	<b>INSTITUTE FOR PLASMA RESEARCH</b>	<b>Revision: 01</b>
	<b>SAFETY PROTOCOL FOR CONTRACTORS OF MECHANICAL/ MAINTENANCE/ FABRICATION/ ERECTION/MAJOR INSTALLATION OF EQUIPMENT/ MACHINARIES AND OTHER RELATED ACTIVITIES</b>	<b>Rev. Date: 11.01.2023</b>

## 1. PURPOSE


The purpose of this protocol is to establish, implement and execute a safe and effective program for the prevention of incidents that may cause injury to persons or damage to the property. The specified responsibilities remain with the contractor for compliance.

## 2. SCOPE


- 2.1 This protocol shall be considered minimum requirements necessary for all works performed inside the Institute for Plasma Research (IPR) and associated centres/units/departments.
- 2.2 All the contractor while at IPR and associated centres/units/departments work site are required to ensure that themselves, their workers and employees, sub-contractors, suppliers, vendors and visitors, must comply with the provisions of this protocol.
- 2.3 The contractor shall review and educate their workers and employees about the stipulations of this protocol.
- 2.4 This protocol is in addition to the responsibility of the contractor towards safety, health and environmental compliance envisaged under law, code or statutory requirements.

## 3. PROTOCOL


- 3.1 The contractor has to provide appropriate Personal Protective Equipments (PPE) like safety shoes, safety helmets, goggles, hand gloves, full body safety harnesses, etc. as required for safety of themselves, their workers and employees, sub-contractors, suppliers, vendors and visitors at site. All PPE must conform to relevant Indian and/or International Standards. These should be maintained in recommended condition by suitable storage, maintenance and inspection. IPR shall have right to examine the PPE and determine their suitability, reliability, acceptability and adaptability.
- 3.2 The contractor shall provide and maintain proper illumination, fencing, guards, stairs, ladders, scaffolding, warning signs, caution boards, etc. as required to ensure safe working conditions at site.
- 3.3 The contractor shall ensure that all floor and wall openings are fixed and properly guarded/barricaded during the course of work and at the end of each day's work with appropriate caution board.
- 3.4 The contractor must adhere to the requirements of Safety, Occupational Health and Environment (SOHE) Policy of IPR, salient features of which are:
  - a. Continual improvement in its Safety, Health & Environment Performance,
  - b. Conservation of natural resources,
  - c. Waste minimization,
  - d. Compliance with applicable statutory and regulatory requirements,
  - e. Creating safety & environmental awareness to its employees and associates.

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- 3.5 The contractor has to ensure to employ only persons who are medically fit and having sufficient skills for execution of work. The contractor must ensure efficient job supervision through educated, qualified, experienced and responsible supervisors to ensure safety at site.
- 3.6 All staff persons including workers must undergo Safety Induction Training prior to depute them at IPR and associated centres/units/departments for any kind of work. Training module may include video film, clippings, photographs etc. related to work execution. In addition to this, Job specific training must be imparted to the concerned workers periodically.
- 3.7 The contractor has to ensure that Daily Tool Box Talk shall be conducted at least for new workers by responsible work in-charge/supervisor for each activity and its record to be maintained.
- 3.8 The contractors themselves, their workers and employees, sub-contractors, if any, shall comply with the instructions given by the Safety Officer or his authorized nominee or IPR's representative regarding safety precautions, protective measures, housekeeping requirements, etc. IPR shall have the right at its sole discretion to stop the work, if the work is being carried out in such a way that it may cause accidents or harm to the workers or damage to the equipments. Contractor shall get the unsafe condition removed and report to IPR.
- 3.9 The contractor shall have no right to claim any damages/compensations for stoppage of work due to safety reasons as provided in para 3.8 .The period of such stoppage of work will not be taken as an extension of time for completion of work or exemption from liquidated damages/compensation delay.
- 3.10 The contractor should ensure that water, fuel and energy are used judiciously. The water & power points must be closed / put off when not in use.
- 3.11 Good housekeeping practices must be followed strictly.
- 3.12 All equipments used for maintenance, fabrication and assembly work, etc. by the contractor must meet Indian/International standards. In case such standards do not exist, the contractor must ensure these to be absolutely safe. All equipments shall be strictly operated and maintained in accordance with manufacturers' operation manual and safety instructions.
- 3.13 The contractor must not interfere or disturb electric, fuses, cables and other electrical equipments belonging to IPR or another agency under any circumstances whatsoever unless expressly permitted in writing by IPR.
- 3.14 Contractor shall arrange adequate facilities for first aid, medical aid and treatment for his staff and workers engaged at the work site.
- 3.15 The contractor has to fully be responsible for the behaviour and conduct of themselves, their workers and employees and sub-contractors. Any cost of loss or damage to client's property caused by contractor's employees or workers will be recovered from the contractor.
- 3.16 In case of any accident that occurs during the maintenance/ fabrication/erection or associated activities undertaken by the contractor thereby causing any minor or major or fatal injury to themselves, their workers and employees, sub-contractors due to any reason, it shall be the responsibility of the contractor to promptly inform IPR's Work in-charge and Safety Officer

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- in prescribed form of IPR. This should also be informed to statutory authority, if required, under the applicable laws. The contractor shall maintain a register of accidents.
- 3.17 In case the contractor fails to fulfil statutory requirements, IPR shall have the right to withhold contractors payments till the requirement are fulfilled.
  - 3.18 The contractor shall plan his activities so as to avoid interference with the assignments of other departments and contractors at the site. In case of any interference, necessary coordination must be sought by the contractor from IPR for safe and smooth working.
  - 3.19 All necessary precautions shall be taken to prevent outbreak of fires at the site. Adequate provisions or as recommended by Safety Officer of IPR must be made by the contractor to extinguish fires.
  - 3.20 The contractor shall follow the stipulated procedure regarding work in the radiation area and other works related with radiography. The contractor shall be fully responsible for the safe storage and handling of his and his sub-contractor's radio-active sources in accordance with AERB rules and other applicable provisions.
  - 3.21 The contractor shall issue photo identity card for themselves, their workers and employees, sub-contractors to be deployed at site. They are required to be displayed prominently during the period of their stay within IPR and associated centres/units/departments.
  - 3.22 The contractor shall obtain gate pass from IPR and associated centres/units/departments for entries and exists of all materials and equipments.
  - 3.23 Smoking and eating/chewing of tobacco is strictly prohibited at site.
  - 3.24 Any person under the influence of any intoxicating beverage, even to the slightest degree shall not be permitted at work site.
  - 3.25 Person below the age of 18 years must not be employed for any work at site
  - 3.26 IPR may from time to time, add or amend to these protocols and issue directions.
  - 3.27 The contractor shall comply with the safety instructions as laid down in as per attached Appendix.

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*Appendix*


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## **1. GENERAL INFORMATION**

- 1.1 The purpose of safety instruction is to establish, implement and execute a practical and effective method for preventing accidents, injuries and property damage.
- 1.2 This document will help contractors and their associates to recognize, evaluate and control hazardous activities within their areas of responsibility.
- 1.3 This document defines the procedure with which safety practice will be administered, identifies responsibilities and ensures control of work area safety.
- 1.4 Contract agreement signed with contractors and the provisions of this document are intended to complement each other to ensure safe working conditions.
- 1.5 The provisions of this document apply to IPR and associated centres/units/divisions/sections.
- 1.6 Throughout this document, reference to a contractor means the contractor's company and the associated subcontractors, consultants, vendors and suppliers. Reference to contractor's management means personnel responsible for managing, supervising or directing contract activities and employees.
- 1.7 Non-compliance of this document is treated as non-compliance of contract agreement that may result in warning/penalty. Wilful or repeated non-compliance may result in contractor dismissal and contract termination.
- 1.8 This document for contractors is a supplementary document to statutory rules, codes and regulations having jurisdiction, and does not negate, abrogate or minimise any provisions of these rules, codes and regulations. It is intended to supplement and enforce the individual program of the contractor and to coordinate the overall safety effort. Contractors are responsible for the safety and health of their employees, subcontractors, consultants, vendors, suppliers, and visitors while in IPR and associated centres/units/divisions/sections.
- 1.9 Contractor's managers and supervisors are responsible for preventing incidents or conditions that could lead to incidents, injuries, illness or fatalities. The ultimate success of the safety program depends on the cooperation of everyone. The contractor's management must ensure that safety provisions are enforced and that effective training and education programs are employed.


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## **2. ROLE OF THE CONTRACTOR**

### **2.1 Top Management of the Contractor**

The commitment of top management of the contractor towards safety is very important. Top management needs to ensure the following:

- 2.1.1 To implement safe methods and practices, deploy appropriate machineries, tools & tackles, experienced supervision and skilled workforce, etc. required for execution.
- 2.1.2 To ensure that employees and workers deployed are physically and mentally fit. They should possess requisite skill, qualification, experience etc. If working at height work is involved then medical fitness certificate from authorised medical officer should be submitted to IPR.
- 2.1.3 To deploy qualified and trained safety supervisor, safety officers and/or safety manager. (Refer chapter-4). Safety team should report to site In-charge for supervision, co-ordination and liaison for the implementation of safety.
- 2.1.4 To ensure that the employees and workers have appropriate health and safety training. The certification of such training should be produced for verification, on demand.
- 2.1.5 To obtain all necessary and applicable licences, permits, and insurance policy of his employees and workers before executing any work. A copy of the same must be submitted to the relevant authority at IPR.
- 2.1.6 To ensure that all incidents (minor/major injuries, fatality, fire, property damage etc.) including near misses shall be reported to the relevant authority at IPR immediately verbally as well as in written format of IPR. Also, keep record for the same.
- 2.1.7 The liability for any compensation on account of injury sustained by an employee of the contractor will be exclusively that of the contractor.
- 2.1.8 To provide personal protective equipment required for the safety and first-aid kits at worksite. Safety Helmet and Safety Shoes are mandatory to wear by all persons working/visiting at site.
- 2.1.9 To maintain appropriate records of all employees and workers deployed to carry out the work at site.
- 2.1.10 Contractor shall not employ any labour below 18 years of age.
- 2.1.11 A photo gate pass duly approved by IPR administration shall be issued by the contractor to their personnel, employees, subcontractors, etc.
- 2.1.12 To co-operate with all the security arrangements of IPR.
- 2.1.13 Contractor may ask for clarifications required in safety related issues, whenever a need arises.
- 2.1.14 To follow and implement all the safety rules and regulations of the local bodies, state, national and international. Contractor shall also comply with all the statutory requirements

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and notifications, as applicable, in relation to employment of his employees issued time to time by the concerned authorities.

## **2.2 Contractor Safety Officer, Safety Supervisor and/or Job Supervisor**


The duties and responsibilities of the contractor safety officer, safety supervisor and/or job supervisor shall include the following:

- 2.2.1 To assess the hazards associated with work at site in consultation with all concerned and establish safe working procedure.
- 2.2.2 To establish a written records of factors that can cause injuries, illness or other safety related problems.
- 2.2.3 To undertake routine/surprise inspections of all work sites to ensure compliance with safety standards, codes, rules, regulations and orders applicable to the work concerned.
- 2.2.4 To check whether the proposed working arrangements/procedures are safe and satisfactory, particularly at the interface between contractors planned work and IPR facilities.
- 2.2.5 To ensure that required guards and protective equipment are provided, used and properly maintained.
- 2.2.6 To ensure that the workers understand the working procedures for carrying out the work safety and the hazards that may be encountered.
- 2.2.7 To take immediate actions to correct any violation of safety rules observed or reported.
- 2.2.8 To ensure that appropriate warning signboards and tags are displayed.
- 2.2.9 To report each incident and/or injury in accordance with established procedures and assists during investigation.
- 2.2.10 To arrange tool box meeting daily and shall continue this process to make workmen safety conscious. To keep a constant liaison with the relevant authority at IPR on safety issues.

## **2.3 Contractor Employees**

The duties & responsibilities of the contractor employees should include the following:

- 2.3.1 The contractors' employees must be trained for safety standards, procedure to carry out high risk job (if involved), use of Personal Protective Equipment (PPEs) in general and specific for a particular job, emergency preparedness and fire extinguisher and medical first-aid. To perform work safely as per the job requirements/instructions.
- 2.3.2 To inform promptly to their management regarding all work related incidents resulting in personal injury, illness and/or property damage, etc.
- 2.3.3 To take all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

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### **3. PENALTY FOR NON-COMPLIANCE**

The penalty shall be imposed on the contractor by the IPR for violation of safety norms/protocols. Imposing the penalty for violation of safety norms does not absolve the contractor from their contractual obligation/responsibility. Contractor shall be fully responsible in all aspects for any accident and/or injury to their employees/workers/subcontractors or property due to violation of safety norms.

### **4. PROVISION FOR SAFETY SUPERVISOR /SAFETY OFFICER OF CONTRACTOR**

The contractor shall depute at least one Safety Supervisor / Safety Officer for critical activities as follows,


- i. Work at height (working beyond 2.5 mtr. above ground)
- ii. Materials and Material Handling which includes movement of heavy material by crane, movement of tractor trolley on slopes, Manual lifting of heavy material to height, erection of heavy machinery, equipment, etc.
- iii. Loading and unloading of equipment, structural materials, machineries, etc., Fabrication and erection work
- iv. Working near high voltage lines, electrical installations, etc., charging of electrical system, transformers, switch yard, switch gears, etc.
- v. Work on pressure vessels/lines
- vi. Work in confined space
- vii. Radiography work
- viii. Leak detection testing / Hydraulic testing / Pneumatic testing

In addition to above list, IPR may also recommend for some specific tasks, which are not covered, to depute Safety Officer/Safety Supervisor.

Safety Supervisor shall be qualified of minimum Diploma in Engineering/ Graduate in Science with approved course in the field of safety and/or fire. He shall able to read and understand English and speak regional/national language. He shall have experience as safety supervisor for a period of minimum one year.

Safety Officer shall be qualified of minimum Bachelor in Engineering/ Post Graduate in Science with approved course in the field of Safety and/or Fire. Safety Officer shall have good communication and written skill to liaison with the client. He shall have good command in English and regional/national language. He shall have experience for a period of minimum three years of supervisory level.




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## **5. GENERAL SAFETY PROVISIONS**

### **5.1 Personal Protective Equipment**

The contractor is responsible to provide all necessary standard make (ISI marked) personal protective equipment (PPE) suitable to give sufficient protection against hazards involved in their work / job to their employees, as per the job requirement and insist/enforce their staff to put on the same while at works and ensure that the PPEs are properly used and maintained in a condition suitable for immediate use. The contractor shall have sufficient stock of various PPEs to avoid any shortage of supply and shall take adequate steps to ensure proper use of equipment by those concerned. The ongoing work is liable to be stopped at any time if the contractor's staff is found working without PPEs.

- 5.1.1 All persons employed at site shall use safety helmet and safety shoes.
- 5.1.2 Persons engaged in welding and gas-cutting works shall use suitable welding face shields. The persons who assist the welders shall use suitable goggles. Protective goggles shall be worn while chipping and grinding.
- 5.1.3 All persons working at heights more than 2.5 m above ground or floor and exposed to risk of falling down shall use full body safety harness, unless otherwise protected by cages, guard railings, etc. In places where the use of safety harness is impractical, suitable net of adequate strength fastened to substantial supports shall be employed.
- 5.1.4 When workers are employed in sewers and inside manholes, which are in use, the Contractor shall ensure that the manholes are opened and are adequately ventilated at least for an hour. After it has been well ventilated, the atmosphere inside the confined space shall be checked for the presence of any toxic gas or oxygen deficiency and recorded in the register before the workers are allowed to get into the manholes. The manholes opened shall be cordoned off with suitable railing and provided with warning signals or caution boards to prevent accidents. There shall be proper illumination in the night.
- 5.1.5 The following is the list of various PPEs to be used for various works/worksites,

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### List of Safety Equipment

Sr. No.	PPE	Purpose
01	Industrial Safety Helmet	For protection of head against falling objects or during fall of person from height.
02	Safety Goggles (Grinding, Welding, etc).	For protection of eyes against flying particles / dust, chemical splash, spark, arc, flashover etc.
03	Face shield	For protection of face against flying particles / dust, chemical splash, spark, arc, flashover etc.
04	Ear plug / Ear muffs	For ear / hearing system protection while working in high noise level area.
05	Apron (PVC /cryo/Cotton)	For body protection against chemicals, oils, cryogenics, sharp edged objects, heat, hot objects etc.
06	Gloves (Nitrile/Leather, cryo, Electrical shock proof)	For protection of hands against chemicals, oils, cryogenics, sharp edged objects, heat, hot metals/objects, electricity etc.
07	Safety Shoes	For protection of leg/feet against falling objects, sharp edged objects, heat, hot metals/objects,, electricity etc.
08	Full body safety harness/ Rope /Life line/ Fall prevention system etc.	For fall prevention while working at heights or in depth, working in vessel or in confined space.
09	Dust Respirator	Protection of respiratory system against dust.
10	Self-contained breathing apparatus (SCBA) set	Working in oxygen deficient areas.


## 5.2 Electricity

The following are provided for general guidance of the Contractor and shall be read as specific requirement, in addition to complying with Indian Electricity Act, Indian Electricity Rules and IS Specifications.

5.2.1 Only qualified electricians familiar with code requirements are allowed to perform electrical work.

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- 5.2.2 Employees are not permitted to work near an unprotected electrical power circuit unless they are protected against electrical shock by de-energizing the circuit and grounding it, or are protected by effective insulation or other means, and are wearing .required personal protective equipment.
- 5.2.3 The electric power supply will be generally made available at one point in the works site of the contractor by the IPR.
- 5.2.4 All three phase equipment shall be provided with double earthing. All light fixtures and portable equipment shall be effectively earthed to main earthing.
- 5.2.5 All earth terminals shall be visible. No gas pipes and water pipes shall be used for earth connection. Neutral conductor shall not be treated as earth wire.
- 5.2.6 The contractor shall not connect any additional load without prior permission of IPR.
- 5.2.7 Joints in earthing conductors shall be avoided. Loop earthing of equipment shall not be allowed. However, tapings from an earth bus may be done.
- 5.2.8 Electrical equipment and installations shall be installed and maintained as to prevent danger from contact with live conductors and to prevent fires originating from electrical causes like short circuits, overheating etc. Installation shall not cause any hindrance to movement of men and materials.
- 5.2.9 Materials for all electrical equipment shall be selected with regard to working voltage, load and working environment. Such equipment shall conform to the relevant standards.
- 5.2.10 Electric fuses and/or circuit breakers installed in equipment circuits for short circuit protection shall be of proper rating. It is also recommended that high rupturing capacity (HRC) fuses be used in all circuits. For load of 5 KW or more earth leakage circuit breaker of proper rating shall be provided in the circuits.
- 5.2.11 Wires and cables shall be properly supported and approved method of fixing shall be adopted. Cables shall not be left on floor/ground. Loose hanging of wires & cables shall be avoided. Lightning and power circuits shall be kept distinct and separate.
- 5.2.12 Reinforcement rods or any metallic part of structure shall not be used for supporting wires and cables, fixtures, equipment, earthing etc.
- 5.2.13 All cables and wires shall be adequately protected mechanically against damages. In case, the cable required to be laid underground, it shall be adequately protected by covering the same with bricks, Plain Cement Concrete (PCC), tile or any other approved means.
- 5.2.14 All armoured cables shall be properly terminated by using suitable cable glands. Multi-stranded conductor cables shall be connected by using cable lugs/ sockets. Cable lugs shall preferably be crimped. They shall be of proper size and shall correspond to the current rating and size of the cable. Twisted connections will not be allowed.
- 5.2.15 All the Distribution Boards, Switch Fuse units, Bus bar chambers, ducts, cubicles etc. shall have MS enclosures and shall be dust, vermin and waterproof.

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The Distribution Boards, switches etc. shall be so fixed that they shall be easily accessible.


- 5.2.16 The Contractor shall provide proper enclosures/covers of approved size and shape for protection of all switch boards, equipment etc. against rain.
- 5.2.17 Isolating switches shall be provided close to equipment for easy disconnection of electrical equipment or conductors from the source of supply, when repair or maintenance work has to be done.
- 5.2.18 All connections to lighting fixtures, starters or other power supplies shall be provided with PVC insulated, PVC sheathed twin/three/four core wires to have better mechanical protection for preventing possible damage to equipment or injury to personnel. Taped joints shall not be allowed and the connections may be made in looping system. Electric starter of motors, Switches shall not be mounted on .wooden boards. Only sheet steel mounting or iron framework shall be used.
- 5.2.19 Only PVC insulated and PVC sheathed wires or armored PVC insulated and sheathed cables shall be used for external power supply connections of temporary nature. Weatherproof rubber wires shall not be used for any temporary power supply connections. Taped joints in the wires shall not be used.
- 5.2.20 All portable appliances shall be provided with three-core cable and three-pin plug. The third pin of the plug shall invariably be earthed. It shall be ensured that the metal part of the equipment shall be effectively earthed.

### **5.3 House Keeping**

- 5.3.1 The Contractor shall at all times keep his work spot, site office and surroundings clean and tidy from rubbish, scrap, surplus materials and unwanted tools and equipment so as not to create unsafe condition or fire hazard.
- 5.3.2 Welding and other electrical cables shall be properly routed.
- 5.3.3 No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
- 5.3.4 Cleaning of the work area at the end of the day and upon completion of work is a part of the job.
- 5.3.5 The Engineer-in-charge has the right to stop work if the Contractor fails to improve upon the housekeeping after having been notified.

### **5.4 Fire Safety**

- 5.4.1 All necessary precautions shall be taken to prevent outbreak of fires at the site. Adequate provisions shall be made to extinguish fires, if it still breaks out.
- 5.4.2 Quantities of combustible materials like timber, bamboos, coal, paints, etc., shall be kept minimum in order to avoid unnecessary accumulation of combustibles at site.
- 5.4.3 Containers of paints, thinners and allied materials shall be stored in a separate room

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which shall be well ventilated and free from excessive heat, sparks, flame or direct rays of the sun. The containers of paint shall be kept covered or properly fitted with lid and shall not be kept open except while using.

5.4.4 Fire extinguishers shall be located at the site at appropriate places.

5.4.5 Adequate number of workmen shall be given education and training in firefighting and extinguishing methods.

### **5.5 Scaffolding**

Accidents are also caused by the ladders falling or the climber losing his balance or failure of scaffolds. As such, utmost care should be taken as ladder and scaffolding are extensively used for maintenance and construction purpose. Some of the safe practices as listed below are to be observed before commencement of work.


5.5.1 Adequate and safe means of access and exit shall be provided for all work places, at all elevations. Using of scaffolding members (avoiding a ladder) for approach to high elevations shall not be permitted.

5.5.2 Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short duration work as can be done safely from ladders. Ladder shall be of rigid construction having sufficient strength for the intended loads and made either of good quality wood or metal and all ladders shall be maintained well for safe working condition.


5.5.3 Short ladder must not be tied together to give greater lengths. All ladders of 6 m or above should be tied to the structure on which they are resting to prevent from. An extra worker shall be engaged for holding the ladder if ladder is not securely fixed. If the ladder is used for carrying materials, suitable foot holds and handholds shall be provided on the ladder. The ladder shall be given an inclination not steeper than 1 in 4 (1 horizontal and 4 vertical). Ladders shall not be used for climbing carrying materials in hands. While climbing both the hands shall not be free.

5.5.4 The free length must extend by 1.5 meters above the point of landing but should not be more than 1/4<sup>th</sup> of the ladder length. No portable single ladder shall be over 9 meter in length. Metal ladders may not be used for electrical work.

5.5.5 Scaffolding or staging more than 3.5 m above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a standard guard rail properly attached, bolted, braced or otherwise secured at least 1.0 m high above the floor or platform of such scaffolding or staging. The guard rail shall extend along the entire exposed length of the scaffolding with only such opening as may be necessary for the delivery of materials. Standard railing shall have posts not more than 2 m apart and an intermediate rail halfway between the floor or platform of the scaffolding and the top rail. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure. Scaffolding and ladder shall conform to relevant IS specification

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- (IS: 3696). Timber/Bamboo scaffolding shall not be used.
- 5.5.6 Working platforms of scaffolds shall have toe boards at least 15 cm in height to prevent materials from falling down.
  - 5.5.7 Every part of scaffolding must be of sound construction. Steel planks used in scaffolds should be carefully inspected and should be tied on both sides with suitable fixing arrangements to the pipes. Scaffolding must not be overloaded.
  - 5.5.8 The Steel pipe & clamp to be used must be of good quality. The spacing between the vertical & horizontal members of the scaffolding should not be more than 1.5m and 1 meter respectively. The scaffolding should be further strengthened with cross bracing and stays.
  - 5.5.9 The scaffolds should be provided with short climbs ladders for safe ascending/ descending of workmen in the job. Only those workmen who are well trained/ experienced in erecting scaffolding should be engaged for scaffolding work. The men working in the actual erection/dismantling of the scaffolding and all persons using the scaffolding must use appropriate PPEs.
  - 5.5.10 A sketch of the scaffolding proposed to be used shall be prepared and approved by the Engineer-in charge, prior to start of erection of scaffolding. All scaffolds shall be examined by Engineer-In-Charge before use.
  - 5.5.11 Working platform, gangways and stairways shall be so constructed that they shall not sag unduly or unequally and if the height of the platform or gangway or stairway is more than 3.5 m above ground level or floor level, they shall be closely boarded, shall have adequate width for easy movement of persons and materials and shall be suitably guarded.
  - 5.5.12 The planks used for working platform shall not project beyond the end supports to a distance exceeding four times the thickness of the planks used. The planks shall be rigidly tied at both ends to prevent sliding and slippage. The thickness of the planks shall be adequate to take load of men and materials and shall not collapse.
  - 5.5.13 Each opening in the floor of a building or at a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing.
  - 5.5.14 Safe means of access shall be provided to all working platforms and other elevated working places. Every ladder shall be securely fixed. No single portable ladder shall be over 9 m in length. For ladders up to 3m in length the width between side rails in the ladder shall in no case be less than 300 mm. For longer ladders this width shall be increased by at least 20 mm for each additional meter of length. Step spacing shall be uniform and shall not exceed 300 mm.
  - 5.5.15 Adequate precautions shall be taken to prevent danger from electrical lines and equipment. No scaffolding, ladder, working platform, gangway runs, etc. shall exist within 3 meters of any uninsulated electric wire. Whenever electric power and lighting cables are required to run through (pass on) the scaffolding or electrical equipment are used, such scaffolding structures shall have minimum two earth connections with earth continuity conforming to IS Code of Practice.

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## **5.6 Lifting/Hoisting Equipment and Erection**

Accidents do happen while working overhead or due to failure or unsafe use of hoisting equipment. As such, adequate care must be taken to prevent it. The following are some of the precautions to ensure safety of the workmen engaged by the contractor:

- 5.6.1 Contractors involved in handling of any material overhead must install necessary barricades, warning signs or take any other steps necessary to prevent others from walking/standing beneath the load.
- 5.6.2 Hoisting machines, tackles including their attachments, anchorage and supports must conform to the good mechanical construction, sound materials and adequate strength and free from patent defect and shall be preserved in good condition.
- 5.6.3 All equipment like crane, chain blocks, sling, rope, etc. including all other material handling equipment must have valid load test certificates.
- 5.6.4 Thorough inspection and load testing of lifting machines and tackles shall be done by a competent person at least once every 12 months and records of such inspection and testing shall be maintained.
- 5.6.5 Every crane driver or hoisting appliances operator shall be properly qualified and no person below the age 21 years should be in charge of any hoisting machine.
- 5.6.6 Every hoisting machine and all gears shall be plainly marked with the safe working load. No part of any machine or gear shall be loaded beyond the safe working load (SWL).
- 5.6.7 In case of IPR's machines, the safe working load shall be notified by Engineer-in-charge. For contractor's machines, the contractor shall notify the safe working load to Engineer-in-charge.
- 5.6.8 Motors, gearing transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with safe guards.
- 5.6.9 No cranes shall be left unattended with hanging load and on completion of work, the boom/jib of the crane may be brought down and kept in horizontal condition.
- 5.6.10 No crane including hydra crane shall be allowed to move on road with suspended load.

## **5.7 Welding and Gas Cutting**

- 5.7.1 Welding and gas cutting operations shall be done only by qualified and authorized persons and as per IS specifications and Code of Practice.
- 5.7.2 Welding and gas cutting shall not be carried out in places where flammable or combustible materials are kept and where there is danger of explosion due to presence of gaseous mixtures.
- 5.7.3 Welding and gas cutting equipment including hoses and cables shall be maintained in good condition.
- 5.7.4 Barriers shall be erected to protect other persons from harmful rays from the work. When welding or gas cutting is in elevated positions, precautions shall be taken to prevent

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sparks or hot metal falling on persons or flammable materials. Adequate ventilation shall be provided while welding in confined space.

- 5.7.5 Suitable type of protective clothing consisting of fire resistant gauntlet gloves, leggings, boots and aprons shall be provided to workers as protection from heat and hot metal splashes. Welding shields with filter glasses of appropriate shade shall be worn as face protection.
- 5.7.6 Welding and gas cutting shall not be done on drums, barrels, tanks or other containers unless they have been emptied, cleaned thoroughly and it is made certain that no flammable material is present.
- 5.7.7 Fire extinguisher shall be available near the location of welding operations. Prior permission shall be obtained from safety section for working at vulnerable areas and operating areas before flame cutting/welding is taken up.
- 5.7.8 Tarpaulin, if used should be of fire retardant.
- 5.7.9 For electric (Arc) welding the following additional safety precautions shall be taken:
- When electrical welding is undertaken near pipe lines carrying flammables, such pipe lines shall not be used as part of earth conductor but a separate earth conductor shall be connected to the machine directly from the job.
  - Personnel contact with the electrode or other live parts of electric welding equipment shall be avoided.
  - Extreme caution shall be exercised to prevent accidental contact of electrodes with ground.
- 5.7.10 The cylinders containing poisonous/toxic or inflammable / explosive gas like Oxygen, Acetylene, Hydrogen, Ammonia, Chlorine, CO<sub>2</sub> etc. shall be handled safely taking due cares. To handle / shift such cylinders a special trolley / cage meant for it must be used but in no case it should be rolled.
- 5.7.11 No domestic LPG cylinder is allowed for Hot Work such as Gas Welding / Gas Cutting.
- 5.7.12 A person must remain in the area for a minimum period of 30 minutes after hot work is completed to ensure the site is safe. Welding machine shall be switched off after the completion of work.


## **5.8 Grinding**

- 5.8.1 All portable grinders shall be used only with their wheel guards in position to reduce the danger from flying fragments should the wheel break during the use.
- 5.8.2 Grinding wheels of specified diameter only shall be used on a grinder- portable or pedestal - in order not to exceed the prescribed peripheral speed.
- 5.8.3 Goggles shall be used during grinding operation.

## **5.9 Painting**

- 5.9.1 The Contractor shall not employ women on the work of painting with products containing lead in any form. Only men above the age of 18 years shall be employed on the work with lead paint.



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- 5.9.2 Smoking, open flames or sources of ignition shall not be allowed in places where paints and other flammable substances are stored, mixed or used. A caution board, with the instructions written in national/regional language, "SMOKING - STRICTLY PROHIBITED" shall be displayed in the vicinity where painting is in progress or where paints are stored.
- 5.9.3 When painting work is done in a closed room or in a confined space, adequate ventilation shall be provided. If adequate ventilation cannot be provided, workers shall wear suitable respirators.
- 5.9.4 Epoxy resins and their formulations used for painting shall not be allowed to come in contact with the skin. The workers shall use plastic gloves and/or suitable barrier creams.
- 5.9.5 Workers shall thoroughly wash hands and feet before leaving the work. Work clothes shall be changed and laundered frequently.

## **5.10 Radiography**

- 5.10.1 Only properly trained, qualified personnel shall be allowed to use radiation producing equipment or handle radioactive source.
- 5.10.2 Radiography works may be carried out preferably after office hours or on holidays.
- 5.10.3 The following are some basic rules to be followed:
- The ionisation radiation source shall not be left unattended.
  - Radiation film and dose meter shall be used.
  - The exposed area shall be clearly identified, barricaded by rope or other effective means and internationally recognized symbol for radiation shall be placed around the perimeter of any area which may be affected by radiation.
  - Contractor shall coordinate with safety officer to ensure that the dose rate at barricade does not exceed 0.75 milirems per hour.

## **5.11 Maintenance of Equipment**

- 5.11.1 Disconnect the electrical power before starting the mechanical maintenance of the equipment/machine.
- 5.11.2 During the maintenance of equipment/machine, it should be doubly ensured that the machine does not move unexpectedly causing injury to the person involved.
- 5.11.3 Full proof lockout system or power lock off system should be followed. Power lock off system shall include the electrical power, energy stored in springs, suspended parts or any other potential power sources.
- 5.11.4 A highly legible information plate should be kept near the equipment/ machine under maintenance giving the details of work being carried-out, warning instructions etc., to enable the workers, supervisors or any visitors to keep away.
- 5.11.5 Removal of such plates immediately after the maintenance, repair etc., shall be -insured.

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- 5.11.6 Instructions from the machine manufacturers' service/installation book should be followed during maintenance of the equipment.
- 5.11.7 Only trained personnel should be employed for carrying out maintenance, repair, adjustment etc.
- 5.11.8 Identified tools should be used to carry out such works.
- 5.11.9 Guards should be replaced immediately after the maintenance work.
- 5.11.10 Eli Chips and debris must be swept up and properly disposed.

## **6. REPORTING FORM**

Any near miss or incident must be reported verbally immediately to Engineer In-charge and Safety Section, IPR. Reporting forms (Near Miss & Incident) are available on IPR website. The duly filled form must be submitted to the Safety Section, IPR within 72 hours from the near miss/incident occurred time.