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Transforming the skill landscape

Sample Test Project

Regional Skill Competitions – Level 3

Skill 43 - Plastic Die Engineering

Category: Manufacturing & Engineering Technology

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SAMPLE

Section - A

A. Preface

Skill Explained:

Plastic Die Engineers involve the design and manufacture of injection moulds for producing plastic components. They should read and understand mould drawings and be able to manufacture them. Plastic Injection moulded components are used in the field of Telecommunication, Automobile, Home appliances, Office automation and Entertainment electronics etc. There are many advanced technologies available for Die making but the basic skills required in planning, designing, machining, measuring, polishing, and fitting only tested in this competition.

The Competition is a demonstration and assessment of the competencies associated with these basic skills. The Test Project consists of practical work only.

Competency specification

Knowledge and understanding of plastic die making with:

- CAD/CAM software like Inventor, Mastercam etc
- Machine tools like CNC Milling machine, Bench drilling machine, Pedestal grinder etc.
- Hand tools like Files, Hammers, Hacksaw, Taps, Reamers, Screw drivers, Spanners, Allen keys etc.
- Metal cutting tools like Drills, face mill cutters and end mills, Machine reamers and taps, Counter boring tools with parallel and taper shanks, reamers etc.
- Cutting tool materials like High speed steels and carbides
- Steel grades and their properties like strength, hardness, machinability, polishability, etc.,
- Marking tools like scribes and punches (centre punch, letter punch, Number punch, etc.).
- Measuring tools like vernier calipers, micrometers, Height gauge ,etc
- Gauges like pin gauges, plug gauges, slip gauges, etc.
- Bench fitting techniques (measuring and marking out).
- Methods and sequence of mould polishing

The competitor shall be able to:

- Efficiently use different machine tools like CNC milling , drilling machine, pedestal grinde etc.
- Create design and machine mould parts.
- Work from drawings or model, mark, machine, measure and produce components by hand and CNC Milling machining technique.
- Polish the moulding surface to mirror finish.
- Follow safe machining practices.
- select right cutting parameters in order to finish machining with required dimensions ,surface finish within the allotted time.

Eligibility Criteria (for IndiaSkills 2018 and WorldSkills 2019):

Competitors born on or after 01 Jan 1997 are eligible to attend the Competition. The team consists of 2 competitors.

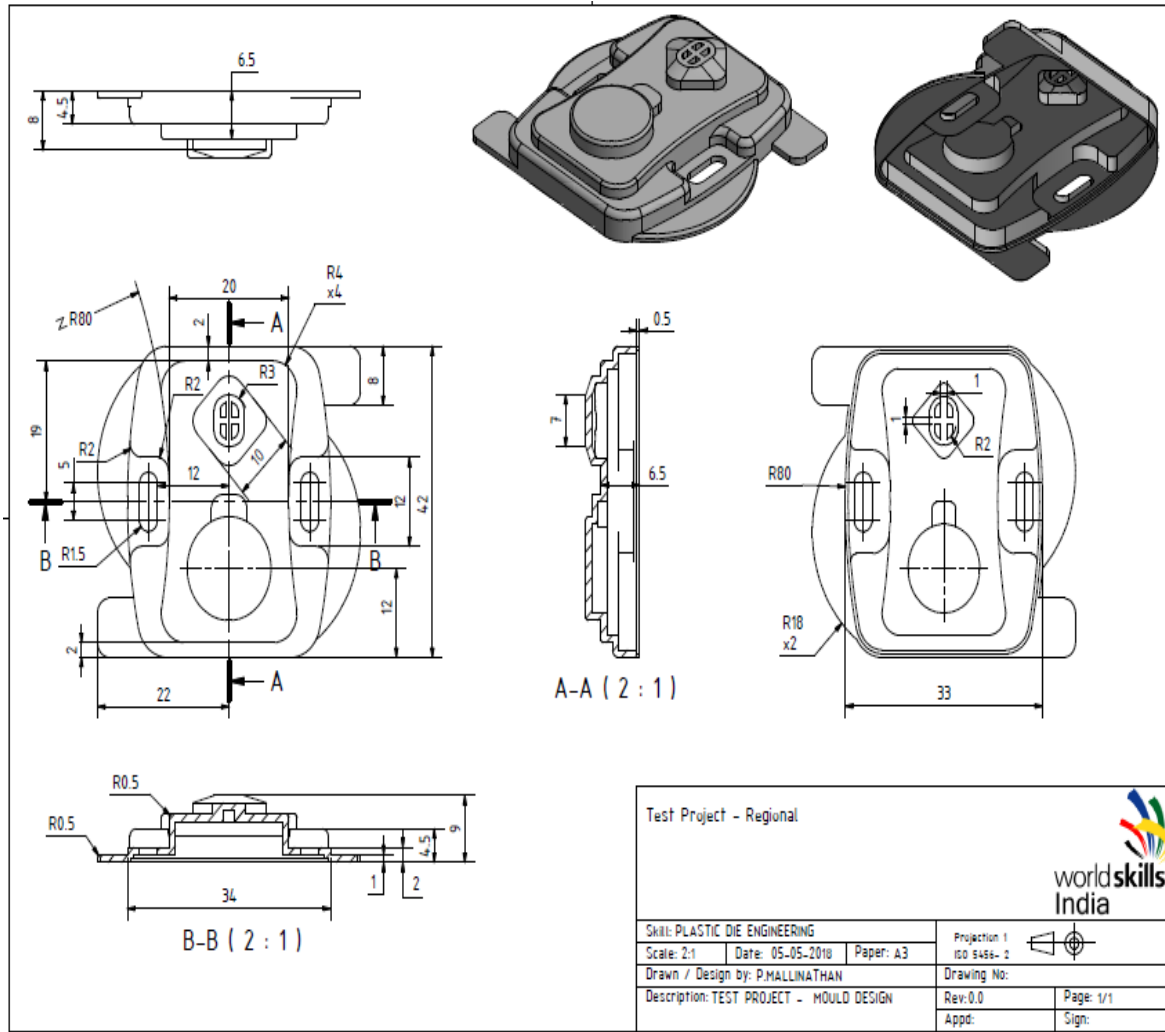
Total Duration: 12 Hrs

Section - B

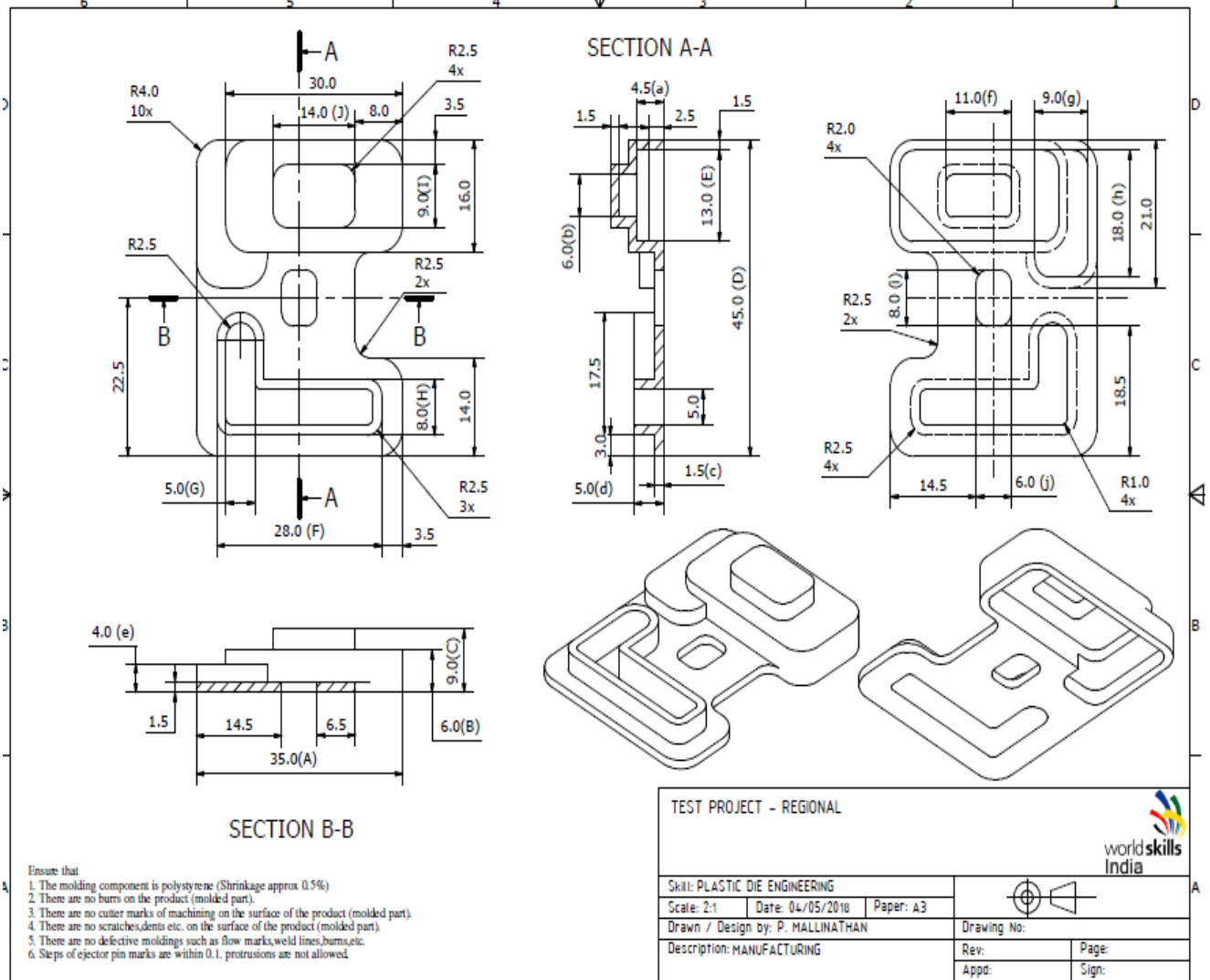
B. Test Project

The test project shall be completed within 12 hrs:

MOULD DESIGN



MANUFACTURING



Section - C

C. Marking Scheme

There are two assessment methods: Measurement and Judgment

Measurement is used to assess accuracy, precision, and other performance which can and should be measured in a robust way. It is used where there should be no ambiguity.

Judgement is used to assess the quality of performance, about which there may be small differences of view when applying the external benchmarks.

2.1 Assessment criteria

The main heading of the marking scheme are the assessment criteria. There will be normally four to six main criteria

2.2 Sub criteria: The Main criteria will be broken down into one or more sub criteria. Marking forms are organized under sub criteria.

2.3 Aspects: Each sub criterion is broken down into one or more aspects. Aspects categorized either as measurement or judgement and marks are awarded to each aspect. No aspect shall be given more than 5 marks

Summary of marking:

Main criteria	Judgment	Measurement	Total
Mould Design	4	26	30
Machining	8	62	70
Grand Total	12	88	100

Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score	Extra Aspect Description (Obj or Subj) OR Judgment Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark
O	Orientation of part (part remain on core side for Ejection)		Deduce 0.5 if not oriented as per requirement		4	0.5
O	Location of part (placement of profile in cavity)		Deduce 0.5 if location / tolerance not specified		4	0.5
O	Shrinkage added		Deduce 0.5 if shrinkage is not added as per requirement		3	0.5
J	Runner Lay out and positioning of cavity				4	1
O	Parting surface		Deduce 0.5 if not selected as per requirement		4	0.5
O	Creation of core & cavity splits		Deduce 1 marks if not creates as per drawing		4	1
O	creation of Ejector holes in the core plate (Minimum 4)		Deduce 0.5 for each missing holes		4	1.5

O	Creation of runner (Round runner)		Created or not		3	0.5
O	Creation of gate (As required)		Selected the right gate or not		3	0.5
O	Creation of cold slug (For both Sprue and Runner)		Created or not		4	0.5
O	Sprue puller		Created or not		3	0.5
O	Creation of sprue bush		Created or not			
O	Creation of return pin holes		Created or not			
O	Creation water line in core		Water line created or not ,Reduce 0.125if it interferes with any hole)		3	0.50
O	Creation water line in cavity		Water line created or not ,Reduce 0.125if it interferes with any hole)		3	0.50
O	clamping screw Cavity (Minimum 4)		reduce 0.05 for each Clamping screw (minimum 4)		4	0.50
O	clamping screw Core (Minimum 4)		reduce 0.05 for each Clamping screw (minimum 4)		4	0.50
O	creation of core back plate					
O	creation cavity back plate					
O	creation of ejector retainer plate					
O	creation of ejector plate					
O	Asembly of mould plates		Deduec 0.5 for each plates missing			2.00
O	creation and assembly of standard items		deduce 0.5 fro each missing item			1.00
J	Drawing &Presentation				4	2.00
O	Assembly Drawing Title block (Product name,Designer,date,s cale,Rev,Angle of projection etc)		Deduce 0.5for each missing data)		4	1.50
O	Assembly Drawing (ISO metric view)		Deduce 0.5if missing		4	0.5
O	Assembly drawing balloons(All the parts should be ballooned)		Deduce 0.2 for each missing balloon		4	1.00
O	Top View (core half - all visible details)		if shown or not, deduce 0.2 if section line not shown		4	0.5

○	Section View (assembly section front and side view)		if shown or not, deduce 0.25 if section ref not mentioned		4	0.5
○	Top View (cavity half - all visible details)		if shown or not		4	0.5
○	Dimensions1 (Length of core insert)		Deduce 0.1 each for missing size or tolerance		4	0.5
○	Dimensions2 (width of core insert)		Deduce 0.1 each for missing size or tolerance		4	0.5
○	Dimensions3 (thickness of core)		Deduce 0.1 each for missing size or tolerance		4	0.5
○	Dimensions4 (location of profile- core)		Deduce 0.1 each for missing location		4	0.5
○	Dimensions5 (Screw hole size& locations)		Deduce 0.1 each for missing, size location or tolerance		4	0.5
○	Dimensions6 (Ejector hole size & locations)		Deduce 0.1 each for missing, size location or tolerance		4	0.5
○	Dimensions7 (Length of Cavity insert)		Deduce 0.1 each for missing location and tolerance		4	0.5
○	Dimensions8 (Width of Cavity insert)		Deduce 0.1 each for missing size or tolerance		4	0.5
○	Dimensions9 (Thickness of cavity insert)		Deduce 0.1 each for missing size or tolerance		4	0.5
○	Dimensions10 (location of profile- cavity)		Deduce 0.1 for missing tolerance		4	0.5
○	Dimensions11 (Screw hole size& locations)		Deduce 0.1 each for missing, size location or tolerance		4	0.5
○	Dimensions12 (Sprue Bush hole size &Location)		Deduce 0.1 each for missing, size location or tolerance		4	0.5
○	Tolerance (GD&T1) - Cavity insert		Deduct 0.2 for each missing data (Reference, symbol or Tol)		4	0.5
○	Tolerance (GD&T2) - Cavity insert		Deduct 0.2 for each missing data (Reference, symbol or Tol)		4	0.5
○	Tolerance (GD&T3) - core insert		Deduct 0.2 for each missing data (Reference, symbol or Tol)		4	0.5

O	Tolerance (GD&T4) - core insert		Deduct 0.2 for each missing data (Reference, symbol or Tol)		4	0.5
O	Other Dimensions (linear)-Cavity		Deduct 0.2 for each missing dimension		4	0.5
O	Other Dimensions (linear)-Core		Deduct 0.2 for each missing dimension		4	0.5
O	Air Vent		Deduct 0.25 if missing in each cavity		3	0.5
O	Placement of section view as per section		Deduct 0.4 if placement not correct		4	0.5
J	Health & Safety				1	0.5
J	Work place organization				1	0.5
Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score	Extra Aspect Description (Obj or Subj) OR Judgment Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark
O	For Critical dimension "A" required on the mould		Dimension required as calculated by average shrinkage value	(35.175) ±0.01	5	3.00
O	For Critical dimension "B" required on the mould		Dimension required as calculated by average shrinkage value	(6.030) ±0.01	5	3.00
O	For Critical dimension "C" required on the mould		Dimension required as calculated by average shrinkage value	(9.045) ±0.01	5	3.00
O	For Critical dimension "D" required on the mould		Dimension required as calculated by average shrinkage value	(45.225) ±0.01	5	3.00
O	For Critical dimension "E" required on the mould		Dimension required as calculated by average shrinkage value	(13.065) ±0.01	5	3.00
O	For Critical dimension "F" required on the mould		Dimension required as calculated by average shrinkage value	(28.140) ±0.01	5	3.00

O	For Critical dimension "G" required on the mould		Dimension required as calculated by average shrinkage value	(5.025) ±0.01	5	3.00
O	For Critical dimension "H" required on the mould		Dimension required as calculated by average shrinkage value	(8.040) ±0.01	5	3.00
O	For Critical dimension "I" required on the mould		Dimension required as calculated by average shrinkage value	(9.045) ±0.01	5	3.00
O	For Critical dimension "J" required on the mould		Dimension required as calculated by average shrinkage value	(14.070) ±0.01	5	3.00
O	For less Critical dimension "a" " required on the mould		Dimension required as calculated by average shrinkage value	(4.522) ±0.02	5	1.50
O	For less Critical dimension "b" " required on the mould		Dimension required as calculated by average shrinkage value	(6.030) ±0.02	5	1.50
O	For less Critical dimension "c" " required on the mould		Dimension required as calculated by average shrinkage value	(1.507) ±0.02	5	1.50
O	For less Critical dimension "d" " required on the mould		Dimension required as calculated by average shrinkage value	(5.025) ±0.02	5	1.50
O	For less Critical dimension "e" " required on the mould		Dimension required as calculated by average shrinkage value	(13.065) ±0.02	5	1.50
O	For less Critical dimension "f" " required on the mould		Dimension required as calculated by average shrinkage value	(11.055) ±0.02	5	1.50
O	For less Critical dimension "g" " required on the mould		Dimension required as calculated by average shrinkage value	(9.045) ±0.02	5	1.50
O	For less Critical dimension "h" " required on the mould		Dimension required as calculated by	(18.090) ±0.02	5	1.50

			average shrinkage value			
O	For less Critical dimension "i" required on the mould		Dimension required as calculated by average shrinkage value	(8.040) ±0.02	5	1.50
O	For less Critical dimension "j" required on the mould		Dimension required as calculated by average shrinkage value	(6.030) ±0.02	5	1.50
O	Ejector pin hole (H7)		Deduce 0.3 if out of Tolerance		5	1.00
O	Ejector pin hole (H7)		Deduce 0.3 if out of Tolerance		5	1.00
O	Ejector pin hole (H7)		Deduce 0.3 if out of Tolerance		5	1.00
O	Ejector pin hole (H7)		Deduce 0.3 if out of Tolerance		5	1.00
O	Sprue puller bush hole(H7)				5	1.00
O	Ejector pin clearance hole (d+0.5)+0.2		Deduce 0.10 if out of Tolerance		5	0.50
O	Ejector pin clearance hole (d+0.5)+0.2		Deduce 0.10 if out of Tolerance		5	0.50
O	Ejector pin clearance hole (d+0.5)+0.2		Deduce 0.10 if out of Tolerance		5	0.50
O	Ejector pin clearance hole (d+0.5)+0.2		Deduce 0.10 if out of Tolerance		5	0.50
O	Core plate		No additional material used		5	2.50
O	Cavity plate		No additional material used		5	2.50
J	Machine mark (outside the moulding area)				6	2.00
J	Surface finish(Core side_moulding area)				8	2.00
J	Surface finish (Cavity side-moulding area)				8	2.00
O	Thickness of Cavity as supplied 0 -0.02		Deduce 0.5 if thick at moulding area below original		6	2.00
O	Thickness of Core after machining 0 - 0.03		Deduce 0.5 if thick at moulding area below core wall height		6	2.00
O	Extra hole or dig in		Deduce 1 if any extra hole or dig in any plate		6	1.00
J	Health & Safety				1	1.00
J	Work place organization				1	1.00

Section - D

D. Infrastructure List

Infrastructure list

General Installations	
Qty	Description
1/competitor	Table
1/competitor	Chair
1/competitor	Locker
1/skill	standard cleaning set
1/skill	standard set stationary
1/skill	standard set Health and safety
Workshop installations	
1/competitor	IT item
1/skill	Tool trolley
1/skill	Measuring tools
1/skill	CMM
1/skill	Granite Surface table
1/skill	slip gauge box
1/skill	Digital Height gauge
1/skill	0-25 Depth Micrometer
1/skill	Dial calliper 150mm
1/skill	Edge finder
1/skill	Digital Outside Micrometer 0-25mm
1/skill	Digital Outside Micrometer 25-50mm
1/skill	Digital Outside Micrometer 50-75mm
1/skill	Digital Outside Micrometer 75-100mm
1/skill	Digital Outside Micrometer 100-125mm
1/skill	Disk micrometer 0-25mm
1/skill	Disk micrometer 25-50 mm
1/skill	Disk micrometer 50-75mm
1/skill	Inside Micrometer 25-50mm
1/skill	Inside Micrometer 5-30mmmm
1/skill	Hydraulic Milling vice 150mm
1/competitor	Vice clamping set
1/competitor	Milling Collet chuck
1/competitor	Drill chuck
1/competitor	ER 32 Colet set
1/competitor	Face mill holder
1/competitor	Face mill holder wrench
1/competitor	Face mill

1/competitor	Face mill tips_CNMG insert for steel
1/competitor	Inventor software
1/competitor	Master CAM software
1/competitor	Post processor
1/competitor	coolant
1/competitor	Parallel block set
1/competitor	Bench Grinder
1/competitor	CNC Milling machine
5/competitor	Pull stud
1/skill	Lever Dial Indicator 0.001mm
1/skill	Plunger Dial Indicator
1/skill	Drilling machine-1-13mm
1/competitor	Work bench with vice

Materials, Equipment and Tools carried by Competitors in their Toolbox

The Competitor should bring their own tools and equipment to ensure manufacturing of the Test Project.

These include:

- End mills Ø2–Ø16 (mm)
- Ball end mills R2 – R3 mm
- Radius end mills R0.5 – R1 mm
- Face mills and inserts
- Machine reamers (Ø3-Ø8H7).
- Drill bits Ø2.8–Ø7.8 (mm) (only reamer size drills)
- centre drills
- countersinks
- Tap wrenches
- Hand reamers (Ø3-Ø8H7)
- Set of metric Allen wrenches (2 –12 mm)
- Parallel blocks
- Files of any kind
- Variety of honing (grinding) stones
- Various polishing equipment
- Air grinder or electric grinder
- Caliper 160 mm
- Outside micrometer 0-25
- Outside Micrometer 25-50mm
- Outside Micrometer 50-75mm
- Outside micrometer 75-100mm
- Disk micrometer 0-25mm
- Disk micrometer 25-50mm
- Depth micrometer set 0-25 mm
- Universal Dial indicator with stand
- Plunger dial indicator

Section – E

E. Instructions for candidates

- Experts shall not be allowed to give any help to Competitors to interpret the Test Project except where agreed by the Jury before the start of the competition
- Competitors have the right to expect fairness, honesty, and transparency during the Competition
- Every Competitor has the right to expect that no other Competitor will receive unfair assistance or any intervention that may provide an advantage
- Interference by officials or spectators that may hinder or assist Competitors in the completion of their Test Project is forbidden
- Accredited personnel at the Competition shall ensure that the above principles of honesty, fairness and transparency are observed at all times
- When the Competition is over, Competitors shall be given time to exchange views and experiences with other Competitors and Experts.
- In case a Competitor has to withdraw due to illness or accident; marks will be awarded for the work completed.
- In the event of Competitor fall ill or has an accident must be informed to Expert (Jury member)

Section – F

F. Health, Safety, and Environment

Following are the suggested personal protective equipment's during the competition.

- Safety footwear - Mandatory and all time
- Protective gloves - While doing drilling operation
(If Required)
- Protective glasses / face protection - While doing drilling operation
(If required)

1. All accredited participants and supporting volunteers will abide by rules and regulations with regards to Health, Safety, and Environment of the Competition venue.
2. All participants will assume liability for all risks of injury and damage to property, loss of property, which might be associated with or result from participation in the event. The organizers will not be liable for any damage; however in case of Injury the competitor will immediately inform the immediate organizer for medical attention.