



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Grinding works

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Grinding machine, Hand tools, spanner set
4. PPE required : Hand gloves, safety goggles, safety shoes, safety helmet, full body harness, boiler suit.
5. Authorization required : Height pass

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Wheel mounting	a) Electric shock	<ol style="list-style-type: none">1. Portable grinding machine shall be well insulated.2. Grinding machine shall be periodically inspected and inspection tag shall be displayed.3. While mounting the grinding wheel on portable grinder, disconnect the machine from electric power.4. Disconnect electric power to the machine when not in use.5. Check all the electric cables, earthing etc. for any damage6. Wear rubber hand gloves7. ELCB to be installed on the extension board.



NLC TAMILNADU POWER LIMITED
SAFETY DIVISION
STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Grinding work

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Wheel damage, cracks etc.	<ol style="list-style-type: none"> 1. Grinding wheel shall be from reputed brand and quality. 2. Check physical damage to the wheel before mounting. 3. Check expiry date of grinding wheel.
2.	Grinding operation	a) Breaking of wheel	<ol style="list-style-type: none"> 1. Based on RPM of machine wheel should be selected. RPM of grinding wheel should be more than that machine. 2. Safety guard to be provided for grinding machine. 3. Always use special reinforcement grinding wheels. 4. Maintain a gap 3 mm between job rest and grinding wheel. 5. Ensure that job rest is fixed firmly.
		b) Fire Hazard	<ol style="list-style-type: none"> 1. Remove flammable material from work area. 2. Use fire blankets to cover any flammable material. 3. Keep fire extinguisher near working area.
		c) Body injury	<ol style="list-style-type: none"> 1. Do not use hand gloves during grinding operation. 2. Persons working at 2.5 m and above shall have valid height pass. 3. Scaffolding/platform shall be inspected and certified for use. 4. Grinding shall be done by trained person.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Grinding work	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
----------------------	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			<ul style="list-style-type: none">5. Grinding shall be carried in a direction away from the face of operator.6. Check the direction of rotation of wheel and install the wheel on machine shaft accordingly.7. Sharp curves to be avoided while grinding with flexible shaft grinder.8. Use face shield to avoid (eye injury).



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Grinding work

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shot/Grit blasting

1. Engineer - in - Charge : NTPL
2. Manpower required for the job : Qualified shot/grit blaster, operator, helper
3. Tools and tackles required : Air Compressor, blasting hose pipe, blasting hopper, hand tools, spanners, exhaust fan.
4. PPE required : Ear plug, safety helmet, safety shoes, face masks, blasting suit, hand gloves, goggles.
5. Authorization Required : Medical fitness of the person engaged by conducting pre-employment and periodic medical check-up, audiometry and lung function test.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Starting of compressor	a) Smoke	1. Keep proper exhaust position so that smoke does not enter work area.
		b) Noise	1. Maintain the equipment such that it makes minimum noise. Use ear plugs.
		c) Vibration	1. Place and align the compressor properly.
		d) Over heating of Engine	1. Ensure cooling water availability in radiator of Diesel compressor. 2. Compressor operator shall carry out the pre checks before starting the compressor.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shot/Grit Blasting	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		e) Fire	1. Provide sealed cap to diesel tank. 2. Keep diesel container away from engine. 3. Avoid of spillage of diesel while filling.
2.	Preparation for blasting	a) Contamination of blasting material.	1. Store grit material in bags at dry place to avoid contamination.
		b) Air hose leakage	1. Ensure proper air hose connections, couplings.
		c) Damage to blasting suit	1. Before wearing the blasting suit check for proper air supply and exhaust.
3.	Blasting operation	a) Flying dust	2. Blaster shall wear blasting suit and compressor operator and other persons shall wear face masks, goggles and ear-plugs/ear-muffs.
		b) Spread up of blasting material	1. Area should be wet to prevent dust explosion. 2. Blasting work area to be enclosed and properly ventilated. 3. Good housekeeping to be maintained
		c) Hose bursting	1. Condition of all hose pipes and couplings to be checked for damage, or leakage before blasting. 2. Compressor operator shall always be present at work spot so that blasting activity can be stopped immediately in case of hose bursting. 3. Always maintain correct pressure.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		d) Fire hazards	1. Put “No Smoking” signboard nearby. 2. Provide adequate quantity of fire-fighting equipment in the area.
--	--	-----------------	---

JHA on Shot/Grit Blasting	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		e) Health Hazard	1. Pre-employment and periodical medical checkup, audiometry and lung function test should be conducted for the persons working in blasting operations.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shot/Grit Blasting

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Pickling work

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Acid storage tanks, acid dilution tank, electric heater, blower, dryer, washing tanks, filter rinse tank, neutralization tank, brushes, separators.
4. PPE required : Safety Gloves, safety shoes, safety goggles, boiler suit, safety apron, sand, rubber hand gloves, rubber shoes/ gumboots, emergency showers and eye washers etc.
5. Authorization required : Nil

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Acid Storage	a) Acid leakage	1. Storage tanks of adequate capacity should be used.
		b) Acid Splash	1. Conduct daily inspection for leakage.
		c) Acid Fire	1. Fire extinguisher must be provided in the area.
2.	Acid dilution	a) Acid Splash	1. Always add acid to water stirring it slowly.
		b) Acid burns	1. Use hand gloves, rubber apron and face shield. 2. Put sign boards showing content of the tank



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Pickling work	Rev. No.	Doc. No:	Page of 2	Sign. of agency	Sign of NTPL Executive
----------------------	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			3. Those who work with the process should be provided adequate training. 4. Provide emergency showers and eye washers.
3.	Pickling of Pipes – Acid heating	a) Electric shock	1. Proper earthing should be provided with ELCB/RCCB.
		b) Electric Fire	1. Electrical wires should be joint free. 2. Suitable types of fire extinguishers to be provided. 3. Use proper temp. controller.
		c) Acid fumes	1. Provide adequate ventilation and illumination.
4.	Pickling	a) Acid splash	1. Deploy trained persons for the job. 2. Always wear PPE.
		b) Fire	1. Suitable types of fire extinguishers to be provided.
		c) Burning from acid	1. Neutralization shall check properly. 2. Provide emergency showers and eye washers.
		d) Acid leakage	1. Follow procedure of acid mixing, storage and shifting. 2. Use acid resistant material for storage. 3. Change old storage devices periodically. 3. Replace the pickling solution after periodic inspection. 4. Make water hose connection for dilution of acid in case of spillage.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

5.	Neutralizing	a) Acid contamination	1. Use rubber hand gloves, boiler suit, safety apron, rubber gum boots and face shield.
----	--------------	-----------------------	---

JHA on Pickling work	Rev. No.	Doc. No:	Page of 2	Sign. of agency	Sign of NTPL Executive
----------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Painting at Height

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : Qualified painter, helper
3. Tools and tackles required : Wire brush, painting brush, cotton cloth for cleaning , spray machine, spanner set, scaffolding working platforms.
4. PPE required : Hand gloves, safety goggles, safety shoes, nose mask, full body harness, safety helmet. boiler suit
5. Authorization required : Height pass and confined space entry certification.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Shifting of painting drums and mixing of paint	a) Spillage of paint	1. Handle painting drums carefully to avoid spill.
		b) Suffocation due to thinner fumes	1. While mixing of paints, area should be well ventilated 2. Use nose masks, hand gloves
		c) Fire hazard	1. Do not smoke in the area. 2. Provide fire extinguishers in the nearby area.
2.	Painting by brush/spray	a) Vapour could irritate the mucous membrane.	1. Provide adequate ventilation 2. Use nose masks.
		b) Long and frequent skin contact could lead to dermatitis/Irritation	1. Use rubber hand gloves, wear boiler suits.
		c) Obstruction hazard due to spray hose.	1. Proper routing of spray hoses.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Painting at Height	Rev. No.	Doc. No:	Page of 2	Sign. of agency	Sign of NTPL Executive
---------------------------	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		d) Fire	<ol style="list-style-type: none"> 1. Avoid the spillage. 2. Maintain good housekeeping. 3. Proper disposal of paint containers, brushes, waste rags, etc. 4. Keep fire-fighting equipment nearby. 5. Provide adequate ventilation. 6. Smoking should not be allowed near the painting works.
3.	Painting at heights.	a) Falling of men and material from height.	<ol style="list-style-type: none"> 1. Safe access/working platform to be provided. 2. Scaffolding and plat form shall be certified. 3. Use full body harness and safety helmet. 4. Persons working at height 2.5 m and above should have valid height pass. 5. Safety net should be provided below the working location. 6. Entry to the bottom area should be restricted by cordoning/ barricading. 7. Keep the material in safe place.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Painting at Height

Rev. No.

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Working in Confined Space

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : Trained manpower, safety supervisor
3. Tools and tackles required : Oxygen meter, explosive meter, toxic gas meter, walkie-talkie, 24V power supply tools, tackles and lamps,
4. PPE required : Full body harness, full body harness, helmets, safety shoes, breathing apparatus, life line, fall arrestor
5. Authorization required : Yes, Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1	Preparations to enter in confined space	a) Reduction in Oxygen level / pressure of asphyxiation gases.	<ol style="list-style-type: none">1. First entry to confined space should be by wearing SCBA sets for sampling and survey.2. Ensure the oxygen content with Oxygen meter at workspot and shall be more than 19.5%.3. Person entering the confined space should use lifeline.4. Provide cell phone/walkie-talkie wherever possible.5. Deploy a responsible person outside confined space for rescue operation.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Working in Confined
Space

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Presence of flammable/explosive gases.	1. Check for any flammable/explosive gases. Concentration of these gases should be < 10% of their respective LEL
		c) Poor ventilation	1. Forced ventilation to be provided.
		d) Poor illumination	1. Provide illumination through 24 V electric supply.
2	Working in confined space	a) Injury due to fall of person, fall of material, mishandling of tools, tackles.	1. Suitable approach, proper working scaffolds, rope ladders, working platforms with handrails shall be ensured. 2. Provide illumination as per statutory requirements..
		b) Suffocation	1. Open the manholes / openings and provide exhaust fan over one of them so that good ventilation shall be maintained. 2. Mask air line to be provided in case of poor ventilation. 3. Person entering the confined space should use lifeline. 4. Provide cell phone/walkie-talkie wherever possible.
		c) Dehydration	1. Before & after the entry in the confined space sufficient quantity of water should be consumed. 2. Working person shall be alternately replaced.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Working in Confined
Space

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		d) Electrocution due to faulty equipment or exposed electrical contact	<ol style="list-style-type: none"> 1. Ensure tools, tackles and equipment are in good condition . 2. Check earthing of equipments. 3. There shall not cut / joints on power cables. 4. Electrical appliances used should of 24 volts only. 5. Ensure availability of torch light in case of power failure and same will be useful.
		e) Fire hazards.	<ol style="list-style-type: none"> 1. Check for any flammable/ explosive gases. Concentration of these gases should be < 10% of their respective LEL. 2. There shall not cut / joints on power cables. 3. Maintain good housekeepingat work place and eliminate inflammable material. 4. Keep proper fire extinguishers available.
		f) Accident due to improper communication	<ol style="list-style-type: none"> 1. Proper communication between the person workingin confined space and monitor shall be ensured. 2. Provide life line to the person working inside. 3. Provide cell phone/walkie-talkie wherever possible.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		g) Unconsciousness	<ol style="list-style-type: none">1. Provide proper ventilation2. Working persons shall be medically fit.3. Person entering the confined space should use lifeline.
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JHA on Working in Confined Space	Rev. No.	Doc. No:	Page of 4	Sign. of agency	Sign of NTPL Executive
----------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			4. Deploy a responsible person outside confined space for rescue operation.
		5. Accident due to lack of rescue facility.	1. For emergency handling purposes, keep rescue team in poised condition. 2. Ensure availability of first aid.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Working in Confined
Space

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Fabrication of Structural Material

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Hand tools, grinding machine, welding machine, cutting set, shearing machine, bending machine.
4. PPE' required : Safety Helmet, full body harness, safety shoe, leather apron, face shield, hand gloves, ear plugs.
5. Authorization required : Safety Work Permit.
6. Cautions/special requirements : Training of workers in fire fighting to be ensured.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Handling of structural steel	a) Fall of materials	1. Use qualified and competent workers and supervisors. 2. Restrict entry to bottom area by cordoning/barricading.
		b) Finger / hand and back injury due to improper handling.	1. Proper handling 2. Wear Safety shoe, Helmet, Hand gloves.
2.	Marking	a) Cut injuries	1. Wear hand gloves. 2. Ensure proper supervision. 3. Proper layout.
3.	Cutting	a) Fire / Explosion due to leakage of acetylene from hose connections	1. Store gas cylinders away from heat source. 2. The connections of the hoses shall be leak tight and with flame arrestors.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Fabrication Structures

Rev. No. 0

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			3. Check all Pressure Gauges (PG) are in good working condition. 4. Gas cylinders should be kept up right. 5. Ensure CO ₂ /DCP/Water-CO ₂ extinguishers/ sand buckets are kept near cutting area. 6. Use flash back arrestor in cutting set.
4.	Bending machine	a) Cut injuries	1. Use hand gloves 2. Ensure protective guarding of machine. 3. Ensure proper supervision. 4. Care should be taken while bending.
		b) Electric shock	1. Ensure proper earthing with ELCB. 2. Cable should be free from mechanical damage. 3. Ensure adequate supervision. 4. Electric cable should be guarded 5. Train the people in fire fighting. 6. Ensure use of 3 pin plug for drawl of power.
5.	Shearing machine	a) Cut injuries	1. Use proper PPE 2. Ensure proper supervision 3. Ensure proper earthing.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

b) Electric Shock

1. Wear safety shoe and rubber hand gloves.
2. Electrical cable should be guarded.
3. Train the people in fire fighting before taking up the job.
4. Ensure use of 3-pin plug

JHA on Fabrication Structures

Rev. No. 0

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			5. . 6. Cables should be free from Mechanical damages. 7. Provision of ELCB 8. Ensure proper supervision.
		c) Hit Injury	1. Beware of side equipment 2. Ensure proper layout of equipment and surroundings. 3. Ensure proper supervision. 4. Wear Helmet 5. Ensure proper guarding of machines.
6.	Hammer drilling	a) Foreign metal particle may enter into eye and causes loss of eyesight.	1. Use safety goggle.
		b) Cut injury to finger/hand during drilling	1. Maintain good grip of both hands on handle of drilling machine. 2. Never touch the drill bit during drilling. 3. Follow manufacturers advice. 4. Do not use hand gloves while performing drilling operation.
		c) Electric Shock.	1. Ensure earthing and connection through ELCB. 2. Ensure joint free cable.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Fabrication Structures

Rev. No. 0

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
7.	Welding	a) Welding fumes, aluminum oxide, lead, iron, and manganese fumes inhalation may cause inflammation of lungs, pulmonary edema, emphysema, chronic bronchitis and asphyxiation	<ol style="list-style-type: none"> 1. Provide good adequate ventilation. 2. Ensure use of face mask with respiratory protection.
		b) Infrared, UV rays may causes eye injury	<ol style="list-style-type: none"> 1. Ensure use of Face Shield.
		c) Air pollution	<ol style="list-style-type: none"> 1. Provide effective ventilation
		d) Fire and or Explosion	<ol style="list-style-type: none"> 1. Ensure good housekeeping. 2. Remove all combustible material from welding area. 3. Never gas cut or weld on any paint/chemical container. 4. Provide portable fire extinguishers. 5. Provide fire watch.
		e) Electric shock, burn and fire	<ol style="list-style-type: none"> 1. Check the cable for any cut or joints. 2. Ensure earthing of welding machine and work piece through ELCB. 3. Use leather hand gloves. 4. Ensure tight joints of cable and holder. 5. Connect return welding lead directly to the work.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

8.	Dye penetration test.	a) Fire may occurs as liquid penetrate near hot object in open container / due to sources of ignition.	1. Liquid Penetrant shall not kept in open container. 2. Declare “No Smoking Area”. 3. Provide fire extinguishers.
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JHA on Fabrication Structures	Rev. No. 0	Doc. No:	Page of 4	Sign. of agency	Sign of NTPL Executive
-------------------------------	------------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Fabrication of Piping for Various Systems

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Cutting set, drilling machine, grinding machine,
welding machines, bending machine.
4. PPE's required : Safety helmet, full body harness, hand gloves, ear muffs, safety shoe, face shield.
5. Work Authorization required : Nil

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Transportation of material (manual)	a) Fall of material on foot.	1. Use safety shoes, gloves etc.
		b) Injury due to rough or sharp surface.	1. Proper Procedure/Practices of shifting, placing and handling to be followed.
		c) Back injury due to improper handling of material.	1. Proper Procedure/Practices of shifting, placing and handling to be followed.
2.	Transportation of material (Mechanical)	a) Slippage of rebars from Tractor.	1. Follow proper procedure of shifting, placing and handling. 2. Tie in secured manner while transporting and handling. 3. Side supporters should be followed. 4. Provide red flags/light at the ends.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

3.	Gas cutting	a) Personal injury	1. Good housekeeping in the area to be ensured
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JHA on Fabrication of Piping	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Fire hazard	1. Gas leaks to be checked and corrected. 2. Provide fire extinguishers.
		c) Penetration of flux and other particles and burn injuries.	1. All flammable materials must be removed from nearby area. 2. Tools shall be inspected periodically. 3. Place fire extinguishers nearby for emergency use. 4. Use suitable hose and clamp the hose properly. 5. Depute trained / experienced gas cutter. 6. Keep safe distance between oxygen and DA cylinders. 7. Clear the area from grease, oil and flammable materials.
4.	Fitting	a) Injury to body parts	1. Use proper PPE's like goggles, gloves etc. 2. Use proper hand tools. 3. Deploy experienced fitter.
5.	Drilling and grinding work	a) Breakage of wheel, injury to person.	1. Fitter should ensure use quality wheels. 2. Check expiry date of grinding wheel. 3. Design RPM of the grinding wheel should be more than that of machine shaft. 4. Ensure inspection tags on portable power tools? 5. Use relevant PPE. 6. Use brush for cleaning chips. 7. Machine should be guarded.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

b) Electric shock

1. Isolate grinding machine before mounting of wheel.
2. Ensure machines electrically earthed through ELCB.

JHA on Fabrication of Piping

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		c) Noise	<ol style="list-style-type: none"> 1. Ear plug/muff should be used during operation. 2. Pre-employment and periodic audiometry of workers shall be carried out.
6.	Welding	a) Ultra Violet radiation	<ol style="list-style-type: none"> 1. Ensure use of specific shielding device such as welding screens, goggles etc. 2. Explain the welder that they should avoid direct look to welding Arc.
		b) Globules of molten metal	<ol style="list-style-type: none"> 1. Ensure use of Welding Apron, face shield, safety shoes hand gloves etc. 2. After welding, chalk mark the hot metal or provide some warning sign.
		c) Electric Shock	<ol style="list-style-type: none"> 1. Use quality earthed cable, holder and ensure joint is proper. 2. All electrical equipment should be well covered to protect from rainwater. 3. Ensure earthing to machines through ELCB. 4. Periodical maintenance of machines. 5. Working floor should be ensured dry.
		d) Fire Hazard	<ol style="list-style-type: none"> 1. No flammable and combustible material should be present nearby work spots and area should be kept, neat and clean. 2. Fire extinguishers should be available in nearby area. 3. Blanket/GI Sheet/Asbestos cloth to be used for avoiding falling of hot molten spatters from height.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

			4. Loose connection of cables to be avoided.
			5. Fire watch should be provided.

JHA on Fabrication of Piping	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Excavation of Trench for Buried Piping

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Pick axes, shovels, cane baskets, excavator, dumper, tractor etc. live cable detector
4. PPE required : Helmet, shoes, cotton boiler suits, self-contained breathing apparatus, gumboots, hand gloves.
5. Authorization Required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1	Clearing of sites.	a) Tripping and cut injury	<ol style="list-style-type: none"> 1. The area should be surveyed for tripping hazards and workers shall be briefed for the hazard. 2. All persons working shall use PPE's like helmet, shoes, hand gloves etc
2	Deployment of machine	a) Inadvertent operation of machine	<ol style="list-style-type: none"> 1. Check the working of machine and its condition before start of the job as per standard checklist. 2. Park the machine at level ground. 3. Keep the machine in appropriate position while parked to avoid movement. 4. Keep the machine locked when not in use.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Excavation of Trench
for piping

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			5. Ensure proper working clearance for the machine. 6. Only authorized persons should be allowed to operate the machine
3	Excavation.	a) Injury due to tools and tackles.	1. Safe distance between crew members to be maintained to avoid injury.
		b) Fall of persons in to pit	1. Impart safety instruction to all workers to guard against fall. 2. Proper demarcation around the pit by tape/lighting and cordoning of the area with sturdy barriers. 3. Ladders should be provided at every 30 m distance
		c) Caving in	1. Provide proper shoring. 2. Remove excavated earth immediately. 3. Keep excavated material away from the pit at least 1.5 m or half of depth of the pit whichever is more.
		d) Land slide due to bad weather.	1. Keep "danger" sign and cordon off the excavated area.
		e) Personal injury due to fall from ladder	1. Use sturdy ladder which is to be secured it at bottom and top by using mechanized means.
		f) Breathing problem and health hazard in deep pit.	1. Check oxygen % and do not allow any body to work if oxygen is less than 19.5% 2. If emergency requirement is there to enter in a pit of more than 3-meter-deep, use breathing apparatus set. 3. Check for flammable/explosive/toxic gas in the pit.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

4. The ladder shall extend at least 1 m above the surface of the ground.

JHA on Excavation of Trench for piping

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		g) Damage to buried utilities	<ol style="list-style-type: none"> 1. Take shutdown / isolation of electric cables. 2. Look for route markers. 3. Look for warning tapes/cables 4. Use cable detectors 5. Adhere to manual excavation in case of presence of underground cables.
		h) Fall of heavy objects/ stones etc in the pit.	<ol style="list-style-type: none"> 1. Use only approved equipment. 2. All the working equipment should be kept away from the pit. 3. Entry in to the pit should be prohibited during excavation. 4. Keep the removed earth at least 1.5 m or half of the depth of the pit whichever is more away from the edges of the pit .
		i) Dust	<ol style="list-style-type: none"> 1. Sprinkle water to moist the ground to settle the dust 2. Use dust mask and the goggles.
		j) Working in congested area.	<ol style="list-style-type: none"> 1. Allow only minimum number of persons to work at the same time 2. Train the workers for the safe use of hand tools and safe manual working procedure. 3. Provide alternate emergency access out of excavation.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		k) Heavy equipment operation.	<ol style="list-style-type: none"> 1. Deploy experienced operator having medical fitness 2. Keep minimum distance of 5 m between two equipment while working. 3. Use only tested equipment and employ competent operators.
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JHA on Excavation of Trench for piping	Rev. No.	Doc. No:	Page of 4	Sign. of agency	Sign of NTPL Executive
--	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			4. Keep safe overhead distance between electric cables. 5. Obtain special permits where ever required. 6. Persons working at 2.5 m or more shall have valid height pass.
		l) Fall of machinery in to pit.	1. Strictly follow banks men signals and directions 2. Follow safety procedure. 3. Operate machinery at safe distance from the excavated area to avoid land slide. 4. Deploy trained banks men.
		m) Precautions against reptiles	1. Use gum boots and long hand gloves



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Excavation of Trench
for piping

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Loading/Unloading and Storage of Equipment

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Crane, slings, D shackles,
4. PPE's required : Helmets, Hand gloves, Safety shoes.
5. Authorization Required : License to crane operators, training to signal man, valid load test certificate.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1	Positioning of crane	a) Accident due to collision with personnel / equipment.	1. Training and authorization of signalman should be ensured before taking up the work. 2. Signalman should give proper signal to crane operator
		b) Toppling of crane due to uneven ground surface or uneven loading.	1. Crane operator should have valid license. 2. Ensure that no persons should stand near crane swinging area. 3. Marching route shall be checked in advance and ensured clear. 4. Persons working nearby should wear PPE. 5. Safe Working Load (SWL) and last date of test should be displayed on the crane. 6. Never exceed SWL.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Loading / Unloading
and Storage of equipment

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
2	Putting sling and D-Shackle	a) Hand injury due to improper handling.	1. Use hand gloves.
3	Loading and unloading of equipment with crane	a) Fall of material due to breaking of D-Shackle, sling and pulley.	1. Inspect all slings, D-Shackle before its use as per manufacturer's instruction and/or NTPL guidelines. 2. Check all safety devices for its healthiness.
		b) Crane failure.	1. Never lift the load above the rated capacity (SWL) of material handling equipment. 2. Lifting machine and tool should be load tested by competent person and should have valid load test certificate.
		c) Injury due to fall of material on person standing nearby	1. Tag line should be tied to the lifting material. 2. No one should be allowed to stand below the lifted load. 3. Area should be clear and barricaded with caution board.
		d) Injury due to caught in between the objects.	1. No person should be allowed in the swinging area of crane.
		e) Collision of lifted material with other material resulting in material damage.	1. Before carrying out lifting operation, check the route that the material has to be lifted. 2. Signalman should give proper signal to the crane operator.
		f) Touching of overhead electric lines.	1. Ensure proper clearance from the supply line.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

4	Removing of sling, D Shackle	a) Injury to finger or hand	<ol style="list-style-type: none">1. Remove sling/D Shackle properly.2. Use PPEs like hand gloves and helmet safety shoes etc.
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JHA on Loading / Unloading and Storage of equipment	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
5	Storing of unloaded equipment	a) Toppling of material due to improper stacking.	1. Before removing the sling/ D Shackle, the equipment should be properly supported on ground level.
		b) Injury to person	1. Wear PPEs like helmet, hand gloves, safety shoes etc.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Loading / Unloading
and Storage of equipment

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Wrapping/Coating of Buried pipes

1. Engineer - in - Charge : NTPL
2. Manpower required for the job : At site work
3. Tools and tackles required : Coating tape, bitumen primer, LPG cylinder, and Holiday detector.
4. PPE required : Hand gloves, full body harness, helmet, nose mask, goggles, boiler suit.
5. Authorization Required : Height pass

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Storage of coating tape and primer	a) Fire	<ol style="list-style-type: none">1. No flammable material should be stored nearby.2. Area temperatures should be maintained around 30°C3. Do not allow smoking in the area.4. Provide appropriate type of portable fire extinguishers.
2.	Surface preparation by shot blasting/mechanical cleaning	a) Flying dust	<ol style="list-style-type: none">1. Blaster should wear blasting suit.2. Mechanical cleaning operator should wear mask and goggles.
3.	Applying Bitumen primer	a) Fall of person or material	<ol style="list-style-type: none">1. Use life line and helmet.2. Persons working at 2.5 m and above shall have valid height pass.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Wrapping/Coating of
Buried pipe

Rev. No.

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			3. No person should be allowed to enter below the working area by barricading/ cordoning.
		b) Fire	Take care of sources of ignition.
4.	Applying coating tape	a) Cut to hand	1. Use hand gloves.
		b) Fall of person or material	1. Use life line and helmet 2. Use ladders of standard design. 3. No person should be allowed to enter below the work area. 4. Only qualified person should do wrapping / coating.
		c) Burn injury	1. Wear Leather Hand gloves.
5.	Holiday testing	a) Electrocution due to high voltage	1. Pipe/vessel has to be properly earthed. 2. Instrument should be calibrated. 3. Do not allow unauthorized person to work in the area. 4. Only qualified operator should carry out testing. 5. Use leather hand gloves.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Wrapping/Coating of
Buried pipe

Rev. No.

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Radiography Work

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Radiography source, camera, manila rope.
4. PPE's required : TLD , Dosimeter, Aprons, gloves etc.
5. Authorization required : Work Permit and AERB qualification to Radiographers.
6. Caution/operating : Number of exposure cases has taken place experience feedback during radiography work. Hence while performing radiograph work, it must be ensured that precautions are briefed to workers in Pre-job brief.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
0.1	Personnel involved in the work should use alarm dosimeter and TLD.		
1	Storage of radiography source	a) Radiation hazard	<ol style="list-style-type: none"> 1. Storage area should be properly barricaded with a caution board. 2. Entry of unauthorized person should be restricted through work permit. 3. Leakage field should be measured to ensure that same is within the limits
2	Removal of radiography source from storage pit.	a) Fall of radiography source	<ol style="list-style-type: none"> 1. A good quality manila rope should be used for lifting / removing.
3	Transportation of radiography source to work site.	a) Radiation Hazard	<ol style="list-style-type: none"> 1. Leakage field should be measured and ensure that it is within the prescribed limit.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Radiography work	Rev. No.	Doc. No:	Page of 2	Sign. of agency	Sign of NTPL Executive
-------------------------	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
4	Radiography job operation.	a) Radiation hazard	<ol style="list-style-type: none"> 1. Experienced and qualified manpower should be deployed. 2. The radiographer should be well conversant with the safety practice and shall have valid certificate/license for source handling. 3. Barricade the area according to survey meter reading so that radiation level is within acceptable limit. 4. Display warning tag, danger board & with flag and barricade tape. 5. Survey meter should be calibrated. 6. Watch and ward should be available to restrict unauthorized entry at all possible entry points to the radiography area. 7. Suitable advance notice to be issued to concerned department so that no other activities are planned at that time or radiography.
5	Termination of radiography work	a) Radiation Hazard	<ol style="list-style-type: none"> 1. Radiography camera should be in proper working condition so that source is not struck in between the operation. 2. Personnel involved in the work shall use dosimeter and TLD.
6	Transportation of radiography source back to storage	a) Radiation Hazard	<ol style="list-style-type: none"> 1. Leakage field should be measured to ensure that it is less than acceptable limit.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Radiography work

Rev. No.

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Erection of Piping

1. Engineer - in - Charge : NTPL
2. Manpower required for the job : At site work
3. Tools and tackles required : Sling, D-shackles, wire ropes, chain pulley blocks, tower crane and mobile crane.
4. PPE required : Helmet, shoes, gloves, full body harness, life line and fall arrestor, face mask, goggles.
5. Authorization Required : Height pass.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
	To shift pipe/fabricated pipe spool from fabrication yard to site on truck.	a) While loading pipes through crane, sling or D – shackle may fail.	1. All lifting Tools & Tackles should be with valid test certificate. 2. No unauthorized person shall be allowed while loading by area barricading/cordoning.
		b) During loading on Truck/Trailer, it may hit any person or objects due to swing.	1. To protect from sharp edge, wear gloves. 2. Tag line should be tied to control the direction of pipes. 3. Clear nearby materials. 4. Barricade /cordon the area.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		c) While pipes are being transported through truck/trailer, it may fall down.	<ol style="list-style-type: none">1. If length of pipe goes outside truck bed, it should be tied properly with rope.2. Red flags and red lights should be tied to the extreme end of pipes.3. Travelling route should be clear.
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JHA on Erection of Piping	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
2.	Lifting of pipe spools	a) Failing of spools/other materials.	<ol style="list-style-type: none">1. For long load, use two slings.2. Erection area should be barricaded and un-authorized persons should not be allowed to enter in the area.3. Pipe should be lifted by hook with adequate strength.4. Properly tie all the loose material.5. Erection tools & tackles should be added up to lifeline.6. Material handling equipment should be tested and certified7. Maintain proper housekeeping at erection area/place.
3.	Erection of pipe members	a) Fall of person	<ol style="list-style-type: none">1. Workman should use full body harness during working at height.2. Person working at height at 2.5 m and above should have valid height pass.3. To climb up and descend down use proper ladder4. Carry out climbing on a clear day when rain or high velocity winds are not existing



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

4.	Electrical checks	a) Electrical shock	<ol style="list-style-type: none">1. Use tested and approved electrical tools for the job.2. Use appropriate insulating gloves for electrical works.3. ELCBs should be used in electrical circuits.4. Don't over load circuit, install additional circuit if needed.5. Ensure that portable electric tools are earthed.6. Only authorized person should be allowed to work.
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JHA on Erection of Piping	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
5.	Gas Cutting	a) Fire hazard	<ol style="list-style-type: none"> 1. Check and correct gas leaks, if any. 2. Remove combustible material from work area 3. Take hot work permit. 4. Provide fire watch and fire extinguishers. 5. Ensure that flashback arrester on gas torch. 6. Use two stage regulators for cylinders 7. Turn off the gas supply when cutting is not carried out 8. DA cylinder should always be upright position.
6	Welding	a) Eye injury due to IR & UV light.	1. Protective welding screen/ goggles should be used.
		b) Burn injury due to falling of weld spatters.	1. Hand gloves, helmets, leather apron should be used to prevent burn injury.
		c) Electric shock due to lack of insulation on welding cables.	1. Ensure that cables are properly insulated and joints are insulated to avoid direct contact.
		b) Fire hazard	<ol style="list-style-type: none"> 1. Remove combustible material from work area. 2. Take hot work permit. 3. Provide fire watch and fire extinguishers.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Erection of Piping	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA On Erection Of EOT Cranes.

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : Crane operator, Riggers, Signal man Trained manpower, OEM expert, competent person
3. Tools and tackles required : Crawler crane, truck/trailer, slings, D-shackles, chain pulley blocks, welding machines, cutting sets, scaffoldings, manila ropes, electrical instruments
4. PPE required : Helmets, safety shoes, full body harness, hand gloves, life line and fall arrestor.
5. Authorization required : Work Permit for welding works, height pass to performers, inspection, testing and certification of crane

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1	Shifting of crane component from stores to work spot	a) Sliding of material from stacked condition.	1. Execute the work as per work procedure 2. Use wooden wedges, sleepers during resting the load
		b) Hand/finger injury	1. Use leather hand gloves 2. While slinging, check that the material is in steady condition
		c) Swinging of load	1. Use tag line for controlling movement of the load 2. Avoid sudden jerk while lifting the load
2	Erection of chain pulley blocks	a) Fall of persons	1. Use proper working platforms which are certified.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Erection of EOT
Cranes

Rev. No.

Doc. No:

Page of 5

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			2. Tie up full body harness to life line.
3	Rail erection	a) Fall of material from height.	1. Use only tested material handling equipment. 2. Provide proper working platforms which are thoroughly inspected. 3. Keep small tools in tied position. 4. Use tool kit.
		b) Electrocution hazard.	1. Use only Industrial type electric fittings.
		c) Fall from height	1. Provide certified working platforms 2. Provide guide railings. 3. Use life line to pass through girder.
		d) Fire due to hot metal falling on material	1. Asbestos cloth should be used to cover the flammable material. 2. Fire extinguishers and water buckets should be provided.
4	Ground assembly of crane components	a) Hitting of parts while aligning.	1. Barricade the area where assembly is going on. 2. Use tag line for controlling the swinging of load. 3. Deploy trained workers. 4. Ensure proper approach. 5. Ensure valid height pass to workers.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		b) Hand finger caught in between objects.	1. Use wooden wedges to keep clearance between loads resting on floors. 2. Use leather hand gloves.
		c) Fall of persons.	1. Provide proper working platforms, guard railings.

JHA on Erection of EOT Cranes	Rev. No.	Doc. No:	Page of 5	Sign. of agency	Sign of NTPL Executive
-------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			2. Use safety nets and full body harnesses.
5	Erection of assembled girder/ components	a) Hitting by load / wire rope slings while tightening the slings.	1. Ensure wire rope slings are not getting stroked. 2. Lift the load gradually. 3. Ensure proper signals are communicated to crane operator.
		b) Cutting of sling due to over load.	1. Lift the girder little and check the position of the slings, centre of slings and centre of girder position. 2. Select proper wire rope slings and shackle with appropriate capacity. 3. Wire rope slings should be load tested and there shall not physical damage. 4. Provide wooden, cotton packing between wire slings and sharp edges of the object to be lifted to prevent damage to sling.
		c) Falling of persons from height	1. Deploy trained and experienced riggers while slinging. 2. Ensure valid height pass for working at height. 3. Provide certified working platforms with guard railings. 4. Barricade the area prone to accident 5. Use full body harness. 6. Use Safety net. 7. Ensure proper communication between crane operator and signal man.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

6	Welding works	a) Falling of welding spatter on ground.	1. Barricade the area where the welding activities are going on.
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JHA on Erection of EOT Cranes	Rev. No.	Doc. No:	Page of 5	Sign. of agency	Sign of NTPL Executive
-------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Burn injury	<ol style="list-style-type: none"> 1. Obtain work permit. 2. Ensure that welder is wearing leather gloves and apron. 3. Walk way below the welding work area to be barricaded and sign boards to be put showing "work in progress"
		c) Fire hazard.	<ol style="list-style-type: none"> 1. Keep water buckets, sand buckets and fire extinguishers to prevent Fire hazard. 2. Cover the flammable material with asbestos cloth.
		d) Electric shock.	<ol style="list-style-type: none"> 1. Electric equipment shall be earthed properly through ELCB and electric appliances shall be of ISI mark and of approved make.
		e) Eye injury	<ol style="list-style-type: none"> 1. Use welding shield/goggles to prevent eye injury.
7	Fixing of cable tray on the platforms, cable cutting and laying	a) Fall of material from the height.	<ol style="list-style-type: none"> 1. Barricading of area to avoid movement of men below. 2. Provide Safety net.
		b) Fall of persons and fall of tools	<ol style="list-style-type: none"> 1. Tools and tackles to be tied with Nylon rope/wire. 2. Provide certified working platforms. 3. Use full body harnesses with life line.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

8	Lubrication of gear boxes and bearings.	a) Fall of persons due to spillage of oil.	<ol style="list-style-type: none"> 1. Avoid spillage of oil by using suitable devices to transfer oil from container to gear boxes. 2. If oil is spilled on floor clean the area immediately. 3. Use full body harnesses with life line.
		b) Fire Hazards.	<ol style="list-style-type: none"> 1. Lubricating oil should be stored in the designated place only. 2. Housekeeping to be maintained.

JHA on Erection of EOT Cranes	Rev. No.	Doc. No:	Page of 5	Sign. of agency	Sign of NTPL Executive
-------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS			NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			3. Ensure proper fire extinguishers are available for first aid fire fighting.
9	No load trial run of crane	a) Electric shock.	1. Use rubber hand gloves while testing.
		b) Eye injury	1. Use goggles/face shield.
10	Load testing	a) Slippage of load and injury to personnel	1. Test load should not exceed more than manufacturer's recommendation. 2. Persons should not stand below the load. 3. Area should be barricaded. 4. Load testing shall be carried out in presence of competent person.

JHA on Erection of EOT Cranes	Rev. No.	Doc. No:	Page of 5	Sign. of agency	Sign of NTPL Executive
-------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA for Fabrication and Erection of Ventilation Duct

1. Engineer – in – Charge : NTPL
2. Manpower required for the job : At site work
3. Tools and tackles required : Marker, cutter, punch, hammer, bending machine, truck
4. PPE's required : Safety Helmet, full body harness, leather apron, hand gloves, earplug, goggles, life line and fall arrestor.
5. Authorization Required : Height Pass to performers.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL/I&FS/0470/Safety Guide – 01 to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Marking	a) Cut injuries to hand	1. Wear hand gloves. 2. Ensure proper supervision by a trained person. 3. Ensure proper layout.
2.	Fabrication of duct	a) Cut injuries	1. Ensure proper supervision by a trained person. 2. Wear leather hand gloves.
		b) Electric shock	1. Ensure proper earthing to electrical equipment through ELCB. 2. Electrical cable should be guarded. 3. Ensure use of 3-pin plug. 4. Power cables should be free from mechanical damages. 5. Ensure routing of electrical cable through ELCB 6. Ensure proper supervision



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Fabrication and Erection of Ventilation Duct	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
--	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			7. Use tested & approved tools for the job.
3.	Transportation	a) Road accident	1. Traveling route should be cleared and checked proper to travel. 2. All ducts should be tied. 3. No person shall be allowed to travel with duct.
		b) Cut injuries	1. Wear leather hand gloves. 2. Ensure proper supervision.
4.	Arranging Scaffolding of	a) Fall of person in to man holes.	1. Care should be taken while moving the scaffolding 2. Properly barricade and cover the manholes 3. Wear full body harness and anchor the hook of the belt to sturdy structure/life line. 4. Provide safety net at necessary location.
		b) Fall from height	1. Use fall arrester in unguarded higher elevations 2. Use safety net as required 3. Wear full body harness and anchor the hook of the belt to sturdy structure/life line. 4. Ensure performer working at 2.5 m and above height has valid height pass.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

5.	Lifting of Ducts	a) Fall of ducts	<ol style="list-style-type: none">1. Ensure proper maintenance of lifting machines & tackles.2. Ensure anchoring of pulleys.3. Do not allow any body under the load.4. Ensure continuous supervision.
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JHA on Fabrication and Erection of Ventilation Duct	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Failure of lifting tackles	<ol style="list-style-type: none"> 1. Test certificate from competent person should be available. 2. Safe working load shall be marked on all the lifting machinery & tackles 3. Ensure valid height pass to individual workers who are working at 2.5 m and above height.
6	Arranging of ducts in sequence	a) Fall from height	<ol style="list-style-type: none"> 1. Ensure performers working at 2.5 m and above height have valid height pass. 2. Wear full body harness and anchor to a stable location. 3. Ensure proper supervision.
		b) Cut or crush injuries to hand.	<ol style="list-style-type: none"> 1. Use leather hand gloves 2. Care should be taken while tightening the bolts of duct flanges.
		c) Hit injuries	<ol style="list-style-type: none"> 1. Check the balancing of the duct while lifting.
7	Arranging rubber gaskets and tightening of flanges	a) Cut and crush injuries to hand.	<ol style="list-style-type: none"> 1. Use leather hand gloves 2. Ensure proper supervision. 3. Tool should be inspected prior to their use.
		b) Fall of person from height	<ol style="list-style-type: none"> 1. Ensure performers working at 2.5 m and above height have valid height pass. 2. Wear full body harness and anchor it to stable structure.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		c) Falling of tools and other materials on persons working below	<ol style="list-style-type: none">1. Tools should be placed in bags.2. Tools should be tied suitably to prevent fall.3. Don't allow any person under the duct area by barricading/cordoning.
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JHA on Fabrication and Erection of Ventilation Duct	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shifting & Erection of Equipment

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Chain pulley blocks, Slings, D-Shackles, mobile crane
4. PPE's required : Safety Helmet, full body harness, hand gloves, safety shoes, goggles, life line and fall arrestor.
5. Authorization Required : Height pass

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Shifting of Boxes/ Crates & Equipment from the main yard	a) Failure of lifting tools/ tackles & fall of material	1. Inspect all the tools/tackles visually on daily basis or before starting job. 2. Ensure that only tested tools and tackles are in use.
		b) Toppling of crane	1. Overloading shall be avoided 2. Soil stability/unevenness of the area shall be checked before handling of the material 3. Load shall not be lifted beyond Safe Working Load. 4. Single person signaling shall be ensured.
2	Unloading, removing materials from box/crate.	a) Toppling of cranes	1. Soil stability/unevenness of the area shall be checked before starting loading of material 2. Overloading shall be avoided.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shifting & Erection
Equipment

Rev. No.

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Crush injury to hand and foot.	<ol style="list-style-type: none"> 1. No body parts shall be kept under any load. 2. Proper packing shall be given to maintain gap.
3.	Shifting by Roller Trolley	a) Hitting against object or pressing of body parts.	<ol style="list-style-type: none"> 1. Proper roller should be selected before shifting of materials.
		b) Toppling of materials	<ol style="list-style-type: none"> 1. Unevenness of surface/floor should be avoided 2. Overloading shall be avoided. 3. No body parts shall be kept under any load, by cordoning/barricading. 4. Proper packing shall be given to maintain gap between stacked materials. 5. While taking the material over roller/trolley, proper packing system should be ensured. 6. The material should be properly tied
		c) Poor lighting	<ol style="list-style-type: none"> 1. No works shall be executed in dark or poor illumination. 2. Sufficient lighting as per the statutory requirements shall be ensured.
		d) Poor housekeeping	<ol style="list-style-type: none"> 1. Stack materials at designated places. 2. Ensure proper housekeeping.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

e) Electrocution

1. All power cables on floor/
overhead to be taken care
during shifting of materials.

JHA on Shifting & Erection
Equipment

Rev. No.

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
4.	Erection of equipment	a) Failure of lifting equipment like sling, crane hook pulley and D shackle	<ol style="list-style-type: none"> 1. All load testing and lifting equipment shall be tested. 2. All lifting machine tools should be tested before being put in use
5.	Alignment of equipment	a) Fall of workman due to improper approach of crane	<ol style="list-style-type: none"> 1. All persons working at and above 2.5 m height shall have valid height pass. 2. Persons working at 2.5 m and above shall use full body harness. 3. Provide safe working scaffolding platform. 4. Arrange safety net at necessary location. 5. Conduct induction training to workers.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shifting & Erection
Equipment

Rev. No.

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shifting And Erection Of Steam Generator

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : Skilled riggers, fitters, safety supervisor, erection engineer
3. Tools and tackles required : Two mobile cranes/ trunion bends and hanger bars, cross lifting beam structure, cross lifting beam structure
4. PPE's required : Full body harness, helmets, safety shoes, breathing apparatus, hand gloves.
5. Authorization required : Work permit, height pass, training to performer

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Transportation of Steam Generator from store to crane pad.	a) RTA (Road Traffic Accident)	1. Plan the entire activity 2. Prepare a procedure for executing the job. 3. Carryout survey of the trailer route. 4. Arrange traffic re-route or block the traffic for trailer route temporarily.
		b) Equipment may hit road side trees, poles or any other structure.	1. Carryout the survey of trailer route. 2. Ensure trailer operator is skilled. 3. Remove obstacles from the route.
		c) Fall of equipment from trailer	1. Arrange proper securing/lashing of equipment with trailer bed. 2. Place wooden packing under the equipment to avoid metal to metal contact.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shifting and Erection
of Steam Generator

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		d) Equipment hitting surrounding enclosures due to improper communication between crane operator and rigging in charge.	1. Arrange Walkie-Talkie set for proper communication between crane operator and Rigging-in-charge. 2. Survey the crane pad and mark the HOT SPOT for parking the trailer, crane and keeping canopy.
		e) Failure of lifting implements like slings, crane hook/pully, D-shackles, Evenner beam etc.	1. Carryout load testing of all the lifting implements as per procedure and ensure healthiness. 2. Avoid jerks while lifting the loads.
		f) Electric shock due to hitting with electric pole or over headlines etc.,	1. Take shut down of electric supply in case of overhead lines.
		g) Falling of loose items from equipment while lifting.	1. Ensure that there is no loose item left over the equipment before lifting.
2	Fixing of rear end structure, cross lifting beams with hangerbars to SG and hook up with crane.	a) Falling of cross lifting beam/ hanger bars, trunion bends on SG from the crane hook.	1. Material handling tools load tested by competent person should only be used. 2. Do not release the load of crane until the trunion bends and lifting bars are fastened/ clamped with required torque value.
		b) Failure of pins, structural weld joints, crane hook	1. All weld joints shall be ND tested. 2. Crane hook shall be load tested by competent person. 3. Ensure application of lubricants in swivel joints, pulleys, wire ropes etc.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

3	Tying of rear end structure with crane	a) Sudden jerk / shock on the rear end structure	1. Crane boom length and height shall be selected from load chart of crane.
		b) Caught in between	1. Wear Leather Hand gloves 2. Instruct correct working procedure.

JHA on Shifting and Erection of Steam Generator	Rev. No.	Doc. No:	Page of 4	Sign. of agency	Sign of NTPL Executive
---	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
4.	Lifting of SG from horizontal position to vertical position	a) Failures of lifting accessories like D-shackles, crane hook, wire sling, pulley etc.	1. Lift the material and hold it for 10 minutes before shifting it on position. 2. load testing of crane shall be checked before lifting the load.
		b) Fall of material/tools /tackles	1. Ensure no loose material / tools/ tackles left on the SG 2. Seize of crane hook/rope movement
		c) Loose items falling from the equipment while being lifted.	1. Conduct a check for any loose items before lifting.
		d) Rigger's hand caught in slings.	1. Impart training, carryout pep talk and ensure that only one person is responsible for signaling to the crane operator. 2. Use Hand gloves
5	Lowering the SG vertically and fix on position	a) Failure of steam generator supporting structure	1. Ensure that the good condition structure is used. It is as per designed thickness/cross section. 2. Load bearing weld joints and surfaces must be checked with NDT for any crack etc. 3. Cordon/barricade the movement path area.
		b) Equipment may hit surrounding equipment due to blind operation and improper communication.	1. Avoid jerk handling. 2. Arrange walkie-talkie set for proper communication.
		c) Obstructions by the fabricated structure	1. Confirm the free passage by removing the obstructions coming in the SG lowering way before lifting.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shifting and Erection
of Steam Generator

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		d) Fall of person	<ol style="list-style-type: none">1. Barricade the erection area to prohibit unauthorized entry.2. Ensure fitness of all working persons for work at height.3. The person working at 2.5 m and above height shall have valid height pass.4. The persons working at height shall use full body harness by anchoring it to a firm structure or life line.5. Provision of safety nets.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Shifting and Erection
of Steam Generator

Rev. No.

Doc. No:

Page of 4

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Erection of On Line Tube Cleaning System of Main Condenser

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Welding generator, grinding machines, gas cutting set, lifting tools and tackles, scaffoldings, hand tools,
4. PPE required : Safety shoes, helmet, hand gloves, full body harness, boiler suit, face mask, 24 V lighting etc.
5. Authorization required : Work permit, confined space entry certification by competent person.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Movement of various materials from Site store to site/ respective Turbine Buildings/CWPH	a) Fall of material	1. Ensure proper rigging, engaging experienced Riggers, using safety gears and load tested cranes.
		b) Failure of material handling equipment	1. Tested and certified equipment only should be used
2.	Loading – unloading and movement of tractor trolley on temporary approach roads in project area.	a) Over Speed, over load	1. Insisting for safe driving speed inside the project area and cross check for overloading.
		b) Using lower capacity vehicles	1. Ensure utilization of suitable capacity vehicle.
3.	Storage of gas cylinders and other consumables	a) Chances of fire	1. Taking precautionary measures, keeping and maintaining proper fire extinguishers.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Cleaning Condenser	of on System of	Line Tube Main	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------------	-----------------------	----------------------	----------	----------	--------------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
4.	Material Handling & Lowering of various items / modules pertaining to OLTC system by making necessary temporary lifting / lowering arrangements	a) Fall of materials	1. Study of existing site condition in detail, submission of separate procedure if required for this activity and obtaining necessary approval. 2. Engaging skilled workmen and by regular PEP talks.
		b) Conditions of the contractor's lifting tools and tackles.	1. Ensure load tested lifting tools and tackles are used for this job.
5.	In-situ, Fabrication & Erection	a) Fall from height/fear of height.	1. Wear proper safety gears, 2. The persons working at 2.5 mand above height shall have valid height pass.
		b) Lack of knowledge of safe work practices and fire hazard	1. The persons working at 2.5 mand above height shall have valid height pass. 2. Provide required First Aid treatment if required. 3. PEP talks on day to day basis. 4. Ensure fire safety precautions.
		c) Violation of safe work practices.	1. Obtaining of necessary gas cutting welding permits.
6.	Working in confined space .	a) Suffocation.	1. Provide proper ventilation. 2. Oxygen sampling and confined space entry certification by competent persons.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		b) Electric shocks and improper illumination	<ol style="list-style-type: none">1. Proper earthing with ELCB using 24 Volts rating hand lamps during inspection.2. Provide flood lights in working area and obtain necessary permits.3. Establish communication from outside
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JHA on of on Line Tube Cleaning System of Main Condenser	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
--	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
7.	Erection & dismantling of temporary platforms scaffoldings	a) Fall of platform/ scaffolding members/ workmen from height	1. Awareness of safe working practices as and when required. 2. Certification of scaffoldings. 3. Use of PPEs . 4. Use of full body harness. 5. The persons working at 2.5 mand above height shall have valid height pass.
8.	NDT works	a) Radiation	1. Approved procedure for radiography. 2. Avoiding radiography during day time
9.	Hydro-test	a) Injury	1. Approved procedure for hydro test. 2. Calibration of the Pressure Gauges and testing of the Safety Relief Valves in V.T.F.
10.	Check electrical connections / providing electrical connections	a) Electric shock due to uninsulated power cables, junction box without safety plug	1. Awareness of the safe working practices. 2. Use portable equipment through ELCB.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Cleaning Condenser	of on System of	Line Tube Main	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------------	-----------------------	----------------------	----------	----------	--------------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Transportation, Erection & Installation of Heat Exchanger

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Mobile Crane, Tractor Red flags, caution tapes, wooden sleepers, skid rollers, chain pulley block, sling, D-shackles, Nylon ropes, communication means.
4. PPE required : Safety shoes, leather hand gloves, full body harness, safety helmet.
5. Authorization Required : Crane operator training and qualification and isolation of electrical overhead lines

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Lifting & placing the Heat Exchanger by the help of mobile crane on the Tractor	a) Fall of material	1. Load tested mobile crane should be used. 2. Only authorised and trained crane operator and signal man should be deployed. 3. Equipment should be properly secured. 4. Correct weight balancing should be ensured.
		b) Hitting nearby material/equipment	1. Proper signaling to be ensured through communication. 2. Depute experienced riggers.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Transportation,
Erection & Installation of Heat
Exchanger

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		c) Breakage of the material handling tools	<ol style="list-style-type: none"> 1. Only load-tested material handling tools should be used. 2. Restrict access to the area by barricading. 3. Ensure that experienced and qualified operator, rigger and signalman is deployed on the job.
2.	Transportation of Heat Exchanger	a) Toppling of the vehicle and equipment leading to accident.	<ol style="list-style-type: none"> 1. Ensure speed limit for the Trailor. Speed should not be more than 5km/h. 2. Make sure that the road is clear. 3. Ensure that electrical charged cables and overhead lines are deenergised. 4. Ensure continuous observation of the equipment during transportation by deployment of dedicated observers/person(s). 5. Ensure good condition of the trailor and road. 6. Operator should be qualified and experienced. 7. Experienced signalman to be deployed on the job. 8. If the material is protruding outside the trailor, red flags and red lights should be displayed on trailor. 9. Proper lashing of Hx to the trailor bed.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS			NTPL/SOP-17

3.	Shifting the Heat exchanger up to erection location.	a) Slip of the Heat exchanger	1. Check access and approach. 2. Review procedure of shifting and initiate necessary measures.
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JHA on Transportation, Erection & Installation of Heat Exchanger	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
--	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Fall of the Heat exchanger	<ol style="list-style-type: none"> 1. Safe unloading area to be maintained. 2. Area should be barricaded and no unauthorized person is allowed to enter the area. 3. Load tested material handling tools should be used.
		c) Breakage of the sling	<ol style="list-style-type: none"> 1. Use only load tested slings. 2. Prevent unauthorized entry to the shifting area.
		d) Injury to body parts	<ol style="list-style-type: none"> 1. Use hand gloves, safety shoes and helmets.
4.	Erection of heat exchanger with the help of skid rollers, chain pulley blocks.	a) Slip of the Heat exchanger	<ol style="list-style-type: none"> 1. Load tested material handling tools should only be used. 2. Proper pads should be provided to avoid material damage.
		b) Fall of the Heat exchanger	<ol style="list-style-type: none"> 1. Area should be cleared. 2. Check the approach 3. Experienced riggers to be deployed while doing the job.
		c) Cut Injury	<ol style="list-style-type: none"> 1. Use wooden sleepers wherever required. 2. Inspect for healthiness of hydraulic jacks for proper positioning. 3. Use PPE like safety shoes, full body harness, safety helmet, leather hand gloves etc.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Transportation,
Erection & Installation of Heat
Exchanger

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Handling Fabrication Installation and Passivation of SS Liner plates.

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : Riggers, fitters, welders, grinder men, helpers, supervisors.
3. Tools and tackles required : Welding machine, Grinding machine, drilling machine switch board, chain pulley blocks, D-Shackle, sling, hammer & spanners.
4. PPE required : Safety helmets, full body harness, safety shoes, gum boots, hand glove, goggles, face screen etc.
5. Authorization Required : Work permit for vacuum testing

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Shifting of linerplates from store to work site.	a) Material fall on foot/or on road.	<ol style="list-style-type: none">1. To avoid injury of foot, always wear safety shoes.2. During shifting, material shall be tied with trolley to avoid falling of material on road.
2.	Marking / cutting of liner plates by grinding machine	a) During cutting, grinding material spread around work area.	<ol style="list-style-type: none">1. Provide metallic shut barricades to avoid spreading of the grinding material.2. Use wheel guard on grinding machine.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Handling,
Fabrication, Installation and
passivation of SS liner plates.

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Electric shock from grinding machine.	<ol style="list-style-type: none"> 1. Install ELCB in main electrical distribution panel to avoid electrical shock 2. Proper earthing to be provided. 3. Ensure periodic inspection of grinding machine and display inspection tag.
3.	Fabrication / erection / welding of liner plates	a) Suffocation due to welding	<ol style="list-style-type: none"> 1. Ensure that proper ventilation is available during welding.
		b) UV and IR rays can injure eye	<ol style="list-style-type: none"> 1. Proper welding helmet with welding goggle to be used.
		c) Electric shock	<ol style="list-style-type: none"> 1. Welding equipment to be properly earthed. 2. Use three pin industrial plug 3. Provide ELCB on power supply boards
		d) Fall of material during lifting	<ol style="list-style-type: none"> 1. Use proper wire slings, D-shackles and chain pulley blocks. 2. Use safety shoes and helmets
		e) Fall of workmen from height	<ol style="list-style-type: none"> 1. Provide safe working platforms with toe guards and use full body harnesses. 2. Provide hand railing on working platforms. 3. Use certified platforms. 4. Persons working at 2.5 m and above height shall have valid height pass.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

4.	Vacuum box testing of liner plates.	a) Person can slip on liner plate floor.	1. Soap solution shall be wiped frequently after testing of joints.
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JHA on Handling, Fabrication, Installation and passivation of SS liner plates.	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
--	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
5.	Cleaning and passivation of liner plates	a) Eye & skin injury	1. Face shield should be used during passivation. 2. To avoid skin burning, good quality of rubber hand gloves should be used.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Handling,
Fabrication, Installation and
passivation of SS liner plates.

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Erection of De-aerator

1. Engineer - in - Charge : NTPL
2. Manpower required for the job : At site work
3. Tools and tackles required : Trailer, crane, hoist, slings, D-shackle
4. PPE's required : Helmet, safety shoes, gloves, goggles, full body harnesses and face masks etc.
5. Authorization required : Height pass for working at height.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1	Shifting of equipments	a) Fall of object.	<ol style="list-style-type: none">1. Crane operator must have valid operating license.2. Lifting machinery and tackles shall be inspected and tested by competent persons and test certificate shall be maintained.3. Maximum safe working load should be marked on all lifting tools and machinery.4. Ensure proper anchoring of the pulleys.5. Do not allow any body to stand under the load being lifted.6. Deploy only authorized operators.7. Use safety helmet, safety shoes and hand gloves.8. Provide life line for anchoring full body harness.9. Ensure anchoring of full body harness.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on De-aerator erection	Rev. No.	Doc. No:	Page of 4	Sign. of agency	Sign of NTPL Executive
----------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS			NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Caught in between object.	1. Wear Leather hand gloves.
2	Sliding the equipment for erection	a) Injury to hand during sliding.	1. Wear hand gloves . 2. Pep talk/briefing before start of work. 3. Establish proper communication between crane operator and signal man.
3	Alignment of equipment	a) Fall of workmen due to improper approach / working at height.	1. Ensure height permit is obtained . 2. Ensure wearing of full body harness and helmet. 3. Provide certified safe working platforms and scaffolding. 4. Arrange safety net at appropriate locations. 5. If wind speed is more stop the work. 6. Ensure that safety work permit is obtained.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

4	Gas cutting	a) Fire hazards and heat radiation.	<ol style="list-style-type: none">1. Use flash back arrester to avoid back fire.2. Use gas hoses specially designed for the purpose with standard Colour code.3. Always keep DA cylinder upright position.4. Take hot work permit.5. Provide fire extinguishers and sand buckets.6. Clear off combustible materials from the area.7. Provide fire watch.8. Use proper clamps for hose connection .Ensure that there are no kinks in the hose.
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JHA on De-aerator erection	Rev. No.	Doc. No:	Page of 4	Sign. of agency	Sign of NTPL Executive
----------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			9. Open the valve of oxygen first and then DA gas for lighting the torch. 10. Protect gas cylinders and hoses from spark. 11. Ensure use of PPE's
5	Welding	a) Shock.	1. Ensure proper earthing of welding machine. 2. Periodically check pit resistance.
		b) Flash over.	1. Use face shield and hand gloves.
		c) Fire.	1. Do not allow to fall welding splatter to ground from height. 2. Take hot work permit. 3. Provide fire extinguishers and sand buckets. 4. Clear off combustible materials from the area. 5. Provide fire watch.
		d) Fumes.	1. Provide proper ventilation.
6	Grinding	a) Eye injury.	1. Use goggles and hand gloves.
		b) Body injury.	1. Use Standard grinding wheels. 2. Use specified RPM grinding wheel as mentioned in the grinding machine. 3. Check expiry date of grinding wheel. 4. Check direction of rotation of grinding wheel.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		c) Electric shock	<ol style="list-style-type: none">1. Ensure proper earthing of grinding machine.2. Grinding machine should be connected through ELCB.3. Periodically check the grinding machine and display inspection tag.
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JHA on De-aerator erection	Rev. No.	Doc. No:	Page of 4	Sign. of agency	Sign of NTPL Executive
----------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
7	Electrical supply system.	a) Shock.	1. Ensure proper earthing. 2. Provide ELCB. 3. Periodically test the ELCBs.
		b) Flash over.	1. Ensure enough space around panel board. 2. Cables should be free from mechanical damage. 3. Provide rubber mats near panels.
8	Working inside de-aerator	a) Electric shock.	1. Use only 24 V power supply.
		b) Suffocation	1. Take confined space work permit and the area certified by competent person. 2. Ensure proper ventilation. 3. Ensure proper communication from outside.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on De-aerator erection	Rev. No.	Doc. No:	Page of 4	Sign. of agency	Sign of NTPL Executive
----------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Transportation, Handling & Erection of Radial Fans

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Crane, slings, chain pulley blocks, D-shackles, manila rope, trolley, welding machine, grinding machine.
4. PPE's required : Safety helmet, full body harness, shoe, leather gloves, hand gloves, ear muff, face shield and masks.
5. Authorization Required : Height pass for working at height.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Lifting of Radial Fans by crane	a) Fall of Radial Fans	<ol style="list-style-type: none"> 1. Proper access should be made available. 2. Ensure proper anchoring of the pulleys. 3. Do not allow any body under the load. 4. Ensure proper supervision. 5. Ensure following display on cranes. <ul style="list-style-type: none"> - Maximum safe working load - Date of load testing. - Due date for next load test. 6. Ensure use of proper PPE like helmet, safety shoes etc.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Transportation,
Handling and Erection of
Radial Fans.

Rev. No.

Doc. No:

Page of 5

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			7. Qualified operator, rigger and signal men should be employed when mechanical material handling is performed. 8. While lifting the fans by crane, use manila or nylon rope. 9. Ensure that path of crane movement is clear. 10. Entry to area below material handling operations should be barricaded with caution signage.
		b) Caught between two objects	1. Care should be taken while handling the fans. 2. Ensure proper supervision. 3. Before handling the fans. Check the dimensions of the Fans and the doors.
2.	Moving of the fans on the floor	a) Body Injury	1. Ensure path way is clear from obstructions. 2. While manual lifting the fan, care should be taken to ensure that the total weight is equally distributed to among all. 3. Generally the weight handled by each rigger should not exceed 55 kg. 4. If the fan is heavy, use Trolley for moving the fans.
		b) Fall of persons	1. Floor openings should be barricaded/closed.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

			2. Wear full body harness and anchor to a stable location, if work is being performed near the edge of slab.
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JHA on Transportation, Handling and Erection of Radial Fans.	Rev. No.	Doc. No:	Page of 5	Sign. of agency	Sign of NTPL Executive
--	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			3. Scaffolding/platform erected for work should be certified. 4. Persons working at 2.5 m and above height should have valid height pass.
3.	Grinding	a) Eye injury/body injury	1. Use face shield/goggles. 2. Use leather hand gloves. 3. Use ear muff/ear plug. 4. Use recommended grinding wheel. 5. Grinding machine should be provided with wheel guard to avoid the flash over injury. 6. No combustible material should be stored near the area.
		b) Electrical shock	1. Ensure proper earthing of machine through ELCB. 2. Ensure use of 3-pin plug. 3. Power cable should be free from mechanical damages and should not have joints. 4. Conduct periodic inspection of grinding machine and maintain records.
		c) Excessive Dust	1. Use dust mask. 2. If the dust is in excess provide artificial ventilation.
4.	Welding	a) Exposure to excessive fumes and heat radiation	1. Use appropriate PPEs like welding screen, goggles etc. 2. If natural ventilation is poor provide artificial ventilation.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Transportation,
Handling and Erection of
Radial Fans.

Rev. No.

Doc. No:

Page of 5

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Electrical shock	<ol style="list-style-type: none"> 1. Use tested and approved tools for the job. 2. Ensure body earthing. 3. Provide ELCBs. 4. Ensure that power cables are free from mechanical damages. 5. Use approved type of cables. 6. Check the regulator condition before starting the work. 7. Regulate current according to the work & cable capacity.
		c) Injuries due to sparks/flash over.	<ol style="list-style-type: none"> 1. Use proper PPE like welding screen, goggles etc. 2. Check the equipment while starting the work.
		d) Trip Hazard	<ol style="list-style-type: none"> 1. The work area should be clear. 2. Cable should not be laid on the floor 3. Scrap should be removed after completing the job. 4. Ensure proper supervision. 5. In case of change in elevation of the floor it should be distinctly painted with glow in dark zebra markings.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		e) Fire	<ol style="list-style-type: none">1. Take cutting and welding permit.2. Provide fire watch.3. Fire extinguisher should always be available for extinguishing the fire.
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JHA on Transportation, Handling and Erection of Radial Fans.	Rev. No.	Doc. No:	Page of 5	Sign. of agency	Sign of NTPL Executive
--	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			4. Avoid storing or stocking of combustible material in welding area. 5. If combustible material is present in welding area, it should be covered with non-combustible material and barricaded with caution signage.
		f) Fall of persons	1. Wear full body harness and anchor to a stable location, if work is being performed near the edge of slab. 2. Scaffolding/platform erected for work should be certified. 3. Persons working at 2.5 m and above height should have valid height pass.
5.	Arranging of fans on the base frame.	a) Body Injury	1. While lifting the fan by manpower, care should be taken to ensure that total weight is equally distributed among to all Riggers. 2. The weight should not exceed 55 kgs for each Rigger. 3. Ensure proper supervision.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Transportation,
Handling and Erection of
Radial Fans.

Rev. No.

Doc. No:

Page of 5

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS			NTPL/SOP-17

JHA on Hydro Testing of Pipe/Vessel

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Spanners, Torque wrenches, De-watering Pumps, Bucket/Pressurizing pump, Torches, Spare Batterycells, Ladder, Pressure gauge, Safety Relief Valves (SRVs) of required rating, scaffoldings, platforms and ladders.
4. PPE required : Full body harness, helmets, safety shoes, gum boots, hand gloves.
5. Authorization required : Approved procedure, Safety work permit, height pass

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Inspection of piping for readiness for Hydrotest.	a) Fall of person	1. Provide proper approach to go in to the system/vessel by ladder, scaffolding and platform. 2. Scaffolding and platform should be certified. 3. Persons working at 2.5 and above height shall have valid height pass. 4. Use full body harness.
		b) Injury due striking against support structure.	1. Sufficient illumination (about 200 lux) should be provided in the area.

JHA on Hydrotesting of vessel or pipe	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			2. Safety helmet shall be worn by personnel involved in work.
		c) Slippage due to water.	1. While moving on the wet surface care towards slippage to be taken by wearing gumboots.
2.	Lowering of Tools and Tackles.	a) Fall of person/fall of material	1. Put tools and tackles in a gunny bag and tie it with manila rope and lower it to ensure them to be firmly secured. 2. No person is to be allowed to stand below the opening while lowering the material. 3. Restrict entry to the area below the work by barricading and caution signage. 5. Provide proper approach to go in to the system/vessel by ladder, scaffolding and platform. 6. Scaffolding and platform should be certified. 7. Persons working at 2.5 and above height shall have valid height pass. 8. Use full body harness. 9. Provide safety net.
3.	Tightening the fasteners of mechanical joints	a) Fall of person	1. Provide proper approach to go in to the system/vessel by ladder, scaffolding and platform. 2. Scaffolding and platform should be certified.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

			3. Persons working at 2.5 and above height shall have valid height pass.
			4. Use full body harness.

JHA on Hydrotesting of vessel or pipe	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---------------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
		b) Injury to human body due to slippage of spanner	1. Use proper spanner tools & tackles to avoid injuries due to slippage of spanners while tightening the bolts.
4.	Closing the openings	a) Live body may remain inside	1. Ensure no living body is inside the circuit/system.
5.	Pressurizing the system	a) Injury due to bursting of hose, piping, gaskets in mechanical joints.	1. Hose should be connected tightly so that it can withstand test pressure. 2. Use calibrated Pressure Gauges and Safety Release Valves. 3. Do not pressurize the circuit/ system above the hydro test pressure. 4. Use only approved gasket for the mechanical joints.
6	Draining / Flushing	a) Damage to the system	1. System should be vented out before drain is opened.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Hydrotesting of vessel
or pipe

Rev. No.

Doc. No:

Page of 3

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Welding of Tube By Auto Tube Welding Machine

1. Engineer - in - Charge : NTPL
2. Manpower required for the job : Qualified welding machine operator
3. Tools and tackles required : Auto tube welding machine, grinding machine Acetone, special tools for machine.
4. PPE's required : Safety helmet, safety shoes, full body harness, leather hand gloves, nose mask, goggles.
5. Authorization Required : Height pass, cutting and welding permit, certification of scaffolding and platform.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Edge Preparation of tube i.e. removing of dust/burr and cleaning by acetone	a) Fire hazard	1. Take cutting and welding permit. 2. Keep proper fire extinguisher near job. 3. Deploy fire watch.
		b) Inhalation of vapour	1. Use of nose mask 2. Provide good ventilation
		c) Cut injury to finger/hand	1. Use leather hand gloves 2. Ensure proper cutting of tube edge
2.	Starting the Argon supply from argon cylinder	a) Hoses strikes to the person due to high pressure	1. Check Pressure Gauges of cylinder and hoses; and ensure their proper fixing and functioning. 2. Clamp the hoses firmly..



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Welding of Tube by
Auto Tube Welding Machine

Rev. No

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
3.	Auto tube welding	a) Fall of persons/ material from height.	1. Ensure that working platform is and certified. 2. Use of full body harness, safety helmet, safety shoes, safety net. 3. Persons working at 2.5 m and above shall have valid height pass. 4. Never throw any hand tools from height. 5. Area of welding to be barricaded and place a caution board.
		b) Electric Shock	1. Ensure proper Earthing through ELCB. 2. Operate the machine as per guide lines given by manufacturer manual 3. Ensure use of Joint free cable with plug top.
4.	Installation of Auto tube welding machine at work site.	a) Transit damage to Auto welding machine	1. Ensure that machine is properly covered with plastic sheet. 2. Ensure that machine is not kept under or near top floor opening, drain line/staircase. 3. Machine should always be kept under supervision.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Welding of Tube by
Auto Tube Welding Machine

Rev. No

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Elevator Erection

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Rope, spanner, Gauge and spirit level, material
handling tools & tackles
4. PPE's required : Full body harness, helmet, safety shoes, safety net, life line & fall arrestor, goggles, face shield
5. Authorization Required : Height Pass to working personnel, Original Equipment Manufacturer (OEM) representatives, Electrical authorization

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1	Loading and unloading of Elevator members into and from the truck.	a) Fall of material while handling/lifting manually or mechanically.	<ol style="list-style-type: none"> 1. Skilled workforce familiar to the nature of job only should be deployed for the job. 2. Use of personal protective equipment such as safety helmet, safety shoes etc. 3. Load tested crane and material-handling equipment should only be used. 4. Check visible defects in the wire ropes and slings.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

			5. Support the item in to the truck properly.
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JHA on Elevator Erection	Rev. No	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
--------------------------	---------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
2	Transportation of elevators members.	a) Transportation Hazard.	<ol style="list-style-type: none"> 1. Competent / licensed driver only shall drive the truck. 2. Traveling route should be clear. 3. Person should not allowed to travel in loading area with the material.
3	Construction of scaffolding for erection of elevators.	a) Fall of men / material from height	<ol style="list-style-type: none"> 1. Caution Board to be displayed on each landing. 2. There shall not be any type of projection, which obstruct movement of men/ material in the lift well. 3. Scaffolding and platform shall be of sound material. 4. Scaffolding and platform shall be inspected and certified for use. 5. Verify stability of scaffolding at each stage of erection. 6. Provide steel platform on each landing of adequate width and tie the platform with scaffolding to prevent movement. 7. Ensure water collected in the lift pit is removed to avoid electrical shock.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

4	Shifting the motor/ controller counter weight etc. to respective location.	a) Fall of material / men from height.	<ol style="list-style-type: none">1. Use PPEs such as safety helmet, safety shoes and full body harness.2. Use of tested chain pulley blocks.3. Proper slinging and signaling is required.4. Deploy qualified signal men.
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JHA on Elevator Erection	Rev. No	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
--------------------------	---------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
5	Erection of elevators	a) Fall of material/ men from height	<ol style="list-style-type: none"> 1. Opening of temporary barrier in each landing shall only be done after getting clearance from Industrial Safety section. 2. OEM and those who have worked for the elevator / similar work and having sufficient skill and experience should be allowed to work. 3. Ensure valid height pass is available with the persons involved in the work. 4. Use full body harness and safety helmets. 5. Material handling equipment should be load tested and certified by competent person. 6. Illumination as per the statutory requirements should be ensured. 7. Proved safety net at feasible location. 8. Welding work for in accessible area to be done with proper suspended platforms. 9. No one should be allowed below the welding spot by restricting the access. 10. Ensure that no combustible material is present below. 11. Permit shall be obtained for welding works. 12. Proper ventilation should be ensured during welding in elevator shaft.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

			13. Take care while handling car door with glass. 14. Working platform and double lanyard full body harness to be anchored properly.
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JHA on Elevator Erection	Rev. No	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
--------------------------	---------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Heat Treatment

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : At site work
3. Tools and tackles required : Thermal & electrical insulation, thermostat, temperature recorder, wire rope, manila ropes, slings, shackles, slide wrench, spanners.
4. PPE required : Safety helmet, safety shoes, leather hand gloves and full body harness, face shield, apron for hot works.
5. Authorization Required : Work permit for hot works, height pass for working at height.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1.	Installation of equipment / pipe inside furnace(coil)	a) Falling / tilting of equipment or pipe	1. Tie the sling properly at the appropriate locations. 2. Avoid persons standing below suspended pad 3. Use load tested material-handling tools only
		b) Damage to heating coil insulation	1. Insulation of heating coil should be checked before heating. 2. Care shall be taken to avoid body contact with hearing coil
		c) Caught in between	1. Provide adequate illumination in the working area as per statutory requirements. 2. Wear leather hand gloves.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on heat treatment	Rev. No.	Doc. No:	Page of 2	Sign. of agency	Sign of NTPL Executive
-----------------------	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
2.	Closing of Furnace (heating coil)	a) Damage of coil / insulation	1. Care to be taken to avoid damage to coil 2. Ensure no live body part remain inside the furnace (coil).
		b) Fire inside the furnace (coil).	1. Remove flammable/combustible material from heating coil.
3.	Heating of furnace (heating coil)	a) Electrical shock to person	1) All electrical connections to be checked by Authorised person. 2) Ensure proper earthing of furnace & panel.
		b) Temperature burn to persons working near by	1. Unauthorized person should not be allowed work nearby. 2. Furnace (heating coil) should be thermally and electrically insulated. 3. Ensure all terminal boxes are closed. 4. Barricade area around the furnace. 5. Display caution boards. 6. Only authorized person should be allowed to operate.
4.	Opening of the furnace after heat treatment	a) Electrocution	1. Ensure electrical disconnection to furnace (heating coil).
		b) Heat	1. Ensure furnace (heating coil) has reached room temperature.
5.	Removal of heat treated equipment / pipe	a) Falling / Tilting of equipment / pipe	1. Tie the sling properly. 2. Restrict presence of any person standing below load by barricading. 3. Use load tested material-handling tools only.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on heat treatment

Rev. No.

Doc. No:

Page of 2

Sign. of agency

Sign of NTPL
Executive



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA On Testing Of Rotating Equipments

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : Equipment operator, Electrician, Engineer
3. Tools and tackles required : Tong tester, megger, vibration analyzer, noise level meter, hand tools
4. PPE's required : Rubber hand gloves, rubber mats, ear plugs, safety goggle, full body harness, boiler suits
5. Authorization Required : Work Permit for testing, Height Pass

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1	Operating the valves	a) Hand injury	1) Wear leather hand gloves. 2) Use appropriate levers.
		b) Fall of person	1. Provide safe approach to valve operator. 2. Wear full body harness when working at height and ensure anchoring of harness to a stable position to workers for Height work. 3. Ensure persons working at 2.5 m and above height, has valid height pass.
2	Checking of oil level and auxiliaries	a) Eye injury	1. Use safety goggles
		b) Fall of person	1. Avoid spillage of lubricants 2. Mop the area promptly.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Testing of Rotating Equipment	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
--------------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
			3. Ensure good housekeeping in the area. 4. Ensure removal of Inflammables from the area. 5. Inspect the area for any ignition source and remove the ignition source.
		c) Fire hazards	1. Maintain proper house keeping 2. Proper fire extinguishers shall be available nearby.
3	Checking of foundation bolts & its tightness, free rotation of equipment, coupling guards, tightness of belts, etc.	a) Injury to hand and foot.	1. Use correct size hand tools 2. Wear hand gloves, safety shoes and safety helmet.
4	Electrical checks	a) Electrical shock	1. Use specified rubber mats, rubber hand gloves. 2. Ensure double earthing of equipment. 3. Have a peer check while performing the task.
5	Testing of Equipment	a) Fall of nearby material due to high vibration	1. Check that alignment / foundation bolts of equipment are proper. 2. Use helmets, safety shoe.
		b) Hearing loss due to noise	1. Wear earplugs/Ear muffs. 2. In case of high vibration and noise stop the equipment.
		c) Eye / body injury due to flying objects,	1. Provide safeguards for rotating parts 2. Use safety goggles



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		d) Caught of body parts, cloths in rotating parts	1. Ensure machine guards to all rotating parts. 2. Ensure that performers do not wear loose cloths.
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JHA on Testing of Rotating Equipment	Rev. No.	Doc. No:	Page of 3	Sign. of agency	Sign of NTPL Executive
---	----------	----------	-----------	-----------------	---------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Erection of Turbine Generator

1. Engineer - in - Charge : *NTPL*
2. Manpower required for the job : Engineer, Safety Supervisor , Riggers, Fitters, helper
3. Tools and tackles required : EOT crane, rope slings, D-shackles, chain pulley blocks, wooden slippers, spanners, hand tools.
4. PPE's required : Safety helmet, safety shoes, leather hand gloves, double lanyard full body harness, face mask, safety net, communication equipment, 24 V lighting and electrical equipment
5. Authorization required : Approved procedure for the work execution and foreign material exclusion.

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per NTPL safety guide lines to be given to all the workers before commencement of the job by the Executing Engineer/Supervisor.		
1	Shifting of lower half, Turbine Rotor, Upper half from ground floor to Turbine floor	a) Fall of man / material	<ol style="list-style-type: none"> 1. Permit only authorized persons and restrict entry by barricading the work area with a centre board . 2. Lifting equipment, tools and tackles shall be load tested as per procedure. 3. Ensure proper implementation of work procedures. 4. Ensure continuous supervision.
		b) Hit by objects	<ol style="list-style-type: none"> 1. While lifting the load no workmen shall be below it. 2. Ensure area cordoning/barricading.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

JHA on Erection of Turbine Generator	Rev. No.	Doc. No:	Page of 2	Sign. of agency	Sign of NTPL Executive
--------------------------------------	----------	----------	-----------	-----------------	------------------------



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
2	Installing lower half of Turbine	a) Fall of person/fall of material/tools/ tackles	<ol style="list-style-type: none"> 1. Use double lanyard full body harness, helmets and safety shoe. 2. Provide proper illumination (100 Lux). 3. Tie the tools with nylon rope/ wire so that it will not fall 4. Safety net to be tied below the openings to arrest the fall of persons or material.
3	Erection/ Aligning of Turbine rotor, Installing of Upper half	a) Same as above	1. Same as above
		b) Hand and foot caught below the load.	<ol style="list-style-type: none"> 1. Crane operator should be experienced trained and authorized person. 2. Signaling to crane operator should be ensured by one qualified signal man 3. Communication to be ensured between crane operator & signalman.
		c) Fatigue due to working atmosphere	1. Maintain proper ventilation
		d) Fire hazards	1. Maintain good housekeeping on the Turbine floor and keep ready fire protection equipment / fire extinguishers
4	Closing of Turbine	a) Injury	<ol style="list-style-type: none"> 1. Use proper size tools & tackles 2. Continuous supervision to be ensured.
5	Insulation of Turbine	a) Hand injury	<ol style="list-style-type: none"> 1. Use hand gloves. 2. Care shall be taken during handling of sheet metals & insulation material.



NLC TAMILNADU POWER LIMITED

SAFETY DIVISION

STANDARD OPERATING PROCEDURE

TITLE:- SOP- JHA FOR MECHANICAL WORKS

NTPL/SOP-17

		b) Health hazard due to glass wool inhalation	1. Wear nose mask. 2. Avoid direct contact of insulation material with body. 3. Wear Gloves 4. Ensure effective Ventilation.
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JHA on Erection of Turbine Generator	Rev. No.	Doc. No:	Page of 2	Sign. of agency	Sign of NTPL Executive
--------------------------------------	----------	----------	-----------	-----------------	------------------------