INTER PLANT STANDARD IN STEEL INDUSTRY		
IPSS	**SAFETY PROCEDURE FOR OXYGEN, NITROGEN AND FUEL GASES**	**IPSS: 1-11-002-19** ***(Second Revision)***
	Corresponding IS does not exist	Formerly-: IPSS: 1-11-002-12 *(First Revision)*

0. FOREWORD

0.1 This Inter Plant Standard formulated by the Standards Committee on Safety Appliances and Procedures, IPSS 1:11, with the active participation of the representatives of Indian steel industry and associated organizations in the field, was adopted in June, 1998. It was first revised in March 2012 and again with **second revision in April**, **2019**.

0.2 This is one in the series of Inter Plant Standards in the area of safety in steel plants with a view to provide guidance to all concerned in accident prevention.

1. SCOPE

1.1 This Inter Plant Standard covers the guidelines for safe handling and working with gases such as Oxygen, Nitrogen and Fuel gases (Blast Furnace, Converter Gas, Coke-Oven gas and mixed gases) excluding **LPG/ Coal Bed Methane / Propane** which are used and/or generated during production processes in steel plants.

1.2 This standard does not cover the aspect of handling and working with gases in cylinders.

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in ISO - 45001 shall apply in addition to the definitions at 2.2 and 2.3 below.

2.2 Protocol - It is a document which lists the activities sequentially for the work to be taken up along with the persons responsible for that particular job with a view to ensure safety.

A protocol shall include the following:

a) Nature of the work.

b) Time of commencement and expected duration of the work.

c) Name of the coordinating department for the work.

d) Name of the person In-charge for execution of the work.

e) List of preparatory jobs to be done prior to the commencement of the actual work and the name of person/department to carry out the work.

f) List of safety provisions and facilities like rescue gadgets, Ambulance and fire safety equipment to meet any Emergent situation.

g) Sequence of the activities for carrying out the work with name of person responsible for each activity.

h) List of safety precautions to be taken/observed by the working personnel with the name of the supervisor who will ensure the compliance.

i) A sketch or schematic diagram showing the gas path and indicating the location of each activity and affected portion/section.

2.2.1 A protocol shall be prepared for carrying out any maintenance activity on charged or uncharged gas lines and associated system after discussions amongst the relevant/concerned persons and/or departments.

2.2.2 If the work falls within one department, the protocol shall be proposed by the executing agency under whose charge the work is to be carried out. It shall be signed by them, maintenance agency, departmental safety officer and connected person from the safety engineering department, **Fire Service department and Energy Management Department** and shall be approved by the head of the department. In case of other departments are affected/involved, the signature of the HOD of concerned department shall be taken and the protocol shall have the signature of approval by the divisional head. In case the work involves larger area or the entire plant, the signature of the heads of all the affected/involved departments shall be taken on the protocol and shall be approved by the head of the plant/work.

2.2.3 If the work is of repetitive nature, a standard protocol may be used every time after revalidation by the HOD or the head of the Division or the head of the plant, as the case may be, with fresh signature and date.

2.3 Work **-** The activity related to the handling and working with the gas (Oxygen, Nitrogen and Fuel Gases).

3. GENERAL SAFETY REQUIREMENTS

3.1 All maintenance jobs on a charged/isolated gas lines or associated system shall be carried out as per approved protocol.

3.2 Danger Boards shall be displayed at conspicuous locations in the hazardous gas installation and gas pipeline areas, to draw the attention of the persons entering the area, about the imminent danger.

3 3 All standard operating, maintenance and repair procedures as approved by the plant management shall be followed.

3.4 There are three possible methods for isolation of gas lines before commencement of any job in gas lines.

a) Blanking

b) Water sealing with isolation valve

c) Simple water sealing

3.5 Gas handling systems which are not in use shall be isolated by blanking from the working system properly, with its manholes and purging system open.

3.6 Gas charging/commissioning of equipment shall be carried out during daylight hours. In case of exigencies when the work is to be carried out after the daylight hours, it shall be done with the approval of the competent authority and under the supervision of an authorized executive.

3.7 Personnel shall not be allowed to work with empty stomach, on gas pipe lines/systems for blanking , deblanking jobs etc.

3.8 No rest rooms, canteens, office building etc to be located close to the gaseous area.

3.9 Resting/sleeping in gaseous areas shall be strictly prohibited.

3.10 Gas masks shall be used while working in and around the hazardous gas areas.

3.11 No shoes, with metallic nails to cause sparks shall be allowed while working in Coke Oven Gas Lines.

3.12 Movement of vehicles will be restricted within 40 meters of the working area of the flammable gas line.

3.12 Smoking of Bidis/ Cigarettes shall be strictly prohibited.

3.13 Safety briefing / Tool Box Talk / Pep-Talk shall be given to all workers daily before start of work.

3.14 Female workers shall not be engaged for cleaning/sweeping of hazardous gas handling equipments and pipelines.

3.15 Proper ventilation shall be provided in control rooms having gas pipelines and impulse lines.

3.16 Provision of fixed gas monitors in control rooms having gas pipelines and impulse lines shall be made.

3.17 Gas safety equipment shall be kept separately with mark for checking and refilling.

3.18 Pipe lines and associated equipments shall be periodically inspected as per procedure (see 4) approved by the competent authority (head of department, division Head of the plant, as the case may be) and shall be recorded.

3.19 Minimum two persons shall work in gas hazard areas and they should carry a calibrated portable CO/ multi-gas monitor.

3.20 Impulse lines from gas mains to instruments shall be cleaned with compressed air / Nitrogen after ensuring proper isolation of the gas line.

3.21 Lighted gas burner in enclosed space shall not be left unattended.

3.22 Gas impulse lines shall not be repaired under pressure.

3.23 Gas impulse lines shall not be blowed out with mouth.

3.24 All gas pipe lines shall be distinctly marked with colour code as per relevant Indian Standard.

4. SAFETY PROVISION IN STANDARD OPERATING PROCEDURE (SOP)

4.1 SOP shall include the following:

a) Sequential description of process and details of equipment's operating parameters.

b) Frequency of inspection of instruments, protection schemes and control systems.

c) Characteristics, MSDS and proportion of gases.

d) Description of hazards, their safeguards & Job Safety Analysis..

e) Procedure for start-up, shutdown (Isolation, blanking, purging etc.) for the process & equipments.

f) Steps to maintain normal regime/parameters of the process.

g) Methods to handle high and low pressures, fire, leakages, power failure and equipment breakdown in the associated systems and process.

h) Disaster combat plan / Emergency Action Plan**.**

5. SAFETY PROVISIONS IN STANDARD MAINTENANCE PROCEDURES (SMP)

5.1 SMP shall include the following.

a) Equipment specifications and details.

b) Scope, type and frequency of inspections.

c) Non sparking tools needed during dismantling, reassembly and commissioning of the equipment and system.

d) Type of lubricants to be used with needed frequency of their change.

e) Identification of critical spares and inventory management plan.

f) Schedule of maintenance activities (with description).

g) Description of hazards, their safeguards & Job Safety analysis.

h) Procedure for record keeping.

6. TRAINING

6.1 All persons working on gas lines/equipment shall be trained in gas safety and rescue operations and shall be deputed for training to periodic refresher program.

6.2 The Operation and Maintenance Personnel Shall be adequately trained in SOPs and SMPs.

6.3 Training for handling cryogenic gases as applicable.

7. SPECIFIC SAFETY REQUIREMENTS FOR OXYGEN

7.1 Work shall not be allowed on a charged oxygen line.

7.2 Work shall be carried out after isolating the line/equipment by putting a blank after the isolating valve.

7.3 The isolated pipe shall be purged to bring down Oxygen level to 22% maximum.

7.4 All tools to be used in the work shall be washed in **Tri Chloro Ethylene (TCE)** before starting the work to ensure absence of inflammable sticking substances on them.

7.5 The pipeline, equipment and the work area & pipe line shall be cleaned and degreased thoroughly before charging the line/equipment

7.6 House keeping in the vicinity of oxygen pipe line shall be proper and so arranged as to ensure smooth working and ease of execution of disaster combat plan (**see 4.1 (h)).**

7.7 The functioning of pressure relief valve shall be checked by a competent person at least once a year and record maintained.

7.8 The protection system between liquid and gaseous oxygen shall be checked atleast once a month for ensuring their proper isolation.

7.9 Grease and oil shall not be used in Oxygen handling installations. Hydrocarbon shall not be stored in areas having fittings on the oxygen line.

7.10 Oxygen line shall not be used for cleaning the dust from the body/ dress. It is very dangerous.

7.11 Oxygen line shall be properly cleaned and made dust free before charging.

7.12 All safety precautions as per IPSS 1-06-034-17 “Code of practice for oxygen gas pipeline” shall be taken.

8. SPECIFIC SAFETY REQUIREMENTS FOR NITROGEN

8.1 The work shall be started only after isolating the line/equipment by putting a blank after the isolating valve.

8.2 A person shall be allowed to enter a vessel or area adjoining a pipeline for work only after ensuring presence of minimum 19.5% oxygen there and after the written clearance of the competent person (head of department, division or plant as the case may be, reference to **para 2.2.2**).

8.3 People working in the area should carry a portable oxygen monitor**.**

9. SPECIFIC SAFETY REQUIREMENTS FOR FUEL GASES (Blast Furnace Gas, Converter Gas, Coke Oven Gas and Mixed Gas)

9.1 No personnel shall be allowed to work in or go to the area where fuel gases are present.

9.2 If the carbon monoxide content in that area is more than 50 PPM, use gas masks in such Emergency situation.

9.3 On line monitoring system with alarm for carbon monoxide concentration shall be provided in the areas around equipment/process handling these gases. Performance of on-line monitoring system shall be checked once in a month for its proper operation and record maintained.

9.4 Non sparking tools shall be used while working on charged pipeline and gas handling system.

9.5 No personnel shall be allowed to work on charged system (where there is possibility of presence of fuel gases) without gas masks.

9.6 Proper escape route and scaffolding shall be provided while working on charged system at height.

9.7 The welding current shall not exceed 100A while welding on charged gas system.

9.8 Cutting or welding job shall not be allowed on isolated system without analysis and written clearance of the competent person. It shall be done only by trained welders in presence of competent gas safety man. A minimum level of 19.5% oxygen shall be ensured.

9.9 Proper electrical jumpers shall be provided between flanges and equipments before a gap is created between them.

9.10 Platform and adjoining structures shall be covered with Ceramic blanket / Fire resistant clothes while blanking and deblanking and the personnel working shall not be allowed to wear nylon or other synthetic fabric/garments.

9.11 Fire brigade shall be kept as standby at the place of work in charged system, especially in case of Coke Oven Gas and Mixed Gases. Running steam line shall also be provided during welding.

9.12 Lime water shall be poured after loosening the bolts of flanges in Coke Oven Gas lines/ equipments at the time of blanking or deblanking or opening the manhole covers.

9.13 The deposits/ incrustation in coke oven & other gas lines and associated equipments shall be kept wet either by steam or by water, after the system has been isolated and opened to atmosphere.

9.14 Cutting in coke oven lines and associated equipments shall be carried out after cleaning of the deposits. In case, it is not possible, deposit shall be kept wet and a running steam hose shall be kept in readiness to prevent a fire. Also, ingress of fresh air shall be prevented by blanking the rejected gas lines.

9.15 All jobs within a radius of 40 m which could be a source of fire/ignition shall be stopped and unauthorized persons shall not be allowed to remain in the

area while shutting down the gas system.

9.16 Lighting in enclosed area shall be done with portable spark proof electric lamp of 24 V or explosion proof fittings.

9.17 All pipelines/systems shall be checked for leakage after completion of repair job as per IPSS-: 1-06-014-17 ‘Code of practice for laying and selection of moist fuel gas lines (third revision)'. The leakages shall be detected by soap solution and all leakages shall be rectified before charging the system. Steam shall be supplied along with compressed air while testing old coke oven and mixed gas lines/systems after repair of leakage.

9.18 Blanking/de-blanking jobs on gas lines shall not be taken up at the time of extreme bad weather conditions when the possibility of thundering/ lightening exists.

9.19 Drain pots and other auxiliaries of gas lines shall be inspected for proper operation atleast once a month and record maintained.

9.20 Permanent connections for purging by steam/ Nitrogen shall be blanked after purging requirements are over.

9.21 There shall not be any discontinuity in blanking/ deblanking. Once started it shall be completed at a stretch.

9.22 Testing of leaks of running mains of Coke Oven, Blast Furnace & Mixed Gases shall be done only by soap water.

9.23 Persons required to work in gaseous atmosphere shall be trained in First Aid and methods of giving artificial respiration.

9.24 Water seals/ Drip pots should be installed above ground level and continuous overflow of water should be monitored for ensuring its proper functioning.

9.25 The Drip Pot/ water seal area shall be fenced to avoid unauthorized entry.

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