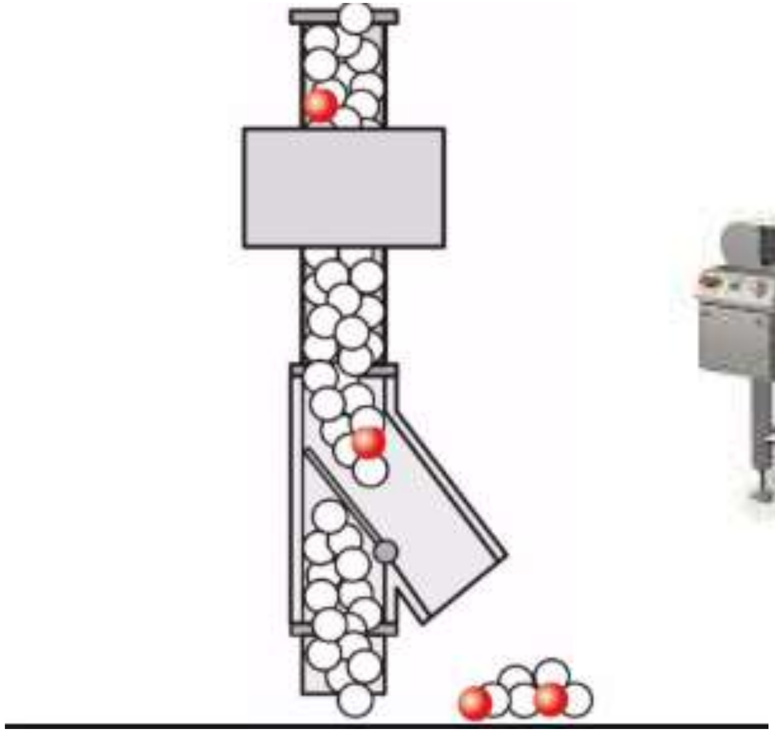
ESPECIALLY THOSE WITH ISO/IEC 17025;2017 & ILAC MRA

By using a calibration laboratory that is accredited to the international standard ISO/IEC 17025.

This standard requires laboratories to demonstrate competence in both the technical aspects of the measurements and in the quality assurance aspects that ensures you get a useful and valid “traceable” calibration certificate and set of results you can rely on.

Case Study (Existing Clients)

Picture with EASY CLEAN option




Q&A

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