## INDEX

<table>
<thead>
<tr>
<th>Section</th>
<th>Category</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Head protection</td>
<td>2 - 5</td>
</tr>
<tr>
<td>II</td>
<td>Eye &amp; Ear protection</td>
<td>6 – 10</td>
</tr>
<tr>
<td>III</td>
<td>Face &amp; Respiratory protection</td>
<td>11 – 20</td>
</tr>
<tr>
<td>IV</td>
<td>Hand protection</td>
<td>21 – 27</td>
</tr>
<tr>
<td>V</td>
<td>Body protection</td>
<td>28 – 46</td>
</tr>
<tr>
<td>VI</td>
<td>Foot Protection</td>
<td>47 – 50</td>
</tr>
<tr>
<td>VII</td>
<td>General PPE’s</td>
<td>51 – 59</td>
</tr>
</tbody>
</table>
Section – I
HEAD PROTECTION

I (i) INDUSTRIAL SAFETY HELMET

Application: To be used in plant premises/installation for head protection.

General: Industrial safety helmet manufactured from high quality, high impact, heat & chemical resistant HDPE material designed to take on clip on accessories like face shields, ear defenders and welding visors without the need for drilling on the helmet. This helmet shall be made with or without fluorescent radium pigment so that the helmet glows in the dark.

1. The Industrial Safety Helmet shall be IS:2925 marked (with Latest amendments) & EN 397 certified.
2. The helmet should be lightweight and weight shall not exceeding 400 grams without any (excluding) external attachments.
3. The shell should be designed in such a manner that, it deflects any liquid that falls from the top.
4. The shell should be provided with ventilation holes on the sides of the helmet.
5. The shell should be provided with versatile slot-fix arrangement to allow use of other accessories such as earmuffs and face shield along with it.
6. Inner headband should be made from synthetic webbing for better comfort and fit.
7. The headband should have minimum 6 point system head harness for better comfort and fit.
8. The headband should be ratchet type with locking facility.
9. The headband should be adjustable between 520mm to 600mm with a tolerance of ± 10 mm for better fit and comfort to various head size.
10. The helmet should be provided with sweat band and synthetic adjustable and removable chin strap.
11. Monogram of GAIL shall be provided at the centre of the front side of the helmet (fore head portion of the helmet.)
12. Vendor shall submit valid test reports along with supply and BIS, DGMS and EN approval along with offer.
13. Manufactures name yr of manufacture and BIS and EN mark shall be embossed on the shell.
14. Guarantee: Minimum 1 year guarantee against any manufacturing defects for the lot shall be provided.

APPROVALS:
1. The helmet shall have BIS, DGMS and EN approval mark.

Note: Colour of Helmets for various working categories:
   a. O&M Personnel - Green Helmets
   b. F&S and Pipeline personnel - Yellow Helmets
   c. VIP & Visitors - White Helmets
   d. Contractor workers - Blue Helmets

Fig: I (i) : INDUSTRIAL SAFETY HELMET
I (ii) FIRE FIGHTER’s HELMET WITH VISOR

APPLICATION:
1. All-round head protection in any fire fighting
2. All-round head protection in rescue service whenever temperatures are significantly increased.

GENERAL:
1. The helmet should be designed to offer overall comprehensive protective solution to fireman. It should be designed and manufactured according to the basic principles of IS: 2745 / European Standard EN 443 Type B.
2. Mass of the complete helmet excluding visor shall not be exceeding 800gm
3. Each helmet to be marked with manufactures name / trade mark, size with color, year of manufacture & IS mark / ENS mark.

DETAIL OF HELMET SHELL:
1. Flame-retardant non metallic manufacturing material with expanded polystyrene padding, nylon retention system consisting of head band (minimum 30 mm wide and cushioned from shell with 5mm thick continuous corrugated shock absorbing material fixed around the head.
2. Protective padding material to be 8mm thick covering whole inner surface of shell to within 15mm of plane of anchorage of retention system to the shell. No gaps to be available in protective padding material that should not be readily detachable.
3. Extended to the back of the neck
4. Longitudinal exterior ribs and interior ventilation channel

HEADBAND:
1. Manufactured from Flame-retardant material
2. Possible adjustment of the head size should be 520mm to 620mm
3. High shock absorbing quality.
4. Lining of special material, which prevents skin irritation.

DETAILS OF CHINSTRAP:
1. Flame-retardant cotton material made-to-purpose.
2. Minimum 20 mm wide and anchored to shell, permanently fitted with a fastener to adjust & maintain tension and cradle (of anti concussion tapes at 08 equidistant points.
3. Size triangle connection for adjusting the head shape and the ear position of the helmet wearer.
4. Quick release snap connection
5. To adjust only when putting the helmet on the head for the first time.
6. Neck protector should conform to either IS: 6153-1971 or to respective ENS.

DETAIL OF VISOR:
1. Face protection against elevated temperatures and mechanical impacts
2. Made of flame-retardant polycarbonate
3. Scratch-resistant and anti-logging protection.
4. The holes for fixing arrangement should not be less than 5 mm size.
7. Visor should conform to either IS: 9995-1981 or to respective ENS.

APPROVAL:
It should have BIS mark / CE marked, Conformed to EN Std 443.

Fig: I (ii) : FIRE FIGHTER HELMET WITH VISOR
Section - II
EYE & EAR PROTECTION

EYE PROTECTION

II (i) WELDING GOGGLES

APPLICATION:
To be used for Eye protection during welding job.

GENERAL:
1. It must be designed as per EN Standards and have CE mark and Conformed to EN 166 / ANSI / DIN mark on it.
2. It should have thermal resistance and protection from UV/IR radiation.
3. The goggle should be providing total enclosure for both eyes.
4. The welding goggle shall consists of soft vinyl/polycarbonate frame, High-impact optical clear - class 1 polycarbonate lens in tinted Green lens of shade 5/7 as per EN 166 & (The shades of the goggles shall be used as per IR / UV radiation level due to different types of operations). It should have means of supports such as an adjustable headband to retain the goggles in front of the eyes. Ergonomically designed lens to ensure unrestricted all round vision.
5. It should be designed to be worn easily worn over numbered/power spectacles.
6. It should be certified for impact protection to EN STD for level F.
7. It should be hard coated to offer scratch resistance with “K” marking.
8. Should be Anti fog and be certified as per the EN standard with the “N” marking on the goggle.
9. The edge of the frame in contact with the face shall be flared so as to prevent cutting of the face and shall have a surface free from roughness or irregularities which may cause discomfort to the wearer.
10. Sample to be supplied along with offer.

APPROVALS: CE marked, Conformed to EN 166 requirement.

Fig: II (i) welding goggles
II(ii) CHEMICAL SPLASH PROOF GOGGLE

Application: Eye protection during handling of chemicals like batteries room, chemical dosing, lab sampling etc.

General:
1. It must be designed & have CE marked and conformed to EN Std. 166.
2. It should have one piece chemical resistant, high impact, crystal clear, polycarbonate lens with a soft vinyl frame which fits perfectly to irregular facial contours of individual wearer to ensure 100% sealing of the eyes against splash of liquids / chemicals. High-impact optical clear class 1 polycarbonate lens as per EN 166. Ergonomically designed lens to ensure unrestricted all round vision.
3. Should be designed to be worn easily worn over numbered spectacles.
4. Lens should provide a sweep of uninterrupted peripheral vision, with unobstructed lines of sight in both horizontal and vertical planes.
5. Shall be certified to impact protection to EN Std 166 for level B.
6. Shall be hard coated to offer scratch resistance with “K” marking and Anti fog and be certified as per the EN standard with the “N” marking on the goggle.
7. Goggles for protection against Liquid Droplets and Splash shall have Frame Markings of 3 / Goggle for protection against Gas and Fine Dust shall have Frame Markings of 5 as per EN Std 166.
8. Sample to be supplied along with offer.

APPROVALS:
CE marked, Conformed to EN Std 166 requirement.

Fig: II(ii) Chemical Splash Proof Goggle
II (iii) GRINDING GOGGLES

Application: To be used during grinding activity in plant or workshop.

General:
1. It must be designed & have CE mark.
2. It should have one piece high impact, crystal clear, polycarbonate lens with a soft vinyl ergonomically frame which fits perfectly to irregular facial contours of individual wearer. High-impact optical clear class 1 polycarbonate lens as per EN 166 to ensure unrestricted all round vision.
3. It should be designed to be worn easily worn over numbered spectacles.
4. Replaceable wrap-around lens
5. It shall be certified to impact protection to EN 166 for level B.
6. It shall be hard coated to offer scratch resistance with “K” marking and Anti fog and be certified as per the EN standard with the “N” marking on the goggle.
7. It should also meet the requirements of relevant BIS.
8. Sample to be supplied along with offer.

APPROVALS:
Approvals: CE marked, Conformed to EN Std 166 requirement.

Fig: II (iii) GRINDING GOGGLES
**II (iv) EAR PLUG**

**Application:** To be used in low & moderate noise areas to avoid recurring hearing loss

**General:**
1. Ear plug must be designed and have IS 9167 mark/CE mark certified to EN 352-2.
2. Material used in manufacturing shall not get damaged/deteriorate easily under normal handling and its strength and elasticity shall be suitable for the purpose.
3. The material of ear plug should be moisture proof, heat resistant and moulded from smooth polyurethane.
4. Earplug with synthetic threaded cord having following features:
   a. Smooth comfortable surface
   b. Tapered shape to resemble ear canal more easily.
   c. Non allergic
   d. Bright color for better visibility
   e. Self-adjusting elastic type, designed for comfortable feeling to the wearer and not to fall off easily from ear when being worn.
   f. Packed in individual polybag.
   g. Operating instruction on the packet containing the ear plug.
   h. Noise reduction not less than 25 dB.
5. Sample to be supplied along with the offer.

**APPROVALS:**
The earplug should be BIS approved / CE marked & conformed to EN352-2. Copy of the CE marked & conformed to EN352-2/ BIS approval to be submitted along with the offer and supply.

![Fig: II (iv) EAR PLUG](image-url)
II (vi) EAR MUFF

**Application:** To be used in high noise areas to avoid recurring hearing loss.

**General:**

1. Ear Muff should be light weight and have IS 9167 mark/ CE mark & conformed to EN 352-1 / ANSI approval
2. Earmuff shall be comprised of headband and adjustable ear cups with soft outer ring intended to fit snugly against the pinna or side of the head around the pinna. Ear muff should have multi position ear cups, contoured ear cushion, a soft padded head band for extra comfort and a sliding tension adjustment system allowing lateral movement of cup to maintain a good fit.
3. It should be capable to reduce the noise level by minimum 30 dB.
4. The adjustable headband and ear cup shall be extended to its largest size. No metal part should be used in design of the earmuff.
5. The earmuff should offer superior attenuation by filtering harmful sounds but allow communication.
6. Sample to be supplied along with the offer.
7. Supplier / vendor shall confirm that the material supplied will be having above certificates and certificate for the same to be submitted with the offer and supply.
8. **Note:** In case earmuff as accessory to helmet is required then the following shall be added to the above specification.
   Sliding provision to fit over the helmet to be provided with locking arrangement.

**TESTING AND APPROVAL:**

Earmuff shall be tested as per IS 9167 / CE marked & conformed to EN 352-1 / ANSI approval. The earmuff shall be tested at Govt. approved test lab / International accredited laboratory & certificate for the same to be furnished along with the offer.

[Image: II (vi) EAR MUFF]
Section - III
FACE & RESPIRATORY PROTECTION

III (i) FACE SHIELD

Application: To be used during handling of chemicals, Battery room, welding, grinding etc

General:
1. It must be have EN/ANSI/DIN approval.
2. Full cover face shield without crown and chin guard, sweat band, fully adjustable, ratchet type adjustable head band.
3. The face shield covered by this specification shall be designed to provide protection to the face (that is, the front of head including forehead, eyes, cheeks, nose, mouth and chin) and neck, when required protection from flying objects and splash of hazardous liquid & slag.
4. Face shield should be made out of optically clear polycarbonate with acrylic panoramic visor made out of molded sheet and shall be Class 1 certified and with frame marked B for protection against medium impact as per EN 166.
5. Face shield shall have mechanical strength and light weight and shall be non-irritating to the skin.
6. Face shield shall consist of headgear including an adjustable headband, durable tilting visor support without crown protector, removable and replaceable sweatband.
7. Headband shall be fabricated of good grade vulcanized fibre, acetate butyrate or equivalent material.
8. It should protect against acid, dust, splash, flying particles and similar hazards.
9. Size of face shield should be as per requirement and standard available in market i.e. 14.5”X9”.

APPROVAL AND TESTING:
The face shield should be CE marked & conformed to EN 166 for grinding test conditions. Copy of the approval certificates to be submitted along with the offer and supply. Test certificate to be provided along with offer and the supply.

Fig: III (i) FACE SHIELD
III (ii) RESPIRATORS

HALF FACE MASK WITH DOUBLE CARTRIDGE FILTER

**Application:** To be used during general maintenance/inspection activities in handling of toxic gases, fumes etc.

**General:**

1. Half Face Mask shall be IS:14746 / EN:140 marked complete with double filter cartridge (Acid Gases / Organic Vapour / Inorganic Vapours / Multi-Gas Filters - as per site requirement).

2. Face Mask shall be made up of light weight, hygienic, soft and easy to maintain thermoplastic elastomer.

3. Filter shall be IS:15323 / EN:14387 certified and marked with colour coded as per applicable standard for easy identification.

4. The supplied filter shall have maximum expiry period and manufacturing date should not be more than 6 months old at the time of supply to GAIL.

5. Date of manufacturing and shelf life for usage shall be marked on the body of the cartridge filter.

6. One pair of gas filter cartridge should be supplied with each face mask.

**APPROVALS:**

Copy of Approval / Certificate for respective BIS / EN standard for the Face Mask and Filters shall be submitted with offer and supply.

![Image of Half Face Mask with Double Cartridge Filter]
III (iii) FULL FACE MASK WITH DOUBLE FILTER

**Application:** To be used during general maintenance/inspection activities in handling of toxic gases, fumes etc.

**General:**
1. Full Face Mask shall be IS 14166 Marked / EN 136 marked complete with double filter (Acid Gases / Organic Vapour / Inorganic Vapours / Multi-Gas Filters - as per site requirement).
2. Face mask shall be of Silicon / Neoprene hygienic material providing leak proof fit over the face of wearer with 4 / 5 strap adjustable head harness.
3. Visor of the Face mask shall be of polycarbonate material, scratch and impact resistant with high clarity and shall provide wide view of vision to wearer.
4. Filter shall be IS 15323 / EN 14387 certified and marked, colour coded as per applicable standard for easy identification.
5. The supplied filter shall have maximum expiry period and manufacturing date should not be more than 6 months old at the time of supply to GAIL.
6. Date of manufacturing and shelf life for usage shall be marked on the body of the cartridge filter. One pair of filters should be supplied with each face mask.

**APPROVALS:**
Copy of Approval / Certificate for respective BIS / EN standard for the Face Mask and Filters shall be submitted with offer and supply.
III (iv) SELF CONTAINED BREATHING APPARATUS (SCBA)

Application:
To be used in enclosed space for rescue operation, fire fighting, emergency escape from control room etc.

A. GENERAL REQUIREMENT:
1. The BA Set shall be open circuit type compressed air breathing apparatus set confirming to EN 137: 2006 (Type 2) standard/BIS approval and should be of light weight. It shall have minimum 45 minutes duration at normal air consumption rate.
2. The BA set shall be with 6.8 L WC / 9.0 L, 300 bar carbon composite lightweight cylinder. The set shall include lightweight back plate, light weight filled breathing air cylinder face mask assembly, pressure reducers, lung demand valve, hoses, harness, ICU with motion sensor (digital pressure gauge, distress signal alarm, low pressure warning alarms etc.), cylinder cover.

B. CYLINDER:
1. Cylinder of air capacity 2000 ltrs. approx. (WC 6.8 L), 300 bar & shall be air filled.
2. The cylinder shall be light weight carbon composite material.
3. It should be approved by PESO along PESO permission for filling along with manufacturer detail certificates, reports shall be submitted.
4. It should be fitted with appropriate valve (EN 144)/BIS approved.

C. BACK PLATE & HARNESS:
1. The back plate shall be ergonomically designed and made of light weight material polyamide fibers/glass filled polyamide / Nylon & carbon fiber fitted with shocker at base for resting. It shall be universal /height adjustable to fit properly as per wearer requirement and cylinder used.
2. It should be orthopedically designed and chemical, heat & flame resistant, water resistant, anti static & non conductive and should have incorporated carrying handles.
3. All securing buckles shall be of the quick release type, designed for accessibility and easy handling.
4. The harness cylinder strap shall be made from 100% Kevlar/Para-aramid material and feature padded shoulder straps made up of flame/heat & water resistant material.
5. Quick release universal cylinder strap should be adjustable to accommodate the all standard cylinder size 04 ltr. to 09 ltr.
D. FACEMASK ASSEMBLY:
1. Full face mask shall be positive pressure and made up of Silicon with reflex seal, speech diaphragm, inner mask, five finger head band, neck strap meeting EN 136: 1988 class 3/BIS approved.
2. The facemask Visor shall be multi curvature and scratch & impact resistant polycarbonate material with flame retardant coating and provide the wide angle excellent panoramic vision.
3. Face mask shall comfortably fit to all face sizes & shall be packed in good quality plastic bag.
4. The visor shall be self-demisting type.
5. It should be fitted complete with speech diaphragm.
6. It should have inhalation and exhalation valves, replaceable type.

E. FIRST STAGE PRESSURE REDUCER:
1. The first stage pressure reducer shall be on the rear, lower portion of back plate.
2. The reducer shall be designed to function with either 200 or 300 bar cylinder.
3. High performance balanced, 1st stage reducer for 200/300 bar pressure cylinder shall be capable of giving flow of more than 550 lpm at cylinder pressure as low as 20 bars without any adjustment.
4. It should have additional/secondary medium pressure connection for accessories such as airline attachment or use of others in rescue operation.

F. DEMAND VALVE (SECONDSTAGE REDUCTION) & HOSES:
1. Balance piston/tilt type designed demand valve shall have 4-10 millibar activation pressure. It shall maintain positive pressure even at 10 bar & 300 lpm supply.
2. Demand valve should be quick plug connectible to face mask and to prevent accidental removal of demand valve.
3. Hoses shall be flexible and non-kinking type and non-collapsible.

G. B. A. SET SHALL HAVE FOLLOWING FEATURES:
1. The set shall be equipped with Digital pressure display as well as analog pressure gauge.
2. There should be provision to display / calculate the consumption of cylinder air and provide the working time (in minutes) left of BA set. (optional)
3. **Low pressure warning alarm**: Warning whistle should operate when 80-85% of air is consumed or 8-10 minutes supply is available & shall have sound exceeding 90 dB.

4. **Distress Signal Alarm**: An automatic motion sensor/distress signal alarm shall have inbuilt motion sensor to give the warning alarm during its operation. It shall have tally key provision with also manual distress signal features.

5. The unit shall be driven by suitable battery (& shall be supplied with material) with long operation life. It should be intrinsically safe to use in hazardous area: class 1, division 1 Group A, B, C or Ex ia IIC T3 or higher rating.

H. APPROVALS (TO BE SUBMITTED ALONG WITH OFFER / SUPPLY):
1. EN 137: 2006 (Type 2) approval for self-contained open circuit breathing apparatus.
2. EN 136 class 3 for face mask
3. Approval (ATEX/IECEx/UL) for intrinsically safe of ICU as mentioned above at G (v).
4. Cylinders CCOE certificate for use in India along with refilling permission. Cylinder manufacturer certificate (physical, chemical, hydro test certificate)
5. Warrantee certificate from manufacturer.

I. LITERATURE, CARRYING CASE, PERFORMANCE TEST, TRAINING:
1. Catalogue, literature of quoted BA set shall be submitted along with offer and supply.
2. Each BA set shall be supplied in suitable superior quality hard carrying wall mountable box / carrying case with BA set self-retaining arrangements and easy to donned from box for emergency use.
3. Performance Test & Training: Supplier shall arrange for performance test and training of 01 day of supplied BA set at GAIL with the supply.

Fig: III (iv) SELF CONTAINED BREATHING APPARATUS (SCBA)
III (v) DUST MASK RESPIRATOR

Application:
To be used in dusty area, construction sites, housekeeping jobs, refilling of DCP etc.

General:
1. The disposable mask/face piece respirator should be suitable for dust, mist, fumes found in industrial application. It should have filtering efficiency of 94% or more.
2. It should be provided with exhalation valve for breathing comfort. It should have non collapsible pre foamed nose/nose cup design and face seal with adjustable head straps for proper fitting.
3. It should be NIOSH certified N95 or EN 149 (FFP2 level) and marked accordingly on respirator. A copy of certificate should be send along with offer.
4. A sample should be send along with offer for evaluation.

Fig: III (v) DUST MASK RESPIRATOR
III (vi) EMERGENCY OXYGEN SET

**Application:** To be used in first aid centre and Ambulance for medical use only

**General:**
1. The emergency Oxygen set shall be lightweight and easy to handle & store.
2. The Oxygen cylinder shall be made of lightweight aluminum of 3 ltrs water capacity. The effective Medical Oxygen USP capacity shall not be less than 400 ltrs i.e. for 1 hour supply.
3. The carrying case shall be lightweight for easy mounting on wall.
4. The cylinder shall have permanently attached on/off handle for easy handling.
5. Pressure gauge shall be provided, post valve to read pressure in cylinder or to know the quantity of Oxygen in cylinder.
6. Medium concentration mask and 1 meter kink proof hose shall be supplied with 01 nos spare of each. The operating instruction shall be painted on the cylinder and carrying case.
7. PESO certification of cylinder is required along with cylinder and valve test certificate.
8. Pressure gauge calibration certificate shall be provided with the material.
9. The set shall be provided with 0 - 15 lpm adjustable flow regulator with calibration certificate & guard against excess flow.
10. Operation, maintenance & testing instruction shall be provided in separate booklet, in two sets.
11. System being a life support system all the certified relevant data/certificates safety against excess flow, cylinder tests and connected valves and piping etc shall be supplied.
12. The party shall provide warrantee and guarantee certificate of 12 months duration against manufacturer defects.

![Fig: III (vi) EMERGENCY OXYGEN SET](image)
**III (vii) EMERGENCY ESCAPE SET**  
*(COMPRESSED AIR CYLINDER TYPE)*

**Application:** To be used in control room for emergency escape in case of emergency

**General:**
1. Emergency Escape Breathing Mask with Compressed Air Cylinder shall be suitable for instant self-evacuation in a toxic / hazardous environment due to smoke and gas leakage.
2. The Mask shall be made of Fire retardant Elastomer / suitable material and offering panoramic / wide field of vision to the wearer and with Neck seal arrangement providing complete sealing of the hood on to the wearer’s neck.
3. The Emergency Breathing Apparatus shall have Compressed Air Cylinder providing 15 min. duration to the wearer.
4. The cylinder shall be made of Carbon composite light weight material and PESO approved.
5. The set shall be provided with easy to operate manual valve for cylinder / automatically activation type valve after opening of the Face hood (as per site requirement).
6. The entire set shall be light weight and supplied in flexible / rigid carrying case for ease of carrying & use during emergency.
7. The set shall be provided with warning whistle indicating low air pressure (For Automatic operating set)

**APPROVALS:**
1. The Escape Set shall conform to IS 10245 Part III & IV / EN Standard / NIOSH standard.
2. The Cylinder shall have PESO approval and PESO Test Certificate with Hydrostatic Stretch Test Certificate shall be submitted along with the supply.
3. Warranty certificate for 12 months shall be submitted with supply.
III (viii) EMERGENCY ESCAPE HOOD  
(FILTER TYPE)  
Application: To be used in building/control room during emergency escape from Gases, smoke, particles/dust etc. area  
General:  
1. Emergency Escape Hood with ABEK Filter (ABEK CO P3 Filter) shall be suitable for emergency evacuation with filter providing at least 15 minutes escape protection against industrial gases, fumes and particles.  
2. The hood shall be made of Fire retardant Elastomer / polyurethane suitable material and with wide, anti-fog lens offering clear view / wide field of vision to the wearer.  
3. Hood shall be provided with integral inner face mask / nose cup / nose mask providing comfortable fit to the wearer’s face.  
4. Head strap shall be easy to use / tight.  
5. Filter should be replaceable and it should have plug/thread type fitting.  
6. The ABEK filter shall be approved according to the DIN 58647-7 for filtering escape devices; additionally, the filter shall be tested in accordance with the EN 14387:2004 for gas and combined filter(s).  
7. The emergency escape hood shall be confirmed to EN 403 and CE marked.  
8. Hood with cartridge/filter shall be supplied along with its carrying bag  
Approvals:  
Approval / Test certificate for EN shall be submitted along with offer & supply.  

III (viii) EMERGENCY ESCAPE SET  
(FILTER TYPE)
Section - IV
HAND PROTECTION

IV (i) MECHANICAL PROTECTION

a. GLOVE FOR GENERAL MAINTENANCE:

Application: To be used for General Maintenance, material handling etc.

SPECIAL FEATURES
1. The glove should be made from cotton knitted material with Nitrile material coating on palm and fingers.
2. The glove should offer very good Abrasion resistance of Level 3, Cut resistance of Level 1 with very good grip.
3. Its Seamless liner should increase wearer comfort.
4. The ergonomic design should reduce Hand Fatigue.
5. The glove should offer Superior Dry grip.
6. The length of the glove should not be less than 240 mm.

APPROVAL:
The glove should be CE marked & conformed to EN 388 for mechanical resistance.

Fig: IV (i) (a) Hand-Gloves for General Maintenance
b. GLOVE FOR HIGH LEVEL OF MECHANICAL PROTECTION

Application:
To be used for heavy material handling where cut injury exposure is available.

GENERAL:
1. The glove should be made from Canvas Cotton fabric fully coated with Nitrile material on palm, fingers.
2. The glove should be provided with safety cuff for added protection.
3. The glove should provide excellent dry grip and superior service when handling rough and abrasive materials.
4. The glove should provide excellent resistance to snags, punctures, abrasions and cuts. Levels of protection –
   • Abrasion Resistance
   • Blade Cut Resistance
   • Tear Resistance
   • Puncture Resistance
   • Impact Resistance
5. The glove should have a length of 250 mm minimum.

APPROVAL:
The glove should be CE marked & conformed to EN 388 (latest edition).

Fig: IV (i) (b) Glove For High Level Of Mechanical Protection
IV(ii) ELECTRICAL RESISTANT HAND GLOVES

**Application:** To be used during Electrical equipment handling and maintenance on live electrical cables, panels, switch gear room, switch yard etc.

**General:**
FOR CLASS 4

1. **INSULATING GLOVES FOR ELECTRICAL WORKS** suitable for min. 33 KV in
   a. Category – RC
   b. Class - 4
   c. Thickness – mm (1) – 3.6
   d. Proof Test Voltage (2) – 40000
   e. Maximum Use Voltage (2) – 36000
   f. Length 360mm to 410mm

2. **MECHANICAL REQUIREMENTS:**
   a. Tensile strength : > 16Mpa
   b. Puncture resistance : >18N/mm
   c. Elongation at break : >600%
   d. Tension set : <15%

3. **CATEGORY: RC**
   a. Oil Resistance
   b. Resistance to Acid
   c. Resistance to ozone
   d. Resistance to very low temperatures

**APPROVAL:**
1. The glove should be CE marked & conformed to EN 60903(Latest revision) FOR CLASS 4 PROTECTION.
**Application:** To be used during handling of chemicals, acids, alkalis etc.

**General:**
1. The chemical hand glove should be made from a blend of latex and Neoprene coating for good chemical resistance.
2. The glove should offer protection for minimum 10 min. / 30 Min. / 60 Min. / having protection index of 1 / 2 / 3 respectively.
3. The gloves should offer maximum flexibility and dexterity combined with high performance and offer excellent protection against chemical hazards.

**APPROVALS:**
1. The glove should be CE marked & conformed to EN 374. Copy of Test Certificate shall be supplied along with offer and supply.
IV (iv) HEAT PROTECTION GLOVE

1. The glove should offer excellent protection of 350 / 500 Deg. C (as per site specific requirement).
2. The glove should be knitted in nature and offer excellent comfort and dexterity.
3. MOC shall be included (hold)
4. The glove should offer outstanding cut-resistance.
5. The glove should be reusable and offer long usage life.
6. The length of the glove should be 400 mm.

APPROVALS:
1. The glove should be CE marked & conformed to EN 407. Test certificate shall be submitted along with the offer and supply.

Fig: IV (iv) HEAT PROTECTION GLOVE
IV (v) LOW TEMPERATURE PROTECTION HAND GLOVE/

**Application:** Handling LPG, Propane, Ethylene, Low temperature chemicals etc

**General:**
1. The low temperature gloves should be of Butyl/Viton/PVC coated and should withstand temperature $-30$ (-ve thirty) Degree Celsius or higher -ve temp for 30 minutes without any damage and should have at least (2, 2, 1) rating as per EN 511. **Lab test report for use at or above $-30$ (-ve thirty) degree Celsius should be submitted with supply.**

2. The gloves should have excellent grip, flexibility and dexterity with high mechanical hazard (resistance to cut, abrasion, tear, puncture) protection and at least 2,1,2,2 rating as per EN 388. It should be supplied in four finger and thumb design. The length of hand gloves should have proper fitting on hand. Size: 9/10 inch.

3. It should have resistance to permeation by chemicals and shall have at least level 3 or more than 60 minutes protection as per EN 374-3.

4. The hand gloves shall meet the requirement of EN: 374, 388, 511 and all test certificates required as per above should be sent along with the offer.

5. A sample hand gloves and literature should be sent with offer for evaluation.

---

Fig: IV (v) LOW TEMPERATURE PROTECTION HAND GLOVE
Application: For grinders and for high mechanical protection

GENERAL:
1. Fore Arm Guards suitable for Grinders and providing protection to complete forearm should be made from high quality chrome leather / soft leather with internal protection lining.
2. Fore Arm Guards should be provided with suitable straps for securing to the forearm / body of the wearer.
3. Arm Guard should provide high level of mechanical protection and excellent resistance to punctures, abrasions and cuts.
4. The gauntlet should be IS: 2754 marked.

Fig: IV (vi) FORE ARM GUARD FOR GRINDERS
Section - V

BODY PROTECTION

V (i) CHEMICAL PROTECTION SUIT

**Application:** To be used in battery room, chemical handling.

**GENERAL:**
Fully encapsulated chemical suit designed for use in conjunction with self contained breathing apparatus worn inside the suit. It should have a fully sealed hood with visor, attached lightweight chemical isolation gloves, attached boots without zips and rear mounted breathing apparatus (BA) pouch.

**Special Features:**
1. The suit should be made from highly chemically resistant fabric.
2. BA Pouch should be such that it should fit to most of the types of B. A. Sets.
3. The suit should be provided with heavy duty frost free visor and it should be both chemical resistant and low misting. This visor should be replaceable and one no of spare visor to be supplied along with the suit.
4. Integral Chemical gloves
5. Integral Booties
6. This suit design should enable easy gauge checking from within / outside the suit without hampering the performance of the suit.
7. The suit should be provided with adjustable internal support braces which increase mobility and enable users of varying sizes to comfortably wear the suit.
8. The suit should be antistatic and tested to EN 1149-1.
9. The suit must be supplied with EN certified Chemical boot and EN 374 certified glove and the complete suit shall be EN certified.
10. The suit should be available in size L, XL and XXL.

**APPROVALS:**
The suit should be CE marked & conformed to EN for Type 3 and Type 4 protection.

---

Fig: V (i) CHEMICAL PROTECTION SUIT
V (ii) CHEMICAL PROTECTIVE SUIT (3 PIECE)

Application: Battery room, chemical handling etc.

GENERAL:
The Chemical protective suit should be manufactured in Coat, Pant and Hood design. (3 Pieces)

SPECIAL FEATURES:
1. The suit should be extremely lightweight. It should offer the wearer excellent protection and high level of comfort.
2. The suit should be made from soft and flexible material made from multi-layered fabric that combines an effective chemical barrier with softness, flexibility and remarkably light to the wearer.
3. The suit should have ultrasonically welded seams ensuring no penetration of liquids through seams.
4. The suit should offer effective protection against hazardous liquid chemicals in Type 3 (pressure spray i.e. strong jet of liquid) and Type 4 (Saturation spray i.e. lighter spray such as that from a sprinkler system) applications as per for Type 3 and Type 4 protection to EN 14605
5. The suit should be antistatic and tested to EN 1149-1.
6. The suit should be available in size L, XL and XXL.

DESIGN OF COAT, PANT & HOOD:
1. The coat should be designed with double overlapping (double) Zip arrangement for complete chemical protection.
2. The sleeves should be provided with double sleeve (cuff) design to enable a liquid tight Protection along with chemical gloves.
3. All seams should be ultrasonically welded.
4. The coat should be provided with elastic at the waist for better fitting.

PANT:
1. The Pant should be provided with elastic at the waist for better & comfortable fit.
2. All seams should be ultrasonically welded.
3. The bottom of the pant should be provided with elastic for better fit over chemical boots.

HOOD:
1. The hood should be designed to cover the head and shoulder area.
2. The hood should be provided with acrylic / polycarbonate visor.
3. All seams should be ultrasonically welded.
4. The hood should be provided with replaceable inner head band for better fitting arrangement.

APPROVALS:
The suit should be CE marked and conformed to **EN 14605 Type 3 and Type 4 protection.**

**V (ii) CHEMICAL PROTECTIVE SUIT (3 PIECE)**
**V (iii) LOW TEMPERATURE SUIT**

**Application:** Handling LPG, Propane, Ethylene, Low temperature chemicals etc.

**GENERAL:**
Low Temperature Suit (Butyl / Viton etc.) suitable for protection against impingement of Liquefied Petroleum Gas / low temperature liquid (Liquid and / vapour- liquid mixture).

Suit must meet NFPA – 1991 /EN Std. requirements including additional provisions for liquefied gases. Vendor to quote the standard according to which the suit has been manufactured and also submit the comparative statement showing equivalence of the standard with NFPA – 1991.

Inside temperature of the suit should remain within allowable tolerable temperature limits of human skin as per International Standards while exposed to the conditions of LPG impingement as mentioned above.

1. The suit should be one piece design with integral boots, gloves and wide vision visor. It should be fully encapsulated, hermetically sealed throughout and accordingly provide full protection to wearer. The suit should have arrangement for internal breathing apparatus set. The sleeves of the suit should be bat wing in design which enables the wearer to adjust breathing apparatus internally and also has connection for supplementary air and ventilation.
2. Suit should be capable of being worn over normal clothes. Suit shall be suitable for human height ranging from 165 cms. to 180 cms.
3. The product must be as per latest NFPA / European standard (Pr EN-943-2: 2002 (ET)). Suit shall be imported and copy of import certificate along with supply of suit shall be furnished.
4. The date of manufacture of the suit shall not be more than 6 months at the time of supply.
5. Material: The material of the suit should be Butyl / Viton etc. coated with polyamide fabric for use in LPG / low temperature liquid.
6. Visor: It should be double glazed giving a wide field of vision. The inner visor shall be moulded inherently and of anti mist material and the outer visor should be moulded in highly chemical resistant material. The thickness of
visor shall be such that it can withstand grade 2 impacts. The size of the visor should be such that it will provide the wearer excellent all-round vision.

7. Zip: A heavy duty 120 cm. Air/Gas tight, leak proof stainless steel / rust proof metal (non-sparking) zipper reinforced with rubber seal should be fitted to the left hand side of the suit.

8. Cuff: Cuff should be fitted with unique gas tight cone and locking ring system consisting of ring, cone and grommet so that if the gloves get damaged it can be replaced easily.

9. Gloves: Made up of suitable material of adequate thermal characteristics equivalent to material used for suit of size 8 / 9 / 10 (as per requirement) are to be provided, these gloves should be attached to the suit by gas tight cone and locking ring system, ensuring simple replacement of damaged gloves. Spare two pairs of gloves to be provided along with suit.

10. Boots: Highly chemical resistance Hazmax safety boots of size 8 / 9 / 10 (as per requirement) having steel toe cap and antislip midsole permanently bonded to the suit shall be provided.

11. Exhalation Valve: Within the body of suit there should be sufficient numbers of exhalation valves to release excess pressure.

12. Air system: A chrome plated brass high pressure swivel pass through should be fitted to the left hand side of the suit s to enable supplementary air via an airline (external source) to be fed into the suit and connected to the airline attachment on the breathing apparatus. A waist belt worn around the wear’s middle should support the air system internally. A wide range of air line coupling should be supplied to ensure compatibility with any breathing apparatus.

13. Low Temperature: The suit should be capable of withstanding a temperature as per NFPA / EN Std.

14. Size: Large, Extra Large (as per site requirement)

15. The suit shall be light in weight so that wearing is comfortable.

16. Carrying case: They should be packed in a rigid carrying case.

17. Test Certificate: The manufacturer shall give test certificate for its low temperature resistance as per latest relevant NFPA / EN Std. and suitability for use in LPG / Low temperature liquid along-with bid and also at the time of supply.

18. Guarantee: A guarantee of 2 years against any operating and manufacturing defects shall be given by supplier. Certificate for same should also be supplied.
19. Manual: Detail operation manual and maintenance procedure to be supplied along with suit.
   The vendor to clearly specify the following:
20. Shelf life (shall not be less than 5 years under specified storage conditions)
21. Batch number, date of manufacture, suit model no., style and Serial No., country of origin, manufacturer’s address and testing method.
22. Operation, maintenance, storage and cleaning guidelines along with the catalogues / booklets / video.
23. The precautions to use the suit and the conditions under which the suit is not to be used.
24. Vendor has to certify the compliance w.r.t all specifications and conditions given here. Compliance of NFPA – 1991. If the specific offered model is already certified under NFPA – 1991 or EN Std., vendor has to submit such document and address who has tested and issued such certificate.

Pre dispatch Inspection: Inspection/testing of suit shall be carried out by GAIL representative at manufacturer site. Manufacturer / vendor shall make arrangements for testing the suit as per applicable standard. Manufacturer / vendor shall bear all the expenses for carrying out the testing of suit. Note: If the PDI at foreign country, then PDI will be carried out for bulk procurement only i.e. procurement of suit should be 10 & more. One site of GAIL may procure centrally for bulk.

V (iii) LOW TEMPERATURE SUIT
V (iv) FIRE RETARDANT SUIT (SINGLE LAYER)

**Application:** To be used by O&M personnel during normal preventive maintenance and operational activities.

**GENERAL:**
1. The coverall shall be made of 100% inherently flame resistant fabric. The fabric shall be of 200 - 220 GSM.
2. It shall be in full sleeve one piece (Dangri).
3. Design: High protective collar with throat guard, encapsulate on each shoulder, touch and close fastening Front double sided zip closure covered by flap with touch and close fastening Elasticised waist at back. Zip and vent closure at sleeve ends.
4. Pockets: 02 pockets at chest, 02 hip pockets with Velcro flap & 02 side pockets.
5. 3M brand or fabric manufacturer own brand flame retardant retro reflective tape bands of white / yellow colour shall be on chest, shoulder back & below elbows & knee.
6. The fabric shall be inherently Flame Retardant and not coated / Treated for Fire Retardant properties. Certificate shall be provided in support for clothing.
7. Fabric shall be compliant to NFPA 2112 Std.
8. The fabric shall have very good antistatic properties (static charge dissipative properties). The overall shall be certified to EN 1149 - 5.
9. Complete coverall shall be stitched with 100% flame retardant thread and all material used for suit shall have flame retardant properties.
10. The accessories used for the garments like zip, threads, reflectives etc. should be Fire Retardant. The inside lining of the pockets shall also be made of material having flame retardant properties.
11. The garment should have more than 250 wash cycles without losing the Fire Retardant properties.
12. Approvals: Fabric shall meet the requirements of EN 15025. Coverall shall confirm to EN – 11612. EN approvals shall be submitted along with offer.
13. Marking / Stamping on the suits:
   a. Manufacturer Name.
   b. Size, Washing Instruction
   c. CE certification with EN
   d. Pictogram of EN
14. Size: As per site requirements
15. Necessary approvals shall be submitted along with offer and Test Certificates, Warranty & Guarantee Certificate for 01 year shall be supplied along with the supply of material.

16. **Colour** of overall: Navy blue/Orange.

17. **Sample**: Bidder must submit the piece of fabric cloth along with offer/bid.

V (iv) FIRE RETARDANT SUIT (SINGLE LAYER)
**V (v) FIREMAN SUIT (THREE LAYER)**
**(APPROVED TO NFPA 1971 (LATEST EDITION) AND CERTIFIED BY UL)**

**Application:** To be used by F&S personnel for turnout during fire fighting/tackling emergency.

**A. GENERAL:**
1. The suit shall be three layer suit (outer-thermal heat protection layer, middle-moisture barrier and inner-thermal barrier).
2. Complete suit (consist of jacket & trouser, helmet, knitted sock hood, hand gloves & a pair of boot) shall be supplied by the party.
3. The complete suit shall be suitable for protection against hazards of flash fire/hazard of entrapment (structural fire fighting).
4. The complete suit (consist of jacket & trouser, helmet, knitted sock hood, hand gloves & a pair of boot) shall be approved to NFPA 1971 (Latest edition) and certified by UL.

**B. JACKET AND TROUSER (Approved to NFPA 1971 (Latest Edition) AND CERTIFIED BY UL):**
1. The suit jacket and trouser shall be certified to NFPA 1971 or latest edition category/higher rating and other condition of the above standard.
2. The suit shall be three layers clothing in two piece i.e. trouser & jacket pattern.
3. There shall be an overlap between the jacket and trouser which shall always remain whilst carrying out job whatever be the position of body parts or the movements are during the work. Suit jacket shall cover throat and neck for protection.
4. Retro-reflective and/or fluorescent elements shall be provided on suit jacket, trouser around lower part of the sleeves, etc. of at least 5 Cms.
5. Adequate number of pockets for shall be provided to suit jacket and trouser for carrying essential tools e.g. communication / radio equipments etc.
6. Suit jackets and trousers shall be supplied in sizes to suit the suitable for persons of height (in cm) 1) 165-170, 2) 171-175, 3) 176-185 (i.e. shirt size 38-40, 42-44, 46-48 and waist size 30-32, 34-36, 38-42 inch approx.) or as per site requirement.
7. Suit trouser shall be given adequate support provision (elasticized, adjustable braces etc.) so that it shall not slip during use.
8. Suit jacket, trouser shall be front open type with suitable sealing, flap closure of suit material. Trouser shall be reinforced at knee level. The stitching shall be by high strength flame retardant material thread (Eg. Kevlar / Para aramid fibers / Met aramid fibers).
9. Suit jacket sleeves shall have suitable arrangement at cuff for firm tight fitting with hand gloves.
10. Suit trouser shall be suitable for use over the boot.
11. The suit jacket and trouser shall be approved to NFPA 1971 (Latest edition) and certified by UL.

C. HELMET APPROVED TO NFPA 1971 (Latest Edition) AND CERTIFIED BY UL
1. The helmet shall be lightweight and approved to NFPA 1971 (Latest edition) and certified by UL.
2. The helmet shall provide protection from high heat, impact with extreme temperature resistance against hydrocarbon fires.
3. There shall be an adequate overlap between the helmet and jacket neck collar and suitable equivalent rating for protection of neck, ears.
4. Helmet shall have adjustable head sizes (50-64 cm approx.) fitting & adjustable flame retardant chinstrap. Helmet shall have Luminescent and reflective tapes visible from all sides and in all conditions.
5. Helmet shall have retractable scratch resistant, anti-fog face protector-visor. The chinstrap shall not cause irritation.

D. KNITTED SOCK HOOD (Approved to NFPA 1971 (Latest Edition) AND CERTIFIED BY UL)
1. The knitted sock hood shall be certified approved to NFPA 1971 (Latest edition) and certified by UL.
2. Knitted sock hood shall provide protection from heat.
3. There shall be an overlap between the knitted sock hood and jacket which shall always remain whilst carrying out job whatever be the movements are during the job. Knitted sock hood shall cover head, ears, throat and neck for protection and perfect fit.
4. It should facilitate use of face mask, helmet, throat-ear communication device/kit.

E. HAND GLOVES (Approved to NFPA 1971 (Latest edition) AND CERTIFIED BY UL)
1. The fireman hand gloves shall be certified approved to NFPA 1971 (Latest edition) and certified by UL.
2. The fireman hand gloves shall provide firm fitting and protection from heat, abrasion, cutting. It should be provided with inner lining.
3. The fireman hand gloves shall have wristband or suitable closing arrangement for firm hand fitting.
4. There shall be an adequate overlap between the hand gloves and suit jacket sleeves for effective heat protection during job.
5. Fireman hand gloves suitable for palm size appropriate sizes / as per site requirement shall be supplied.
F. BOOT (Approved to NFPA 1971 (Latest edition) and certified by UL.)
1. The fireman boots shall be approved to NFPA 1971 (Latest edition) and certified by UL.
2. The fireman boots shall have flame retardant outsole with heat insulation, antiskid sole, toe cap, cotton lining etc. It shall be designed for high temperature F2 level protection, high heat insulation.
3. Fireman boots of sizes as per European Sizes / as per site requirement shall be supplied.

G. Certificates, literature
1. UL certificate for approval of suit approved to NFPA 1971 (Latest edition) for complete suit and accessories (suit jacket & trouser, helmet, knitted sock hood, hand glove, boot) as per above requirements shall be sent along with the offer & material.
2. Technical information / literature / catalogue, actual photograph / booklet depicting pictures of materials offered by the party shall be send along with the offer.
3. Operation & maintenance information / manual (suit jacket & trouser, helmet, knitted sock hood, hand glove, boot) shall be provided along with the material.

H. Pre dispatch Inspection: Inspection/testing of suit shall be carried out by GAIL representative at manufacturer site. Manufacturer / vendor shall make arrangements for testing the suit as per applicable standard. Manufacturer / vendor shall bear all the expenses for carrying out the testing of suit.

Note: If the PDI at foreign country, then PDI will be carried out for bulk procurement only i.e. procurement of suit should be 20 & more. One site of GAIL may procure centrally for bulk.

Fig: V (v) FIREMAN SUIT (THREE LAYER)
V (v) Electrical Arc Resistant Suit/ Electrical Arc Flash Protective Suit

Application: To be used by Electrical personnel during maintenance activity over the electrical panels/equipment etc.

General:

Material of Construction

1. The suit shall be made for maximum arc protection and the fabric used shall able to offer protection against Electrical ARC with max Mechanical strength.
2. The suit shall be designed with COAT, PANT, HOOD, GLOVES & SHOES of the fabric with maximum level of protection.
3. The fabric shall offer protection against ATPV 65 kcal / cm2
4. It shall offer a unique combination of Chemical & mechanical properties.

The design of the suit

COAT:

1. ARC Heat flux 65 kcal / cm2.
2. The coat shall provide with single / double fabric designed to offer maximum protection with limited discomfort to the user.
3. It shall be provided with double front closure with flame retardant Zipper tape
4. The sleeves of the coat are provided with knitted sleeve cuff.
5. The coat is stitched with inherent FR and with strong thread.

PANT

1. ARC Heat flux 65 kcal / cm2
2. The Pant shall be provided with single / double fabric designed to offer maximum protection with limited discomfort to the user.
3. It shall be provided with heavy duty flame retardant suspenders for better fit.
4. It shall be provided with hemmed leg with no need for strap for tightening.
5. It shall be stitched with inherent FR and with strong thread.

HEAD PROTECTION / HOOD

1. Arc heat flux 65 kcal / cm2
2. The visor of the hood shall be having sufficient strength with energy absorbing polycarbonate plastic.
3. The visor shall provide superior Visible Light Transmission (VLT).
4. The visor is coated on the outer surface to be scratch resistant to extend their use life, with a permanent Anti – fog coating on the inner surface to avoid fogging.
5. The hood shall be designed keeping in mind to offer maximum comfort and head space.

**ELECTRICAL COMPOSING INSULATING GLOVES - CLASS 4**

1. The gloves shall have protection from electrical arc flash over.
2. The composite base offers high dielectric characteristics.
3. The gloves shall be designed to give maximum comfort for ease of operation.
4. Manufactured according to the standards (EN -60903 & IEC-60903).
5. The length of gloves is 12”/ 14” (As per site requirement).

**STANDARD:**
EN 60903:2003; CEI 60903:2014
Test report regarding IEC 61482-02 (class 2 / 7KA-0,5 sec), ASTM F2675

**APPROVAL REQUIRED:**
1. Fabric shall be tested and certified to EN. The suit shall be made from SILICON Coated Aramid based ISO 15025 & EN 388:2003 STANDARD- LEVEL 3, 3, 5, 2
2. Shelf life of the suit shall be provided with proven records and its stowing procedure.
3. The thread used for the suit shall have details of physical and chemical properties and its relevant test that reveals that suit offer the level of protection as intended.
4. Sample of cloth of sufficient size shall be sent along with offer.
5. The manufacturer shall give test certificate for its ARC resistance as per required standard.
6. Certificate for the fabric base and coated material and its technical data with result shall be provided.

**NOTE:** Heat flux calculation for correct selection of appropriate arc protection suit shall be necessarily carried out by inhouse team or third party and finalize the Arc heat flux resistivity. The above suit is based on the Arc heat flux 65 kcal / cm²

![Electric Arc Resistant Suit](image)

**Fig: V (v) Electric Arc Resistant Suit**
**V (vi) STEAM PROTECTION SUIT**

**Application:** To be used during hot liquid handling in plant area like steam etc.

**GENERAL:**

**Material of Construction**

1. The suit shall be made from SILICON Coated and ARAMID fiber base material. The fabric shall be able to offer protection against hot liquid splash / steam of temperature up to 350°C.
2. The suit shall be designed with single piece unit or may be provided with COAT, PANT, HOOD, GLOVES & SHOES of the same fabric with same level of protection as per site requirement. It means site may procure either single piece or three piece units with accessories.
3. The fabric shall offer protection against hot liquid splash of temperature up to 350°C.
4. It shall offer a unique combination of Chemical & mechanical properties.

**The design of the suit**

**COAT:**

1. The coat shall be provided with front Zip fastening arrangement with overlapping flap with Velcro provision.
2. It shall be provided with collar.
3. The sleeves of the coat are provided with elastic wrist with good strength.
4. It shall be stitched with flame retardant and with strong thread.

**PANT**

1. The pant shall have heavy duty elastic at the waist and suspender with loop for fit adjustment.
2. It shall be with elastic at the bottom.
3. It shall be stitched with flame retardant and with strong thread.

**HOOD**

1. The hood shall be designed to cover the full head area and overlapping the shoulder.
2. It shall be provided with two fastening arrangements to hold the hood firmly on the head.
3. It shall be provided with panoramic clear vision.
4. The inner of the hood shall be provided with head band for securing firmly on users head.
5. The hood shall be stitched with flame retardant and with strong thread.
GLOVES
1. The gloves shall be designed to give maximum comfort for ease of operation.
2. The length of gloves is 12”/ 14”(as per site requirement).

SHOES
1. The shoes shall be designed to give maximum comfort for ease of operation.
2. The shoe size shall be UK size 7, 8, 9, 10, 11 etc (as per site requirement)

APPROVALS:
1. Fabric shall be tested and certified to EN. The suit shall be made from SILICON Coated Aramid based ISO 15025 & EN 388:2003 STANDARD- LEVEL 3, 3, 5, 2
2. Shelf life of the suit shall be provided with proven records and its stowing procedure.
3. The thread used for the suit shall have details of physical and chemical properties and its relevant test that reveals that suit offer the level of protection as intended.
4. Sample of fabric of sufficient size shall be sent along with offer.
5. The manufacturer shall give test certificate for its temperature resistance as per required standard.

Certificate for the fabric base and coated material and its technical data with results shall be furnished.

Fig: V (vi): STEAM SUIT
V (vii). WATER GEL BASED BLANKETS & BURN DRESSINGS

Application: To be apply over burned surface of body as First aid.

General:
1. Water gel-soaked Blankets made from 100 % wool base and -soaked in sterile protective water gel, dressings and wraps made of 100 % Polyester.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of material</th>
<th>Approx. Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Burn Wrap</td>
<td>3’ X 2.5’</td>
</tr>
<tr>
<td>2</td>
<td>Burn Mini-wrap</td>
<td>18” X 8”</td>
</tr>
<tr>
<td>3</td>
<td>Burn Dressings</td>
<td>4” X 16”</td>
</tr>
<tr>
<td>4</td>
<td>Fire blankets</td>
<td>2.4mX1.6m / 6’ X 5’</td>
</tr>
<tr>
<td>5</td>
<td>Burn dressings for facial burns</td>
<td>12” X 16”</td>
</tr>
</tbody>
</table>

2. The water-based gel shall be sterile, chemically stable, and capable of lowering of skin temperature with prevention of contamination by protection of burn wounds and contain minimum 96% of water as main component and gelling agent and stabilizer as remaining components.

3. Blankets/dressings and gel shall be easily removable / non-sticky and should not shred threads etc. at the burned body part.

4. The boiling point of gel shall not be less than 92 °C and freezing point shall be –15 °C.

5. Blankets shall be primarily provided in polyethylene bags and then in sturdy plastic containers for easy storage and portability. Dressings shall be suitably packed in polyethylene pouches for ensuring maximum durability & avoid contamination. Airtightness is to be ensured by the supplier.

6. The party shall provide details of Microbiological limits and properties, Heat test / Burn through test, Chemical composition of gel, Sterility Assurance material, Material Safety Data Sheet along with the offer and product. Test certificate shall be provided along with the supply of the materials. Verification of the batch of production is to be checked by the inspecting authority (GAIL).

7. Shelf life: 5 Years (minimum). Product manufacturing date should not be more than 6 months old at the time of delivery.

8. The blankets should be FDA & CE approved.
**V (viii) FULL BODY SAFETY HARNESS**

**Application:** To be used by maintenance personnel when working at height.

**General:**

1. Safety body harness shall be of Polyamide webbing in two colors made of adjustable 45 mm polyamide shoulder, thigh seat, chest and waist straps.
2. The safety harness shall be double lanyard and provided with, adjustable buckles in high strength zinc plated steel, 2 chest attachment D-Ring and a dorsal attachment D-Rings with ID plates/locking arrangement.
3. Lanyard shall be 3 strand rope lanyard (life line) of ½” diameter and 2 meter length having 20 kN strength; with one side loop/thimble and one side karabiner self locking with manual adjustable collar and shall be attached to body harness.
4. Kinetic energy absorber fork shall be provided Twin rope (polyamide rope) lanyards attached to dorsal D ring, **with scaffold hook as anchorage points.**
5. The system shall be CE mark and certified to International Standards (EN 361). Also it should meet the requirement IS 3521. The Party shall submit with the offer, certificates of testing of the entire system / all individual units including the rope clearly specifying their strength and capacity, obtained from the Government Approved Laboratory / International Laboratory.

6. **The safety harness shall be of anti-static type.**
7. Certificates of testing & approval shall be supplied with offer and supply.
8. Proper stacking, use, testing instruction, procedure & periodicity shall be submitted by party along with offer.
9. The party shall provide warrantee and guarantee of 12 months for the system.

![Fig: V (viii) FULL BODY SAFETY HARNESS](image)
**V (ix) SELF RETRACTING LIFELINE (FALL ARRESTOR)**

**Application:** For work at height and enclosed space

**General:**
1. It should be an automatic locking system in the event of fall.
2. Retractable length: 5-6 M. However, length can be modified as per the requirement of site.
3. Housing: Durable thermoplastic/ABS/PP casing and wide opening karabiner as connector/anchoring point and 1 Mtr length, dia. 4-5 mm (approx.) wire rope sling for anchoring on beam, pipe etc.
4. Rope/Cable lifeline: Galvanized steel/SS rope.
5. It should have connector attached to wire rope of swivel eye type, double locking snap hook, fall indicator.
6. Approval: CE Marked and conformed to EN 360. Copy of approval/certificate shall be submitted along with the offer.
7. All relevant test certificates, operation & maintenance manual/leaflet shall be submitted along with bulk supply.

Fig: V (ix) SELF RETRACTING LIFELINE (FALL ARRESTOR)
V (x) FALL ARRESTOR FOR WORKING AT HEIGHT WITH WINCH / HANDLE

**Application:** For work at height and enclosed space/vessel entry along with tripod

**General:**

1. It should be an automatic locking system in the event of fall.
2. It should be useful for rapid evacuation (upward or downwards) of a person who has arrested due to fall with the help of handle fitted to fall arrestor.
3. It should have two modes. Auto: for arresting the fall and Manual: for taking person upward and downward manually.
4. Retractable length: 18-20 M.
5. Housing: Durable thermoplastic /ABS/PP casing and wide opening karabiner as connector/anchoring point and 1 Mtr length, dia. 4-5 mm (appro.) wire rope sling for anchoring on beam, pipe etc.
6. Rope/Cable lifeline: Galvanized steel/SS rope.
7. It should have connector attached to wire rope of swivel eye type, double locking snap hook, with fall indicator.
8. Approval: CE Marked and conformed to EN 360. Copy of approval/certificate shall be submitted along with the offer.
9. All relevant test certificate, operation & maintenance manual/leaflet shall be submitted along with bulk supply.

**Fig:** V (x) FALL ARRESTOR FOR WORKING AT HEIGHT WITH WINCH / HANDLE
Section - VI
FOOT PROTECTION

VI (i) ELECTRICAL SAFETY SHOE

Application: To be used by electrical O&M personnel during general maintenance.

General:
1. Safety shoe should have four eyelets (on one side) suitable for use in industries should be safe, elegant and comfortable in wearing in different size.
2. Lather: Good quality of assorted color leather with full grain finish.
4. Electrical Safety shoe should be having non-metallic toe cap. Sole: Non skid, antistatic, PU (Polyurethane) double density sole having acid, alkali and oil resistance (Manufacturer certificate should be attached) and of assorted color.
5. Sole Fixing: Direct Injection molding process.
6. Tongue: Full tongue stitched with upper.
7. Stitching: Minimum two lines at joint.
8. Lace should be flat good quality with breaking strength 45-55 Kg.
10. Maximum Weight: Should not exceed 1000 gms (For pair Size -8)
11. It should be heat resistant minimum up to 100 Deg C
12. Electrical safety shoe must confirm to relevant IS & tested at 15 KV.
13. The inspection for Electrical safety shoes to be carried out & shall be tested at 15KV as per IS requirement from the supplied lot & test certificate also to be produced. The inspection charges shall bear by party.
14. Size: Strictly as per the standard size of BATA / Liberty.
15. Guarantee: One year against any manufacturing defect.
16. Sample shoe of size No. 8 to be sent along with the offer for quality and measurement purpose on returnable basis.

Fig: VI (i) ELECTRICAL SAFETY SHOE
VI (ii) GUM BOOT

Application: To be used by O&M personnel during night time in plant area, during gardening, grass cutting by civil labors, in plant areas where unknown risk of serpent bites available etc.

General:
1. The gum boots shall be full size, black colour and made from Rubber/PVC
2. It shall be provided with inner cotton lining up to knee.
3. It should be acid & alkali resistant.
4. Gum boot of reputed brand like Liberty / Bata / Duck back.
5. Sizes of gum boots shall be as per site requirement.
6. The detailed catalogue, literature and sample of one gum boot shall be submitted with offer.

Fig: VI (ii) GUM BOOT
VI (iii) INDUSTRIAL SAFETY SHOES

**Application:** To be used by O&M personnel in plant premises.

**General:**

1. High Quality low ankle Industrial Safety Shoes should be
   a. Made from 100% mammal leather. High-grade leather must be used for making the shoes.
   b. Colour should be Black
   c. Finish: Grain or Plain
   d. Shall be necessarily either IS 15298 marked (IS 15298 part-2 latest) or ENS 20345 approved and confirming to following specifications.

2. Steel toes / hard toe provided in the shoes shall be marked with relevant IS mark / ENS mark, manufactured and tested to International standard / European Standards.

3. Inner lining must be of superior quality of soft leather / cambrell.

4. Tongue must be stitched from both sides with upper leather.

5. Double stitching shall be provided at all angular and interlinking joints.

6. Sole shall be
   - Made up of black colored PU material
   - With direct injection molding process.

   Sole shall be
   - Anti-static
   - Acid-Alkali resistant
   - Water Resistant
   - Shock absorbent and
   - Heat resistant

   as per IS/International Standard. Certificates must be enclosed in this regard along with offer for scrutiny.

7. Maximum weight shall not exceed 1000 grams for size no. 08 (one pair). Weight of shoes of smaller or larger sizes should be within ± 10% per size. Light weight shoes meeting with all other requirements will be preferred.

8. Soft cushion / Foam padding shall be provided around the collar with high quality filament mat (fiber reinforced thermoplastic resin) material for greater comfort.

9. Shoe shall be well comfortable for continuous heavy-duty industrial use. Shoes giving more comfort to wear will be preferred.
10. Minimum Warranty/Guarantee of One Year from the date of receipt of material at site against any manufacturing defect and free replacement during this period (either in used condition or under storing condition) shall be given at the time of delivery.

11. Small sized minimum four numbers of eyelets/brackets on each side with round/flat lace shall be provided.

12. The party shall submit a pair of shoes of size 08 as sample on non-returnable basis along with offer for approval / technical evaluation.

13. Any no. of samples drawn at random from the stock manufactured for GAIL may be expended during inspection procedure, as the sample is to be damaged for verification of IS Mark, etc. All tests of shoes shall be carried out as per standard and our specifications at vendor’s site in presence of M/s GAIL’s representative. Relevant tests as per BIS must be shown in a BIS approved Laboratory, at the time of PDI and documentary support shall be submitted with Delivery. All necessary arrangements regarding testing of shoes shall be in scope of vendor.

14. Party shall submit valid testing certificate from ENS approved Laboratory / Govt. Approved / IS Laboratory as deemed fit by GAIL.

15. Year & Month of manufacture shall be stamped on shoe.

16. Sizes must be strictly as per the sizes charts of UK size. Shoes size shall be size no. 05 to 12.

17. The shoes for ladies should be of same style & design except the fitting. The fitting of the shoes should be such that it fits properly to the ladies.

Fig: VI (iii) INDUSTRIAL SAFETY SHOES
Section – VII

GENERAL PPE’S OTHER THAN ABOVE CATEGORIES

VII (i) SAFETY NET

**Application:** To be used during construction activity to avoid free fall of any object on ground work, work at height job etc.

**General:**

1. Size of safety net: 5 M X 15 M or as per site requirement.
2. It should have mesh size like 25mmX25mm, 50mm X 50mm, 75mm X 75mm (as per site requirement).
3. Mesh rope diameter: 4 mm (2 mm twin core rope) double corded Nylon rope.
4. Knotless rope shall be used.
5. Safety net shall be UV treated to avoid degradation (optional as per site requirement).
6. Tensile strength of mesh shall be 3.20 KN and breaking strength shall be at least 2.2 KN.
8. Tie cord: 2 - 3 M length nylon/PP/polyamide rope provided at suitable intervals and at corners for securing net firmly to supports.
9. Polypropylene / polyamide /nylon rope as per IS 5175 shall be used for the safety net.
10. The safety net should be suitable for industrial application.
11. All relevant test certificates shall be submitted along with bulk supply.

Fig: VII (i) SAFETY NET
**VII (ii) DISTRESS SIGNAL UNIT (D. S. U)**

**Application:** To be used by rescue personnel, O&M personnel during vessel entry as motion sensor.

**General:** The personal distress signal Unit shall be designed to raise Continuous Audio-visual distress alarm as and when the unit experiences no movement including vibrations for more than 25 seconds.

1. **The DSU shall meet the following requirement:-**
   a. Size: Small and compact that could be attached to the waist belt with on/off key.
   b. Audio Out-Put: Not less than 90 dB at 3 meter distance
   c. LED Indicators: Green LED to show unit is on and Red LED to show when unit has raised distress alarm.
   d. **Battery** Compatible with DSU.
   e. Standby Battery Life: Minimum 100 hours stand by life after full charge.
   f. Distress Alarm: Not less than 2 audio signals per second at full noise level
   g. Weight: Not more 350 grams.

2. **APPROVAL:** The DSU shall carry national/international Certification for use by the emergency service personnel and the relevant document shall be submitted along with the offer.
   ATEX/ PESO approval certificate for intrinsically safe shall be submitted during the bid submission and certificates of particular model shall be submitted at the time of supply.

3. **WARRANTY:** The DSU offered shall carry warranty for not less than 5years.

4. **TECHNICAL EVALUATION:** The technical evaluation of the DSU shall be subject to the following:-
   a. Meeting the requirements as mentioned from Sr. No. 1 to 4 above
   b. Design in conformity to EN/DIN standards and certificate to be submitted along with the offer and
   c. Weight of the DSU: Subject to compliance in all other respect, the units shall be listed in descending order-lightest on top and the financial bid shall be opened in respect of first five bidders and the lowest financial offer would be selected.

**Fig: VII (ii) DISTRESS SIGNAL UNIT (D. S. U)**
VII (iii) SAFETY TORCH (RECHARGEABLE / CELL POWERED)
(AS PER SITE REQUIREMENT)

Application: To be used in plant area during night time by O&M personnel

General:
1. The safety torch shall be intrinsically safe type for use in hazardous Zones 0, 1 and 2 Gas groups IIA, IIB and IIC.
2. Copy of valid approval certificate PESO shall be sent along with the offer and supply.
3. The light source shall be high power LED. The light output shall be more than 120 lumens.
4. The safety torch should be rechargeable or powered by batteries (as per site requirement) to be included in the supply.
5. The lens shall be of polycarbonate.
6. Light duration of safety torch should be more than 6 hours on full power.
7. It should be light weight and have impact resistance, electrostatic non-hazardous thermoplastic / resin or equivalent enclosure. It shall have ingress protection rating of IP65 or higher.
8. Bidder shall send the literature for offered model, manufacturer’s detailed catalogue / literature in respect of above requirement along with the offer. Test Certificates, Warranty & Guarantee Certificate (minimum 01 year from the date of supply) shall be provided with the supply.

Fig: VII (iii) SAFETY TORCH (RECHARGEABLE)
**VII (v) SAFETY HAND LAMPS (Rechargeable)**

**Application:** To be used in plant area during night time by O&M personnel

**General:**

1. Rechargeable safety hand lamp must be intrinsically safe and suitable for use in Zones 0, 1 and 2 Gas groups IIA, IIB and IIC.
2. It shall be PESO approved for safety rating / hazardous area Zone 0, 1 & 2 use. Copy of approval certificate shall be sent along with offer.
3. It should have high impact resistant, electrostatic enclosure. The lamp enclosure shall ingress protection of at least IP 66 or higher.
4. Light source should be LED and have single light source. Hand Lamp shall have facility of spot and flood light. Light output should be not less than 350 lumens.
5. Light duration of lamp shall be up to 7 - 8 hrs.
6. The safety hand lamp must be supplied along with the charger. The charger should have the options to charge at input power supply 110 – 120 V & 220 – 240 V.
7. The detachable shoulder strap shall be provided along with lamp.
8. The necessary approvals / certificates shall be provided along with the offer. Test Certificate and Warranty & Guarantee Certificate (minimum 01 year from the date of supply) shall be submitted along with the supply of material.

---

![Fig: VII (iii) SAFETY HANDLAMP (RECHARGEABLE)](image-url)
VII (iv) Specification for Portable LEL & Oxygen combined Gas Detector

Application: Measuring the availability of gas leakage, before any hot job, the area shall be monitored with LEL detector. Before making vessel entry, must check oxygen level, along with gas concentration.

General:

1. The gas detector should be portable (weight not more than 500 grams along with pump), rugged, impact resistance, water resistant with high visibility display.
2. The detector should have sensor for LEL & Oxygen measurement:
   - LEL (combustible gas): Catalytic/ IR (as per site requirement),
   - Oxygen: Electrochemical/Electrolyte
   Sensor should be over range protected. The detector should be manufactured recently not more than six months old (at the time of supply).
3. Range: LEL- 0-100 % LEL (calibrated to methane) resolution/ Accuracy 1%, Oxygen: minimum range 0-25 %, resolution accuracy 0.1%.
4. Physical parameters:
   a. Temperature range: -20 to 50 degree Celsius or above range.
   b. Humidity range: 15-90 % RH, typical or more/wider range.
   c. Ingress protection: IP 67 or higher
   d. Inbuilt pump.
   e. Display: simultaneous reading for both types of gases (LEL & Oxygen) along with other (e.g. pump operation, Battery display etc.)
   f. Fast action, easy to operate type interface.
   g. Carrying case, ring/belt clip or suitable arrangement for attachment should be provided.
   h. Should have protection (concussion proof boot etc.) to avoid damage due to fall from height.
5. Battery & charger: Rechargeable battery (Ni-Mh or Lithium-ion) should be used for detector operation. Average usage time with fully charged battery should be more than 10 hrs.
   AC main charger unit, battery pack should be provided along with each detector. Charge status indication (charging/charged) should be provided on main charger unit/deck.
6. Sampling:
   a. Detector should be provided with an inbuilt/mounted on detector pump with required filters to avoid intrusion of foreign material.
should be able to draw sample from more than 10 M distance with sampling tube.
b. Detector should be supplied with sampling tube of 10 M and spare filter(s).

7. **Intrinsic Safety:**
a. Intrinsically safe for class 1, division 1, Group A, B, C or Ex ia IIC T3 or above rating.
b. PESO approval certificate for use in hazardous area shall be submitted along with offer & supply.

8. **Calibration:**
The instrument to be supplied with factory calibration certificate (methane & oxygen). Zero and span adjustment facility should be provided in detector.
The bidder should give calibration certificate with the supply. Calibration adaptor should be supplied with the instrument.

9. **Alarms:** Unit should be equipped with simultaneous visual, vibration, and audible (>85 dBA) alarms & should warn in the event of a gas alarm condition, low battery, sensor fault & an instrument status alarm. Detector should show gas alarm level, low battery & pump fail etc.
**Alarm set-points:** The alarm set points (gas monitoring) should be displayed on startup. Alarm set-points should be user settable.

10. **Display & Backlight:** Large LCD display with backlight. Backlight should automatically illuminate in all alarm conditions (auto with time-out) and can be reactivated by user on demand by button operation.

11. **Warrantee:** Warrantee for at least 2 years from the date of supply/use for the complete instrument including sensors should be provided. Warrantee certificates should be sent along with the supply.

12. **Literature/Catalogue:** Bidder should mention make and model of offer product. Bidder should send relevant literature, catalogue, technical details/specification of the offered product along with the offer and supply. Operation and maintenance manual, operational accessories should be supplied along with supply.

**Fig:** VII (iv) Specification for Portable LEL & Oxygen combined Gas Detector
VII (v) Specification for Portable Volatile Organic Compound (VOC) Detector

Application: Measuring and monitoring the concentration of Volatile Organic Compounds.

General:
1. The gas detector should be portable (weight not more than 500 grams along with inbuilt pump), rugged, impact resistance, water resistant with high visibility LCD/LED display. The enclosure should prevent spark generation.
2. The detector should have sensor for Volatile Organic Compounds (VOC) including Ethyl Mercaptan by PID sensor, CO, SOX sensors if required. It should be able to measure 5/6 gas simultaneously & all sensors should be replaceable type smart sensors.
3. Sensor should be over range protected. The detector should be manufactured recently not more than six months old.

4. Range: Measurement Gas:
   - Volatile Organic Compounds (VOC): 0-2000 PPM in 0.1 PPM increments
   - The initially gas detectors should be supplied with only VOC but instruments should have capacity to add below mentioned any 4 sensor in future.
   - Combustible Gases (LEL) 0 – 100% LEL in 1% increments
     - (Catalytic or IR Type)
   - Oxygen (O2) - 0 - 30% in 0.1% increments
   - Carbon Monoxide (CO) - 0-1500 PPM in 1 PPM increments
   - Hydrogen Sulfide (H2S) - 0-500 PPM in 0.1 PPM increments

   LEL- 0-100 % LEL (calibrated to methane) resolution 1%,
   - Oxygen: minimum range 0-25 %, resolution 0.1%.

2. Physical parameters:
   i. Temperature range: -20 to 50 degree Celsius or above range.
   j. Humidity range: 15-90 % RH, typical or more/wider range.
   k. Ingress protection: IP 65 or higher
   l. Inbuilt pump.
   m. Display: simultaneous reading for both types of gases (LEL & Oxygen) along with other (e.g. pump operation etc.)
   n. Fast action, easy to operate type interface.
Carrying case, ring/belt clip or suitable arrangement for attachment should be provided.

Should have protection (concussion proof boot etc.) to avoid damage due to fall from height.

3. **Battery & charger**: Rechargeable battery (NI-Mh or Lithium-ion) should be used for detector operation. Average usage time with charged battery should be more than 10-14 Hrs.

AC main charger unit, battery pack should be provided along with each detector. Charge status indication (charging/charged) should be provided on main charger unit/deck.

4. **Sampling**:
   a. Detector should be provided with an inbuilt/mounted on detector pump with required filters to avoid intrusion of foreign material. It should be able to draw sample from more than 10 M distance with sampling tube.
   b. Detector should be supplied with sampling tube of 10 M and spare filter(s).

5. **Intrinsic Safety**:
   a. Intrinsically safe for class 1, division 1, Group A, B, C or Ex ia IIC T3 or above rating.
   b. PESO approval for use in hazardous area.
   c. Necessary certificates a) ATEX/IECx/UL/CSA for intrinsic safety and b) PESO for use in hazardous area should be submitted along with the offer and supply.

6. **Calibration**:
   The instrument to be supplied with factory calibration certificate (methane & oxygen). Zero and span adjustment facility should be provided in detector.

   The bidder should give calibration certificate with the supply and after each calibration.

   Calibration adaptor should be supplied with the instrument.

7. **Alarms**: Unit should be equipped with simultaneous visual, vibration, and audible (>85 dBA) alarms & should warn in the event of a gas alarm condition, low battery, sensor fault & an instrument status alarm. Detector should show gas alarm level, low battery & pump fail etc.

   Alarm set-points: The alarm set points (gas monitoring) should be displayed on startup. Alarm set -points should be user settable.

8. **Display & Backlight**: Large LCD display with backlight. Backlight should automatically illuminate in all alarm conditions (auto with time-out) and can be reactivated by user on demand by button operation.
9. **Warranty:** Warrantee for at least 2 years from the date of supply/use for the complete instrument including sensors should be provided. Warrantee certificates should be sent along with the supply.

**Literature/Catalogue:** Bidder should mention make and model of offer product. Bidder should send relevant literature, catalogue, technical details/specification of the offered product along with the offer and supply. Operation and maintenance manual, operational accessories should be supplied along with supply.

![Portable Volatile Organic Compound (VOC) Detector](image)

**Fig:** VII (iv) *Specification for Portable Volatile Organic Compound (VOC) Detector*