SAFETY GUIDELINES FOR IRON & STEEL SECTOR		
MINISTRY OF STEEL, GOVT. OF INDIA	**COKE OVENS PLANT (Non-Recovery Type)**	Doc. No: SG/29 Rev no.: 00 Effective Date: --

1. OBJECTIVE:

The main function of Coke Ovens is to convert coal into coke which is used as a fuel and reducing agent in the Blast Furnace

This entire process of coke making is associated with various safety hazards like hit / entanglement with mobile equipment, burns, fire and explosion, slip & fall, exposure to dust, noise, heat & gas etc. Most health hazards in coke production arise from the emission that takes place during coal charging, coal carbonization, coke pushing & coke cooling. Coke oven emissions contain cancer-causing polynuclear aromatic hydrocarbons, along with toxic products.

2. SCOPE:

This recommended guideline is applicable to Coke ovens department of an Integrated Steel Plant**.**

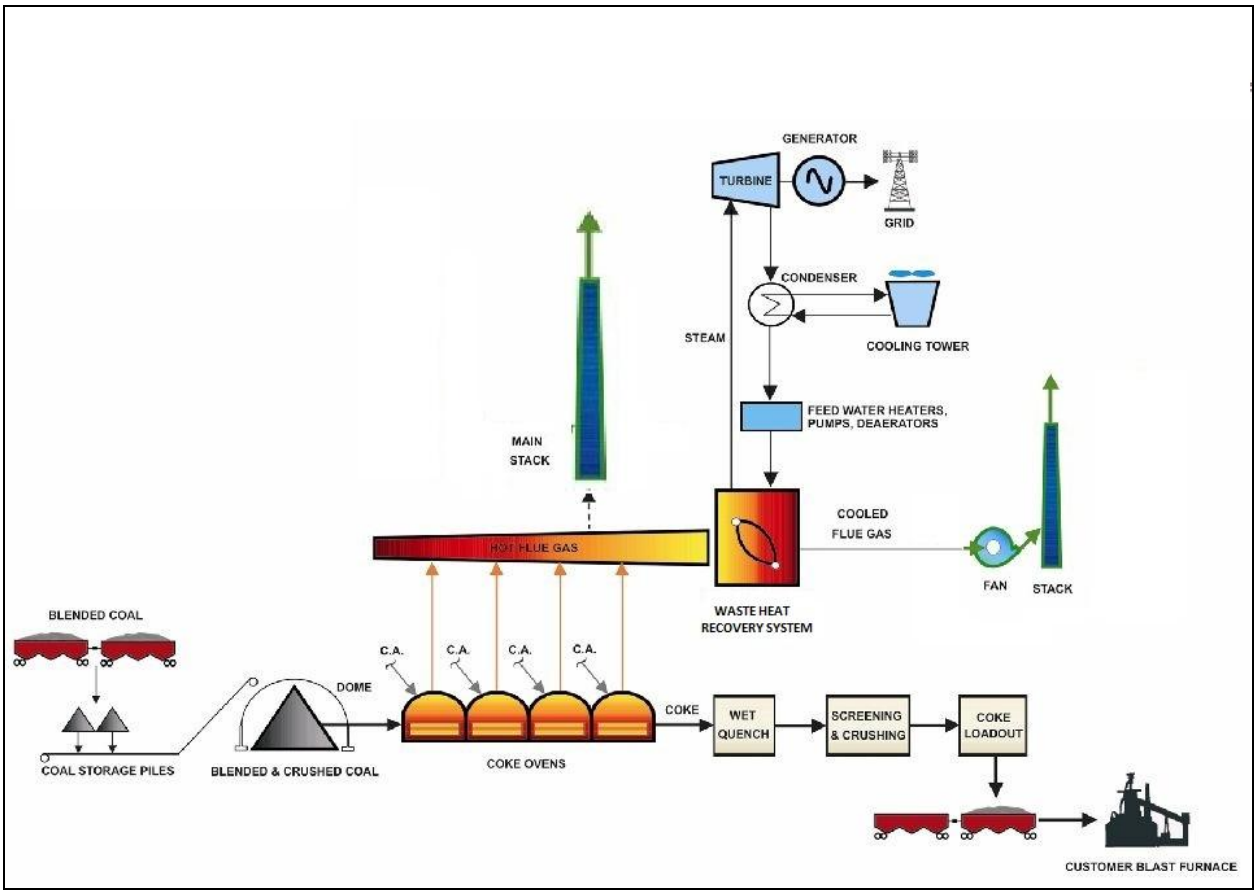
3. PROCESS BRIEF:

The Coke Ovens Plant has following main sections

a) **Coal Handling Plant**: To prepare coal blend suitable for carbonisation in Coke Ovens batteries to produce BF coke.

b) **Coke Oven Batteries**: To convert coal into coke by carbonising coal in absence of air and thereby distilling the volatile matter out of coal. The combusted volatile matter i.e. flue gases are collected in a common tunnel. In order to recover heat from the flue gases, waste heat recovery boilers are used which convert the excess heat into steam for power generation Hence the process is also called ‘heat recovery coke making’.

c) **Coke Sorting Plant**: To crush and screen coke to 25-80 mm size (metallurgical coke) required by blast furnaces. The 0-10 mm fraction (breeze coke) is used in sinter making and 10-25 mm fraction (nut coke) is added along with sinter supplied to Blast Furnace.



4. PROCESS HAZARD ANALYSIS & NECESSARY RISK CONTROL MEASURES:

Sl. No	Area/Section	Hazards	Risk Control/ Measures
1.	Material handling through conveyor belt	Caught in-between the head/tail pulley/take-up pulley and belt resulting into fatality, deep cut, impact injury, blunt injury	a) Workers not to wear loose clothing while working. b) Cleaning of spilled material not to be allowed in running condition of the belt c) No job to be allowed on a running belt. d) Proper housekeeping to be done regularly to ensure obstruction free

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			movement. e) Permit to work system to be followed for any repair/ maintenance activity. f) Hooters/siren to be sounded for at least one minute before starting the conveyor g) Safety guards to be provided and inspected at regular intervals. h) SOP for conveyor belt operation to be prepared & followed. i) Pull cord system to be provided/ j) Illumination level to be checked regularly. *(Refer SG-19: Safety Guideline on Operation and Maintenance of Conveyor Belts)*
2.	Gas cutting operation	Fire/ Explosion resulting into burn injury	a) Prior inspection of gas cutting set by site supervisor. b) Cylinder to be supported properly & shifted using properly trolley and kept with individually chained. c) Gas regulators to be provided on gas cylinders d) No gas cylinder to be allowed inside the confined space. e) Use of flash back arrestor to be necessary in all cutting set. f) Pilot Lighter to be used for gas cutting set. g) Only skilled workers to be deployed on the job *(Ref. SG-01: Safety Guideline on*

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			storage, handling & use of gas cylinders, SG-07 : Safety Guideline for Gas cutting & Gas Welding)
3.	Maintenance / repair of coke cutter	Slip & fall from cutter receiving chute resulting into fracture of bones, deep cut & blunt injury.	a) Only skilled manpower to be deployed for this job b) Use of hand gloves, safety shoes to be ensured. c) Illumination level to be checked as to the schedule. d) Shutdown to be taken with proper power ISOLATION before starting inspection *(Ref. SG-05: Safety Guideline for Illumination at workplace , SG-18: Personal Protective Equipment (PPE) Management , SG-04 :Safety Guideline for Permit to Work(Operation & Maintenance)*
4.	Maintenance of gas pipeline header.	Slip & fall from header maintenance platform resulting into fracture of bones, deep cut & blunt injury.	a) Isolation to be done for section under maintenance. b) Only skilled workers to be engaged. c) Maintenance platform to be fixed every time before the job. d) Life line for fixing safety harness belt to be ensured. e) Safe maintenance procedure for maintenance/repair of Gas header to be developed and implemented. f) Requisite PPE's to be used *(Ref. SG-21: Safety Guideline for Handling Fuel Gas, SG-02 : Safety Guideline for Working at*

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			Height, SG-18: Personal Protective Equipment (PPE) Management)
5.	Replacement of oven door	Door may fall during operation resulting in to fracture & burn.	g) Sling rope to be fixed with door lifter so that in case the hydraulic fails, the door will not fall. h) SMP to be developed and implemented. i) Pin to be welded with bracket. j) Bracket bolt tightening to be done as per the schedule. k) Only skilled workers to be engaged. l) Preventive maintenance schedule to be followed as per check list.
6.	Operation of Pusher car machine.	Person may trap between rail track and machine resulting in to crush injury or fatality	a) Hooter is to be blown while machine is in operation. b) Safety instructions to be developed and implemented
7.	Operation of quenching car.	Contact with hot coke during shifting through car resulting to burn injury.	a) Flap gate to be provided to prevent coke spillage from the tray. b) Hooter to be provided and sounded while car is in operation. c) Safe operating procedure to be developed and implemented
8.	Working near DSL	Contact with Live DSL resulting into electric shock	a) Danger signs & warning lights to be provided at suitable locations.

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			b) Fencing to be provided along the DSL c) Shutdown procedure is to be strictly followed. *(Refer SG-14: Safety Guideline for work on Electric Overhead Travelling (EOT) Crane)*
9.	Coke quenching	Contact with hot water resulting into burn injury	a) Hand railing on drain and settling tank to be provided. b) Caution Danger board to be displayed to ensure the safety from hot water. c) Use of gum boots & hand gloves to be ensured.
10.	Repair / maintenance of hydraulic system	Contact with hydraulic oil under pressure resulting into amputation of limbs or fatality	a) Residual pressure to be released by relief valves. b) Permit to work system to be followed. c) Only skilled persons to be engaged for the job. d) Safe operating procedure on operation/ maintenance of hydraulic system to be developed and implemented. e) Training on safe work practices to be imparted *(Refer SG-10: Safety Guideline for Hydraulic System)*
11.	Lifting of Tools and Tackles	Body parts coming in between the materials & lifting tool resulting in Crush/ Impact Injury	a) Damaged & un- certified slings not to be allowed at job. b) Proper Inspection of lifting Tools & Tackles to be carried out & documented. c) Yearly inspection through

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			authorized agency to be done. *(Refer SG-13 : Safety Guideline for Material handling (manual and mechanized) & storage)*
12.	Lifting of Equipment through jack / Chain Pulley blocks.	Failures of Jack/chain block hanging arrangement resulting into crush injury, impact injury, and deep cuts	a) Proper checking of base & position of jacks & chain block before using of above tools. b) Damaged & un certified slings not to be used at job.
13.	Heating process of bridge pipe & oven door.	Exposure to high temperature, smoke resulting into severe burn injury. Exposure to CO gas resulting unconsciousnes s & blood poisoning.	a) CO detector to be used in regular way. b) Vent Pipe to be provided for exhaust the burnt gas. c) Inspection of burner to be done before starting heating chamber to ensure safety. d) Use of PPEs like hand gloves, fire retardant trousers & dust mask ensured *(Refer SG-21: Safety Guideline for Handling Fuel Gas)*
14.	Working with electrical appliances.	Electric shock resulting into muscular spasm, cardiac arrest, burn injury	a) 3-pin plugs /industrial socket are to be provided for connecting the source of power to the electrical appliance. b) Shifting of electrical appliances in running condition to be prohibited. c) RCCB to be provided with portable tools. d) Electrical related jobs to be performed by qualified

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			persons. *(Refer: SG-15: Safety Guideline for Electrical safety)*
15.	Operation of HT motors of hammer mill.	Flashover of HT Bus bar resulting into electric shock or burn injury	a) Interlocks to be provided to prevent contact of two feeders. b) Safe operating procedure to be developed and implemented c) Shutdown procedure to be strictly followed d) Only skilled workers to be engaged. e) Use of PPE is to be strictly followed. *(Refer: SG-15: Safety Guideline for Electrical safety)*
16.	Checking/repair /replacement of Pressure Transmitter & Thermo-Couple	Exposure to high temperature, resulting into severe burn injury	a) Only skilled workers to be deployed for the heat area job. b) No workers allowed without proper PPE like hand gloves, fire jacket etc.
17.	Cleaning of coal blending silo when the coal jamming.	During cleaning from inside, if rope snapped or unbalance , accident may happen Asphyxia (Lack of oxygen) resulting in breathing problem which may lead to fatality. Sudden Spillage of coal resulting in injury.	a) Permit to Work to be followed for confined space entry. b) Cross ventilation to be ensured. c) Before starting the job , checking to be done as per the check list. d) Job to be done in day time only e) Proper illumination is to be maintained before starting the job. f) Proper PPE is to be used while cleaning g) Yearly testing of lifting tools and tackles done.

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			h) Opening Of Discharge Chute Controlled by Manually Control Gate from safe working distance *(Refer: SG-03 :Safety Guideline for Working in a Confined Space , SG-05 :Safety Guideline for Illumination at workplace)*
18.	Welding	Electric Shock resulting into Fatality or muscle spasms or cardiac arrest or unconsciousnes s or severe burn injury.	a) Cable lugs used for the connections of the cables. b) Use of all relevant PPE is issued. c) Double earthing d) Use of ELCB/ RCCB in the incoming side *(Refer: SG-07 :Safety Guideline for Gas cutting & Gas Welding)*
19.	Operation of Hydra 20MT	Breaking of boom structure may result into impact, injury, fatality	a) Lifting of rated capacity to be ensured. b) Person not allowed going below the lifted material. c) Rigging practices to be followed. d) Load chart to be followed before every lifting. e) Ensure barricade before every erection work. f) Yearly testing of tackles through competent authority done. *(Refer: SG-13: Safety Guideline for Material handling (manual and mechanized) & storage)*
20.	Replacement of battery header pipe	Tripling of hydra, Burn Injury Fall of material and person	a) Engagement of hydra with proper load analysis. b) Only trained person with proper PPEs for hot zone

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			should be engaged. c) Loose material should not be kept at the edges of the height area. d) Proper fall protection system (full body harness, lifeline etc.) should be used. e) Person with height pass should be engaged for height job. f) Strictly adherence to work permit system *(Refer: SG-02: Safety Guideline for Working at Height , SG-13 Safety Guideline for Material handling (manual and mechanized) & storage)*
21.	Wheel bogie replacement of Quenching Car	Cut injury, bone fracture, fall of material, failure of hydraulic jack	a) Only certified & tested chain block, slings to be used for handling load. b) LT wheel to be locked mechanically. c) Power to be kept off from electric panel. d) Certified & tested hydraulic jack to be used & in parallel packing plate provided to bear lifted load
22.	Replacement of Quenching tray	Fall of quenching tray / any loose material resulting into injury & serious accident	a) Usage of certified sling. b) Welding of hook to be done by skilled welder & before lifting the tray, load testing done by lifting to a small height. c) Before lifting of tray , loose material to be removed to avoid falling of any object.
23.	Sole Repairing of Oven	Burn Injury Material fall from height	a) Covered Cage is to be made to protect from fall of hot bricks. b) Inspection of Heat resistant

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			and protection shield to be done before starting the job. c) Face shield safety Helmet, Heat resistant gloves, shoes & jacket to be provided to protect the workers.
24.	Coal handling plant	Hand getting pressed during coupling / decoupling of wagons	a) Use scotch block below wagon wheel . b) Ensure proper communication. c) Use PPEs *(Refer SG-25: Safety guideline for loco operation & SG-18 Personal Protective Equipment (PPE) Management)*
		People struck by moving Side arm charger	a) Unauthorized entry to be restricted. b) Alarm system c) Interlock between side arm charger ground working.
		Wagon rollover	No movement across the track while wagons are pushed or pulled. *(Refer SG-25: Safety Guideline for Loco Operation)*
		Hit during rotation of tippler	a) Siren system prior to start of rotation. b) No person is allowed at tippler table top during rotation c) Development & adherence to SOP
		Sudden opening/falling of wagon doors.	People are not allowed to stay or walk within 5 ft from wagon during in haul/ outhaul
		Moving	a) Shutdown/permit to work

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		Conveyor	with electrical isolation b) No work should be done on conveyor in running condition. c) Always operate local emergency switch for approaching conveyor. d) Availability of pull chord e) Siren system prior to restarting conveyor. f) Loss cloth to be prohibited. g) Area barricading if material is removed from height. h) Head end and tail end guard. i) Crossing the conveyor only through the designated place. j) Conveyor guard throughout length of conveyor including return side. k) Sufficient illumination to be maintained. l) Spillage, if any, to be cleaned regularly to avoid slippages *(Refer SG-04: safety Guideline for permit to work operation & maintenance) , SG-19: safety guideline on operation and Maintenance of Conveyor belts, SG-05 : safety Guideline for illumination at work place)*
		Rotating machineries	Coupling guards to be in place. Loose cloth to be prohibited. *(Refer SG-09: Safety Guideline in Equipment & machine Guarding)*
25.	Coke Oven Batteries	Wrong Pushing	Machine interlock to be provided & maintained.
		Coke falling on person from an open door	a) Nobody should pass in front of open door b) All door man should wear

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			FR Jacket c) Manual frame cleaning to be done by standing in a side and not directly in front d) Use coal cake scrapper during cake breakage most of the time to clean it (for Stamp charge) e) During coal cake breakage never stand in front of oven for cake cleaning if required (for Stamp charge) f) Wear helmet with glass protection for face.
		Person hit by moving machines	a) Siren / Bell / hooter during Movement of Oven Machine. b) Before starting a standing car, long Hooter should be given and operator to check for any person doing any Job c) Permit to work prior to under taking any maintenance job d) Climbing prohibited on running machine e) Interlock to be provided to stop the machine if someone tries to climb on running machine.

Note:

1) The operating procedure as given in the write-up may vary from shop to shop due to different equipment disposition and type. Safety precautions under each head may be separately identified.
2) Other standard plant safety procedures shall be followed.
3) Signage's and emergency escape route shall be shown covering the entire shop.
4) Provision & operability of safety fences should be ensured covering the entire shop.
5) The above safety guidelines have been prepared keeping in view standard points applicable to the area of work in the steel industry. SOPs (Standard Operating Procedures) & SMPs (Standard Maintenance Procedures) are to be developed and followed by users as per specific processes / equipment/ technologies deployed as well as prevailing site conditions, in respective plants.