Mill Training Notes

1 Safety

- Usual machinery rules apply – long hair, loose clothes etc
- PPE –
    - Safety glasses required
    - Hearing protection generally bad – interferes with hearing what the machine is doing – but good for comfort if you have chatter etc
    - Gloves – not for operation (risk of entanglement) but might be good for handling burred parts and clearing swarf
    - Footwear – good shoes or trainers required (e.g. no sandals)
- Biggest hazards specific to the mill:
    - Entanglement – be careful of fingers, sleeves etc
    - Drawbar spanner being left on - NEVER LEAVE DRAWBAR SPANNER IN PLACE
    - Flying chips
- Safety features of the machine – E-stops

2 Machine Setup

- How to turn on the machine – uncover, turn on main switch, turn on separate DRO
- Be aware of the isolator on the wall, in case someone turns that off

3 Workholding & Controls

- Only cover the vice during initial training
    - Don't cover setting it up and tramming in at this stage, look for tutorials online
- Briefly describe other clamping methods - direct to table, angle plates, rotary table, dividing head…
- Set up a scrap piece on parallels in the vice for a test cut
- Y-axis
- X-axis, including power feed
- Z-axis and quill – when to use each
- X-axis, including power feed

4 Basic Drilling

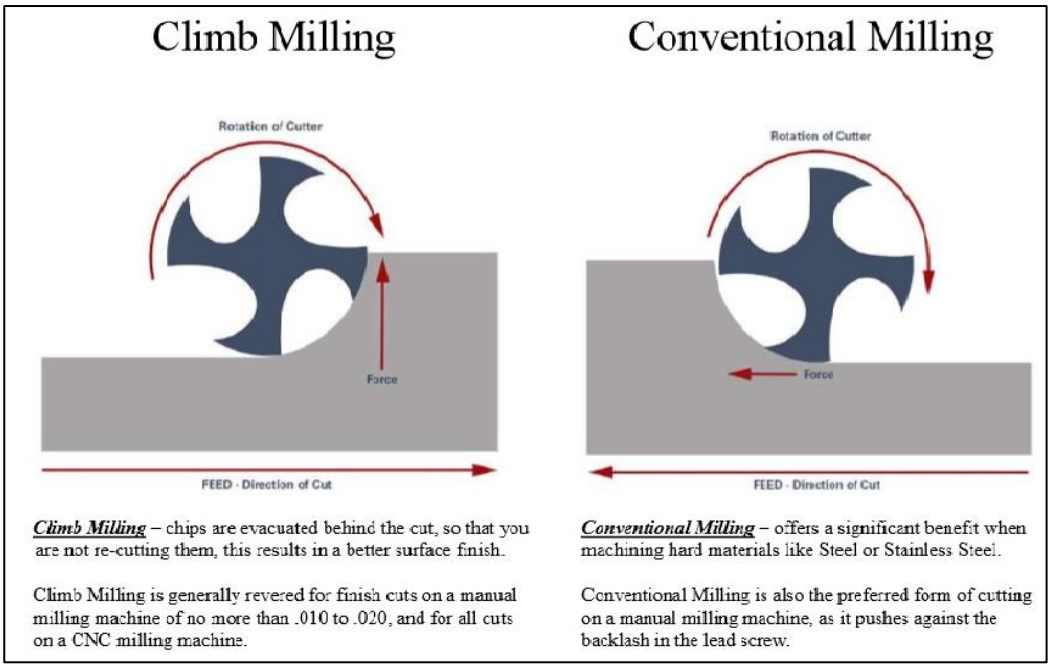
- Operating the drawbar to hold the drill chuck
- How to select a speed
- Use of coolant
- Speeds aren't critical but here's a guideline table:

GUIDELINE RPM FOR DRILLING												
mm:	≤ 2	≤ 4	≤ 6	≤ 8	≤ 10	≤ 12	≤ 14	≤ 16	≤ 18	≤ 20	≤ 22	≤ 24
in:	≤ 0.08	≤ 0.16	≤ 0.24	≤ 0.32	≤ 0.40	≤ 0.48	≤ 0.56	≤ 0.64	≤ 0.72	≤ 0.80	≤ 0.88	≤ 0.96
ALUMINIUM, PLASTICS	4000	4000	4000	3100	2300	1900	1600	1400	1250	1070	1000	900
BRASS, FREECUTTING STEEL	3400	3400	2500	1900	1450	1250	1050	900	800	700	640	560
BRONZE, GREY IRON, MILD STEEL	4600	2500	1700	1260	1000	800	700	600	540	480	420	400
TOOL STEEL, STAINLESS	3600	1700	1150	880	660	550	480	420	300	380	350	200
HARD CAST IRON	1800	1000	650	500	400	330	280	240	220	200	180	160

- Test drill a hole

5 Basic Milling

- Types of end mills
- How to hold an end mill in the collet
- How to select a speed (presto counsellor)
- Conventional vs Climb



- Do some test cuts

6 Measuring Progress & the DRO

- Introduction to main DRO
- How to set a zero
- How to do offsets
- How to use an edge finder
- The quill DRO
- Do a test measured cut

7 Mill Shutdown

- Clear all chips by brush
- Slot clearance tool for table
- Hoover key areas around vice
- Remove card, turn off DRO
- All accessories back to toolroom
- Cover machine

8 Expansion Topics for Future Training

- Rotary table, other clamping methods
- Boring head
- Fly cutters, shell mills etc
- Slitting saws