1 OBJECTIVE

The objective of this safety code is to provide safe working procedure while carrying out jobs on Oxygen & Nitrogen system in iron & steel industry and to prevent from the major **hazards** such as **fire & explosion** in oxygen service and **Asphyxia** in case of nitrogen gas lines.

2 SCOPE

2.1 This safety code covers the guidelines for safe handling and working with Oxygen & Nitrogen gases in pipe lines in iron & steel Industry.

2.2 This code does not cover the aspect of handling and working with oxygen & nitrogen gases in cylinders.

3 PROCEDURE

3.1 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:

i. Nature of the work.
ii. Time of commencement and expected duration of the work.
iii. Name of the coordinating department for the work.
iv. Name of the person In-charge for execution of the work.
v. 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.
vi. List of safety provisions and facilities like rescue gadgets, Ambulance and fire safety equipment to meet any Emergent situation.
vii. Sequence of the activities for carrying out the work with name of person responsible for each activity.
viii. List of safety precautions to be taken/observed by the working personnel with the name of the supervisor who will ensure the compliance.
ix. A sketch or schematic diagram showing the gas path and indicating the location of each activity and affected portion/section.

3.1.1 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.

3.1.2 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.

3.1.3 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.

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

4 GENERAL SAFETY REQUIREMENTS

4.1 All maintenance jobs on a charged (de-pressurized Nitrogen only)/ isolated gas lines or associated system shall be carried out as per approved protocol.

4.2 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.

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

4.4 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.

4.5 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.

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

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

4.8 Rest/ sleeping in gaseous areas shall be strictly prohibited.

4.9 Gas masks shall be used while working in and around the hazardous gas area.

4.10 Smoking of Bidis/ Cigarettes shall be strictly prohibited.

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

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

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

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

4.15 Pipe lines and associated equipments shall be periodically inspected as per procedure (see 5) approved by the competent authority (head of department, division Head of the plant, as the case may be) and shall be recorded.

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

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

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

4.19 Gas impulse lines shall not be repaired under pressure.

4.20 Gas impulse lines shall not be blown out with mouth.

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

5 SAFETY PROVISION IN STANDARD OPERATING PROCEDURE (SOP)

5.1 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**.**

6 SAFETY PROVISIONS IN STANDARD MAINTENANCE PROCEDURES (SMP)

6.1 SMP shall include the following.

a) Equipment specifications and details.

b) Scope, type and frequency of inspections.

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

d) Identification of critical spares and inventory management plan.

e) Schedule of maintenance activities (with description).

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

g) Procedure for record keeping.

7 TRAINING

7.1 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.

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

7.3 Training for handling cryogenic gases as applicable.

8 SPECIFIC SAFETY REQUIREMENTS FOR OXYGEN

8.1 No work shall be carried out over charged section of Oxygen gas lines. Complete isolation and purging with nitrogen gas of the working part shall be ensured before start of work.

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

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

8.4 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.

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

8.6 Housekeeping 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 5.1 (h)).

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

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

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

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

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

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

9. SPECIFIC SAFETY REQUIREMENTS FOR NITROGEN

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

9.2 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 is there and after the written clearance of the competent person (head of department, division or plant as the case may be, reference to Clause 3.1.2.

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

REFERENCE

1. IPSS 1-11-002-19: Safety Procedure For Oxygen, Nitrogen and Fuel Gases
2. IPSS 1-06-034-17: Code of Practice for Oxygen Gas Pipeline
3. IS: 309 – 2005: Compressed Oxygen Gas