Confined Space Entry (CSE) Procedure

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1. **OBJECTIVE:**

   Objective of this procedure is to provide the safe work practices required for Confined Space Entry and to protect personnel from the hazards of entering and performing jobs in confined spaces.

2. **SCOPE:**

   This procedure applies to all operating and project sites of Tata Power Group companies including JVs/ Subsidiaries.

3. **EXPECTED RESULTS:**

   3.1. Manage Confined Space Entry jobs being done under Permit-to-Work safely.

   3.2. Control of incidents related to Confined Space Entry.

   3.3. Compliance to Regulatory requirements related to Confined Space Entry.

4. **ACCOUNTABILITY & RESPONSIBILITY:**

   4.1. **ACCOUNTABILITY**: Concerned Division's Heads/Assets Custodian.

   4.2. **RESPONSIBILITY**: Concerned Engineer

5. **GLOSSARY/ DEFINITIONS:**

   Approver: Location Manager in charge of plant/dept. Authorized shall be as per the permit to work procedure.

   Confined Space: A confined space is defined as a space, which may or may not be enclosed.

   - It is large enough and a person can bodily enter and perform assigned work.
   - It is not designed for continuous human occupancy.
   - It has got limited or restricted means for entry and exit.

   CSE: Confined Space Entry

   Entrant: A person who is authorized to enter a confined space; who understands the potential hazards, the precautions to be taken, the scope and limits of the specified work, and the evacuation and communication procedures; and who knows the other people involved in the entry.

   ELCB: Earth Leakage Circuit Breaker

   HIRA: Hazard Identification and Risk Assessment

   Hazard Identification & Risk Assessment: Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put control~~s~~ measures for safe execution of activities.

   Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage property. .

   IDLH Immediate Danger to Life and Health

   Holder(Maker): Person who initiates the Permit- to-Work process, works with relevant people involved in the confined space entry to ensure that all Permit-to-Work requirements are met.

Job: A piece of physical work defined by time or other limits and that has a clear start and end point.

Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.

LCS: Local control station

LEL: Lower explosive limit

LOTO: Lock out Tag out

Non Routine Job / Task: Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed

PPE: Personal Protective Equipment

PTW: Permit to Work

Risk : Effect of uncertainty, Risk is a combination of the consequences of an event and the associated "likelihood" of occurrence

OH&S Risk: Combination of the likelihood of occurrence of a work-related hazardous event(s) or exposure(s) and the severity of injury and ill health that can be caused by the event(s) or exposure(s)

Risk Assessment: A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized in order to reduce risks to acceptable levels.

Severity: The level of consequence / harm of an event that could occur due to event / exposure to the hazard present

SCBA: Self Contained Breathing Apparatus

Severity: The level of consequence / harm of an event that could occur due to exposure to the hazard present

SHE Safety, Health and Environment

Shall: Mandatory requirement

Should: Optional requirement

Stand-by Person: A certified trained person assigned to remain on the outside of, and in close proximity to, the confined space and capable of being in continuous communication with and to observe those inside.

Task / Activity: A sequence of steps taken to conduct a job. A task is a sub element of a Job.

TLV-TWA Threshold Limit Value – Time Weighted Average

6. PROCEDURES:

6.1. Initiation for Confined Space Entry: Upon receipt of requirement for confined space entry, the issuer will discuss with the approver on the scope of the work for the CSE.The Issuer shall initiate the Permit-to-Work and plan the preparation for confined space entry to ensure that the necessary requirements of the CSE are met.

6.2. Planning for Safe Confined Space Entry: The Issuer and acceptor prepare the work site ready for safe work and this includes but not limited to the following:

a. Identify the location where confined space entry permit is required.
b. Identify the hazards and conduct risk assessment in the confined space.
c. Eliminate or control the hazards in the confined space
d. Decide the employees who will enter the confined space
e. Train employees for entry operations
f. Make sure employees know their duties and responsibilities
g. Plan for emergencies – Communication and rescue equipment

6.3. Preparation for Confined Space:

6.3.1. Identification and Listing of Confined Spaces: A Cross Functional team (CFT) comprising of Issuers, Acceptors and Safety Professional should identify all Confined Spaces in a plant /project area and give an identification number. A signage at the entrance so that everyone can identify that it is a Confined Space and precautions required to enter must be displayed in Hindi, English and Local language.

6.3.2. Identify hazards and asses risks: The Permit-to-Work (PTW) issuer along with accepter shall organize and conduct a Hazard Identification and Risk Assessment (HIRA) or Job Safety Analysis (JSA) along with acceptor and get it approved by approver. This shall be done in accordance to the type of confine space entry as identified in Annexure 3 – Types of Confined Space entry.

6.3.3. Securing the work area: Locations where unprotected confined spaces are there (e.g. Confined open trenches / pits), noticeable cautions sign “Notice - Confined Space Entry Permit Required for Entry.” shall be displayed. Barricades and signs shall be put up to warn and prevent unauthorized access to the work area where confined work is in progress.

WARNING	• **Provide caution board that vessel entry is in progress.** • **Remove gas-cutting torch when not in use from confined space.**

6.3.3 Isolate the confined space

6.3.3.1 Decontaminate, disconnect, de-energize, blind, lock out, tag out of equipment as per the Tata Power Lock-out / tag-out (LOTO) procedure (TPSMS/CSP/LOTO/001).

6.3.3.2 **Process isolation:** The issuer shall ensure that all incoming and outgoing pipe lines connected to confined space are disconnected physically after isolating and tagging the valves. Blind the live ends at the nearest joint by inserting a metallic plate having correct size, material of construction and appropriate pressure rating (minimum thickness). Spectacle blinds are preferred. Fill the Isolation and blind check sheet as per Annexure-4 Location of Blinds/Isolations.

CAUTION	**Isolation of confined spaces by simply closing of isolation valves shall not be accepted for man entry purpose.**

Each plant shall hold drawings / sketches indicating details of the preparations required for entry into a confined space. These drawings / sketches should include slip plate positions, sizes and physical disconnection positions. Isolation / blind check sheet shall be filled and retained by Issuer / Approver and shall be available for inspection / audit.

6.3.3.3 **Isolation of power driven equipment:** If a vassal has power driven equipment installed, such as an agitator, a positive isolation of the drive unit must be made in addition to electrical isolation as per LOTO procedure. The following isolation in addition to LOTO shall also be used to positively isolate the power driven equipment.

- Disconnection of the drive coupling
- Disconnection of the electrical supply cable from the drive motor by removing fuses.
- Removal of belts from belt driven equipment.

6.3.3.4 **Electrical isolation:** Electrical system associated with the confined space shall be isolated as per the lockout / tag-out procedure for electrical isolation. In the case of a high voltage drives, the circuit breaker shall be racked out from the electrical supply and LOTO procedure shall be followed for Lock out and Tag out.

6.3.3.5 **Radioactive Sealed Sources:** Ensure that any radioactive sources present in the vicinity of the confined space is positively isolated or removed from the work site.

6.3.3.5.1 In equipment/vessels having radioactive source permanently installed, it is either attached to a vessel or is in a tube inside the vessel.

6.3.3.5.2 If the vessel has a radioactive source located inside a tube, i.e. internal, it must be withdrawn into the source holder and the shutter closed and locked before an approval of the Permit- to-Work.

6.3.3.5.3 If this is not possible, the source shall be physically removed.

6.3.3.5.4 If a vessel has an attached radioactive source, i.e. external, then the source shutter shall be moved to the shut position and then locked off and tagged in this shut position before Permit- to-Work is issued.

6.3.3.6 **Depressurisation:** The confined space for entry must be completely depressurised and all the sources of energy are brought down to zero.

6.3.3.7 **Eliminate or control atmospheric hazards:** Eliminate or control the hazards in the confined space; conduct the risk assessment to identify and document the method and the steps necessary to eliminate or control the hazards.

6.3.3.8 **Decontamination:** The vessel is to be cleaned prior to entry by forced mechanical ventilation, purging, steaming, draining, washing, or neutralizing, as required. When it is necessary to enter a vessel to clean it out and there is any possibility of toxic fumes being released from pockets of crusty or sludgy material, the necessary personal protective and respiratory equipment must be worn as specified in HIRA.

6.3.3.9 **Ventilation:** Forced mechanical ventilation either by air blower/movers shall be used and maintained throughout the job. Test should be carried out to ensure gas/Vapour concentrations are below 50% of Threshold Limit Value-Time weighted Average (TLV TWA).

CAUTION	**Oxygen should not be used to ventilate the Confined Space**

WARNING	**Air Hose should not be put in confined space for ventilation**

6.3.4 Test the space for atmospheric hazards:

6.3.4.1 Testing Sequence: Conduct the tests as per following sequence:

6.3.4.1.1 Test for oxygen: it must be performed first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere.

6.3.4.1.2 Test for Combustible gases: It must be performed next because of the threat of fire or explosion.

6.3.4.1.3 Test for Toxic Gas: this test is done to ensure that toxic gases and vapors are within limits as mentioned below.

Note: Measurement of values for each atmospheric parameter should be made for at least the minimum response time of the test instrument specified in the instrument manual. Instruments used for measuring atmospheric condition in the confined spaces must have current calibration

6.3.5 **Acceptance Criteria**: An atmosphere is free from danger when the following conditions are satisfied:

6.3.5.1 The oxygen content is between 19.5% to 23.5% as per OSHA.

6.3.5.2 The explosive meter test (indicates the absence of flammable gas or vapour), LEL reading shall be zero.

6.3.5.3 The concentration of toxic gases or vapours is at a safe level as indicated by appropriate testing, i.e. below 50 % of Threshold Limit Value -Time weighted Average (TLV TWA).

6.3.5.4 The Gas test readings shall be recorded for the subsequent testing which is to be attached with Permit- to-Work in the format as shown in Annexure-5 -.Gas Test record Sheet

6.3.5.5 Gas cylinder/welding machine shall never be taken in confined space.

CAUTION	**Gas cylinder / welding machine shall never be taken in confined space**

6.3.6 **Continuous and/or Periodic monitoring:** Testing should always be carried out as close as possible to the time at which entry is to be made. Continuous monitoring shall be used when the activity inside the confined space can alter atmospheric conditions or there is a known activity-taking place outside the space during the entry that has direct potential to alter the atmospheric conditions inside the space. Periodic monitoring (not more than 2 hours apart) shall be done in the cases when the condition inside the confined space is not likely to be altered because of the work inside the confined space and/or activities being carried out in the surrounding space.

6.3.7 **Testing stratified atmospheres:** When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested from top and bottom and using a probe so that representative sampling is done.

6.3.8 **Sampling:** A person authorized & trained in Confined Space entry procedure (for the purpose shall carry out sampling of confined space atmosphere and testing and the results of such tests shall be entered in the Permit- to-Work at appropriate space available for the purpose and also in sheet for recording gas test as per Annexure 5 - Gas Test Record.

6.3.9 The confined space shall be evaluated prior to re-entry after any break in continuous entry, for example if both the attendant and the entrant leave the work area to take a lunch break

6.4 Identify Necessary Equipment:

6.4.1 Safety equipment and working tools: Safety equipment required for a job shall be indicated on the Permit- to-Work. Before entry can proceed, equipment must be available at the entry point for each person who is to enter and for each standby personnel. Safety equipment shall be checked before each use to make sure these are in working condition. Indicative list of equipment but not limited to is given as below -

- Full body Safety Harness with double life line
- Respiratory PPE
- Power Tools with ELCB
- Two-Way Communication equipment
- Portable Gas Detector
- A Confined Space Entry (CSE) Board with green tokens.

6.4.2 **Visibility:** When visibility is inadequate, additional illumination shall be given both prior to entry and during the work. The type of lighting used should not create additional hazards. 24 V DC hand lamps shall be used.

6.4.3 After completion of the job the acceptor of Permit- to-Work shall complete the protocol with process representative to get the vessel checked for cleanliness, removal of tools and tackles and personnel. The bolting of the manhole shall be done in presence of maintenance / process representative.

6.4.4 The Permit- to-Work shall be signed off prior to the issue of a new Permit to Work for boxing up equipment and removing isolations.

6.4.5 Maximum validity of the Confined space entry shall be as per the Tata Power Permit-To-Work procedure.

6.5 Duties: Duties of persons involved in confined space entry related jobs are mentioned as below-

6.5.1 Confined Space Entry Supervisor (Permit Issuer):

6.5.1.1 Ensures that concerned persons are trained in Confined Space Entry and are aware about the hazards associated and of their responsibilities to carry out the work safely.

6.5.1.2 Ensures that a risk assessment (HIRA/JSA) has been completed with the prior to the commencement of any work in a confined space.

6.5.1.3 Issue Permit-To-Work (PTW) and energy isolation is done as per Lock Out & Tag out (LOTO) Procedure.

6.5.1.4 Arrange for all individuals who are required to enter confined spaces to attend Confined Space Entry training program prior to entry of confined spaces.

6.5.1.5 Authorize individuals to enter confined space only if they are trained.

6.5.1.6 Ensure that all Entrants understands and follow the Standard Operating Procedures of specific jobs to be carried out inside the confined space like hot work, chemical cleaning, coating etc.

6.5.1.7 Supervise or arrange supervision of the confined space, including providing a stand-by person.

6.5.1.8 Ensure confined Space is prepared as per Confined Space Entry procedure.

6.5.2 Confined Space Entry Permit Acceptor:

6.5.2.1 The acceptor shall discuss with the Issuer to understand the risk assessment (HIRA/JSA) and Permit- to-Work requirements, and he shall make sure that all the safety precautions mentioned in Permit- to-Work are in place.

6.5.2.2 He shall also explain the risks & hazards associated with the HIRA/JSA to his team. He shall ensure with the help of issuer that the safe working conditions are maintained throughout the work.

6.5.2.3 Ensures lockout & tag-out of all power-driven equipment.

6.5.2.4 Ensures that blinds are in place on disconnections on all pipelines including hydraulic and pneumatic energy lines feeding the vessel/confined space.

6.5.2.5 Ensures that radio -active sources are isolated.

6.5.3 Standby Person:

6.5.3.1 Monitors the conditions around the confined space, tracks activities of entrants and remain in communication with them for the purpose of summoning rescue services in case of emergency.

6.5.3.2 Maintains a list of entrants into confined space as per the Annexure-I and controls access of unauthorized persons inside the confined space.

6.5.3.3 Stays outside the confined space (entry point) during entire period of entry until relieved by another authorized stand by person.

6.5.3.4 Remains alert to all situations that may adversely affect the entrants.

6.5.3.5 In the event of an emergency, he shall inform the entrants to evacuate the space and summon rescue help and other emergency services. He will not attempt for rescue himself without arrival of Emergency Rescue Team or additional help.

6.5.4 Entrant:

6.5.4.1 Reads and understands the permit requirements and ensures that all permit requirements have been met before confined space entry.

6.5.4.2 A Confined Space Entry (CSE) Board with green token should be placed at the entrance of the confined space. Any person entering the confined space will take out a

token and keep it with him when he is inside the confined space. He will put the token back on the board after he comes out of the confined space. This will indicate how many persons are inside the confined space at any time.

6.5.4.3 Wears required personal protective equipment.

6.5.4.4 Comply all the requirements of Permit- to-Work and shall ensure that any entry to a confined space shall be carried out in accordance with the procedure.

6.5.4.5 He shall show evidence of his current Confined Space Entry training.

6.5.4.6 He shall not enter a confined space without an authorization from the Confined Space Entry Supervisor.

6.5.4.7 Notify the immediate Standby Person/ Confined Space Entry Supervisor of any abnormal situation.

6.6 Plan for Emergencies:

6.6.1 Standby person shall provide assistance to the entrants from outside the space and in case of emergency he shall call Emergency Response Team.

6.6.2 The Approver shall prepare confined space specific rescue plan considering the following points and shall Communicate to Emergency Response Team prior to carry out confined space entry :

- Access / Exit way
- Rescue equipment / tools
- Communication equipment.
- PPE

7. Records:

7.1. Confined Space Entry Log sheet (TPSMS/CSP/CSE/003/FORM/001) - Retention period 12 months

7.2. Locations of blinds/Isolations (TPSMS/CSP/CSE/003/FORM/002) - Retention period 12 months

7.3. Gas test record sheet (TPSMS/CSP/CSE/003/FORM/003)- Retention period 12 months

8. Training & Communication:

8.1. Training of Confined Space Entry procedure shall be carried out to cover for following-

a) Entrant,
b) Stand by person,
c) Authorized Gas tester (AGT)
d) Entry supervisor.

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9. VERIFICATION

9.1. Verification of implementation shall be done during Confined Space entry procedure audit, field safety visit and site inspections.

10. REFERENCES

- Indian Factory Act 1948 and State Factory Rules
- Permit-To-Work Procedure(TPSMS/CSP/PTW/008)
- Shoring and Sloping procedure (TPSMS/CSP/EXS/002)
- LOTO Procedure (TPSMS/CSP/LOTO/001)
- Job Safety Analysis (JSA) Procedure (TPSMS/CSP/JSA/009)
- Hazard Identification & Risk Assessment (HIRA) Procedure (TPSMS/GSP/HIRA/005)

11. Exceptions: Any Exception to this procedure shall only be done as per Document Control Procedure (TPSMS/GSP/DC/014**).**

12. REVIEW:

12.1 Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

12.2 In case release of revised procedure gets delay due to obtaining feedback or any other reasons, safety advisory may be issued immediately to take precautions for the proposed changes in the procedure and revised procedure should be released subsequently.

13. ATTACHMENTS/APPENDIX :

Annexure-1: Confined Space Entry Log sheet

Annexure-2: Hazards of Confined Spaces

Annexure-3: Types of confined space entry

Annexure-4: Locations of blinds/Isolations

Annexure-5: Gas test record sheet

Annexure-1

TPSMS/CSP/CSE/003/FORM/001

LIST OF PERSONS ENTERING THE CONFINED SPACE

A). Date: _____

Plant: _____ Equipment Tag No.: _____
Area: _____ Permit No.: _____

B). Details of Trained Persons /Entrant entering in the confined space:

SL. No.	Name of the Trained person/Entrant entering in Confined space*	Emp.No ./ Gate pass no.	In Time	Sign of Person entering	Out time	Sign of Person coming out

Name of the Stand by person : _____ Sign: _____

Authorized by TATA POWER Engineer Name: _____ Sign: _____

Annexure: 2

HAZARDS OF CONFINED SPACE

The hazards which may be encountered during entry into confined space are lack of Oxygen causing asphyxiation -This may result from chemicals absorbing or replacing Oxygen in the air, or from inert gas often used to remove Oxygen to reduce the possibility of explosions. Air in vessels closed for an extended period may become deficient in Oxygen because of rusting (or oxidation) of the metal of the tank.

- **Ventilation** - Improper or inadequate ventilation during vessel work may also result in Oxygen deficient or Oxygen enrich atmosphere.
- **Toxic Vapors in Dangerous Concentrations** - These may result from known material in the tank, by gradual release from sludge or scale, or by leakage from inter-connection system due to failure of slip plate or disconnect pipelines or ducts.
- Flammable gases with the potential for fire or explosion.
- Hazards from process preparation and cleaning.
- **Dust** - non-hazardous dust having obnoxious smell (unpleasant smell) which can induce nausea/vomiting.
- Hazards created by the task(s) to be carried out, e.g. use of solvents for cleaning, crack detection fluids, painting of vessel from outside etc.
- Injury from mechanical equipment such as stirrers, Agitators, conveyors, etc. being inadvertently activated.
- Bodily injury from direct contact with corrosive or dermatitis producing materials.
- Physical hazards such as slipping, falling objects.
- Presence of radioactive sources.
- Interconnected vents, PSV'S to other system or vessels can cause cross contamination.
- Inadvertent start or close of services in the jackets/limpets of vessel.

Annexure-3

TYPES OF CONFINED SPACE ENTRY

Normal Entry: Any entry into confined space is considered normal where all hazards have been eliminated or minimised to an acceptable level and where persons can enter and work safely without using breathing apparatus.

Precautions to be taken: Supply of breathable air must be maintained for ventilation and cooling in the Confined Space. Air mover / blower must be used.

CAUTION:

a. Pure oxygen shall not be used for ventilating a confined space.

b. Plant air hoses shall not be used for ventilation of confined space when persons are working inside the confined space.

c. A standby person shall be posted to keep in regular contact with the person(s) working inside the confined space and summoning rescue help in case of an emergency.

d. The permit acceptor should ensure that person(s) intended for entry into confined space is fit to work under the prevailing conditions.

Indiscriminate entry without the valid Permit- to-Work and entry without knowledge of Issuer / Approver is prohibited. Entrances and manholes must have entry prevented by the provision of a cover, barrier or notice at all times except when a Permit- to-Work is in force.

Difficult Entry: Certain entries are considered difficult usually due to means of entry or because internals make means of escape or rescue difficult. For such entries, additional standby and communication facilities must be necessary, in addition to usage of a safety belt & life-line.

Note: - Entry should only be considered when approved risk assessment is available and when all the specified safety precautions have been fully considered.

Precautions to be taken:

In case of a difficult entry, the Fire Station/ Safety Dept. / Gas Safety shall be informed before work commences and again when it has been completed.

When working inside a vassal or a space where persons may be hidden from view, two-way communications for maintaining contact with the persons inside should be used. The area manager (Approver) shall ensure that a rescue plan has been made and discussed with all concerned persons.

Confined Space Entry with Breathing Apparatus: In exceptional circumstances it may be necessary to enter a confined space with breathing apparatus and other necessary precautions, under the adverse conditions as described below:

a. An irrespirable atmosphere inside confined space, i.e. contains less oxygen which poses an immediate danger of asphyxiation (i.e. Oxygen content < 19.5%),

b. An irrespirable atmosphere due to presence of toxic or poisonous gas / vapour, i.e. contains such a quantity of toxic gas or vapour that there is an immediate danger to life.

Precautions to be taken:

a. Before authorising such entry, a Risk Assessment shall be carried out and discussed with all concerned persons including the entrants.
b. In case of critical or emergency operational circumstances, at least two standby men shall be positioned outside the confined space, one of whom shall be a member of the Fire Service, who will have direct radio communication with the area manager / SSM or Fire Station to request immediate rescue and medical services.
c. Entrant (s) with breathing apparatus must have undergone formal training in the use of breathing apparatus before start up of the job. Area manager to validate the training.
d. Any person entering the confined space shall wear breathing apparatus, (SCBA), Safety belt with double harness lifeline. The free end of the lifeline shall be anchored outside-confined space. Additional supplies of breathing apparatus/spare filled cylinders and rescue equipment shall be readily available before work in confined space commences.

Annexure-4

TPSMS/CSP/CSE/003/FORM/002

LOCATION OF BLINDS/ ISOLATIONS

Plant: _____ Equipment Tag No.: _____

Area: _____ PTW No.: _____Date: _____

Initiated By:_____
Purpose of blind:

Show the sketch of the blinds / isolations (attach relevant P&ID, if possible).

SL No.	Description	Type	Size & Rating	Installed by		Approved by		Removed by	
				Sign	Date & Time	Sign	Date & Time	Sign	Date & Time
1.									
2.									
3.									
4.									
5.									

Annexure-5

TPSMS/CSP/CSE/003/FORM/003

GAS TESTS RECORD SHEET

Permit- to-Work (PTW) No: _____ Date of Permit- to-Work:_____

Oxygen meter, LEL Meter, Toxic/Multi Gas Detector should have the sticker indicating the Date of last Calibration & due date of calibration.

S No & Make of Gas Detector/s:_____,Due date of Calibration:_____

Gas Test must be done as per 6.3.4 and 6.3.7 of Tata Power Confined Space Entry Procedure TPSMS/CSP/CSE/003

Readings are measured at interval not more than two hours apart

Date	Time (hrs)	Oxygen, %	LEL, %	Toxicity, ppm	Name	Signature