



GOVERNMENT OF PAKISTAN

NATIONAL OCCUPATION SKILL STANDARD

FOR

MACHINIST



NATIONAL TRAINING BOARD

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1. General

1.1 The Occupational Skill Standard referred to relates specifically to workers at craft level and is directly related to the skills, equipment, tools and materials in common use in Pakistan at the present time.

1.2 This Occupational Skill Standard is divided into three grades or levels. These are;—

1.2.1	The Basic Level	Grade III
1.2.2	The Intermediate Level	Grade II
1.2.3	The Advance Level	Grade I

(Note: The Basic and Intermediate Levels of this standard have been given priority considerations setting aside for future development the requirements under The Advance Level).

1.3 The Basic Level relates to the level of knowledge and skills expected from craftsman who have undergone training in this trade conducted by a training institution of equivalent standard or from those who already have to their credit at least 4 years of recognized "On-the-job" experience.

1.4 The Advance Level is based on the highest level of knowledge and skills expected from a craftsman in this trade.

1.5 The Intermediate level falls approximately midway between the advance level and the basic level.

1.6 The Occupational Skill Standard will be subject to a periodic review and modification to be responsive to the changing technology and to the requirements of the industry.

1.7 Persons who are wishing to be certified as competent in any of the three grades should undertake a trade test to be designed to show by oral and/or written examination and by practical demonstration that they are in possession of the knowledge and skill set out in this standard.

1.8 The emphasis in all certification tests will be on objectivity and the requirements of the industry.

2. BASIC LEVEL (Grade III) TURNER/MACHINIST

S. No.	Knowledge Requirements
2.1	Safety precautions-Personal and equipment.
2.2	Housekeeping-Storing and routine maintenance of tools and equipment.
2.3	Introduction to measuring system and their units.
2.4	Care, application and reasons for using different types of measuring instruments such as steel rules, vernier calipers, micrometers, bevel protector.
2.5	Different types of tool holders and correct height setting of tools.
2.6	Introduction of ferrous and non-ferrous metals.
2.7	Use of dividing head, direct and indirect....
2.8	Different types of hand tools and their use.
2.9	Different types of taps and dies, meaning and use of following terms:- BSW, BSF, BSP & Metric.
2.10	Reading and interpretation of simple mechanical drawings.
2.11	Description of lathe, shaping and milling machines, their principal parts, attachments and accessories.
2.12	Basic operations performed on lathe, drilling, shaping and milling machines.

S. No.	Tools and equipment
1	Steel rules
2	Files and file brushes
3	Vernier calipers
4	Cold chisel and punches
5	Depth gauge
6	Hammer and mallets
7	Thread gauge
8	Hacksaws
9	Centre gauge
10	Drills, tap, dies, reamers
11	Screw pitch gauge
12	Lathe cutting tools, Shaper cutting tools and Milling cutter

S. No.	Skill Requirements
2.13	Use properly, measuring and testing instruments i.e. steel rules, inside & outside calipers, surface gauges, tri-square, bevel square, Protractor, dial indicator protector, height, depth, radius and feeler gauges.
2.14	Use of vernier caliper.
2.15	Carry out scribing and marking according to workshop drawings/sketches & listing the sequence of operations & tool required for the job.
2.16	Distinguish, use and maintain hand cutting tool.
2.17	File flat, square and angular surfaces to an accuracy of +/- 0.1 m.m.
2.18	Fit and assemble simple objects.
2.19	Operate bench & Piller drilling machines for centreing, drilling, reaming, countersinking & counter boring.
2.20	Operate centre lathe, perform simple operations such as facing, knurling, parallel turning, use of three jaws and four jaws.
2.21	Drill and bore to an accuracy of +/- 0.1 mm.
2.22	Cut internal/external threads using tap and dies.
2.23	Cut simple threads on centre lathe by using lathe thread cutting tools, internal and external.
2.24	Perform step turning.
2.25	Perform taper turning, external & internal, by compound slide & tail stock respectively.
2.26	Set and turn irregular shaped jobs (use of face plate).
2.27	Mounting the work piece on mandrel and clamp between centre.
2.28	Wheel mounting on pedestal tool grinder, dressing and balancing.
2.29	Off-hand grinding of bench tools, turning and shaping tools.
2.30	Set the shaper machine, clamp job on shaper vice, shape square and parallel step shaping and simple form shaping.
2.31	Mill flat, square surfaces and simple slotting on vertical & horizontal milling machine.
2.32	Mill square and hexagonal head of bolts by dividing head.
2.33	Mill spur gear and rack.
2.34	Drill holes on different pitch circles.
2.35	Diameters (PDC) by rotary table.
2.36	Mill simple counter and pockets by end milling

3. INTERMEDIATE LEVEL (Grade II) MACHINIST

S. No.	Knowledge requirements
3.1	The different types of gauges & measuring instruments e.g. radius plug, ring, snap, tapers, thread calipers, drill, cylindrical and telescopic gauges, gauge blocks & sine bar.
3.2	Different types of lathe machines, their uses and operations commonly performed.
3.3	The different types of holding/clamping devices and machine chucks in common use.
3.4	More familiarity with shop drawing and sketches.
3.5	Trigonometric ratios and tables.
3.6	Different types of cutting tools, material and their construction.
3.7	Tools geometry and its application to different materials.
3.8	Calculation relevant to screw cutting and tapper
3.9	The equipment used for dressing and balancing grinding wheels of pedestal grinders.
3.10	The different types of shapers and planners, their uses & operations commonly performed.
3.11	The different types of vices and other clamping devices commonly used in shaping and milling operations.
3.12	The principals of intricate shaping operations.
3.13	Different types of drilling and boring machines.
3.14	Types and use of coolants for different cutting operations.
3.15	Types and use of lubricants for different machines.
3.16	Cutting speed and feed for different materials of workplace and cutting tools with relevant formulae.
3.17	Drive systems/transmission ratios and speed variation systems.
3.18	Types and functions of gears.
3.19	Calculations for gear cutting.
3.20	ISO fits and tolerance.
3.21	Use of dividing head for differential, indexing, angular indexing & helical head.
3.22	Heat treatment, hardening, tempering, annealing, carburizing and hardness testing.

S. No.	Tools and equipment
1	Morse taper gauge set plug & ring
2	Brown and sharp taper gauge
3	Floating tapping chuck
4	Different carbide tips
5	Collets
6	Marking tools
7	Modular gauge
8	Boring heads
9	Milling cutters
10	Dial indicators
11	Centricator
12	Cylindrical gauge
13	Reams
14	Universal bevel protector
15	Edge finder

S. No.	Skill Requirements
	Must be able to:-
3.23	Use precision measuring instruments such as internal micrometer, depth gauge, cylindrical gauge, protractor etc. & work to a detailed drawing in metric measurements.
3.24	Perform boring operation to minimum limits; 0.05mm on depth.
3.25	Cut Internal & external threads to supplied gauges.
3.26	Set up to maintain concentricity with in an accuracy of 0.025mm.
3.27	Perform turning. Boring, shaping, and milling on different materials.
3.28	Use tungsten carbide cutting tools.
3.29	Carry out minor maintenance work & adjustment on lathe, shapers milling & planners.
3.30	Perform wheel dressing and balancing on pedestal grinders.
3.31	Shape slots, internal and external keyways and radii.

S. No.	Skill Requirements
3.32	Shape intricate irregular forms.
3.33	Perform simple operations on boring and planners.
3.34	Sharpening drill, lathe and shaper tools and milling cutters.
3.35	Milling circular slot by rotary table.
3.36	Boring with boring head and reamer at different points and angles.
3.37	Making of helical, bevel, gear worm wheel, ratchet and chain wheel.
3.38	Make internal square, hexagon, spline and round shapes.
3.39	Mill different contours and pockets and making female fittings.
3.40	Make worn shaft by lathe machine.
3.41	Surface grinding of square and angular shapes.
3.42	Cylindrical grinding of parallel steps and taper shapes.
3.43	Make Vee, square, acme and worm threads.