



CARSHALTON BOYS SPORTS COLLEGE

Excellence * Character * Aspiration

TECHNOLOGY DEPARTMENT - ENGINEERING - KS4 BRIDGE YEAR

Vocabulary Booklet

YEAR 9 ENGINEERING

Tier 2 & Tier 3 Vocabulary | Expected & Aspirational

Unit 1: Working Processes

Unit 2: CAD & Engineering
Drawing

Unit 3: Manufacturing
Systems, QC & QA

Unit 4: Forming Processes &
Composite Materials

CBSC Technology Department | KS4 Bridge Year | Practical: Tension Bar + Forming | CAD: Onshape + Manufacturing Theory | 2026-2027

Academic Year 2026-2027

For students and parents/carers



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A Note for Students, Parents and Carers

Welcome to the Year 9 Engineering vocabulary booklet. This is the most technically demanding vocabulary document produced by the Technology Department — because Year 9 Engineering is the most demanding course we offer at Key Stage 3.

Why Engineering Vocabulary is Different

In most subjects, vocabulary is the language you use to discuss the subject. In engineering, vocabulary **IS** the subject. Every term in this booklet describes a specific tool, process, standard or principle that either works correctly or does not. 'Taper tap' is not a synonym for 'tap' — it is a specific type of tap that does a specific job that no other tap can do. 'BS EN 8888' is not a description of a tidy drawing — it is the legal standard that governs every engineering drawing produced in the UK and Europe. Using the wrong word does not just earn you fewer marks. In professional engineering, it means the wrong component gets made.

The vocabulary in this booklet is the same vocabulary you will encounter at KS4, in technical college, in apprenticeship training and in the engineering workplace. Every term you master now is one less term you have to learn under more pressure later.

How This Booklet is Organised

- * Unit 1 — Working Processes & Precision Measurement: the vocabulary of hand tools, machine tools and measurement. Covers sawing, filing, shearing, drilling, threading, laser cutting, milling, lathe turning and precision gauging.
- * Unit 2 — CAD & Engineering Drawing: the vocabulary of BS EN 8888 engineering drawing standards and Onshape 3D CAD, from line types to Kirimoto CNC toolpaths.
- * Unit 3 — Manufacturing Systems, QC & QA: the vocabulary of production types (one-off, batch, mass), quality management (QC, QA, ISO 9001, FAI), JIT, MRP, lean manufacturing (TIMWOOD, Kaizen, Kanban) and globalisation.
- * Unit 4 — Forming Processes & Composite Materials: the vocabulary of forging, press forming, strip heating, vacuum forming, GFRP and CFRP — the processes that shape the high-performance engineering world.

How Vocabulary is Tested

- * Vocab Quiz (odd fortnights): 10 questions on key Tier 3 terms from both lessons of the fortnight.
- * Keywords Task (even fortnights): define 8 key terms and use each in a correct engineering context sentence.
- * PATHS Assessment Prep (end of each half-term): 10-question knowledge check. Self-mark in green pen.
- * Six PATHS Assessments (one per half-term): written assessment covering both strands. Extended question (6-8 marks) requires precise vocabulary and engineering-specific examples.



How to Learn Vocabulary by Heart

Engineering vocabulary is not learned by reading. It is learned by retrieval — by effortful production of the word and its meaning from memory. These strategies work because they force retrieval, not recognition.

1. Look, Cover, Write, Check

Look at the term and its full definition. Cover both. Write the term and its definition from memory. Uncover and check every word. Repeat any you got wrong immediately. This strategy works because the effort of retrieval — not the exposure to the information — builds long-term memory.

2. The Leitner System (Spaced Flashcards)

Make engineering flashcards: term on the front; definition AND one industrial example on the back. Sort into three boxes:

- * Box 1 — review every session: terms you cannot yet recall.
- * Box 2 — review every 3 days: terms you recalled correctly once.
- * Box 3 — review weekly: terms you recalled correctly twice in a row.

Any card answered incorrectly returns to Box 1. After 3-4 weeks the improvement is measurable.

3. Engineering Diagrams + Labels from Memory

For every process and machine tool, draw the diagram from memory and label it correctly. A diagram of the centre lathe with all parts labelled (headstock, tailstock, cross-slide, carriage, saddle, tool post, chuck) produces memory traces that text alone does not.

4. Use the Term in an Engineering Context Sentence

Write a sentence using the term in a genuine engineering manufacturing context. 'The taper tap is the first tap used because its 8-10 thread lead helps it enter and start the thread accurately.' Using the term in a sentence you have composed is worth ten readings of the definition.

5. Teach It

Explain a concept out loud to a parent, friend or yourself without notes. Teaching forces you to confront the gaps. If you hesitate, the knowledge is not yet secure. The PATHS extended questions demand the same confidence: a fluent, evidence-based answer built from precise vocabulary.

Tier Markers - Expected and Aspirational

E - Expected

Every Year 9 Engineering student must be able to define, spell and use these terms accurately in PATHS assessments, extended writing and practical lessons. Without them, you cannot write or speak like an engineer.

A - Aspirational

The vocabulary of CBSC Level 4 (Greater Depth) answers and KS4-level extended writing. These terms appear in the extended question mark schemes and in KS4 Engineering and Construction qualification specifications. Mastering them now is preparation for KS4.

The extended PATHS questions (6-8 marks each) are directly designed to reward students who deploy Aspirational vocabulary accurately. A student who can explain that 'an IT7 clearance fit specifies a tolerance band of 0.015mm on a 10mm feature, ensuring the shaft can rotate freely in the bearing housing without lateral play' is writing at a level that distinguishes them from students who write 'the parts fit together loosely'.



Unit 1 - Working Processes & Precision Measurement

HT1-HT4. The vocabulary of hand and machine tools, sawing, filing, shearing, drilling, threading, laser cutting, milling and lathe turning, plus the precision measurement tools used to verify finished work.

Tier 2 - Working Processes & Precision Measurement - Academic Vocabulary

Academic vocabulary - words used across many subjects

Word / Term	Type	Definition	Example in Engineering	Tier
identify	verb	To name something precisely and say what it is.	Identify the correct saw type for cutting a 3mm slot in mild steel.	E
compare	verb	To examine two or more things to find similarities and differences.	Compare the advantages of laser cutting over a coping saw for cutting acrylic.	E
classify	verb	To group things together based on shared characteristics.	Classify each file type by shape and state its most suitable use.	E
mark out	verb	To transfer measurements onto a material surface as a guide for cutting or drilling.	Mark out the tension bar from a datum edge using engineer's blue and a scribe.	E
sequence	verb	To put steps in the correct order.	Sequence the drilling operations: centre punch, pilot hole, then correct diameter.	E
annotate	verb	To add notes or labels to a drawing to explain materials or manufacturing decisions.	Annotate the engineering drawing to identify the datum edge and key dimensions.	E
manufacture	verb	To make a product using tools, machines or a defined process.	Manufacture the tension bar to the engineering drawing by following the process sequence.	E
refine	verb	To improve something by making careful, targeted changes.	Refine the filed radius using a half-round file and check against the drawing tolerance.	E

Tier 3 - Working Processes & Precision Measurement - Subject-Specific Vocabulary

Subject-specific vocabulary - the language of an engineer

Word / Term	Type	Definition	Example in Engineering	Tier
hacksaw	noun	A metal-framed hand saw with a replaceable blade, used for cutting metals. Blade is specified in TPI (teeth per inch).	A hacksaw with a 24 TPI blade is appropriate for cutting mild steel bar to length.	E
TPI	noun (acronym)	Teeth Per Inch — the number of saw teeth per inch of blade length. Higher TPI = finer cut, lower TPI = faster but rougher cut.	A 32 TPI blade is used for thin section and sheet metal; a 14 TPI blade for faster roughing cuts.	E
datum edge	noun	A reference edge or surface from which all subsequent measurements are taken, ensuring dimensional accuracy and consistency.	All dimensions for the tension bar are measured from the datum edge to ensure the finished component matches the engineering drawing.	E
draw filing	noun	A filing technique in which the file is pushed and pulled sideways along the workpiece to produce a flat, smooth surface across the full width.	Draw filing the tension bar after rough filing produces a smooth, flat datum face ready for marking out.	E
deburring	noun	The process of removing sharp edges and burrs left on a component after cutting, drilling or machining.	Deburring after drilling removes the sharp raised ring around the hole that could injure the user or prevent assembly.	E
twist drill	noun	A rotary cutting tool used in a drilling machine or hand drill. Made from HSS	A twist drill must be ground to the correct point angle (118 degrees for general steel) for efficient cutting.	E

**Tier 3 - Working Processes & Precision Measurement - Subject-Specific Vocabulary**

Subject-specific vocabulary - the language of an engineer

Word / Term	Type	Definition	Example in Engineering	Tier
		(high speed steel) or cobalt. Has a helical flute to evacuate swarf.		
HSS	noun (acronym)	High Speed Steel — a tool steel alloy that retains its hardness at elevated temperatures, used for twist drills, taps, dies and milling cutters.	HSS twist drills can cut continuously in mild steel without losing their cutting edge, unlike carbon steel tools.	E
countersink	noun	A conical recess cut at the top of a drilled hole to allow a countersunk screw head to sit flush with or below the surface.	The tension bar drawing specifies a countersink at 90 degrees to accept a CSK head M6 screw.	E
work-holding	noun	Equipment or techniques used to secure a workpiece safely and accurately during machining or hand tool operations.	A machine vice with V-blocks is the correct work-holding arrangement when drilling a cylindrical component on the pillar drill.	E
die	noun	A hardened cutting tool used to cut external threads onto a cylindrical bar. Held in a die stock.	Use an M8 die in a die stock to cut an M8 x 1.25 external thread on the tension bar. Lubricate and reverse regularly to break swarf.	E
taper tap	noun	The first tap used when cutting an internal thread: has a gradual taper of 8-10 threads to ease entry and start the thread accurately.	Always start threading a blind hole with the taper tap before finishing with the plug tap.	E
plug tap	noun	The final tap used when cutting an internal thread: has a very short lead so it cuts threads to the bottom of a blind hole.	The plug tap is used to complete the full thread depth at the bottom of a blind hole.	E
blind hole	noun	A drilled hole that does not pass all the way through the material.	When threading a blind hole, use a taper tap first, then plug tap to reach the full depth without bottoming out.	E
surface roughness (Ra)	noun	A measure of the texture of a machined surface, expressed in micrometres. Lower Ra = smoother. Ra 25 = rough machining, Ra 0.8 = fine machining, Ra 0.1 = mirror finish.	The tension bar specification states Ra 1.6 for the bearing surface — this requires a finishing cut on the lathe.	E
centre lathe	noun	A precision machine tool used for rotating a workpiece against a cutting tool to produce cylindrical forms by turning, boring, facing, threading or knurling.	The tension bar parallel section and threaded section are both machined on the centre lathe.	E
roughing cut	noun	The first, heavier cut taken on a lathe or milling machine to remove the bulk of material quickly.	Take a roughing cut to remove 2mm of material in one pass, then a finishing cut to achieve the specified diameter.	E
surface speed (Vc)	noun	The speed at which the cutting tool moves relative to the workpiece surface, measured in m/min. The correct surface speed depends on the workpiece material.	Soft aluminium is machined at a higher surface speed than hard steel to achieve the same quality of finish.	E
vernier caliper	noun	A precision measuring instrument used to measure internal and external dimensions and depths accurately to 0.02mm or 0.05mm.	Use a vernier caliper to check the drilled hole diameter against the engineering drawing tolerance.	A
micrometer	noun	A precision measuring instrument used to measure external dimensions to an accuracy of 0.01mm or better.	Use an outside micrometer to verify the tension bar diameter is within the ±0.05mm tolerance specified on the drawing.	A





Unit 2 - CAD & Engineering Drawing

HT1-HT4. The vocabulary of BS EN 8888 engineering drawing standards, Onshape 3D CAD modelling, and the digital tools used to communicate engineering designs.

Tier 2 - CAD & Engineering Drawing - Academic Vocabulary				
Academic vocabulary - words used across many subjects				
Word / Term	Type	Definition	Example in Engineering	Tier
dimension	noun	A measured quantity defining the size, position or angle of a feature.	All dimensions on the engineering drawing are in millimetres.	E
tolerance	noun	The permitted variation from a stated dimension; the difference between the maximum and minimum acceptable sizes.	A tolerance of $\pm 0.1\text{mm}$ means the dimension can be anywhere between 9.9mm and 10.1mm.	E
project	verb	To show or represent a 3D object in 2D by mapping it onto a drawing plane.	Project the front, side and plan views of the bracket onto an A3 sheet in third angle projection.	E
apply	verb	To put knowledge or a standard into practice.	Apply BS EN 8888 standards to your orthographic drawing: correct title block, line weights and projection symbol.	E
constrain	verb	To restrict the movement or size of a sketch element in CAD using geometric or dimensional rules.	Constrain the sketch fully by adding a horizontal constraint and a 20mm dimension to the rectangle.	E
simulate	verb	To model or test something digitally before committing to physical manufacture.	Simulate the Kirimoto CNC toolpath to check for tool collisions before running the real machine.	A
calculate	verb	To work out a number or quantity using mathematics.	Calculate the material volume from the Onshape mass properties tool and compare to the estimated blank weight.	A

Tier 3 - CAD & Engineering Drawing - Subject-Specific Vocabulary				
Subject-specific vocabulary - the language of an engineer				
Word / Term	Type	Definition	Example in Engineering	Tier
BS EN 8888	noun	The British and European standard that governs all aspects of engineering drawing: projection method, line types, title block, dimensions, tolerances and surface finish notation.	All engineering drawings produced in this course must meet BS EN 8888 to ensure they can be read and manufactured correctly by any engineer.	E
first angle projection	noun	A drawing convention (predominant in Europe) in which each view is projected away from the viewer: the view from the right is drawn on the left of the front view.	Use the first angle projection symbol (filled/empty cone pointing left) in the title block to indicate a European-standard drawing.	E
third angle projection	noun	A drawing convention (predominant in the USA) in which each view is projected toward the viewer: the view from the right is drawn on the right of the front view.	Use the third angle projection symbol (filled/empty cone pointing right) in the title block to indicate a US-standard drawing.	E
IT grade	noun	International Tolerance grade (e.g. IT6, IT7, IT8): a number that defines the tightness of a dimensional tolerance. Lower IT grade = tighter tolerance.	An IT7 tolerance on a 10mm hole specifies a tolerance band of 0.015mm — only achievable by precision grinding or reaming.	E

**Tier 3 - CAD & Engineering Drawing - Subject-Specific Vocabulary**

Subject-specific vocabulary - the language of an engineer

Word / Term	Type	Definition	Example in Engineering	Tier
clearance fit	noun	A fit between mating parts in which the shaft is always smaller than the hole, providing a guaranteed gap for free movement or rotation.	A clearance fit is used for a rotating shaft in a bearing housing so the shaft can spin freely without force.	E
interference fit	noun	A fit between mating parts in which the shaft is always larger than the hole, requiring force to assemble and creating a permanent joint.	An interference fit is used to press a gear onto a shaft — the components are permanently fixed without fasteners.	E
transition fit	noun	A fit between mating parts that may result in either a clearance or an interference, depending on the actual sizes of the parts manufactured.	A transition fit is used for a locating pin that must be removable but must not rattle loose.	E
boss	noun	A raised circular pad on a casting or moulding, usually used to provide extra material around a drilled or threaded hole.	A boss around the M8 tapped hole in the bracket provides extra thread engagement depth.	E
fillet	noun	In CAD and engineering drawing: a concave curved surface at an internal corner, added to remove stress concentrations.	Add a 3mm fillet to all internal corners of the bracket to prevent fatigue cracking under load.	E
chamfer	noun	An angled flat surface at an edge or external corner, used as a lead-in for assembly or to remove a sharp edge.	A 1x45 degree chamfer at the start of the threaded section helps the die engage cleanly.	E
feature tree	noun	In Onshape and other CAD systems: the sequential record of operations (extrude, cut, fillet, chamfer, etc.) used to build a 3D model.	Review the feature tree to find and edit the radius dimension applied in the third extrude operation.	E
geometric constraint	noun	A rule in CAD that fixes the relationship between sketch elements (horizontal, vertical, parallel, perpendicular, coincident, concentric).	A fully constrained sketch — all geometric constraints and dimensions applied — prevents accidental changes to the geometry.	E
Kirimoto	noun	A browser-based CAM software used to generate CNC toolpaths from imported STL files and export G-code for machining.	Export your Onshape model as an STL file and import it into Kirimoto to generate the CNC milling toolpath.	A
post-processor	noun	Software that converts the machine-independent toolpath generated by CAM into machine-specific G-code for a particular CNC controller.	The Kirimoto post-processor outputs G-code formatted for the school's CNC router controller.	A



Unit 3 - Manufacturing Systems, QC & QA

HT2-HT5. The vocabulary of production types, quality management systems, lean manufacturing, materials requirements planning and global manufacturing.

Tier 2 - Manufacturing Systems, QC & QA - Academic Vocabulary				
Academic vocabulary - words used across many subjects				
Word / Term	Type	Definition	Example in Engineering	Tier
manufacture	verb	To make a product using tools, machines or a defined process.	Manufacture at high volume requires automated production equipment to maintain consistent quality.	E
inspect	verb	To examine a component carefully against a specification or drawing.	Inspect each tension bar against the drawing using a vernier caliper and a go/no-go gauge.	E
eliminate	verb	To completely remove or get rid of something.	The aim of lean manufacturing is to identify and eliminate all sources of waste from the production process.	E
analyse	verb	To examine something carefully to understand its causes, features or impact.	Analyse the production process to identify which of the seven lean wastes are present.	E
justify	verb	To give clear reasons for a choice or decision.	Justify the choice of batch production for this component by comparing unit cost at different volumes.	E
evaluate	verb	To judge the success or quality of something against evidence or criteria.	Evaluate batch versus mass production for manufacturing 500 units of a simple steel bracket.	A

Tier 3 - Manufacturing Systems, QC & QA - Subject-Specific Vocabulary				
Subject-specific vocabulary - the language of an engineer				
Word / Term	Type	Definition	Example in Engineering	Tier
one-off manufacturing	noun	Producing a single bespoke component or product to a specific customer requirement. Also called jobbing production.	A custom racing car component is produced by one-off manufacturing — no jigs or fixtures are set up because only one is needed.	E
batch production	noun	Producing a defined quantity (batch) of identical products before changeover to a different product.	Batch production of furniture components allows the same CNC router program to produce 200 chair legs before being reprogrammed for table legs.	E
mass production	noun	Continuous, high-volume production of identical products on a dedicated, often automated production line.	Ford's moving assembly line established mass production for the Model T — reducing unit cost from GBP800 to GBP300.	E
jig	noun	A device that holds and locates a workpiece in a fixed position, guiding the tool to the correct position for drilling, cutting or welding.	A drilling jig ensures that every bracket has its mounting holes in exactly the same position, without the need for individual marking out.	E
fixture	noun	A device that holds a workpiece in position for machining but does not guide the tool. Ensures repeatability without individual marking out.	A milling fixture holds the tension bar securely for the CNC milling operation, preventing movement under cutting forces.	E
go/no-go gauge	noun	A quality control tool with two measurement elements: the 'go' end must enter the feature (feature is not undersized) and the 'no-go' end must not enter (feature is not oversized).	A go/no-go gauge for an M8 hole checks that the thread is within tolerance in a single operation, faster than a vernier measurement.	E

**Tier 3 - Manufacturing Systems, QC & QA - Subject-Specific Vocabulary**

Subject-specific vocabulary - the language of an engineer

Word / Term	Type	Definition	Example in Engineering	Tier
statistical sampling	noun	A QC method in which a representative sample of components is inspected rather than every component. Results are used to monitor process capability.	Statistical sampling reduces inspection time: if 5 out of every 100 components are checked and all pass, the batch is released.	E
ISO 9001	noun	An internationally recognised quality management system standard specifying requirements for a systematic approach to quality assurance.	ISO 9001 certification tells customers that a manufacturer has documented processes for controlling quality at every stage of production.	E
First Article Inspection (FAI)	noun	A formal inspection of the first production sample to verify that the manufacturing process is capable of producing a component that meets all specification requirements.	An FAI is carried out on the first tension bar produced to verify that the machining process delivers the drawing dimensions before full production begins.	E
MRP	noun (acronym)	Materials Requirements Planning — a system that schedules production and orders materials based on the Master Production Schedule (MPS) and Bill of Materials (BOM).	MRP calculates that if 100 brackets are required on week 8, the mild steel bar must be ordered by week 5, allowing for 3 weeks supplier lead time.	E
JIT	noun (acronym)	Just-In-Time — a production philosophy in which materials and components are delivered only when needed, eliminating inventory holding.	Toyota's JIT system holds only 2 hours of component inventory on the production line, compared to traditional batch manufacturers holding weeks of stock.	E
TIMWOOD	noun (acronym)	The 7 wastes in lean manufacturing: Transportation, Inventory, Motion, Waiting, Overproduction, Over-processing, Defects.	TIMWOOD applied to the workshop: transporting materials unnecessarily (T), holding more acrylic sheet than needed (I), walking to collect tools (M).	E
Kaizen	noun	A Japanese philosophy of continuous, incremental improvement involving all workers at every level of the organisation.	A Kaizen event in the school workshop identified that storing files by shape rather than cut grade reduced tool search time by 80%.	E
Kanban	noun	A visual scheduling system that signals when components or materials need to be produced or ordered. Uses cards, bins or electronic signals.	A Kanban card in the component bin triggers a reorder when stock falls below a defined minimum level — preventing production stoppages.	E
Poka-Yoke	noun	A Japanese term for error-proofing: designing a component, tool or process so that mistakes are impossible or immediately obvious.	A Poka-Yoke solution for the jig adds a locating pin so the workpiece can only be loaded one way, preventing reversed-orientation defects.	A
globalisation	noun	The increasing interconnectedness of world economies through trade, technology and capital flows.	Globalisation means that a CFRP aerospace component may be designed in the UK, manufactured in Japan, and assembled in France.	E
offshoring	noun	Moving manufacturing to a lower-cost country, typically to reduce labour costs.	UK electronics manufacturers offshored production to China in the 1990s, reducing unit labour costs by 70%.	A



Unit 4 - Forming Processes & Composite Materials

HT5-HT6. The vocabulary of forging, press forming, strip heating, vacuum forming, GFRP and CFRP — the processes and materials that shape the high-performance engineering world.

Tier 2 - Forming Processes & Composite Materials - Academic Vocabulary

Academic vocabulary - words used across many subjects

Word / Term	Type	Definition	Example in Engineering	Tier
forge	verb	To shape metal by applying heat and compressive force, using hammers, presses or dies.	Forge the tension bar head to shape by heating to orange heat and striking with a hammer on the anvil.	E
form	verb	To shape a material into a three-dimensional form without removing material (as opposed to machining/wasting).	Form the acrylic cover by heating it in the strip heater and bending it over a former to 90 degrees.	E
compare	verb	To examine two materials or processes to find similarities and differences.	Compare GFRP and CFRP: both are fibre-reinforced composites but CFRP has a 3-5x higher tensile strength at 2x the cost.	E
evaluate	verb	To judge the suitability of a material or process for a specific engineering application.	Evaluate CFRP as a material for bicycle frames: consider strength-to-weight ratio, manufacturing cost and repairability.	E
composite	adjective	Made from two or more materials with different properties, combined to produce a material with properties superior to either component alone.	CFRP is a composite material: carbon fibre provides tensile strength, epoxy resin provides shape and matrix.	E
draft	noun	A taper applied to the walls of a mould to allow the formed part to be removed without sticking or tearing.	A minimum 3 degree draft angle on the vacuum forming mould allows the formed HIPS tray to be released cleanly.	E

Tier 3 - Forming Processes & Composite Materials - Subject-Specific Vocabulary

Subject-specific vocabulary - the language of an engineer

Word / Term	Type	Definition	Example in Engineering	Tier
hot forging	noun	Forging metal above its recrystallisation temperature, making it more ductile and easier to shape without cracking.	Hot forging at orange heat (approximately 900-1100C for mild steel) allows the metal to flow and conform to the die shape.	E
grain flow	noun	The alignment of the crystalline grain structure in forged metal, following the contour of the component. Forging produces continuous grain flow that increases fatigue strength.	Forging the tension bar head improves its fatigue strength because the grain flow follows the shape, unlike machining which cuts across the grains.	E
swage	noun	A shaped forming tool (usually used as a pair) for rounding, forming or reducing metal by hammering.	A swage is used to form a smooth round section on the tension bar by hammering over the shaped cavity.	E
press forming	noun	A cold-working process in which sheet metal is shaped between a punch and die, typically in a press brake or hydraulic press.	Car door panels are produced by press forming: a steel blank is stamped between a matching punch and die in a single stroke.	E
deep drawing	noun	A press-forming process in which a flat sheet is drawn into a hollow 3D form (cylindrical or box-shaped) by a punch forcing it into a die.	A kitchen sink is made by deep drawing stainless steel sheet — the punch draws the metal into the die cavity to form the basin shape.	E

**Tier 3 - Forming Processes & Composite Materials - Subject-Specific Vocabulary**

Subject-specific vocabulary - the language of an engineer

Word / Term	Type	Definition	Example in Engineering	Tier
springback	noun	The elastic recovery of a metal after bending or press forming: the metal springs back partially toward its original shape when pressure is released.	Allow for 3 degrees of springback when press forming aluminium: set the press to overbend to 87 degrees so it springs back to 90 degrees.	E
strip heater	noun	An electrical heating element used to heat a narrow strip of thermoplastic sheet for line bending. Also called a line bender.	The strip heater heats a 5mm wide zone of 3mm acrylic to 160-180C, allowing it to be bent cleanly over a former.	E
draft angle	noun	The taper applied to vertical surfaces of a mould to allow the formed component to be released without sticking.	A draft angle of at least 3 degrees on the vacuum forming mould prevents the formed HIPS sheet from locking onto the mould.	E
GFRP	noun (acronym)	Glass Fibre Reinforced Polymer: a composite material made of woven or chopped glass fibres (E-glass) in a polyester or epoxy resin matrix.	GFRP is used for boat hulls because it is strong, corrosion-resistant and can be formed to complex shapes using a single-piece mould.	E
E-glass	noun	The most common commercial glass fibre type, used as the reinforcement phase in GFRP. Strong, cheap and corrosion-resistant.	E-glass chopped strand mat is layered with polyester resin to build up the required wall thickness in a GFRP boat hull.	E
gelcoat	noun	A pigmented polyester resin applied to the mould surface before lay-up, forming the outer coloured, smooth surface layer of a GFRP component.	The gelcoat is applied first to ensure a smooth, colour-finished outer surface without any exposed glass fibre.	E
MEKP	noun (acronym)	Methyl Ethyl Ketone Peroxide: the catalyst added to polyester resin to initiate the curing reaction in GFRP.	Add MEKP at 1-2% by weight to the polyester resin and mix thoroughly — the resin will cure within 20-30 minutes at room temperature.	E
CFRP	noun (acronym)	Carbon Fibre Reinforced Polymer: a composite material made of carbon fibre (woven or unidirectional prepreg) in an epoxy resin matrix. Very high strength-to-weight ratio.	CFRP is used for F1 monocoques because its tensile strength (1500 MPa) with very low density (1.6 g/cm ³) produces the best available strength-to-weight ratio.	E
prepreg	noun	Pre-impregnated carbon or glass fibre fabric in which the fibre reinforcement is already combined with a resin that is partially cured (B-stage). Requires autoclave curing.	Prepreg carbon fibre is used in aerospace structures because the controlled fibre-to-resin ratio and autoclave curing produce superior, consistent mechanical properties.	E
autoclave	noun	A pressure vessel used for curing composite materials (prepreg CFRP or GFRP) under elevated temperature and pressure to remove voids and achieve maximum mechanical properties.	Autoclave curing at 120-180C and 7 bar produces CFRP components with porosity below 1% — far superior to hand layup GFRP.	E
strength-to-weight ratio	noun	A measure comparing a material's strength to its density. Materials with a high strength-to-weight ratio are strong and light.	CFRP has a tensile strength-to-weight ratio approximately 5 times higher than steel — explaining its dominance in aerospace and motorsport applications.	A