JHA on Concreting of Tall Columns

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Shuttering Materials, teel Rod, transit
   i. Mixer, vibrators.

4. PPE's required : Helmet, Hand Gloves, Goggles, safety belt
   i. Manila, rope, Boiler suit etc.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisors.		
1.	Loading, unloading, transportation of shuttering materials and steel rod.	Fall of material, hit injury, cut injury	1. Vehicle worthiness to be checked along with break, horn and near view mirror. 2. All the materials should be kept inside the tractor safety (in layers) no over hanging will be allowed. Red flag to be displayed at the back. 3. Special care should be taken during loading & unloading by constant supervision. 4. Material should be properly loaded considering its weight, dimensions, capacity of the carrier, centre of gravity of load, clearance required for safety, etc. 5. Proper written down and approved procedures should be followed for loading and unloading of materials (Manually and mechanically) 6. While transporting, the material should be stacked and lashed properly. 7. Steel bars should be stacked properly and red caution or red lamp in the nights should be displayed on the projected end. 8. Men should not site near the load or over the load where

			there is a possibility of rolling or shifting due to sudden application of brake.
2.	Staging with sole plates.	Fall of person, fall of materials	1. Necessary PPE's like helmet, safety belt shall be provided. 2. Workers shall be given toolbox talk regarding safe material handling. 3. No other activity other than staging shall be carried out nearby. 4. Before starting the scaffolding erection, the surface on which it has to be erected must be made free and level. 5. Once the surface is ready, sole plates have to be kept. It can be timber sleeper or steel plate. Sole plates should be long enough to hold at least two veridical pipes and should extend 600 mm beyond the vertical pipes. Sole plates may be avoided incase if the scaffold is erected on a firm ground like concrete floor. 6. The working platform shall be sufficiently wide and provide with hand rail of about 42 inch height with one top rail, mid rail and toe board of 4 inch high.
3.	Lifting of shuttering material & Reinforcement	Fall of person, fall of material, shearing off rope.	1. Necessary PPE like safety helmet, safety belt, hand gloves etc., shall be provided. 2. Ladders with handrail should be provided to approach the working spot. 3. Safe working platforms and walk ways with double mat width and hand rail should be used along with toe board. 4. Landing mat should be tied to scaffolding and safety net should be provided below the platform. 5. Competent workers should be allowed to work at height. 6. Use Crane as far as possible or A good quality manila rope of sufficient rope should be used for the purpose of lifting forms

			and reinforcement bars with double knot tying device using chain pulley block. 7. Visual checking of rope should be done everyday before start of job. 8. Chain pulley block should be tested before use and the safe lifting capacity should be mentioned over the blocks. 9. All ladder of vertical height more than 30 feet shall be provided with an intermediate landing with guard rail, mid rail and toe board. 10. Do not use a metal ladder close to life electric wiring or any operational piping like acid, gas, etc., which could be damaged. 11. Housekeeping should be good.
4.	Reinforcement placing & binding	Fall of material, fall of person	1. Working platform with handrail. 2. Ladder for approach platform. 3. Use pre-fabricated steel cages tested at secure location and used. 4. Necessary PPE like safety helmet, safety belt anchored with lifeline, hand gloves etc., to be used.
5.	Shuttering	Fall of material, fall of person	1. Tested chain pulley blocks to be used. The chain pulley block to be fixed at secure location. 2. Necessary PPE like safety helmet, safety belt, hand gloves etc will be provided.
6.	Transportation of concrete	Over speeding/over turning of Transit mixer	1. Speed limit to be maintained below 15 kmph. 2. Proper ramp for unloading of concrete to be made. 3. Check worthless of transit mixers. 4. All gears, chains and rollers of concrete mixer should be adequately guarded to prevent damage/danger. 5. Concrete mixer hopper shall be protected by side railing to prevent damage/danger. 6. Concrete mixer hopper shall be protected by side railing to prevent workers from passing

			under them and operators shall make sure before lowering the skip that all workers are safe. 7. Ensure double earthing is done for Electrical Mixer.
7.	Pouring of Concrete	Tilting of concrete platforms, fall of persons	1. Concreting platforms will be rigidly tied and supported firmly. 2. Safety belt will be tied to rigid structure and not to the scaffolding. 3. Concrete to be poured under a authorized supervisor/with due care. 4. No person shall be allowed to work below the area of connecting. 5. During concrete pouring operation, there should be constant inspection of the staging system with provision for correction as necessary.
8.	Vibration of concrete	Electric Shock	1. Vibrator shall be properly earthed and cable joints should be avoided. 2. Vibrating unit should be completely enclosed and belt transmitting the power to the unit adequately guarded. 3. Electrically operated compact vibrators shall be totally enclosed and be protected against overloads by suitable overload relays and shall be effectively earthed. 4. Be sure that sufficient length of cable is provided to the vibrator.

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JHA on Concreting of Tall Columns

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Tower crane, Electric Winch, Cargo Pulley Blocks, Steel wire ropes, D shackles, slings, Polypropylene / nylon, rope, wrenched, 8mm steel wire rope etc.

4. PPE's required : Fall arrester system, Full body harness with Double lanyard, Safety net, Safety helmet, Safety shoe, hand gloves, Boiler suit etc.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Lifting the purlin and chord Bracings using Electric Winch to the particular location where truss structure rests.	a) Sling Failure due to loose D shackles deteriorated slings, etc.	1. Ensure load test of lifting machine, toll and tackles. Ensure slings free of cuts, breaks etc., (daily visual inspection). 2. Properly attached to hook with proper required D shackles. 3. Use four legged sling for lifting. 4. While Purlin erection Rigger/Supervisor should observe there is no obstruction of the purlin while lifting. 5. Safety belt of the worker should not be hooked on the job. 6. Safety Net should be provided at possible locations. 7. Proper access way to higher election is to be made with suitable stairs, scaffoldings and platforms with railings. Lifelines (for hooking the

			safety belt) are to be prevent fall of person on floor. 8. Housekeeping of the area should be checked. 9. Safe working load with gearing arrangement should be marked on the winch and tested regularly and it should not be overloaded. 10. The break, ratchet arrangement, gear and pinion including the meshing, wire rope and its clamping arrangements and direction of receiving rope drum, tie rods should be checked before using the winch.
		b) Load may slip from rigging if not properly attached.	Ensure the usage of gunny bags or half round pipes at the points where wire rope comes into contact with the sharp edges of concrete lifting members.
		c) Displacement of winch assembly from the working position.	1. Ensure that the winch is in a rigid ground and fixed well. 2. Longer members to be tied atleast two points while lifting.
		d) Electrical hazards/Shock hazards	1. Ensure proper earthing of electric winch. 2. Proper cover/guard should be given to all moving parts like gears, shafts etc.
		e) Hitting of Bracing pipes to persons/ structures due to free movement in air and could result in injury/property loss/load failing.	1. A puller to be tied at each end the of the members to arrest the frees movement. 2. Warn with proper cautioning nearby workers and ensure continuous supervision. An assistant/ signalman should be there to give standard signals to the operators.
2.	Bolting the Purlin, Top Chord bracing and Bottom Chord bracing to the truss structure	a) Fall of person from height.	1. All workers who are engaged must be qualified for height pass & should wear full body harness/ safety belts and hooked of 8 mm steel wire rope.

	for sheeting arrangement	b) Fall of materials/tools from height.	2. They should use all other required PPE. 1. All hand tools should be properly tied while working, it should not fall down. Hand tools should be carried in a bag while going up and coming down. 2. Intense care should be taken while working to avoid slipping of tools/tackles. 3. A safety net made of poly propylene/nylon wire of size (12m x 12m) should be hooked to the truss structure. So that fall of persons and tools/objects can be safely arrested.
		c) Body strain/loss of Balance	1. Should be in a convenient position preferably on working platform while working. 2. A continuous lifeline made of 8mm dia steel wire rope or 25mm dia ply propylene/nylon rope should be tied along the truss surface. 3. They should use all other required PPE.

JHA on Erection of Roof Truss

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Tower crane, Electric Winch, Cargo Pulley blocks, Steel wire ropes, D shackles, slings, welding generator, poly propylene/nylon rope, wrenched, 8mm steel wire rope etc.

4. PPE's required : Fall arrester system, Full body harness with double lanyard, Safety net, Safety helmet, safety shoe, hand gloves, Boiler suit etc.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per Thermax Ltd/I&FS/0470/Safety Guide-01 to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Unloading the truss parts of length 10-12m (variable) from the Trailer/Tractor	a) Crane failure	3. Ensure the crane and load lifting appliances are load tested and certified by a competent person and available with valid documents. 4. Ensure that the max safe load of the crane is more than the weight of the load to be lifted. 5. Ensure there is no person under the crane.
		b) Sling Failure because of loose D shackles, broken sling etc.	1. Use proper D shackles and ensure its strength and capacity. 2. Check the sling for cracks, breaks etc. (daily visual inspection). 3. Gunny bags should be provide at each tied position. 4. Use proper SWL rated slings & 'D' shackles.
		c) Body part caught between	1. Ensure proper training imparted to workers like riggers, signal man, fitters, welders and helpers.

			2. Ensure proper supervision. 3. Use proper PPE (viz. Safety Helmet, Safety Shoe, Hand Gloves etc.)
		d) Fall of the entire load by slipping and injury to the persons refer near by.	1. Wherever possible provide mechanical stopper to arrest fall of material from the trailer, otherwise properly tied. 2. Proper clearance (of both persons and objects) should be ensured in the vicinity. Safety persons should ensure that no personal movement during the time of unloading and loading to the respective place. 3. Required number of wooden sleepers in required lengths, size etc. should be placed on the ground below the load. 4. Load to be kept on firm and level ground or wooden sleeper. 5. Deploy proper number of manpower including one experience signal man/assistant
2.	Assembling of truss parts to form full span by welding.	a) Body parts caught in between.	1. Proper clearance (of both persons and objects) should be ensured in the vicinity.
		b) Shock Hazard	1. The Welding machine should be connected with proper cable connector. 2. Welding machine should be properly earthed (including body earthing) 3. Switch off before any maintenance works.
		c) Radiation	The welders are to be protected from radiation by using suitable face shield.
		d) Flash (Eye injury)	1. Ensuring no molten slag is failing down and use proper sheet / asbestos blanket to prevent fall of molten slag and other materials.

			2. A welder should wear a special type of helmet with a shaded face mask attached to the helmet. 3. Welding goggles shall be free from damage. 4. All the welders/operators must be well experienced. 5. Gloves are to be dry and hole free.
3.	Placing the assembled part in a lifting position (horizontal).	a) Sling Failure due to loose D Shackles, deteriorated slings, etc.	1. Ensure that the max safe load of the crane is more than the weight of the load to be lifted. 2. Use proper D shackles and ensure its strength and capacity. 3. Check the slings for cracks, breaks etc. (daily visual inspection). 4. use proper SWL sling & 'D' shackle.
		b) Load may slip on ground if nor properly placed on required number of wooden sleepers/blockers.	1. Required number of wooden sleepers in required lengths, size etc. should be placed on the firm and level ground below the load.
		c) Load may hit to the nearby persons/objects causing injury/ property damage.	1. Ensure proper peptalk imparted to workers before proceeding work. 2. Use Proper PPE (viz., Safety Helmet, Safety Shoe, Hand Gloves, etc.) 3. Proper clearance (of both persons and objects) should be ensured in the vicinity. 4. Deploy proper number of manpower including one experienced signal man/ assistant.
4.	Movement of crawler crane to the load/truss structure location for lifting	Contract/hit with any other mobile/ stationery bodies nearby.	1. An assistant/signal man should be there to convey standard hand signals to guide the operator or he must be deployed with a Walkie-Talkie for communication. Signal persons to be trained before

			the start of work and walkie to be tested before the work. 2. Area clearance should be ensured for both persons and objects. 3. While trailer/crawler is in movement provide red flags on both sides.
5.	Lifting the respective Roof truss structure to the particulars EL	a) Sling Failure due to loose D Shackles deteriorated slings, etc.	1. Ensure slings free of cuts, breaks etc. (daily visual inspection). 2. Use four legged sling for lifting. 3. Properly attached to hook with proper required D shackles. 4. Ensure load must not be eccentric on shackles.
		b) Load may slip from rigging if not properly attached.	1. Proper selection of rigging materials. 2. Inspect hook for wear and tear. 3. Ensure the usage of tagging to control all loads.
		c) Electrical hazards/ Shock hazards	1. Check the area for any electrical overhead lines and clear it before lifting. 2. Ensure proper grounding of crane and other equipment that could come into contact.
		d) Crane failure	1. Ensure the crane and load lifting appliances are load tested and certified by a competent person and available with valid documents. 2. Ensure that the max safe load of the crane is more than the weight of the load to be lifted.
		e) Hitting of Girder to persons/ structures due to free movement in air and could result in injury/ property loss/load failing	1. Before lifting ensure the availability of a continuous lifeline made of 8mm dia steel wire rope or 25mm dia poly propylene rope, tied column to column at both sides along the axis.

			2. Warm with proper cautioned nearby workers and ensure continuous supervision. 3. An assistant/signal man should be there to give standard registered signals to the operator. 4. Ensure wind velocity is not exceeding the prescribe limit while doing the operation on a working platform. 5. Ensure proper approach ladder to reach the working platform. 6. Ensure the crane is positioned such that hoist ropes are vertical. 7. Ensure the load is not raised high above the ground than is necessary. 8. Ensure if the load has a large surface/Weight ratio not be carried out during high wind. 9. Ensure all motions should be carried out at low speed. 10. Ensure the operation should be under the direct supervision of a competent person and should be carefully planned in advance. 11. Ensure the usage of gunny bags or half round pipes at the points where wire rope comes into contact with the sharp edges of concrete beams.
6.	Placement of Truss assembly to the anchor bolts on the beams required	a) Fall of person from height.	1. All workers who are engaged should wear full body harness/safety belts and hooked it to the lifeline made of 8mm steel wire ropes. 2. Ensure the availability of a continuous lifeline made of 8mm dia steel wire rope or 25mm dia poly propylene rope, tied column to column at both sides along the axis. 3. At most care should be taken while working. 4. Should be in a convenient position while working on the working platform.

			5. Proper approach ladder to reach the working platform to be provided. 6. Use four legged sling arrangement for lifting. 7. An assistant/signal man should be there to give standard registered signals to the operator.
		b) Fall of materials/tools from height	1. The tools have to be carried in a separate bag tied to the worker's body.
7.	Releasing the steel wire rope sling from the body	Hitting of sling wire/D shackles to the body parts of workers, while releasing	1. Intense care should be maintained while releasing. 2. Ensure proper clearance from the sling while releasing.

JHA on Brick Masonry Work

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Mortar basket, trowel plumb.
4. PPE's required : Helmet, goggles, safety shoes, safety belt.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Storage of concrete bricks	Fall of bricks causing injury	1. Restrict height of stack of blocks to 1.5 m. 2. Adopt cross tier system of storage. 3. Wear safety shoes.
2.	Loading, transportation and unloading of concrete bricks to site	a) Fall of bricks causing injury. b) Cut injury due to edges of blocks	1. Bricks should be stacked in cross tier in the truck/tractor/ trolley. 2. Speed limit should be observed. 3. Use safety shoe. Bricks should be handled carefully with gloves to avoid injury.
3.	Shifting & stacking of blocks	a) Back strain while manual lifting. b) Collapse of stack	Training should be given to workers about correct lifting method. No. of blocks stacked on a platform should not exceed load carrying capacity of the platform.
4.	Preparation of cement mortar	a) Improper handling of cement bags. b) Cement dust causing allergy/eye/injury	Training for handling method should be imparted. 1. Use gloves and dust mask while handling cement bags. 2. Wash eyes with clean water if cement enters in eyes.
5.	Laying of concrete block	a) Fall of platform/fall of materials	1. Working platform should be adequate (at least 900mm wide) and securely tied with the scaffolding.

		b) Allergy to hand due to use of cement mortar.	2. No worker should be allowed to work under the area where masonry work is in progress. 3. Loose bricks should not be left on the wall or on working platform at the end of the day. All placed blocks should be joined with cement mortar. Gloves should be used to protect hand.

JHA on Concreting of Rate.

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Concrete mixer, Concrete pump, vibrator, De-watering pump.
4. PPE's required : Helmet, hang gloves, Goggle, Boiler suit etc.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Manual concreting	a) Tilting of mixture machine. b) Workers may come in contact with the rotating parts of the machines	1. Ground for mixture machine should be leveled properly so that the machine can rest firmly. 2. All rotating parts like gears, chains & rollers should be guarded or barricaded. 3. Fall of mixture hopper hoist & anchoring break will be checked & adjusted.
2.	Concreting with ready mix concrete	Injury due to unsafe driving of transit mixture	1. Speed limit should be more than 15 kmph. 2. Proper ramp for concrete unloading in bucket/pump should be provided. 3. One signal man should be deputed for proper signaling. 4. Adequate turning area and end stoppage for transit mixer should be provided.
3.	De-watering	a) Worker may come in contact with the rotating parts of machine. b) Electric Shock	1. All rotating parts should be barricaded /guarded. 2. Earthing & other electrical line should be checked before operation.
4.	Use of Vibrator	Electric shock	3. Vibrator shall be properly earthed and cable joints should be avoided.

5.	Placing of Concrete	Excessive vibration directional charge	1. Trained person should be deployed for vibration activity. 2. Proper supervision should be ensured. 3. Technical specification should be strictly followed.

JHA on Dismantling of Jump Form

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Tower crane, pulley, wire rope and other lifting tools & tackles

4. PPE's required : Helmet, hang gloves, Goggle, safety belt, Boiler suit etc.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing as per Thermax Ltd/I&FS/0470/Safety Guide-01 to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Collecting & Lowering all loose materials from jump form platform	Injury due to fall of materials at ground levels.	1. Area should be cordoned off. 2. Signal Man should be deputed. 3. PPE's should be ensured.
2.	Taking the whole load of jump form unit by tower crane before taking out fixing bracket.	Fall of lifting tools and tackles	1. Special care will be taken to prevent fall of materials. 2. No person will be allowed to work under the dismantling activity.
3.	Removal of outer platforms of jump form and ladder beam	Fall of materials, fall of persons.	1. Worker who is loosening the ladder beam bolts for outer platform should tie his safety belt to nearby jump form. 2. Outer platform should be held with tower crane before loosening of bolts at ladder beam. 3. Removal of outer platform should be started after the workers have moved to inner platform of nearby jump form. 4. Ladder beam should be removed after checking all the bolts of load carrying brackets of inner platform are fully tightened.

4.	Unscrew and detachment of fixing bracket from shell	a) Injury due to the fall of nut bolts and fixing brackets.	1. All nut bolts should be kept in gunny bags only. 2. All fixing brackets should be tied with nylon rope before taking out of the shell. 3. Only trained persons should be deputed for the job.
		b) Fall of person	All workers handling brackets should anchor safety belts to hooks on the shell.
5.	Taking out jump form unit from shell and lowering down by crane.	i) Failure of wire rope	Condition of wire rope, pulley, hook etc. should be checked.
		ii) Failure of boom	1. Check swinging of boom. 2. Obstruction, if any, in boom swinging area should be checked. 3. Obstruction, if any, in lowering position of jump form unit should be cleared. 4. Check clearance of boom.
		iii) Failure of brake.	Proper functioning of brakes.
		iv) Failure of sling	1. Sling should not be overloaded. 2. Condition of sling should be checked after each repetition.
		v) Twisting of jump form unit, lifting tools and tackles due to heavy wind or bad whether condition.	No dismantling work will be done in bad whether.
		vi) Improve operation due to insufficient illumination	1. Clarity of cabin glass. 2. Proper illumination should be maintained.
		vii) Mis-communication with the signal	Authorised signal man should give signal and guide crane operator with walkie-talkie.
6.	Handling, shifting and stacking of jump form unit at ground floor	1. Injury due to improper handling of materials.	1. Only trained workmen should be allowed to handle the materials.
		2. Injury due to collapse of stacking of jump form units.	Proper stacking should be ensured.

(Power Division)

JHA on Erection construction equipments

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : parts of batching plant, crane, lifting tools
4. PPE's required : Helmet, hand gloves, safety shoes, cotton boiler suit.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Foundation	a) Tilting of machine parts.	1. Ground for machine part will be leveled and compacted properly so that the machine can rest firmly. The machine should be firmly secured with mechanical means.
		b) Labour may come in contact with the rotating parts of the machines.	1. All rotating parts like gears, chains and rollers will be covered or barricaded. 2. Fall of mixture hopper hoist and anchoring break will be checked and adjusted. 3. Advise workers not to war loose cloths.
		c) Body injury due to fall of material and tripping hazards.	1. Appropriate PPEs like helmet, gloves, gum-boot, etc., will be provided.
		d) Injury due to unsafe driving of transit mixture	1. Speed limit will not be more than 15 kmph. 2. Signal man has to be deputed for proper signaling. 3. Check break, horn and rear view mirror.
		e) Shock during vibrating	1. Earthing and other electrical line required to be checked before operation.

2.	Erection and assembling of batching plant.	a) Human injuries due to fall of materials fall of persons, shearing off lifting tools and tackles.	1. Load shall be property ascertained to identify centre of gravity. 2. Checking will be done regarding fitness of all lifting tools and tackles. 3. Eyebolts provided at correct slinging points for heavy machinery parts. 4. No sling will be overloaded. 5. Nobody will be allowed to walk, stand or work beneath the suspended load. 6. At the time of erection only an authorised person will give the signals. 7. While using spanners, hammers etc., at height, they will be tied up with a rope fixed to the workman so that it will not drop on the ground in case of any slip. 8. Safety appliances like safety helmet, gloves, safety belt shoes will be provided to all erection people. 9. Crane healthiness through specified Inspection to be ensured before use. 10. Crane should be parked on firm ground.
		b) Unsafe operation of crane.	1. Crane should never be over loaded check the maximum stable load limit. 2. Brake, boom, wire ropes etc., should be checked before operation. 3. It should be ensured that the boom or any part of the crane does not comes in contact with live electrical line.

JHA on Handling and Placement of Reinforcement

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Reinforcement material, binding wire, binding Tools.
4. PPE's required : Helmet, safety belt, and hand gloves.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Lifting of reinforcement bars	a) Slippage of bars causing injury.	1. Bar bundles should be tied with sling/wire rope before lifting at minimum two points. 2. No jerk should be given to the load. 3. Centre of gravity of load should be ascertained.
		b) Fall of bars due to overloading/breakage of sling	1. All the preventive measures required to be taken while lifting a load should be observed strictly. 2. Overloading should not be permitted and slings of adequate capacity should be used. 3. Slings should be tightened before lifting. 4. Use of PPE-Gloves, Safety shoes etc.
2.	Cutting of bar binding wires	Injury due to defective tools/slipping of chisel.	1. Sharp chisel should be used. 2. Chisel should not be held with hands but appropriate 'holder' should be used.
3.	Placement of bar binding wires	a) Trapping of hand below bars.	1. Do not drop the bars. 2. Care should be taken to remove the hand before placing the bar in position.

			Bars should preferably be placed on cover blocks to avoid trapping of hands. 3. Proper coordination between co-workers should be ensured.
		b) Fall of heavy bars while binding.	1. Tie the bars at 2-3 locations with more numbers of binding wires. 2. Use couples in case of very heavy and long bar.
		c) Tripping due to loose binding of bars.	1. Bars should be tied with double binding wires. 2. Walking over bars should not be allowed till bars are tied with binding wires.
		d) Injury due to sharp ends of binding wires.	1. Bend the ends of binding wire so that it is not protruding. 2. Use gloves.

THERMAX LTD

(Power Division)

JHA on Slip Form Erection

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Parts of slip form, Tower Crane, Lifting Tools & tackles, nuts & bolts, spanners

4. PPE's required : Helmet, Hand Gloves, Safety Belt, Manila Rope and Boiler suit.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Area clearance for slip form erection	Injury due to tripping	1. Area to be barricaded where erection if in progress. 2. House keeping should be good so that hitting/tripping injury can be prevented. 3. No activity other than lifting of assembly to be carried out.
2.	Erection and Assembling of slip Form	a) Human injury due to fall of person, shearing of lifting tools and tackles. b)	1. Only tested slings should be used for erection work. 2. Workers with experience of similar job should be deployed for erection work. 3. Load should be properly ascertained to identify centre of gravity. 4. It should be ensured that all the components of jump form are tied up/bolted fully. 5. Checking should be done regarding fitness of all lifting tools and tackles. 6. Normal strength and high strength bolts should be used at appropriate location and full tightening of bolts should be ensured. 7. No. sling should be overloaded.

			8. Nobody should be allowed to walk, stand or work beneath the suspended load. 9. At the time of erection only a trained authorized person should give the signals. 10. Safe platform should be made and tied with safety net on each jump form before lifting for erection so that platform may be used erecting worker for fixing bolts through shell for erection of jump form. 11. Crane shall be engaged till fixing of the bolts at proper place is completed. 12. While using spanners, hammers or other light tools at height, the same shall be tied up with a rope fixed to the users or put in a bag so that injury may be avoided due to fall of said tools. 13. PPE like safety helmet, gloves, safety belt and safety shoes should be provided and used by all erection people. 14. Safety belt should be tied to permanent structure if possible or to a lifeline. 15. Planks of platform should be tied properly to avoid failing.
		a) Hazard due to unsafe operation of tower crane / electric winch	1. Crane / Electric winch should not be over loaded. 2. Brake, boom, wire ropes, etc. should be checked before operation. 3. It will be ensured that the boom or any part of the Tower Crane / winch should not come in contact with live electrical or any other structure. 4. Only manufacture supplied bolts to be used for assembly of slip form and ensure proper tightening and of each port of assembly.

THERMAX LTD

(Power Division)

JHA on Excavation on Soil

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Pick Axe, Shovels.
4. PPE's required : Helmet, Safety Shoes, and breathing set Apparatus, cotton boiler suit.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Cleaning of site	Tripping and cut injury	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 etc.
2.	Excavation	1. Injury due to tools and tackles	1. Experienced persons shall be deployed who are aware of handling excavation tools. 2. Safe distance between crew members to be maintained to avoid hit injury. 3. Regular inspection of tools condition of tools.
		2. Fall of person into the pit.	1. Proper access ladder. 2. Proper barricading with warning signs to be put. 3. Provide proper slope for stability of excavation.
		3. Caving in	1. Provide proper shoring. 2. Remove excavated earth immediately. 3. Do not keep heavy objects and muck near the edge of pit. 4. Excavation from top to bottom.

			5. Provide benching where depth is more than 3 mtrs. keep area de-watered at all time.
		4. Fall of person due to leaving the excavated area overnight.	1. Impart safety instructions to all workers to guard against fall. 2. Proper demarcation around the pit by tape/lighting and cordoning off the area with study barriers where ever possible.
		5. Land slide due to bad weather	Keep 'Danger' sign board and cordon off the hazardous area.
		6. Personal injury due to fall from ladder.	Use ladder with guard which is to be secure at bottom and top by using mechanized (slips) means. Steps of the ladder should be of standard specifications.
		7. Breathing problem and health hazard in deep pits.	1. Check oxygen % and do not allow anybody to work if oxygen is less than 20%. If emerged requirement is there to move in the pit, use breathing set apparatus for making an entry to a pit 3 meters deep. 2. Implement buddy system.
3.	Removal of excavated materials	1. Fall of heavy objects/stones, boulders etc. in the excavated pit.	Keep the removed earth at least 1.5 m away from the pit.

JHA on Mechanical Excavation

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Excavator, Dumper, Tractor, Pick Axe etc.
4. PPE's required : Helmet, Shoes, cotton boiler suit.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Deployment of machine	a) Defective machine	1. As per standard checklist, check the working of machine and its condition without fail before start of the job. 2. Get the differences remove before use.
		b) Inadvertent operation of machine	1. Park the machine at level ground. 2. Keep the machine in appropriate gear while parked to avoid movement. 3. Keep the machine locked when not in use. 4. Only authorised persons should be allowed in the excavation area. 5. No one will be allowed to come near machine while machine is in use.
2.	Excavation	a) Damage to buried utilities.	2) Take shutdown in case of any electric cable is buried in vicinity. 3) Look for route markers. 4) Look for warning tapes/cable covering mats/concrete saddles/ sand padding. 5) Use cable detectors. 6) Adhere strictly to manual excavation in case of presence of underground cable.

		b) Fall of heavy objects/ stones, boulders etc. in the excavated pit.	1. Use only approved equipment. 2. No entry into the pit during excavation. 3. Keep the removed earth at least 1.5m away from the pit.
		c) Caving in	1. Maintain proper slope. 2. Provide shuttering/shoring. 3. Remove the excavated earth immediately. 4. Do not keep heavy objects on the edge of the pit.
		d) Fall of persons into pit.	1. Provide barricading with warning signals (warning light at night). 2. Use standard ladder to get into the pits. 3. Keep muck minimum 1.5 meter away from the edge of the excavation. 4. Provide barrier 1.5 meter (min) away from the edge of excavation.
		e) Dust	1. Sprinkle water to moist the ground to settle the dust. 2. Use dust mask and goggles. 3. Consumer sufficient drinking water.
		f) Working in congested areas.	1. Allow only minimum number of persons to work at the same time with a time limit of. 2. Train the workers for safe use of hand tools, and safe manual working procedures. 3. Provide alternate emergency access out of excavation.
		g) Heavy equipment operation.	1. Deploy experienced operator having medical fitness. 2. Provide trained banks person men. 3. Keep distance of minimum 10 m between two equipment while in use. 4. Use only approved equipment and employ competent operators. 5. Keep safe overhead distance.

			6. Obtain special permits wherever required. 7. Strictly adhere to banks men's signals and directors.
		h) Fall of machinery into pit	1. Follow safety procedure. Operate machinery keeping safe distance to avoid excavating area landslide. 2. Deploy trained banks man.
		i) Dumper/tripper	1. Provide hood over driver's cabin check brakes horn, rear view mirror. 2. Provide stay for wheel of dumper while is in parking position.

THERMAX LTD

(Power Division)

JHA on Painting on the External Wall of the Building

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Jhulla, Pulleys, PP rope & Fall arrester facility
4. PPE's required : Safety Shoe, Safety helmet, Safety Belt, Hand Gloves, Goggles.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Preparation of suspended scaffold/ Boatswain chair	Improper knot/tie at top with rigid member both fall arrester and pulley rope. Improper anchoring of the suspended scaffolding.	1. Ensure fall arrester rope & Jhula's rope are tied to a rigid and strong member/structure. 2. Tying of rope for Jhula & fall arrester must be proper and should be checked by second person to confirm the anchoring/fastening by rope is done rightly.
2.	Lifting and lowering of Jhula through pulley from top	1. Striking and sudden drop of Jhula while lowering tilting of Jhula.	1. Keep the surface neat & clean over which PP rope of Jhula will be passing to ensure smooth passing or rope and to avoid damage of Jhula rope. 2. Engage trained personnel to lopwer the Jhula parallely to maintain the level of the Jhula and to avoid tilt.
		2. Fall of person and material from Jhula.	1. Area should be cordoned and nobody should work under Jhula. Don't over load the Jhula. 2. Jhula should have handrails and toe board at all the four sides. 3. No loose materials should be put in Jhula.

		3. Fire hazards during painting.	Work shall be carried out under effective supervision.
3.	Painting	1. Eye injury due to paint.	1. Safety goggles should be used. 2. In case fall of paint in eyes, immediately it should be washed with water.
		2. Fire hazards during painting.	1. Painters should not smoke during painting. 2. No cutting, grinding & welding works should be carried out at near by painting work spot. 3. Ensure fire extinguished in the area.
		3. Working in dark, fall of person while getting into Jhula & coming out from Jhula	Ensure work carried out with adequate illumination to prevent mislanding of persons while getting into Jhula from ladder due to darkness or inadequate illumination.

THERMAX LTD

(Power Division)

JHA on Fabrication of Reinforcement Work

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Crawler crane, hydra, cutting machine, Bending machine etc.
4. PPE's required : Hand Gloves, Safety helmet, safety shoe, Boiler suit, etc.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Transportation	a) Injury to personnel due to hit of protruding rods beyond the truck desk. b) Slippage of rods from the trailer bed.	1. Provide red flags at the end of protruding rods. 2. Speed of the trailer/truck should be kept minimum. 3. Load material in stable condition. 1. Side stoppers should be ensured in the trailer/truck. 2. Wooden planks shall be used between the bed of trailer and the rods. 3. Bars should be tied with trailer body.
2.	Unloading	a) Fall of the load b) Hitting of personnel due to sway.	1. The crane capacity should be tested before lifting the load. 2. The weight being lifted should be less than crane capacity. 1. The ends of the load should be tied with rope to control the sway. 2. The workman should use proper PPE. 3. The work should be carried out under proper supervision. 4. Stack material on sleeper after loading.
3.	Straightening of rods	Person may get his hand injured.	Use proper PPE like hand gloves, safety shoes etc.

4.	Cutting and bending of rods by machine	a) Person may injure his finder/hand in the machine.	1. Use of necessary PPE shall be ensured. 2. Provision of safety plug/pin in the machine shall be ensured 3. Provide guard to moving parts.
		b) Machine dysfunction.	Machine should be serviced and certified for safe use.
		c) Shock hazard	1. Ensure proper electrical connections. 2. Ensure the machine is earthed properly.
		d) Fly of rods after cutting	Provide stand on bolts of the machine to hold the steel in place.
5.	Cutting and bending of rods manually	a) Toppling of chisel	1. The tools shall be handled safely. 2. Only competent workmen should be put on the job. 3. Use catcher to hold chisel.
		b) Slippage/fly of bar after cutting.	1. The bar should be firmly held in position. 2. The operating handle should be handled safely.
6.	Stacking of rods.	Slippage or rods.	1. The fabricated rods shall be stacked over wooden planks only. 2. The number of layers should be separated by additional wooden planks in between the layers. 3. More than 5 layers should not be stacked.
7.	Transportation of fabricated rods.	a) Fall of load while lifting & placing on the trailor.	1. The rods should be bundled and tied before lifting. 2. While lifting, the load carrying capacity of the crane and sling quality should be checked. 3. No. of sling shall be decided based on 4 way sling.
		b) Slippage of rods from the trailor on transportation	1. Slide stoppers should be ensured in the trailer. 2. Wooden planks shall be used at appropriate locations in between the stacks of bars.

			3. Tie the bar with body of trailor.
8.	Unloading at site	Same as Sl. No.2	Same as Sl. No.2

JHA on RCC ay height using Pumped Concrete

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Concrete pump, Pipelines, Vibrator, transit mixer etc.
4. PPE's required : Hand Gloves, Safety helmet, safety shoe, Boiler suit, etc.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Election of staging for working platform and approach.	1. Injury during transportation. 2. Fall of person. 3. Fall of material 4. Toppling of staging	Experienced manpower for transportation of material should be deputed. Use of PPE. 1. Barricading the area. 2. Authorised entry only. Proper anchoring of staging is to be done.
2.	Placing of concrete pump	1. Toppling of pump. 2. Struck by other moving vehicle.	Pump is to be rested on firm ground and form base. Placed away from heavy traffic area.
3.	Concreting concrete pump line.	1. Fall of pipe line while erecting. 2. Leakage of pipe line at joints.	Proper manual handling method is to be adopted. Leak proof couple is to be provided at joints.
4.	Unloading of concrete into pump by transit mixer	1. Hitting the pump by transit mixer. 2. Over pouring of concrete into pump hopper	3. Stop blocks are is to be provided at joints. 4. Proper signal to be given by signal man. 1. Proper communication should be ensured. 2. Operation by trained pump operator should be ensure.

5.	Placing concrete	1. Excessive vibration at directional charge.	Proper anchoring of the pipeline with him support should be ensured.
		2. Choking of pipeline.	1. Slump of concrete not less than 150 mm should be maintained. 2. regular concrete pump strokes should be maintained. 3. Use of excessive sharp angle ends should be avoided.
		3. Bursting of elephant hose.	1. The house should not bent ore than 60^0C with the concrete load. 2. Care should be taken to keep up the continuous flow of concrete. 3. When the flow is in upward direction, utmost care is to be taken. 4. The operation should be supervised by experienced supervisor.
6.	Green cutting of concrete operation	1. Fall of retarder	1. Use of appropriate PPE should be ensured. 2. Any spillage of retarder should be cleaned off.
		2. Failure of air compressor pipe.	1. Use of heavy duty pipe should be ensured. 2. All pipes to be connected with couplar joints.
7.	Ball passing operating	1. Hitting by flying fragments	1. Ensure non-entry of outside person withi the area during the operation. 2. Use of bucket head at opening of the pipeline to arrest the ball should be ensured.

JHA on Rock Breaking with Pneumatic Equipment/Breaker

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Pneumatic hammer, Breaker, Wooden log, Barricading tape etc.
4. PPE's required : Helmet, safety shoes, ear plugs, dust masks
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Attachment & removal of hammer	Hydraulic oil leakage	Disconnect hydraulic hose only after closing appropriate valves.
2.	Rock Breaking	1. Fall of hammer	1. Barricade the area where rock breaking is planned. 2. Deploy trained operator.
		2. Damage to surroundings	1. Covering to nearby equipment, if any, should be done.
		3. Shock due to overhead lines.	Keep safe distance of 15m from overhead lines.
		4. Hitting/striking reversing	1. Keep the work force at least 5m away from breaker. 2. Strict adherence to the instruction of banksman.
		5. Jolts to operator	1. Avoid application of excessive force to hammer. 2. Deploy trained operator.
		6. Flying particles	1. Provide shield to the cabin window. 2. Keep workers at safe distance.
		7. Noise 8. Dust	Use of ear plugs to be ensured. Use Dust masks to be ensured.
3.	Leaving trench after end of day's work.	Fall if material/equipment/ persons.	1. Barricade the area and post warning signs.

			2. Deploy watchman during off working hours.
4.	Laying down the hammer	Injury due to fall of hammer	Place wooden block and lay the hammer pointing inside.
5.	Removal of pin of hammer	Striking/hitting	Position the hammer horizontally on wooden block and remove pin by gentle tapping.

JHA on Scaffolding Erection and Dismantling

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Hammer, Piller, Spanners etc.
4. PPE's required : Safety belt, helmet, Safety shoe, and Cotton Boiler Suit.
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Erection of scaffolding for safe working at height, with cross bracing, planks, holding pins, split pin etc.	1. Man & material may fall from height. 2. Fear of height. 3. Unsafe surroundings or environment.	1. Wear safety helmet, wear safety belt anchor the same with lifeline. Use fall arrest system. 2. Ensure safety net is installed. Ensure medical checkup and physical fitness of the workers. Height pass Climb in the clear atmosphere.
2.	Placement of the scaffolding.	Scaffolding may collapse.	1. Check for bracing in each stage. 2. Use hard soil. If soil is sandy use piece of wood or thick plate beneath the scaffolds. 3. Lock the structure with permanent structure building. 4. Use of base plate and tie should be ensured.
3.	Use of Tools & Tackles.	Falling material i.e. tools, bracing and other material	1. Carry tools in a bag or tie the tools with rope. 2. Use rope & pulley for lifting the material. 3. Check that the rope knot is properly tied while lifting the material. Check all the locking pins split pin etc., are properly in position. 4. Cordon off the area and post sign of caution.

4.	Tie up of wooden planks/landing mats.	Man & material may fall & lead to injury to personnel.	Fix wooden planks/landing mats properly with the scaffolding. Preferably cross the rope to each other.
5.	Up & down movement of persons for work.	1. While moving up & down, persons may slip and fall or may hit against fixture. 2. Material may fall.	3. Allow person(s) up & down in stage with safety belts & helmets. The safety belt to be anchored to lifeline. 4. Fall arrester to be provided. Safety Net to be installed as ultimate defence. 5. Ladder to be used for climbing. 1. Check and rectify the scaffolding for any loose material before using the same. 2. Put safety net below the work. 3. Remove the barricade & allow the persons up & down for work after checking the complete installed scaffolding tower like bracing, locking pins & split pins, etc.
6.	Dismantling of scaffold	Fall of scaffold material while dismantling	1. The area where dismantling takes place should be barricaded and appropriate communication in nearby area made. 2. People working in near by area should use proper PPE. 3. Dismantling should be done by competent workmen.

JHA on Shuttering and De-shuttering at Height

1. Engineer - in - Charge : (Site specific)
2. Manpower required for the job : (Site specific)
3. Tools and tackles required : Shuttering materials, hammer, nails, wood cutting machine, lifting devices spanners, crowbars etc.
4. PPE's required : Helmet, safety belt, safety goggles, Boiler suit
5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to be all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Handling of wooden planks and supports	1. Injury due to sharp edges/nails in old materials. 2. Fall of material 3. Tripping hazard	1. Avoid handling the material with sharp edge side. 2. Remove nails before reuse. 1. Secure the pieces properly in a stack. 2. Do not overload if carried in a truck/tractor with all sides of the vehicle closed to prevent fall of items. Maintain good Housekeeping.
2.	Cutting wood/ply to required size.	1. Defective cutting machine/tools causing injury 2.	1. Check for proper operation all the tools & cutting machine before start of the job. 2. Ensure greasing/lubrication to machine parts as per Manufacturer's Instruction (MIs). 3. Guard moving parts of the machines. 4. Maintain tools on sharp conditions as blunt tools may cause injury due to application of excessive force.
3.	Preparation of shuttering parts	1. Flying nails while hammering.	1. Wear safety goggles/shoes. 2. Do not allow crowding near the work place. 3. Drive the nail with full concentration and maintain hammer centre on the nail.

4.	Erection of shuttering	1. Fall of shuttering.	1. Provide proper access to the work place. 2. Do not keep bolts/materials attached to shuttering. Carry tool bag at height. 3. No worker should be allowed to stand below suspended load. 4. Shuttering should be firmly tied at centre after proper assessment of centre of gravity. 5. Check condition of bolts and threads of through bolts and nuts before use. 6. Ensure full tightening of holding bolts/through bolts in the shuttering before detaching from the lifting device. 7. Barricade the area.
		2. Fall of workers.	1. Anchor safety belt to a rigid structure before starting job. 2. Provide lifeline where anchoring is not possible to rigid structure. 3. Provide working platform with hand rail before erection of shuttering and tie it with scaffolding. 4. Provide safety net, where possible.
5.	De-shuttering	1. Fall of shuttering	1. Observe all precautions relevant to the used lifting device. 2. Keep other workers away from the deshuttering area. 3. Tie the shuttering at its centre of gravity with the crane/lifting device before loosening the supports/bolts. 4. Do not throw bolts/nuts from the top. 5. Do not throw shuttering material rather lower it slowly with the lifting device/crane.
		2. Injury by nails.	1. Inspect for protruding nails. 2. Removing nails wherever holding the shuttering.

		3. Fall of workers.	3. Collect and dispose used nails at the ground level and maintain good housekeeping. 1. Anchor safety belt to a permanent rigid structure not part of the shuttering/ scaffolding immediately after reaching work place. 2. Provide lifeline when anchorage is not possible and anchor safety belt to lifeline. 3. Follow the sequence of deshuttering as per engineers instructions.

JHA on Shuttering and De-shuttering at Height

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Parts of the tower crane, crane, lifting tools & tackles.

4. PPE's required : Helmet, hand gloves, goggles, safety belt, boiler suit, etc.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	- Erection & assembling. - Tower erection. - Boom erection - Operator cabin erection	1. Settlement of foundation 2. Human injury due to fall of materials, fall of person, shearing off lifting tools and tackles. 3. Hazards due to unsafe operation of crane.	1. Proper leveling and compression of ground. 1. Load should be properly ascertained to identify centre of gravity. 2. Checking should be done regarding fitness of all lifting tools should be provided at correct slinging points for heavy machinery parts. 3. No sling should be overloaded. 4. No body should be allowed to walk, stand or work beneath the suspended load. 5. At the time of erection only an authorized person should give the signals. 6. While using spanners, hammers etc. at height, they should be tied up with a rope fixed to the workman so that it will not drop on the ground in case of any slip. 7. Safety appliances like safety helmet, gloves, safety belt should be provided and used. 8. Competent supervisor shall be deployed with safety officer during erection. 1. Crane should never be over loaded.

			2. Brake, boom, wire ropes etc., should be checked before operation. 3. It should be ensured that the boom or any part of the crane do not come in contact with live electrical line. 4. Competent riggers & signal man shall be employed. 5. Check fouling with other near by crane/structures.

JHA on Dismantling and Chipping of Concrete

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Chipper (Electrical or pneumatically operated)

4. PPE's required : Goggles, hand gloves and cotton boiler suit.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Chipping and dismantling	a) Eye injury	Goggle should be worn to protect against flying particles.
		b) Electric Shock	1. Shock proof electric chipper shall be used. 2. The earthing of the equipment should be ensured.
		c) Hand injury	Gloves should be worn.
		d) Injury to other persons.	Work area should be isolated/cordoned off.
2.	Accidents	a) Improper lighting	Area shall be well illuminated
		b) Fall of person	1. Ensure that scaffolding is stable. 2. The person should use necessary PPE.
		c) Fall of material	1. Use safety nets. 2. Area below should be cordoned off.
		d) Fly off of chipped material	Workers involved should use eye protection.

JHA on Plastering of Walls & Ceiling

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Mortan basket, trowel, etc.

4. PPE's required : Safety shoes, safety helmet, safety belt, Goggles, cotton boiler suit.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Scaffolding and working platform	Refer JHA on Erection and dismantling of scaffolding.	
2.	Plastering	a) Workmen fall from height.	1. The scaffolding should be firm. 2. The platform should be of minimum width of 1m. 3. Safety belts should be anchored at a firm location.
		b) Fall of mortar	1. Workman should use goggle to avoid mortar failing on to his eyes. 2. GI sheet may be used at the level of the working platform so that the failing mortar is collected there itself.
		c) Inhalation of cement dust.	Wear respiratory Protection PPE's.
		d) Absorption and ingestion of cement.	1. Wear goggles. 2. Wash hands before taking food. 3. Take shower after completion of job.

THERMAX LTD

(Power Division)

JHA on Rock Blasting

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Drilling equipment, Explosive van, explosives.
   i. Detonators and stemming bamboo.

4. PPE's required : Helmet, Hand Gloves, Goggles, Dust mask.
   i. Ear plugs, cotton boiler suit.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Cleaning of site	Tripping hazards and cutting injury	1. All workers will be guided properly through safety induction program regarding tripping hazards and cutting injury due to unleveled land, bushes and cutting instruments. 2. Use of proper protective equipment like helmet, shoes hand gloves, etc to be ensured. 3. Entry of unauthorised persons should be controlled through a work permit.
2.	Drilling of holds	a) Dust and noise.	Dust musk and Earplug shall be used.
		b) Injury due to unauthorised operation of Drilling Machines.	Only authorised, skilled and experienced workers to be deployed for carrying out this task.
		c) Occupational health hazards	Drilling operators will be checked by a qualified doctor and medical fitness certificate should be issued before starting the operation.
		d) Electric Shock	Burled power lines if any should be diverted before drilling.
		e) Eye irritation due to dust.	1. Safety goggles and fresh water will be provided for washing eyes in case of injury.

			2. Advise drinking sufficient water.
3.	Blasting permit	Unauthroised entry of explosive and blasting operation.	Documentation signed by Site-in-Charge need to be submitted to NPCIL Civil & safety Dept. for their approval and then to CISF for their final approval to avoid unauthorised entry of explosive and control of blasting activity.
4.	Charging operations	Unintended explosion	1. Licensed persons shall only be deployed (Mining Engineer/ Foreman) 2. Smoking shall not be allowed. 3. Electronic and Electric Instruments should not be permitted, in blasting area. 4. Use of synthetic clothes by persons handling detonators and explosives should not be allowed to avoid blast by static charge if possible provide cotton boilers suits to perform. 5. Total charge will be properly calculated and charged accordingly to control ground vibrations. 6. The condition of the holes will be checked by wooden bamboo.
5.	Blasting	Chances of flying of rock and ground vibration.	1. Before blasting all the persons and machinery to be shifted from the blasting zone to a safe place at least 250 meters away from the location. 2. Vibration to be measured in nearby structures & to be reported/recorded.
6.	Post Blasting	Chances of misfire	After proper checking, misfire of, if any, to be identified by authorised blaster and to be reblasted.
7.	Completion of blasting	Unauthorised handling of explosive	After the blasting remaining explosives and other materials will be checked and balance will be recorded & signed by the Thermax Ltd, CISF representatives & Company safety officers.

8.	Storage of explosives.	Mishandling	1. The blasting material should be stored in a in licensed areas. 2. Detonator and explosives shall be stored in separate compartment. 3. Combustible materials like grass, papers etc., shall be removed from vicinity.

JHA on Disposal & dumping of excavated earth

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Dumper of suitable loading capacity.

4. PPE's required : Safety helmet, fluorescent signals & aprons, Cotton boiler suit.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Dumper movement	Overturning	1. Trained driver with valid license shall be deployed. 2. Medical fitness of driver shall be ensured. 3. Physical fitness of vehicle like brake, horn, rear view mirror, reveres horn. 4. Presence of attendant. 5. Each dumper should have a signal man attached. 6. Dumper should be driven at a maximum speed of 15 kmph.
2.	Improper access road	Fall of dumper	1. Ensure proper access roads with suitable gradient. 2. During monsoon ensure that roads are not slippery. 3. Turning radius on curves. 4. Width for two vehicle movement. 5. Deep water pit shall be barricaded. 6. Proper lighting of dumping area.
3.	Overloading	over turning, slippage, failure of equipment	Overloading shall be avoided by keeping check on load by putting suitable markings in loading area.
4.	Dumping yard	over turning of dumper	From bottom to top the storage should be in layers duly compacted.

JHA on Roof Insulation and Water Proofing

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required : Gin Wheel arrangement, Nylon rope, Concrete mixer, transit mixer, painting brush etc.

4. PPE's required : Safety helmet, gloves, goggles, apron and Cotton boiler suit.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Installation of ladders / scaffold stairways	a) Slipping or failing from scaffold.	1. Standard should be erected vertically in plumb on the base plate. 2. Sole board should be used while erecting on loose soil. 3. Landing plate should preferably be made by steel grating. 4. Grating should be secured at both ends. 5. All ledger should be horizontal. 6. Bracing should be provided diagonally. 7. It is essential that all scaffolds be securely tied to the building or structure throughout their length and every interval of 4m height to prevent their movement. 8. Foundation must be of adequate strength and disperse the load. 9. Ladder to be used for climbing on scaffold. 10. Only steel scaffold to be used.
		b) Fall of materials	1. Area below the scaffolding tower should be barricaded. 2. Entrance should be cleaned and obstruction should be removed.

2.	Installation of Gin wheel	a) Fall materials	1. Scaffolding arrangement should be made on parapet wall. 2. Suspension of scaffold tube should not be extended more than 750m. 3. Gin wheel hook must be suspended with at least five turn round the hook and tube. 4. Hook must be latched to ensure it cannot be displaced. 5. Nylon rope/polymide rope should have a minimum dia of 18mm.
		b) Collapse of scaffolding arrangement	1. The maximum load that should be raised or lowered by a Gin wheel and rope at any one time is 50 kg. 2. Care should be taken particularly when lowering materials. If the weight is too great either the man lowering the load will weigh less than the load and will pull off his feet or complete assembly may collapse.
3.	Installation of foam processing machine and concrete mixer	a) Caught on or between	1. All gears, belts rollers of the mixers shall be properly guarded. 2. Operators, workers, helper should wear safety helmet/ shoes. 3. When workmen are cleaning inside of the mixer, the operating power supply should be switched off. Suitable notice should be hanging at the places. 4. No cleaning work should be carried out without informing the operator. 5. All cables, clamps, hooks, gears, slings etc. of the mixer shall be checked and cleaned, oiled and greased once in a week.
		b) Electric shock due to insulation break down of cables and wires.	1. Check all the cable and wires once in month/weekly with the help of Megger.

			2. Do not allow and PVC wire or joints to come in contact with water. Because water reduces insulation resistance. 3. Do not keep any cable/wire with joints on the floor or ground. 4. Do not pass more current than the rating or wire. 5. Cable joints should not lie in water. 6. Use cable glands when connecting cables to electrical switch. 7. Identify the replace/damaged cables. 8. Cable should be kept away from the source of heat or sparks such as welding, grinding, gas cutting etc. 9. Cable should be prevented from mechanical damages such as fall of material, contact with sharp objects, crushing due to heavy equipment. 10. Cables should be protected from rat bites. 11. Electrical motor, starter and mixer should be double earthed. 12. Electrical connection should be made through ELCB. 13. Electrical should use proper insulated tools, rubber hand gloves, electrical resistant shoe etc.
4.	Concrete mixing by concrete mixer (cement + sand mortar and unloading	Skin diseases irritant to skin, eyes, nose, throat	1. Workers should wear gum boot and rubber hand gloves. 2. Use proper goggles. 3. Use nose mark or suitable respirator.
5.	Mortar lift in container by Gin wheel	Fall of mortar	1. Extreme care should be taken while lifting container full of mortar. 2. Extreme care should be taken while filling container with mortar. Total weight or mortar with container should not be more than 50 Kg.

			3. Gin wheel should be tied with 6mm wire rope lashing with atleast 5 turns round the hook and tube and with 'U' clams. 4. Use polymide/nylon rope with minimum 18mm dia. 5. Workers who are engaged in rope pulling, they should be instructed to use proper hand gloves, shoe and hand helmet with chin strip.
6.	Transportation of mortar concrete mixer	a) Overturning of the concrete mixer	1. Transit mixer moving area should be leveled. 2. While reversing the transit mixer in the vicinity of an excavation the weight of concrete and transit mixer should be considered.
		b) Transit mixer accident	1. No person should stand behind reversing concrete delivery transit mixer. 2. Identify the place of transit mixer for loading concrete into the bucket of tower crane. 3. Check back view mirror and reverse horn. 4. One attendant to signal the driver shall be available.
7.	Placement of mortar by concrete bucket of tower crane	a) Crane failure	1. Ensure tower crane and load lifting appliances are load tested and certified by competent person and available with valid documents. 2. Ensure that the maximum safe load of the tower crane is more than the weight of filled mortar bucket to be lifted.
		b) Sling failure because of loose 'D' shackles or broken slings etc.	1. Sling and 'D' shackles should be tested by competent person. 2. Use proper 'D' shackles and ensure its strength and capacity. 3. Use proper SWL rated slings. 4. Deploy trained signal man.

			1. Buckets handled by crane should be inspected prior to each operation. Following points should be taken care of. a) Safely latch of the hook. b) Condition of slings. c) Welded joints. d) Closing & locking of exist door of the bucket. [It is essential to avoid accidental opening of the exist door & consequent failing of the mortar]. 2. Care must be taken that the loose mortar does not fall off during lifting. 3. Men should be moved away from the swinging area. 4. Unloading and loading area shall have proper lighting.
8.	Laying of two coats of bitumen paint	Skin disease, allergy and irritation.	1. Workers should wear hand gloves. 2. Workers should wear safety helmet and safety shoe
9.	Heating of tar/Bitumen	a) Fire b) Burn injury	1. Heating should be done in vats or drum or other container away from building. 2. Container should be resistant to damage by heat and transportation. 3. it should be leak proof and should have suitable outlet which can be controlled for taking out the hot material. 4. Heating should be done in the presence of a person and the cover of the container kept closed. 5. Observer temperature constantly. 6. Remove all unwanted and combustible materials near by area. 1. Worker should wear suitable PPEs lie gumboot, safety helmet, safety goggles and safety aprons etc.

			2. While handling hot bitumen, workers should be careful to prevent accident spillage. 3. Buckets and cans used for carrying hot materials from the boiler should be checked before use to ensure that they are intact and in safe condition. 4. In no case leak bitumen shall be allowed to remain around the worker at the end of the day. 5. Painting of the hot bitumen should be very careful and should be done with long brush. 6. Area should be neat and clean before painting of hot bitumen.

JHA on Erection of Roofing Sheets/Pre cast slabs on roof

1. Engineer - in - Charge : (Site specific)

2. Manpower required for the job : (Site specific)

3. Tools and tackles required :

4. PPE's required : Safety shoe, safety helmet, safety belt, hand gloves, goggles, cotton boiler suit.

5. Authorization required : Work Permit

Sl. No.	Sequence of the job	Potential Hazards	Protective measures to be taken
0.	Pre-job briefing given to all the workers before commencement of the job by the Executing Engineer/ Supervisor.		
1.	Location of crane and crane positioning (in case if mobile crane)	Settlement/titling of crane due to un compacted earth/ ground	Ensure ground over which crane is going to be positioned to carry out truss erection is leveled and strong/hard enough to bear the load of crane with materials during erection and the same if to be checked & confirmed crane reaches.
2.	Lifting of Precast slab	Fall of slab while lifting and placing	1. Ensure suitable capacity crane, wire rope are used and their proper usage. 2. Ensure effective usage of guide rope to position and control the swinging of the slab. 3. Clear men & materials where precast slab has to be lifted and placed over truss & purlins. 4. After placing of the slabs, welding or bolting should be done immediately to prevent fall of precast slabs before placing next member/ slab.
3.	Lifting of Sheets, A/c sheets or GI sheets	Fall of sheets during lifting and fixing	1. Use suitable clamps with rope arrangements to prevent fall of sheets while lifting to elevations. 2. Number of sheets to be lifted have to be tied together tightly and lifted by 4 way slings. 3. Have minimum number of sheets at top(i.e) over purlin and the same has to be kept

			on tag by trying using a rope to prevent flying of sheets. 4. Trained personnel should be engaged on works. 5. During lifting and fixing of roofing sheets wind velocity must be taken into account. 6. Graveller boards shall be used to avoid point load bearing on ridges of the sheets.

Civil Works – Excavation

Activity	Type of Hazard	Threat	Control Measures
MECHANICAL			

Excavation by using machinery	a) Defective machinery	a) Damage to the machinery	a) Check machine thoroughly before starting the job. Use good machines.
	b) Mis-operation	b) Damage to underground elected, telecom cables and water services.	1. Look for route markers. 2. Make trails pits. 3. Look for warning taps/ cable covering mats/ concrete saddles/ sand padding.
	c) Operating near the edge of excavation.	d) Fall of machinery into the pit.	1. Follow safety procedure. Operate machinery keeping safe distance to avoid excavating area landside.
	e) Working near the edge of excavation.	c) Fall of persons inside the pit.	1. Keep away from the edge of the excavation. 2. Provide barrier away from the edge of excavation. 3. Provide sign boards & binding lights.
Excavation	d) Fall of heavy objects (stone, boulder, soil etc.) into excavated pit.	e) Fatal/injury	1. Use only approved equipments. 2. Competent Operators. 3. No entry into the pit during excavation. 4. Keep the removed earth at least 1m away from the pit.
	f) Caving in.	f) Fatal / Injury	1. Provide shutting/ shoring. 2. Remove the excavated earth immediately. 3. Do not kept heavy object on the edge of the pit.
	f) Fall of person into the pits.	g) Fatality/Injury	1. Provide barricading with earning signals (warning light at night) 2. Provide proper ladder to get into the pits.
	h) Dust	h.1. Breathing complaints.	Sprinkle water.
		h.2. Eye injuries	Use dust mask and goggles.
Excavation	i) Congested work site too many persons working in	i) Hit injuries	1. Allow only minimum number of person to work at the same time.

	the pits or trenches.		2. Train for safe use of hand tools and safe manual working proceedings. 3. Provide adequate emergency access out of excavation.
Transportation of explosive	a) Unauthorised and mishandling	a) Explosion	Detonators shall be kept in separate wooden box to avoid any sparking with floors of the vehicles.
	b) Inexperienced and untrained drivers		Loading & unloading of explosive shall be carried out very carefully.
	c) Unlicensed and unsuitable vehicles.	b) Explosion	1. Only trained person shall be allowed to handle the explosive. 2. Explosive shall be carried in approved explosive van only. 3. Fire extinguisher shall be placed in explosive van. 4. Do not drive the vehicle other than the recommended speed. 5. Vehicle must be in good working condition and it should be equipped with tight wooden floor with sides and end high enough to prevent the explosive from falling off. 6. Don’t allow smoking inside or near to the vehicle.
Drilling holes using crawler/ wagon drills.	a) Air hose bursting.	a) Injury person.	1. Regular checks of the condition of the hosepipe and clamp. 2. Only experienced person must be allowed to work on drilling machines. 3. Tightening the hose fittings properly.
	b) Dust hazard		1. Dust mask shall be used by the persons involved in the drilling operation.

			2. By sprinkling water on the top portion of the hole.
	c) Noise		1. Ear plug shall be used by the operations.
Toppling from heights.	a) Eye hazard		1. By using the spot before placing the drill machine. 2. Examine the spot before placing the drill machine. 3. Care must be taken while drilling at the edge of bench. 4. Blow out holes hall not be drilled again & do not drill during charging of explosives.
Charging	a) Unskilled/ untrained personnel and lack of supervision	a) Explosion	1. Electric detonators shall be short circuited & kept in wooden box. 2. Electric detonators shall be handled by a responsible person. 3. Only bamboo poles shall be used for stemming. 4. Smoking / carrying lighting sources within a radius 30m from the charging area. 5. Do not keep excess explosive near the holes. 6. Only authorized persons area allowed to handle explosive. 7. Prevent any unauthorized entry.
	b) Presence of unauthorised person in blasting zone.	a) Injuries or death of animals and persons present.	1. Use radio frequently transmitters at safe distance only. 2. All the persons/animals shall be removed from the blasting zone with in a radius 300m. 3.
	c) Lack of security guards in blasting zone.		1. Sufficient no. of trained sentry person shall be deployed in order to prevent the entry or

			outside personnel to the blasting zone. 2. All the sentry person shall have red flags, whistle & helmets while clearing eth area.
	d) Inadequate warning sings and sirens		1. Sufficient audio warning alarms shall be given in order to inform all the outside and working personnel that the blasé if going to take place. 2. Blasting shall be carried out during fixed hours of the day; the hours shall be made known to the people in the vicinity.
	e) Inadequate shelter to the blaster	a) Injury to person.	1. Firing shall be done only from a blasting shelter.
After blast	a) Fumes.	a) Health effects	1. Nose mask shall be used by the concerned person. 2. Only the blaster shall be allowed to inspect the site form misfire. 3. Work area personnel's shall be allowed to enter into the quarry only after giving "all clear siren". 4. return to be blasted area only after smoke and fumes from the blast have been dissipated.
	b) Misfires.	a) Explosion	1. Open all the connections and cordon off the area of misfire if time doesn't permit for blasting misfired holes.
Mucking operations.	a) Dust and fumes.	a) Health effects	a) Wait till the dust subsidies. If require use ventilation fans and see that fumes are removed.

Topic : Excavation Work

Sl. No.	Activity	Hazards Identified	Control Measures
1.	Site access	✳ Unauthorised personnel entering into site without proper PPEs. ✳ Improper site access leading to vehicle accidents	✳ Site access point shall be identified sign boards shall be erected. Gate man shall be stationed to prevent persons without PPEs from entering the site. ✳ Site access road to be properly ear marked.
2.	Drilling	✳ Involves lot of dust which can cause eye injury and health hazards due to dusts entering into the respiratory tract.	✳ PPEs viz. safety goggles and dust masks shall be worn. ✳ Continuous sprinkling of water.
3.	Blasting	✳ Excessive quantity of explosive transported leading to unnecessary handling of explosive. ✳ Drilling of holes and loading of explosive at the same blasting location which may lead to loss of concentration of the loading men and also explosion. ✳ Smoking of synthetic cloths by persons handling detonators and explosives which may lead to static charges. ✳ Smoking in the blasting location. ✳ Improper handling of detonators.	✳ To ensure that only required quantity of explosive toe be transferred. ✳ To ensure that drilling of holes and loading of explosives does not take place at the same blast location. Any other activities viz. drilling heavy machinery movement shall not be carried within 10 meter distance from the loaded holes. ✳ To ensure that personnel associated with handling of explosives and detonators shall never use synthetic clothing. ✳ Smoking shall be strictly prohibited. ✳ Jerks impacts and friction to be avoided detonators should not be pressed.

		✳ Congestion at blasting location.	✳ Barest minimum personnel should be present at blast location.
		✳ Persons straying in the blasting zone at the time of blasting.	✳ Pre-blasting survey shall be carried out to ensure that no person is remaining in the blasting zone. Persons with red flags shall be sent in all directions, from where there is possibility of entry of men, vehicles etc. persons shall be evacuated to a distance of at least 200 meters from the blasting zone to escape from fly rock. Siren shall be blown before shot firing and also after shot firing ensuring that all the loaded holes have been blasted.
		✳ Blaster running to check for misfires immediately after blasting inviting health hazard of inhaling poisonous gases.	✳ To ensure that blaster should not run to the blasted area immediately after blasting. At least 5 minutes should be allowed for diffusion of obnoxious gases.
		✳ Excessive vibration which may damage the electrical and electronic installations.	✳ Safe charging per delay shall be adopted as per recommendation from CWPRS. Peak particle velocity of 3mm/s and 10mm/s is recommended as safe vibration level for building with electrical. Electrical equipment and other civil structures respectively. Monitoring of the above mentioned is very essential.

4.	Removal of excavated rock.	✳ Improper barricading of excavation pits shall lead to persons/vehicle falling into it.	✳ Proper barricading of the excavated pits, sign boards wherever necessary. Barricading should be at least 2 meters away from the edge of the pit.
		✳ Heavy equipment such as excavating machinery, dumper trucks passing around the edge of the excavated side.	✳ Heavy equipment and road traffic shall be kept away from the excavated side at a distance not less than the trench or at least 6 meters for excavations deeper that 6 mtrs.
		✳ Unstable loose rock fragments on edges which may fall and injuries men working inside excavation.	✳ Loose rock fragments to be pulled down wherever & wherever sighted.
		✳ Vibration due to adjacent machinery vehicles and blasting.	✳ Additional bracing precautions to be taken.
		✳ Poclain operators over loading dumpers which may lead to topping of the excavated rock and leading to serious injury hazards.	✳ To ensure that Poclain operations shall not over load the dumper.
		✳ Non-compliance in using PPEs viz. safety shoe, safety helmets and nose masks which lead to head, foot and health hazards respectively.	✳ Checklist shall be prepared and monitored regularly for its compliance.
5.	Work during night hours.	✳ In sufficient light.	✳ Flood light of at least 50 lux & fluorescent sign boards shall be posted around the excavated area.

JOB HAZARD ANALYSIS

1. Name of the Job : Shell Painting
D
2. Engineer - in - Charge : Sh. A.K. Pandey
3. Manpower required : Engineer, Supervisor, experienced workers.
4. Tools and Tackles required : Tower crane, Pulley, Wire Rope and other lifting
5. PPE's required : Helmet, Hand Gloves, Goggles, Safety belt etc.

Sl. No.	Sequential steps of the job	Potential Hazards	Protective measures required to be taken
1.	Storage of paints	✧ Fire incident at storage area of paints	Paints will be stored separately away from the source of heat.
2.	Issue of paints	✧ Splitting, spreading of paints in the store and working area due to unauthorised issue of paints.	Only the concerned Engineer and the store Incharge will issue paints to stop such bad practices.
3.	Keeping paints at site	✧ Fire incident due to smoking gas cutting, welding etc. ✧ Trickling and falling of paints.	Smoking, gas cutting, welding etc. will not be allowed nearby paints. Only trained workers will be allowed to handle paints.
4.	Lifting of painting bucket by tower crane.	✧ Fall of bucket due to: Failure of wire rope. Failure of boom Failure of brake Failure of sling Collision of boom with other structure. Collision of bucket with guying rope. Overloading	Operator should check the following item before operations:- 1. Condition of wire rope, pulley, hook etc. 2. Obstruction, if any, in boom swinging area. 3. Obstruction, if any, in lifting position of bucket. 4. Avoiding over load. 5. Checking swing of boom. 6. Checking of gear oil 7. Proper functioning of brakes. 8. Clarity of cabin glass 9. Ribbing of winch & its wire rope.

5.	Painting of tower shell	✧ Injury due to fall of painting materials from bucket at height. ✧ Unnecessary delaying due to improper movement of bucket causing exhaustion and short temper to the painting workers. ✧ Twisting or jerking of buckets, lifting tools and tackles due to heavy wind or bad weather condition. ✧ Injury due to insufficient illumination. ✧ Injury (head, eye etc.) due to lack of or improper PPEs.	Platform of the bucket will be fabricated with toe guard. Moreover, the bucket will be covered by safety net. no person will be allowed to work under painting work. Crane operator and painting workers will be trained. proper communication will be ensured. No painting work will be done in bad weather. Painting will be done in proper illumination. Proper and sufficient no of PPEs will be ensured.
6.	Lowering down painting bucket after painting	✧ Fall of bucket from height. ✧ Fire incident due to smoke, welding, gas cutting etc. ✧ Injury due to unauthorised operation.	Bucket will be rested on the pond floor after painting. No smoking, gas cutting, welding etc. will be allowed nearby storing area of paints. Special care will be taken to prevent such operation.

JSA prepared by : - Supervisor / Engineer Concerned Signature

Safety review by : - Safety Engineer Signature

Approved by : - Engineer In-Charge Signature

JOB HAZARD ANALYSIS

Name of the Job: Radiography

Sl. No.	Sequential steps of the job	Potential Hazards	Protective measures required to be taken
1.	Removal of radiography source from pit.	Fall of radiography source.	a) Proper lifting arrangement should be used.
2.	Transportation of radiography source to work site.	Radiation hazard	Leakage field should be measured and ensure that it should be with in the limit.
3.	Radiography job started.	Radiation hazard	i) Experienced and qualified manpower shall be deployed. ii) Personnel involved in the work shall use dosimeter device such as TLD. iii) Ensure availability of required PPEs & its use. iv) The radiographer shall be well conversant with the safety practice and shall have valid BARC certificate/ license for source handling. v) Area barricading should be ensured. vi) Survey meter should be calibrated. vii) A person should be deputed to restrict unauthorised entry in the radiography area.
4.	Completion of radiography work.	Radiation hazard	a) Radiography camera should be in proper working condition so that it should not struck in the middle of the job. b) Personnel involved in the work shall use dosimeter device such as TLD.
5.	Transportation of radiography source from work site to the storage area.	Radiation hazard	a) Leakage field should be measured and ensure that it should be with in the limit.

Prepared by:-

Received by :-

Approved by :-

JOB HAZARD ANALYSIS

1. Identification of task:- Reinforced cement concrete at height using concrete pump

2. PPE required : - Safety net, safety belt, safety shoes.

Prepared by :-

Reviewed by :-

Approved by :-

Sl. No.	Activity	Hazards	Precaution to be taken
1.	Erection of staging for working platform and approach	a) Injury during transportation. b) Fall of person. c) Fall of material d) Topping of staging.	i) Experienced manpower for transportation of material should be deputed. i) Use of PPE. ii) Barricading the area. i) Proper anchoring of staging is to be done.
2.	Placing reinforcement	a) Fall of material b) Fall of person	i) Erection area to be barricaded. ii) No unauthorised entry is allowed. i) Use of PPE such as safety net, satisy belt, safety shoe, helmet etc.
3.	Erection of Eps	Same as S.No.2	Same as S.No.2
4.	Fixing of shuttering.	Same as S.No.2	Same as S.No.2
5.	Placing of concrete pump line.	a) Topping of pump b) Struck by other moving vehicle.	i) Pump is to be rested on firm ground and firm base. i) Placed away from heavy traffic area.
6.	Connecting concrete pump line.	a) Fall of pipe line while erecting. b) Leakage of pipe line at joints.	i) Proper manual handling method is to be adopted. ii) Leak proof couple is to be provided at joints.
7.	Unloading of concrete into concrete pump by transit mixer.	a) Hitting the pump by transit mixer. b) Over pouring of concrete into pump hopper.	i) Stop blocks are to be placed. ii) Proper signal to be given by signal man. i) Proper communication should be ensured. ii) Presence of trained pump operator should be ensured.

8.	Placing concrete into form work.	a) Excessive vibration at directional charge. b) Chocking of pipeline.	i) Proper anchoring of the pipeline with firm support should be ensured. ii) Slump of concrete not less than 150 mm should be maintained. iii) Use of excessive sharp angle ends should be avoided.
9.	Green cutting of concrete operation.	a) Fall of retader b) Failure of air compressor pipe.	i) Use of appropriate PPEs should be ensured. ii) Any spillage of retarder should be cleared off. i) Use of heavy duty pipe should be ensured. ii) All pipes to be connected with couplar joints.
10.	Ball passing operation.	a) Hitting by flying fragments.	i) Ensure non-entry of any person within the area during the operation. ii) Use of bucket head at opening of the pipeline to arrest the ball should be ensured.
11.	De-shuttering operation.	a) Fall of material b) Fall of person.	i) The area should be barricaded. ii) Tested chain pulley block should be used. iii) Material should be stacked at proper place only. i) Safety belt with proper lifeline should be ensured. ii) Use of PPEs such as safety shoe, helmet etc. should be ensured.

CHECKLIST FOR WORK AT HEIGHT

Checklist for work at height
Name of job: - Work at height Date:-

Sr. No.	Description	Observation Yes/No	Remarks, if any
1.	Work area inspected prior to starting of the job.		
2.	Area below the work place barricaded.		
3.	Working platforms of adequate strength.		
4.	Adequate illumination		
5.	Proper communication system established.		
6.	Beg for hand tools and arrangement for fastening hand tools made.		
7.	All the workers have been explained safe work procedures through pep talk.		
	HOUSEKEEPING		
1.	Walkways and all overhead work palaces cleaned of loose materials		
2.	Platforms and walkways is free of oil, grease or other slippery material.		
3.	Dropping collected scraps from height.		
4.	Shuttering material removed after de-shuttering is done.		
	ACCESS		
1.	Walkways provided with hand rail, mid rail and toe guard.		
2.	Are ladders inspected their good conditions and soundness		
3.	Are ladders properly secured to prevent slipping, sliding or falling.		
4.	Ladders placed at right slope.		
5.	Metal ladders not used around electrical hazards.		
	PPES AND SAFETY DEVICES		
1.	Use of safety belts, safety shoe, helmet ensured for all workers		
2.	Safety belt anchoring point provided at all places of work.		
3.	Common lifeline provided wherever linear movement at height is required.		
4.	Safety nets are used wherever required.		
5.	Proper fall arrest system is deployed at critical work places.		

Job Safety Analysis Scaffolding erection up to a certain height

1.	Identification of task	:	Scaffolding erection upto a certain height.
2.	Engineer In-charge	:	
3.	Manpower required	:	Supervisor-1 Skilled-2 Unskilled-2
4.	Tools & tackles	:	Hammer, Plier, Spanners etc.
5.	Other items	:	Walkie – Talkie, Manila Rope, Pulley, Planks, locking pins & split pins.
6.	PPE required	:	Safety belt, helmet, boiler suit & shoe.
7.	J.S. Prepared	:	Supervisors:-
			Reviewed by:-
			Approved by:-

Sl. No.	Activity / Breakup	Hazards	Precaution
1.	Scaffolding erection for safe working at height, with cross bracing, planks, holding pins, split pins etc.	Man & Material may falls from the height	Wear safety helmet, wear safety belt. Use fall arrest system.
		Fear of the height.	Medical checkup & physical fitness.
		Getting tired (exhaustion).	1. Take rest after next stage of height. 2. Ensure for fitness.
		Unsafe surroundings or environment.	Climb in the clear atmosphere.
2.	Placement of the scaffolding.	Scaffolding may collapse.	1. Check for bracing in each stage. 2. Use hard soil, if sandy may use piece of wood or thick plate. 3. Locking with permanent structure building. 4. Use of base plate and tie should be ensured.
3.	Tools & tackles.	Failure materials i.e. tools, bracing and other materials.	1. Carry tools in a bag or tie with rope. 2. Use rope & pulley for lifting the materials. 3. Check knot properly tied while lifting the materials check all the locking pins, split pins etc. properly in position. 4. Cordon off the area with red rope with sign of caution.
4.	Tie up wooden planks/landing mats.	Man & material may fall & get injury.	Fix wooden planks/landing mats properly with the scaffolding. Preferably cross the rope to each other.
5.	Up & down movements of personals for the work.	1. While moving up & down, person may slip or may hit against fixture. 2. The material may fall.	1. Allow personal ups & down in stage with safety & helmets. 2. Fall arrest system to be provided. 3. Check all the scaffolding for any loose material. 4. Put safety net.

Remove all the barricade & allow the personals up & down for work after checking the complete installed scaffolding tower like bracing, locking pins & split pins, etc.

JOB SAFETY ANALYSIS

1. Identification of task : Erection of beams and columns
2. Engineer-In-Charge :
3. Manpower required : Supervisor-1
   Rigger-2
4. Tools & tackles required : Sling-1 No.
   D shackle-1 No.
   Manila rope-10mm dia x 12m long.
   Pulley-1 No.
   Scaffolding-6 sets.
   Wooden planks-5 Nos.
5. PPE required. : Helmet, shoe, later glows, safety belt.
6. JSA prepared by :
7. Reviewed by :
8. Approved by :

Sl. No.	Activity / Breakup	Hazards	Precaution
1.	Issue of chain pulley block.	a) defective locking arrangement, lock pin, chain link, link corrosion, may cause failure of the chain pulley.	1. Thorough inspection of chain block should be done.
2.	Transportation & handling of chain block.	a) Strain during lifting of chain block. b) Injuries due to fall and sharp edge of chain block.	1. Proper positioning of workers during lifting. 2. Unloading from vehicle with the help of rope. 3. Use leather hand gloves, safety shoes.
3.	Erection of scaffolding plate.	a) Fall of material. b) Fall of person from height. c) Supporting structure.	1. Use manila rope for lifting frames & wooden planks. 2. Use helmets & safety belts during installation. 3. Restrict unauthorised entry.

4.	Installation of chain block on monorail.	a) Fall of materials. b) Fall of person from height. c) Failure of supporting structure.	1. Carry all tools/tackles in covered beg. 2. Use manila rope for lifting frames & wooden planks & check for the stability of the supporting structure. 3. Use helmets & safety belts during installation. 4. Restrict unauthorised entry.
5.	Inspection of platform and chain pulley block.	a) Fall of materials. b) Fall of person from height. c) Failure of scaffolding platform.	1. Thorough inspection of chain pulley block, its supporting structure and scaffolding platform should be done.

CHECKLIST FOR DISMANTLING OF JUMP FROM

Location: Date:

S.No.	Items to be checked	OK/Not OK	Remarks
1	Cordoning off the area		
2	Availability of signal man/Watchman		
3	Proper Lifting tools and tackles Available		
4	Proper PPE's Available		
5	Tightening of lifting tools and tackles		
6	Availability of trained crane operator		
7	Functioning of communication system		
8	No Person under dismantling activities		
9	Condition of wire rope		
10	Functioning of tower crane brakes		
11	No obstruction during operation of tower crane.		
12	No loose materials on jump from platform		

Checked By: - Reviewed By:-

JOB HAZARD ANALYSIS

1. Name of the Job : **Tower Crane Erection**
2. Engineer In- Charge :
3. Manpower required : Engineer , Supervisor , experienced workers
4. Tools & Tackles required : Parts of the tower crane , crane, Lifting tools & tackles.
5. Other items :
6. PPE required : Helmet , Hand Gloves , Goggles , Safety belt etc.

Sl. No.	Sequential steps of the job	Potential Hazards	Protective measure required to be taken
1	Area clearance for blasting	Unexpected mishaps	✪ No other activity other then charging operation to be carried out
2	Charging operations	Charge of explosion	✪ Smoking will not be allowed. ✪ Electronic and electric instruments will not be permitted. ✪ Total charge will be properly calculated and charged accordingly. ✪ The condition of the holes will be checked by wooden poles
3	Blasting	Chances of fly of rock and ground vibration	✪ Any nearby structure (L&T pump house, HCC Project office & temporary shed) to be protected/ Shifted to a safe place. ✪ Before blasting all the persons, animal and machinery to be shifted from the blasting zone to a safe place.
4	Foundation	Labors may come in contact with the rotating parts of the machines. Body injury due to fall of material & tripping hazards.	✪ All rotating parts like gears, chains & rollers will be covered or barricaded. ✪ Fall of mixture hopper hoist & anchoring break will be checked & adjusted ✪ Appropriate PPE's like helmet, gloves, gumboot safety goggles etc., will be provide .as tripping

		Injury due to unsafe driving of transit mixture. Sock during vibrating.	hazards concern, the gangway for concreting will be made safety .No unnecessary material will be kept on the way. A strict & constant supervision will be there during concreting. ✪ Speed limit will not be more than 15 kmph. ✪ One signal man will deputed for proper signaling. ✪ Earthing & other electrical line will be checked before operation.
5	Gas cutting	Eye injury/ burn injury. Fire incident.	✪ Gas cutter will be provided necessary PPE's like safety goggles, hand gloves etc., availability of water & fire extinguisher will be ensured. ✪ Gas cylinders shall be stored away from open flames & the work place will be free from combustible materials.
6	Welding	Electric shock. Fire hazard. Burns, heat effects. Radiation's & fumes/ eye injuries	✪ The welding machine & the cables will be placed on dry place. ✪ Working place will be ensured as dry. ✪ The welder will be in dry condition. ✪ Body earthing of the machine will be ensured. ✪ Except the electrode holding jaw, the remaining part of the welding holder will be fully insulated. ✪ Working place will be free from combustible materials like oils, paint etc. ✪ At the time of suspending welding the holder will be hung safety to avoid contract with the job causing spark as well as supply will be disconnected. ✪ Before leaving the place of job, smoldering fires if any will be put out. ✪ Cable joints will be made very rigidly & properly insulated to avoid cables getting heated up or producing sparks causing fires. ✪ All hot objects will be made cool as soon as possible after welding or the objects will be kept

			separately with strict supervision so that no worker will touch it. ✪ A welding shield or welding helmet made of fibber glass, dark in colour & fitted with a protect the welder from radiation; spatter & hot stags.
7	Erection & assembling	Human injury due to fall of materials, fall of person, shearing off lifting tools & tackles. Hazards due to unsafe operation of crane.	✪ Load will be properly ascertained to identify centre of gravity. ✪ Checking will be done regarding fitness of all lifting tools & tackles. ✪ Eyebolts provided at correct slinging points for heavy machinery parts. ✪ No sling will be overload. ✪ No body will be allowed to walk, stand or work beneath the suspended load. ✪ At the time of erection only an authorized person will give the signals. ✪ While using spanners, hammers etc. at height, they will be tied up with a rope fixed to the workman so that it will not drop on the ground in case of on the ground in case of any slip. ✪ Safety appliances like safety helmet, gloves, safety belt will be provided to all erection people. ✪ Crane will never be over loaded. ✪ Brake, boom, wire ropes etc. will be checked before operation. ✪ It will be ensured that the boom or any part of the crane will not come in contact with live electrical line.

JAS prepared by:- Supervisor / Engineer Concerned Signature

Safety review by:- Safety Engineer Signature

Approved by:- Engineer-in-Charge Signature

Job Safety Analysis

1. Identification of task : Handling of Steam Generator

2. Man Power required :
   (i) Supervisor - 01
   (ii) Riggers - 06
   (iii) Skilled helpers - 04
   (iv) Crane Operator - 02
   (v) Trailor Operator - 01
   (vi) Trailor Helper - 01
   (vii) Electrician - 01
   (viii) Security Guard - 01
   (ix) Cutter - 01
   (x) Safety Person - 01

3. Tools & tackles required
   (i) 140 Te capacity Crane
   (ii) 75 Te capacity Crane
   (iii) Wooden Sleeper 6”x9”x2.5 mtr.
   (iv) Slings 3”
   (v) D-Shackle 100 Te
   (vi) Manila Roper 1”
   (vii) Cutting Set
   (viii) Spanners
   (ix) Hammer
   (x) Hacksaw
   (xi) Rustoline
   (xii) Crowbar
   (xiii) Wooden Bamboo
   (xiv) Lacing Wire
   (xv) Torque Wrench
   (xvi) Red flag
   (xvii) Fire extinguisher
   (xviii) Ladder

4. Personnel Protective Equipments required. :
   (i) Lather hand gloves
   (ii) Safety helmet
   (iii) Safety shoes
   (iv) Goggles

5. Job Safety Analysis prepared by :

   Reviewed by :

   Approved by :

6. Location :

S. No.	Activity	Hazards	Precautions
1.	Route survey	a) Pit on the road. b) Electric wire (over head line) c) Tree touches the Steam Generator. d) Loose soil.	a) Fill the pit. b) De Energize the line & wire push arrangements. c) Trimming of the trees. d) Compact the soil.
		Note – One week before, the survey is to be conducted by committee & contractor tentative lay out of route for transportation to be attached.	
2.	Loading of steam generator on trailor	a) Sling failure. b) D-shackle failure. c) Fear to injury. d) Failure of trailer. e) Failure of crane. f) Scratches on SG.	a) Use tested sling as per IS. b) Use tested D-shackle. c) Use trained man power. d) Use good condition of trailer tyre, service brake etc. e) Use tested crane. f) Use saddle.
3.	Transportation of steam generator from store to site by trailer.	a) Steam generator may down may fall down. b) Poor communication failure. c) While climbing down from steam generator, a person may get injured. d) Trailer may hit to any body in the path. e) Small vehicle may hit the trailer.	a) Steam generator lacing properly. b) Proper communication. c) Use ladder in trailer. d) One Escort for clearance of path. e) Use Red flag for warning & dipper in night.
4.	Unloading steam generator at work place (site).	a) Un even floor. b) Fire may occur. c) Improper signal hazard. d) Crane may fail. e) Jerking on steam generator. f) Occupying of personnel near steam generator.	a) Use wooden sleepers. b) Structure cutting in presence of fireman. c) Use proper signal. d) Lift load by crane and kept lifted at 1” height for some time. e) Lowered on the wooden sleepers gently. f) Use barricade & caution tags surrounding the steam generator.

Check list for Hydro Testing of Pipes / Vessels:

Sl. No.	Item	OK	Not OK	Remark
1.	Proper scaffolding erected proper working platform.			
2.	Proper access & access clear of obstruction.			
3.	Valid height passes issued to persons working at height.			
4.	No make used shift arrangement.			
5.	Availability & use of PPE.			
6.	Sufficient working space & adequate illumination.			
7.	Arrangement for removal of spilled water/ stagnated water.			
8.	No living body & foreign material present inside piping & vessel.			
9.	Arrangement for keeping & taking tools to elevated places.			

Engineer concerned
Signature with date
Name :-
Designation:-

Job Hazard Analysis on Hydro Testing of Pipes / Vessels

1. Tools & tackles required:-

1.	Spanners	2.	Torque wrenches
3.	Dewatering pumps	4.	Pressuring pump
5.	Torch	6.	Bucket
7.	Ladder	8.	Pressure gauge
9.	Safety relief valve of required rating	10.	Gaskets

2. Personnel Protective Equipments required:-

1.	Safety helmet	2.	Safety shoes
3.	Safety belt	4.	Gumboots
5.	Safety glasses	6.	Hand gloves

Sl. No.	Sequence of the job	Potential Hazards	Remedial action required to be taken
1	Inspection of piping & fittings for readiness for Hydro test.	a) Fall of person from height.	✪ Proper scaffolding working platform with handrails & toe board should be made. ✪ Proper approach to the working platform to be provided. ✪ Persons identified to work at height should have valid height passes. ✪ Avoid make shift arrangement for working platform & approach. ✪ Strict enforcement of use of PPEs. ✪ Any opening available in the area/ piping/ over the tank should be guarded/ covered.
		b) Injury due to striking against.	✪ Sufficient working space should be made available. ✪ Adequate illumination should be ensured.
		c) Slippage due to water spillage.	✪ Access to work place should be made clear of obstruction. ✪ Use of safety shoes having anti skid provision should be ensured.

		d) Presence of living body & foreign material inside piping & vessels.	✪ Removal of spilled water should be ensured on regular/ basis. ✪ Extra care must be exercised while moving in wet surfaces. ✪ Tools to be kept in a tool box/ bag and should be taken to elevated working platform with the help of pulley & rope. ✪ Tools & tackles should never be dropped from height. ✪ Space below the working area should be barricaded. ✪ Use of safety helmet & safety shoes must be ensured.
3.	Tightening of the fasteners of mechanical joints.	a) Fall of person due slippage of spanner & other tools.	✪ Ensure proper working platform. ✪ Ensure use of proper tools. ✪ Ensure use of safety belt. ✪ Avoid use of tools with damaged grips. ✪ Avoid make shift arrangement.
4.	Pressurizing the piping & vessel.	a) Air trap in the piping & vessel. b) Bursting of hose. c) Personnel injury due to bursting of piping, gaskets etc. d) Over pressurizing.	✪ Air vent to be kept open till the complete piping & vessel filled with water. ✪ Hoses & pressurizing pump should be of adequate capacity. ✪ Ensure use of calibrated pressure gauges having capacity of 1.5 times above the pressure required for Hydro Test. ✪ Ensure use of calibrated safety relief valve of required rating. ✪ Ensure used of good quality & approved make gaskets.
5.	Depressurizing & draining the system.	a) Damage to the system.	✪ Ensure opening of vent valve before opening the drain valve.

		b) Flooding of the area.	✪ System should be depressurized slowly to zero. ✪ Ensure provision of dewatering pump of adequate capacity.

Prepared by :

Reviewed by:

Approved by:

Job Safety for Condenser Erection Works

Sr. No.	Steps	Risk Assessment	Risk Control
1.	Loading & unloading of condenser shell	Failure of slings may occur.	Load tested slings will be used. the sling conditions will be checked before use.
2.	Visibility of shell to the crane operator.	The condenser shell may hit the civil structure and personnel working around since length the shell hinders the visibility of the crane operator.	Crane operator will be guided & instructed by an experienced foremen/ employee to avoid any confusion.
3.	Hoisting the condenser shell by the crane.	The condenser shell may rotate and hit the personnel working in the area because of the wind force acting on the shell.	Manila rope or Rope PP will be tied up to the ends of the condenser shell top control the movement created by the wind force acting on it.
4.	Transportation of the shell.	The shell may fall from the trailer or dislocate from it position.	The condenser shell will be laced properly to the vehicle. The position of the material in the trailer will be checked by the rigging team travelling in Jeep behind the trailer.
5.	Loading condenser of shell.	The personnel leading the shell may fall in the condenser foundation pit.	Use of platform and rest grill is ensured near the place of work. The rigging team will be guided by the experienced foreman and safety supervisor.
6.			