1. **Objective:** Falls are among the most common causes of serious work related injuries and deaths. The safety code aims to ensure safety while working at height (more than 2 meter height) and protection from fall.

2. **Scope:** This safety code covers general requirements for working at height, safe approaches viz ladders, scaffolds, MEWP etc. including safety requirements for Roof & side sheet changing work and is applicable for all sectors of Iron & Steel Industry.

3. **Procedure**

3.1 **Definitions**

**Anchorage** – A secure point of attachment may or may not part of the work structure, to which lifelines, drop lines, or lanyards are affixed. An anchorage must be capable of supporting a minimum dead weight of 2000 kilograms for every person attached to it. An anchorage not meeting the 2000 kilograms requirement must be part of a complete personal fall arrest system which maintains a safety factor of at least two and is ascertained and used under the supervision of a qualified person. An anchorage is often a beam, girder, column, or floor.

**Travel restraints** - Travel restraint systems physically prevent a person from approaching an unprotected edge. The user is totally restrained from reaching a position where a fall is possible.

**Anchorage Connector** – A component or device that is installed on an anchorage and is specifically intended for attaching a fall-arrest system to the anchorage. Anchorage connection straps, carabiners, and girder grips rated to support minimum dead weight of 2000 kilograms can be purchased from fall-protection equipment manufacturers.

**Base Plate** A steel plate providing a flat bearing surface with a spigot or screw jack for distributing the load from posts (standards). It has an integral spigot and fixing holes for use with sills.

**Bearer (Transom)** -A horizontal transverse scaffold member, that may support platform units, and which is supported by at least two runners (ledgers) or connected directly to at least two posts (standards).

**Brace** -A rigid connection of scaffold tubing that holds one scaffold member in a fixed position with respect to another member to give the scaffold rigidity.

**Bay** - The space between the centerlines of adjacent posts (standards) along the face of a scaffold

**Carabineer** – A trapezoid or oval-shaped connector component with a gate or similar arrangement that remains closed until it is intentionally opened for connection or disconnection.

**Competent person** – A person/ engineer of the executing department performing
the job, executing contractor, & consultant if any, who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, plant and who can take prompt, corrective measures to eliminate them.

**Deceleration Device** – Any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

**Descent Device** – A device or piece of equipment used to escape from an elevated structure such as a work platform, tower, column, or an overhead crane cab.

**Fall Hazard** – A condition or situation that could result in a fall.

**Fallout** – An unintentional separation of a person from a body-support component during or after fall arrest.

**Fall Prevention** – Eliminating fall hazards during all phases of work at heights, including access and egress. Examples of fall prevention measures include using complete scaffolds, aerial lifts, and secured ladders.

**Free Fall** – An un-arrested fall.

**Harness (Full-Body)** – A device with straps that can be attached to a personal fall-arrest system. The straps are fastened around a person's body to contain the torso and distribute fall-arrest forces over at least the upper thighs, pelvis, chest, and shoulders.

**Leading Edge** – The edge of a floor, deck, or grating that changes location as additional floor or deck sections are placed.

**Lifeline** – A flexible vertical or horizontal line, secured to an anchorage or between two anchorages, to which a lanyard or harness may be attached.

**Lanyard** - A flexible line with a positive means to lock end connections closed (i.e., locking type snap hooks or carabiners with a self-closing, self-locking keeper) that is used to secure the wearer of a full body harness to a lifeline or a point of anchorage.

**Ladder** - A device used for climbing vertically between levels.

**Outrigger** - The structural members of a supported scaffold used to increase the base width of a scaffold in order to provide support for and increased stability of the scaffold.

**Positioning Device System** – Equipment that allows a person to work with both hands free while standing in such a way (for example, leaning backwards) that a fall could result. Positioning device systems are often used on framework construction and concrete rebar placement.

**Personal Fall-Arrest System** – A system used to arrest a fall from a working level. A personal fall arrest system consists of an anchorage, connectors, a body harness, and may include a lanyard with a locking snap hook, deceleration device, lifeline or suitable combination of these.

**Qualified person** – A person / engineer of the executing department performing the job, executing contractor & consultant if any, who by possession of a recognized degree certificate or professional standing or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve or resolve problems related to the subject matter, the work or the project.
Retractable Lifeline – A fall-arrest device that allows free travel without slack rope, but locks instantly when a fall begins. Retractable lifelines may be used when vertical movement is required but must be limited, such as in tanks, manholes, and pressure vessels, or on roofs.

Rollout – A process by which a snap hook or carabiner unintentionally disengages from another connector or object.

Rope Grabs (Fall-Arrester) – Automatic lifeline devices that act by inertia to grab the lifeline if a fall occurs. Rope grabs are used when vertical movement is required, such as work from boatswain chairs or suspended scaffolds.

Self-Locking Snap Hook – A hook-shaped connector with a gate or similar arrangement that remains closed and locked until it is intentionally opened for connection or disconnection. When the gate is released, it automatically closes.

Scaffold - A temporary elevated platform (supported or under hung) and its supporting components (including ties) used for supporting workmen, materials, or both.

Shock-Absorbing Lanyard – A flexible line that secures a person wearing a harness to an anchorage, anchorage connector, lifeline, or drop line, with an integral energy shock absorber that limits shock load forces on the body. Most energy shock absorbers are made of a webbing material with tear-away stitching designed to gradually absorb the fall-arrest load. A lanyard must have a nominal breaking strength of 2000 kilograms and may be nylon or Dacron® rope, flexible aircraft steel cable, or webbing.

Sole Board or Sole Plate- A timber spreader used to distribute the load from a base plate to the ground

Tie - Scaffold components installed to provide an anchor point for a scaffold to a building or structure, including tie tubes attached to the scaffold. Used to provide lateral stability to the scaffold.

3.2 Steps to take before working at height
   i) Check there is a safe method of getting to and from the work area.
   ii) Decide what particular equipment will be suitable for the job and the conditions on site.
   iii) Make sure work platforms and any edges from which people are likely to fall have guard rails and toe boards or other barriers.
   iv) Due considerations to be given for scaffolding and ladder standards. However as per site requirements and based on height & type of building/structures proper sketch/scheme to be made. It is to be approved by a competent/qualified Engineer of the execution department performing the job. Make sure that the equipment needed is delivered to site in good time and that the site has been prepared for it.
   v) Check that the equipment and Body Harness is in good condition and make sure that whoever puts the equipment together is trained and knows what they are doing.
   vi) Make sure those who use the equipment are supervised so that they use it properly. The more specialized the equipment (for example, boatswain’s chairs and rope access equipment or system), the greater the degree of training and supervision required to ensure safety.
vii) Check any equipment provided by another company is safe on site before using it.
viii) Find out whom to tell if any defects need to be remedied or modifications need to be made and keep them informed.
ix) Make sure that tested equipment, systems etc. are used.

**When selecting a means of access,**

i) Only when it is not practicable to provide a work platform with guard rails should other safe means of access (for example, boatswain’s chairs or rope access techniques) be used;

ii) Only when no other method is practicable, or risk assessment shows other methods are safer when work platforms cannot comply with all requirements for safe work (e.g. a guard rail has to be removed to land materials), should a way of arresting falls (for example, a harness and lines or nets) be relied upon;

iii) If no other means of providing a safe place of work at height is available, then appropriately anchored harness should be worn. However, whenever harnesses are used a method must be available to enable people to be rescued from fall and be left suspended in their harness.

iv) Nets may also be needed to protect those working to put guard rails or other protection in place. For overhead hot work fire proof nets are to be used in case nets are to be used.

v) Ladders should always be secured if possible both laterally & longitudinally at the ends.
   They should be primarily used for access and only be used as workplaces to do light work of short duration, and only if it is safe to do so. It is generally safer to use a stable tower scaffold or MEWP, Man lifter even for short-term work. Heavy work activity such as drilling or carrying heavy loads should never be carried out from a ladder. When using a ladder ensure that the ladder is as per standard drawings and the person on the ladder always has three points of contact, i.e. two legs and a hand. People should never have to lean sideways when up a ladder.

vi) When selecting a safe system of work at heights, all the risks have to be considered before one method is selected. For example, if nets are selected, is there adequate clearance under the nets to prevent injury to those who may fall into them? If harnesses are used, is there sufficient clearance from the ground to allow the shock absorbing lanyard or inertia reel to fully extend?

vii) Before any work at height, check that there is adequate clearance for equipment. For example, overhead power lines can be a risk when erecting scaffolds or using MEWPs; there can be a risk of crushing against nearby structures when mobile access platforms are maneuvered.

viii) Work permit for working at height shall be issued as per suggested checklist given in *Annexure-I*.

ix) Before starting the day's work, the site shall be inspected by the executing officer for ensuring compliance of all safety aspects. After ensuring compliance of all safety aspects, the Contractor, the Executing Officer and the Safety Officer should sign the above document given at giving clearance for starting the work. In the event of discontinuation of the work and before re-starting, the site inspection shall be re-done, as above by the executing officer.

x) Following checks shall be carried out before issuing permit.
   a) Personnel skill
      • Whether the Person is a certified rigger.
• Whether Person is fit for working at height (ask for certificate from Doctor whether the person has vertigo-height phobia, for working at height more than 2 meter).
• Person is trained on working at height.
• Person is having valid height pass issued by SED after completion of safety induction and verifying the medical fitness.

b) Suitability of approach.
• Physical condition and suitability of steps, rung ladders.
• Scaffolding, ramps, stairs with respect to load

c) Suitability of platform
• Whether handrails provided at 1.0 meter height with top rail middle rail and toe guard.
• Whether extended support roof/working platform fabricated or available.
• Whether secondary support provided while working at fragile or hazardous roof.

d) Availability of PPE and tools.
• Helmet with chin strips, in working condition.
• Full Body Harness with double lanyard with arrangement for life line support.
• Fall arrester.
• Manila rope used as lifeline or for any other purpose shall be checked before each application, when it is in use. Diameter to be ascertained before use and to be certified by a competent & qualified Engineer of the department executing the job. The test procedure for manila rope will be same as being followed for all other construction tools & tackles.

e) Communication.
• Tools, tackles, figures, fasteners, cages, rope ladders, plant & machinery, cranes etc. to be used must be tested prior to use.
• Appropriate anchorage points identified / connected.
• Hazard of nearby work vicinity has been identified like, power line, power mobile equipment, gas line, etc. and proper care has been taken and same communicated to persons expected to work at height.
• Operator of mobile equipment in the close vicinity informed about job being done.
• Area on ground beneath the height where job is being executed has been properly barricaded/fenced indicating danger.
• Concerned departmental personnel whose work may get affected by the job have been identified and communicated.
• Loose material not to be kept at heights
• Damaged, torn, bend scrap sheets not to be used on platforms.
• Materials at heights are kept in arranged manner to avoid slip/trip/fall hazards.
• Tools, tackles, consumables, holders etc are kept tied to avoid their fall.

f) Any work at height shall be carried out only in presence of skilled supervisor.
g) Only trained persons shall be allowed to work at height.
h) Permit shall be issued only if the findings of the above checks satisfy the issuing authority.
i) If working at height includes gas cutting and welding, working in gaseous hazardous area, near electrical installation, work permit should be obtained from authorized agencies separately for each hazard.
j) Work permit shall be returned daily after completion of job.
k) Work at height shall be permitted only when a reasonable level-of natural sunlight is available as per the discretion of the contractor, the executing officer and the
safety officer. The work shall not be permitted in inclement weather conditions like, Heavy Rain, Lightning, scorching heat, Thunder storm, high wind velocity etc. When work at height is done indoors, there shall be adequate illumination.

l) Underneath area to be barricaded for providing protection against hazards due to falling objects.
m) Adequate Safety signage’s / caution board to be conspicuously displayed for alerting personnel about imminent hazards.
n) It is advisable not to use mobile phones while working at height.
o) Tool Box talk / safety talk to be imparted to all personnel engage in height job and a record of same to be maintained.

3.3 Systematic Approach to Continuous Fall Protection

Every site must take a three-step, systematic approach to protecting people from falls.

i) **Eliminate Fall Hazards** – The first step in this approach is to assess carefully the workplace and the work itself in the earliest design/engineering stages of project work and during the planning stages of all work. The objective is to eliminate all fall hazards. Ask “who, what, when, where, why, how, and how much” questions about each possible exposure to a fall. This assessment of the site and the work not only helps eliminate hazards, but also identifies alternative approaches to the work that can measurably enhance productivity. Addressing fall protection in the early phases of a project means that safety can be designed into the work process, not added as an afterthought to an inherently unsafe work procedure. For example, the project can be designed so that structural steel can be assembled at grade and then raised as a “module,” thus eliminating a significant amount of work at heights.

ii) **Prevent fall** – The second step in continuous fall protection also requires assessing the workplace and work processes. If fall hazards cannot be completely eliminated during the first step, try to prevent falls by improving the workplace. Avoid relying on a worker’s behavior or fall-arrest equipment to prevent injuries. Early installation of stairs, guardrails, barriers, and travel restriction systems can ensure a safe work environment.

iii) **Use the Proper Fall-Arrest Equipment** – The third step, the last line of defense against falls, is to use fall-arrest equipment. Use fall-arrest equipment, however, only after determining that potential falls cannot be eliminated by changing work procedures or the workplace. Equipment such as harnesses, lanyards, shock absorbers, fall arresters, lifelines, anchorages, and safety nets can reduce the risk of injury if a fall occurs. Carefully assess the workplace and work processes to select the most appropriate equipment and to install and use it correctly.

Before using a personal fall arrest system, the supervisor and/or the user must address the following questions:

a) Has the user been trained to recognize fall hazards and to use a personal fall-arrest system properly?

b) Are all components of the system compatible according to the manufacturer’s instructions?

c) Have appropriate anchorage points and attachment techniques been reviewed?
d) Has the free-fall distance been considered so that a worker will not strike a lower surface or object before the fall is arrested?

e) Have pendulum-swing fall hazards been eliminated?

f) Have safe methods to retrieve fallen workers been planned?

g) Have the full-body harness and all of its components been inspected both before each use and on a quarterly basis?

h) Is any of the equipment, including lanyards, connectors, and lifelines, subject to such problems as welding damage, chemical corrosion, or sandblasts?

**Retractable Lifelines** – A retractable lifeline is a fall-arrest device used in conjunction with other components of a fall-arrest system. A retractable lifeline should be used by only one person at a time. The retractable lifeline must be connected directly to the back D-ring of the safety harness and never used in conjunction with or connected to a shock absorbing lanyard. A properly inspected and maintained retractable lifeline, when correctly installed and used within the fall-arrest system, automatically stops a person’s descent in a short distance after the onset of a fall. Consider using retractable lifelines when working in or on areas such as roofs, scaffolds, tanks, towers, vessels, and manholes. Also, consider using retractable lifelines when climbing such equipment as vertical fixed and portable ladders and telescoping derricks. The retractable lifeline must not be used again after it has worked as fall arrester once. Before using a retractable lifeline, the supervisor and/or the user must address the following questions:

a) Has the user been trained to use a retractable lifeline correctly?

b) Is the retractable lifeline being used in conjunction with a correctly configured fall arrest system?

**Safety Net Systems** – A safety net system is the least desirable fall-arrest system. If used below a work area where no gas cutting & welding jobs involved, the system must be installed as close as practical under the walking or working surface. For over head gas cutting & welding, fire proof tested nets are to be used, otherwise all other means of fall arrest systems are to be used strictly. A safety net system must never be more than 30 feet (9.1 m) below the working surface (except for bridge / gallery / structural frame construction). Safety nets shall be capable of absorbing an impact force equal to that produced by a drop test. The test if practicable & safe to drop bag of sand as specified, shall be conducted by dropping a 400-pound (180 kg) bag of sand 30 ± 2 inches (76 ± 5 cm) in diameter into the net from the highest walking or working surface at which employees are exposed to fall hazards. The drop distance shall never be less than 42 inches (1.1 m) above the net level. A drop test must be conducted after initial installation and before use, whenever relocated, after major repair, and at six-month intervals if left in one place. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Materials, scrap pieces, and equipment and tools, which have fallen into the safety net, shall be removed as soon as possible but at least before the next work shift. Before using a safety net, the supervisor and/or the user must address the following questions:

a) Are workers protected from fall hazards while they install and dismantle the safety net
b) Is the safety net installed as close as practical under the working surface? Except for bridge / gallery / structural frames at height.

c) Is there sufficient clearance under the net to prevent contact with surfaces or objects below if the net is subjected to an impact equal to that imposed under the required drop test?

d) Does the safety net extend beyond the outermost projection of the work surface? For vertical distances of up to 5 feet (1.5 meters) between the net and the work surface, the minimum required horizontal distance from the net's outer edge to the working surface edge is 8 feet (2.4 meters). For vertical distances between 5 and 10 feet (1.5 meters and 3 meters), the horizontal requirement is 10 feet (3 meters). For vertical distances greater than 10 feet (3 meters), the horizontal requirement is at least 13 feet (4 meters).

f) Are the safety net supports designed so that a fall victim will not land on them?

g) Has the manufacturer or supplier of the net been consulted for assistance and recommendations concerning the proper type of net and proper installation and testing?

In case of site requirement of non-placement of the safety net and non-feasibility of adequate fastening and fixing the net, all other means of fall arrest system and fall hazards controlling measures are to be taken strictly.

**Lifeline Installation** – Horizontal and vertical lifelines shall be designed, installed, and used under the supervision of a qualified person as part of a complete personal fall arrest system. Horizontal lifelines allow horizontal movement while providing protection against falls provided the equipment is properly installed and used. A horizontal lifeline may serve as a mobile fixture point for the attachment of lanyards, lifelines, or retractable lifelines. A lifeline must be wire rope of at least ½ inch (1.20-centimeter) diameter, not more than two persons shall be permitted to attach their lanyards to a single horizontal life line, at one time. The lifeline shall be anchored between two posts/supports not more than six meter apart. If intermediate post required to be put at spacing more than 6 m , proper anchoring, post/support and life line arrangement to be made as per sketches with approval of competent & qualified Engineer of the executing department performing & supervising the job.

Vertical lifelines extend from an overhead independent anchorage and should be maintained in a vertical position while in use. A lanyard is attached to a vertical lifeline using a rope grab device. No more than one person may tie-off to a vertical lifeline.

**Anchorage** – Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms. Anchorages must be capable of supporting at least 2000 kilograms per employee attached, or shall be designed, installed, and used as follows:

i) Part of a complete personal fall arrest system that maintains a safety factor of at least two.

ii) Under the supervision of a competent & qualified person.
iii) The anchorage points are to be certified by a competent & qualified Engineer of the department executing & supervising the job.

**Standard Harnesses:** Harnesses for general purpose work should be constructed with back D-ring, integral hip D-rings for work positioning capability, and tongue-buckle thigh straps. Standard harnesses are suitable for continuous fall protection while climbing, riding, or working on elevated platforms. They are suitable for positioning, fall arrest, and the rescue and evacuation of people who are working at heights.

**Standard Lanyards:** Lanyards should not be less than 10 mm in dia. adjustable up to 6 feet (1.8 meters). They should also have shock-absorbing capability and self-locking snap hooks. Only double lanyard safety belt is permitted. Only nylon or polyester or synthetic fiber lanyards shall be used. It shall not break under a minimum tensile load of 2000 Kg. The lanyard shall meet the requirement of IS 3521.

3.4 Safe Approaches for working at heights

i) Steel Scaffold

Some important points to remember when dealing with mobile scaffolds include:

a) They should be erected, maintained, altered and dismantled by a certificated scaffolder of the correct class if they are more than five meters in height.
b) They should be erected, maintained, altered and dismantled by a competent person if less than five meters in height.
c) They should be erected to the manufacturer’s instructions.
d) They should be used on a sound, clear and level surface.
e) Ensure working platforms are decked to the full width and adequately restrained against displacement.
f) Ensure top and mid guardrails are erected on platforms.
g) Erect platform toe boards to prevent items on the platform falling on people below.
h) Provide safe means of access to work platforms.
i) Where the platform incorporates a hatch door, ensure the hatch is closed except during access or egress.

ii) Scaffold Materials

a) The components used to assemble scaffolds shall be inspected before each use and shall conform to requirements of this section regarding materials, strength, dimensions, etc.
b) Scaffold components manufactured by different manufacturers shall not be intermixed unless the components are compatible (fit together without mechanical force) and the scaffold’s structural integrity is maintained. Scaffold components manufactured by different manufacturers shall not be modified in order to intermix them.
c) Scaffold components shall be free from detrimental corrosion.
d) Any scaffold component that is obviously damaged, excessively corroded, defective, or does not meet the applicable codes and standards shall be marked and be
immediately destroyed and shall not be re-used on the project site. However, if possible, defective sections of planks or tubing may be cut off. In this case, the plank or tubing may be reused.

e) Scaffold components made of dissimilar metals shall not be used together because of the potential for galvanic corrosion.

f) Scaffold components shall not be exposed to acids or other corrosive substances, unless adequate precautions have been taken to protect the scaffold from damage.

g) Where a built-in ladder is part of a scaffold system, it shall conform to the requirements for ladders (IS: 3696, Pt-II).

h) Scaffold components shall be properly stored to prevent damage.

 iii) Scaffold Foundation

a) Foundations shall be sound, rigid, and capable of carrying the scaffold self-weight plus the maximum intended load without settling or displacement. Unstable objects such as barrels, boxes, loose brick or concrete blocks shall not be used to support scaffolds, planks, or timber sills.

b) A sound base is essential. Therefore, the ground or floor on which a scaffold stands shall be carefully examined for its load-bearing capacity. Sand or made-up ground (fill) may need compacting to ensure there are no cavities. Such bases as floors, roofs, etc. may need shoring from underneath.

c) Timber sills (sole boards) at least 225 mm (9 inches) wide by 38 millimeters (1-1/2 inches) thick shall be used to spread the load on sand, made up ground, asphalt pavement, wooden floors, and other soft or slippery surfaces. The ground beneath sills shall be level and compact. A sill shall extend under at least two posts (standards), unless not feasible because of uneven or sloping ground. In this case, sills under individual posts (standards) shall be at least 765 mm (30 inches) long. Scaffold planks shall not be used as sills.

d) All scaffold posts (standards) shall be pitched on steel base plates at least 150 millimeters (6 inches) by 150 millimeters (6 inches) and 6 millimeters (1/4-inch) thick. For Special Scaffolds, the base plate shall be designed to support the maximum scaffold post (standard) load. Timber sills shall be used where base plates may be exposed to corrosive materials.

e) Screw jacks shall be used to compensate for variations in ground level. Screw jacks shall not be adjusted to more than two-thirds of the total length of the threaded section. Screw jacks shall be used and loaded in accordance with the manufacturer’s specifications.

f) Front-end loaders, forklifts, or pieces of equipment shall not be used to support scaffolds.

g) Scaffolds shall not be hung from or supported by guardrails or handrails.
h) A crane or other lifting device shall not lift any scaffold, unless it’s a Special Scaffold specifically designed for lifting and the scaffold plan was reviewed in accordance with the requirements of the standard practices.

iv) Scaffold Stability

All freestanding scaffolds, whether mobile or static, need to be stabilized against overturning forces. Mobile scaffolds in particular are prone to tip over during use for a variety of reasons, including:

a) Sudden stops while being moved. This is a key reason why they must not be ridden while being moved.

b) Height to the top most platforms is greater than three times the minimum base dimension.

c) People standing at or near the edge of the platform in conjunction with a sudden movement or action. This creates a temporary high point loading.

d) Capacity being based on a distributed load, not a point load at the edge. This means overturning can occur even when the design load capacity of the platform is not exceeded.

e) The narrower and lighter the scaffold, the more likely that it will tip over.

v) Scaffold Platform and Decking

a) The decked width must be not less than 700 mm, with sufficient additional width to leave 450 mm minimum clear walkway at all times. The distance between the outer edge of the platform to be guarded and the projection of the inner vertical face of a guardrail must not exceed 200 mm.

b) Scaffold planks must be so placed, locked or secured as to prevent tipping or displacement during normal use, or movement by strong wind. End overhang must be 80 mm minimum to 220 mm maximum.

c) It is good practice to butt planks in a decked platform. When butted, each end bearing shall be not less than 75 mm.

d) When lapped, the amount of overlap must be not less than 150 mm. Decking planks which are lapped must be fitted with wedge cleats or fillets to reduce the risk of tripping or facilitate the wheeling of loads.

e) Every working platform must be decked as close as practicable to the working face of the structure it is being used with. Where the height is greater than 3 m, a guardrail or other protection must be provided within 200 mm of the outer edge of the plank.

vi) Scaffold Guardrails, Midrails and Toe board

a) Guardrails, including Midrails, must be provided on the exposed sides and ends of all Working platforms more than 3 m in height. The height to the top of the guardrail must be not less than 0.95 m or more than 1.1 m from the deck to be protected.

b) A midrail is required on a working platform which should be placed exactly half of the height of the top rail.
c) Each rail, when secured to the standards or upright members, must be capable of sustaining without failure or undue deflection a force at any point of 70 kg (690 N) vertical and horizontal, acting separately.
d) A toe board of 150 mm minimum height should be provided for protection against fall of materials from the platform.

vii) Scaffold- Clearance from Electrical Lines

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Safe Clearance</th>
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<tbody>
<tr>
<td>750-15, 000 Volts</td>
<td>3.0 meter</td>
</tr>
<tr>
<td>15, 001-250, 000 Volts</td>
<td>4.5 meter</td>
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<tr>
<td>Over 250, 000 Volts</td>
<td>6.0 meter</td>
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</tbody>
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Double deck width mobile scaffold

Five deck wide mobile scaffold
Frame mobile tower

System mobile tower

Use of base plate and sole board

Platform Decking
ii) **Approach Ladders & Staircase:**

a) **General points for Proper Use of Ladders**

- Check the ladder for defects at the start of a shift, after it has been used in another location by other workers, or after it has been left in one location for a lengthy period of time (inspection procedures)

- Areas surrounding the base and top of the ladder should be clear of trash, materials and other obstructions since getting on and off the ladder is relatively more hazardous than other aspects of use.
• The base of the ladder should be secured against accidental movement. Use a ladder equipped with non-slip feet appropriate for the situation, nail a cleat to the floor, or otherwise anchor the feet or bottom of the side rails.

• The ladder must be set up on a firm level surface. If its base is to rest on soft, uncompacted or rough soil a mud sill should be used.

• The top of the ladder should be tied off or otherwise secured to prevent any movement. If this is not possible, given the type of ladder or circumstances of its use, one worker should hold the base of the ladder while it is being used.

• If a ladder is used for access from one work level to another, the side rails should extend a minimum of 914 millimetres (3 feet) above the landing. Grab rails should be installed at the upper landing so that a worker getting on and off the ladder has secure handholds.

• All straight or extension ladders should be erected at an angle such that the horizontal distance between the top support and the base is not less than one-quarter or greater than one-third the vertical distance between these points.

• Before setting up straight or extension ladders, check the area for overhead power lines. Ladders made of aluminum or other conductive material should never be used near power lines. Only competent electricians and linemen using ladders made of non-conductive material are allowed to work in close proximity to energized electrical lines.

• Portable ladders should never be used horizontally as substitutes for scaffold planks, runways or any other service for which they have not been designed.

• When a task can only be done while standing on a portable ladder, the length of the ladder must be such that the worker stands on a rung no higher than the fourth from the top. The ladder should also be tied off or equipped with a suitable stabilizer.

• Short ladders must never be spliced together to make a longer ladder. Side rails will not be strong enough to support the extra loads.

• Straight ladders should not be used as bracing, skids, storage racks or guys. They were not designed for these purposes and the damage caused by such abuse can later result in an accident during normal use.

• Unless suitable barricades have been erected, ladders should not be set up in passageways, doorways, driveways or other locations where they can be struck or displaced by persons or vehicles using the access route.

• Only one person at a time should be allowed on a single width ladder. In the case of a double-width ladder, no more than two people should be allowed on it at one time and each should be on a separate side.

• Ladders should not be placed against flexible or movable surfaces.
• Always face the ladder when climbing up or down and when working from it.

• Maintain 3-point contact when climbing up or down a ladder. That means two hands and one foot or two feet and one hand on the ladder at all times. This is especially important when you get on or off a ladder at heights.

• When working from a ladder, keep your center of gravity between the side rails. A person's center of gravity is approximately in the center of the body at belt height. The location of your center of gravity can shift when you reach out to either side of a ladder, especially with materials, tools or equipment in your hands. As the center of gravity of your body and hand-held objects moves beyond the side rails, the ladder is tending toward instability.

• Whenever, possible, avoid climbing up or down a ladder while carrying anything in your hands. Tools, equipment and materials should be placed in a container and raised or lowered by rope, if necessary.

• Workers should be instructed and frequently reminded to keep their boots free of mud, snow, grease or other slippery materials if they are using ladders.

• Always hold onto the ladder with at least one hand. If this is not possible because of the task to be done and in particular if the work is 3 metres (10 feet) or more above the floor, the worker should wear a safety belt and tie the lanyard off to the structure before beginning work.

• Never straddle the space between a ladder and another object.

• Persons frequently required using or work from ladders should wear protective footwear with soles and heels made of slip-resistant materials such as soft urethane.

• Never erect ladders on boxes, carts, tables or other unstable surfaces.

• Fall-arresting equipment such as ladder climbing devices or lifelines should be used when working from long fixed ladders or when climbing vertical fixed ladders.

• Never rest a ladder on any of its rungs. Ladders must rest on their side rails.

• When erecting long, awkward or heavy ladders, two or more persons should share the task to avoid injury from over-exertion.

• Instruct all personnel to watch overhead power lines before attempting to erect any ladder. When overhead power lines are in proximity of the work, aluminum ladders must not be used.

b) Specification of ladders & staircase
Fig.1- Inclined step ladder
Fig.2- Rises & Treads of step ladders

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<th>PITCH</th>
<th>R (MM)</th>
<th>T (MM)</th>
<th>Z (MM)</th>
<th>X (MM)</th>
<th>Q (MM)</th>
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WIDTH
MIN. = 500
DESIABLE = 500-700
RISER (R)
DESIABLE = 200-250
Fig.3- Rung ladder without cage

Note: -
Use of fall arrestor is a must with this ladder which is without safety cage.
Fig.4- Rung ladder with cage
Typical Geometrical parameters for steps for staircases are to be as per Standard Drawing shown below. As per site feasibility similar other staircases may be used for construction.
iii) Safe working platforms

Working platforms are the parts of structures upon which people stand while working. A wide range of appropriate capacity & stable mobile access equipment like man lifters, scissor lifts, Mechanized climbers, including mobile elevating work platforms (MEWPs), suspended cradles, mast climbing work platforms (MCWPs), appropriate rope access technique /system are to be used for carrying persons with tools & tackles for height work. As well as being adequately supported and provided with guard rails or barriers, working platforms should be:

a) Wide enough to allow people to move back and forth safely and to use any equipment or material necessary for their work at that place and in any case, at least 600 mm wide;

b) Free of openings and traps through which people's feet could pass, causing them to trip, fall or be injured in any other way;

c) Constructed to prevent materials from falling. There shall be toe boards or similar protection at the edge of the platform. The platform itself should be constructed to prevent any object which may be used on the platform from falling through gaps or holes, causing injury to people working below. For scaffolds, a platform without any gap shall be provided. If MEWPs or cradles are used and they have meshed platform floors, the mesh should be fine enough to prevent materials, especially nails and bolts, from slipping through; and

d) Kept free of tripping and slipping hazards. Where necessary, provide handholds and footholds. Keep platforms clean and tidy. Do not allow mud to build up on platforms.

In case of non-availability / justified non suitability of above, it is to be made possible to work from the existing structure and to use a scaffold & working platform. In case of justified non suitability of above, boatswain's chairs or seats, rope ladders and rope access equipment can be used.

Those using mobile and suspended access equipment should be trained and competent to operate it. They should learn emergency and evacuation procedures so that they know what to do, for example, if the power to the platform fails, or fire breaks out in the building being worked on. With many pieces of equipment, more than one person will be needed to ensure safe operation.

Before work starts check that:

a) A handover certificate is provided by the installer. The certificate should cover how to deal with emergencies, operate, check and maintain the equipment, and state its safe working load;

b) Equipment is installed, modified and dismantled / removed only by
competent specialists;
c) There is a current report of thorough examination for the equipment;
d) Area of the site where people may be struck by the platform or falling materials have been barricaded;
e) Systems are in place to prevent people within the building being struck by the platform as it rises or descends and prevent the platform coming into contact with open windows or similar obstructions which could cause it to tip;
f) Supports are protected from damage (for example, by being struck by passing vehicles or by interference from vandals);
g) The equipment can be protected from adverse weather. High winds can tilt platforms and make them unstable. Establish a maximum safe wind speed for operation and do not work when there is lightning. Storms and snow falls can also damage platforms, so they should be inspected before use after severe weather.

At the end of each day check that:

a) The platform is cleared of tools and equipment;
b) All power has been switched off and, where appropriate, power cables have been secured and made dead;
c) The equipment is secured where it will not be accessible to vandals or trespassers;
d) Notices are attached to the equipment warning that it is out of service and must not be used. Check the shift report for warnings of malfunction etc.
iv) **Boatswain's chairs/seats**

Boatswain's chairs and seats can be used for light, short-term work. They should only be used where it is not practicable to provide a working platform. In general, use a chair which consists of a seat with a back, a central suspension point and a carrying point for tools. Whether a chair or seat is used, the user should be attached to the suspension system by a harness and lanyard to protect against falls. See also the general advice about mobile and suspended access equipment. The Boatswain Chairs shall be operated as per the manufactures and its competent installer’s guidelines.

v) **Rope access techniques**

Rope access system is a safe method of working at height, where ropes and associated equipment are used to gain access to and egress from the workplace, and to be supported at it.

Industrial rope access techniques is a specialized techniques for which IRATA International Code of practice for Industrial rope access is to be followed. Only specialized agency following the IRATA rope access guidelines are to be engaged. Reference Standard Source: [www.irata.org](http://www.irata.org), [www.petzl.com](http://www.petzl.com)

The detailed planning, management, guidelines, risk mitigation & equipment etc, to be prepared based on IRATA International Code of Practice before its use.

This technique can be used for inspection and some short-term light-duration construction work and other work etc. It should only be used where access from a working platform is not practicable. Check that:

a) The equipment is erected under the supervision of a competent person and then a pre-check is carried out;
b) Anyone using the technique has been expertly trained and is competent;
c) Safe descent does not depend upon a single suspension point. Wherever possible the main rope and safety rope should be attached to separate suspension points;
d) All the equipment are checked carefully before each use and maintained to a high standard;

e) Any tools which are needed for the work are attached to the operator with suitable ropes or chains, so that they cannot be dropped; and Where a risk of dropped tools or falling materials remains the area beneath the work should be fenced off or protected by fans, covered walkways or similar.

For all the above system, stable, firm, adequate anchoring points / locations of a structure to be identified and used. The anchoring points & anchorage capacity shall be as per number of persons accessing with the system.

For each person the anchoring capacity is to be 2000 Kg. For multiple person, the capacity is to be increased correspondingly. The system is to be adopted only when a competent agency already practicing the system is being involved. The anchorage point & its capacity is to be approved by competent & qualified Engineer of the executing department performing & supervising the job, in consultation with the installer of the rope access system.

3.5 Roof work:

Structural roof work is the most hazardous activity of construction operations. The most common accidents to the roof workers are fall from the edge of roofs, fall through openings in roofs, falls through fragile roof materials. Most accidents happen to roof workers while carrying out maintenance and cleaning job on roofs. To undertake roof work safely, worker and site supervisor must require knowledge and experience along with proper engineering and appropriate approach.

Before the job begins, a safe system of work must be planned. General precautions as mentioned under Clause-4 must be adopted to reduce the risk of a worker falling. However, the specific precautions to be taken will depend on the type of roof and the nature of the work to be undertaken.

a) The executing officer, departmental safety officer and the in-charge of the shop where the roof sheet is being changed, shall visually inspect the site, identify the potential hazards (like weak purlins, exposure to heat or chemicals and thick layer of dust), chalk out the appropriate strategies and inform all concerned about the work plan details including a safe means of access to the sheet roof top.

b) No person shall be allowed to stand, walk or do any work or go for any purpose on a GC, GP or AC sheet roof, where there may be danger of the sheet giving way (breaking) due to the weight of the person.

c) No person shall be allowed to walk on the centre of the sheets. He shall walk only on purlins (i.e. the line of the protruding hook tops)

d) Movement of persons shall be restricted from the point of climbing to the roof top via the shortest safe approach to the point of work.
e) Suitable and sufficient safety devices and safe means of access like ladders, which must have length to project at least one meter above the lower end of the roof, duck ladders, access boards and crawling boards securely supported and fixed, shall be provided.

f) The workman shall work on suitable movable frames or ladders made of bamboo, wood, aluminium or similar material, which shall span at least between two purlins (so that his weight is not on the sheet) and this frame/ladder shall be anchored to a purlin or other fixed structure. The full body harness with double lanyard of the worker shall be tied to the frame/ladder suitably and securely. Use of crawling boards and/or bamboo chalis shall be encouraged.

g) If any damaged or cracked sheet is found, then the same shall be reported to the EA / In-charge and the sheet shall be changed under supervision of his representative.

h) Wherever possible, suitable and sufficient parapet wall or railing, toe guards or any other equally effective device to prevent the person from falling shall be provided. Where railings cannot be provided, holding nets shall be provided.

i) Safety full body harness with double lanyard having ISI mark shall be used.

j) Normally use of a drilling machine shall not be allowed on a sheet roof. In exceptional cases where their use is unavoidable, the drilling shall be carried out under supervision of a competent person with specific permission of the Executing Officer.

k) It is advisable not to allow the workers to carry their mobile sets to the roof.

l) Where transparent sheets are fixed there should be guard fencing around the same or suitable netting should be provided below the sheets spreading from purlins to purlins.

m) Life line or fixed fall protection system (angles) should be provided for fixing lanyards.

n) In respect of electrical lines, the following precautions shall be taken:

- Three core flexible cable conforming to appropriate Indian Standard shall be used.
- Connection shall be provided by a competent person, with proper earthing.
- All plugs, sockets, etc, shall conform to appropriate Indian Standard and earthing shall remain continuous.
- The switch board shall conform to the provisions of the Indian Electricity Rules.

Care shall be taken to see that the cables are not damaged by sharp edges of the sheets and shall be kept in such a way that nobody stumble upon or get entangled with them.

o) Loose materials like nuts, bolts, hooks and tools shall be kept in a box which shall be kept safely away from the edges of the roof. Care shall be taken to prevent fall of objects like old/new hooks, nuts and bolts.
p) Not more than two new sheets shall be lifted at a time from ground. The lifting shall be done by means of manila ropes and pulleys. The persons receiving the sheets at roof top shall essentially wear full body harness with double lanyard suitably tied to a firm structure. Till the sheets are fixed, they shall be tied down for avoiding any accidental fall. No loose sheet shall be left on the roof top at the end of the shift.

q) Dismantled sheets shall not be thrown down from top. They shall be lowered to the ground by means of manila ropes and pulleys, and shall be stacked on ground properly before the workmen leave the site.

r) Dismantling of old sheets shall start from ridge downwards while laying of new sheets shall start from bottom end to the ridge, unless otherwise required as per site conditions. Both dismantling of old sheets and fixing of new sheets shall be done row by row.

s) The contractor shall deploy a supervisor, experienced in the job, to be present at site 100% of the time to ensure compliance to the rules and safety procedures by the workers from the time of mobilization for work to the time last worker leaves the workplace.

t) Workers should not be allowed on the roof at the time of high wind, rain and when lightning striking, inclement weather or insufficient light.

u) Emergency rescue procedures are in place if there is a risk of a fall and someone needs to be rescued.

v) No access is permitted to fragile roofs and that such roofs are covered off and warning signs are placed where persons can gain access.

w) Where work is required on a steep roof where the slope exceeds 35 degrees, do not stand on the roof. A steep pitched roof is an inappropriate surface to stand on due to the likelihood of sliding. Perimeter guard rails and catch platforms are also insufficient measures to protect workers on such roofs. In these circumstances, roof workers need a systems to prevent sliding and to prevent falls from the perimeter.

   Use one or more of the following systems in such circumstances :
   
   • Aerial access equipment, such as a cherry picker;
   • A work positioning system, such as a travel restraint or industrial rope access system; and
   • A scaffold platform, located at the roof edge and a roof ladder.

x) Any openings or holes in roofs are clearly identified and have edge protection such as guard railing placed around them.

y) Where roof work is going to take longer than a few hours, ensure edge protection is installed such as perimeter guard railing and/or scaffolding where this is feasible.
z) Where minor roof tasks of short duration (less than a couple of hours) are to be undertaken and there is an increased risk of a fall due to either weather conditions, a sloping roof or access is required near a potentially fragile section – then higher order safety measures need to be considered and used where reasonably practicable. In such a situation, apply one or more of the measures below where feasible until the risk of a fall is minimised:

- If weather is the only factor increasing the risk of a fall, where possible wait until conditions improve before commencing or finishing a job.

- Where feasible, undertake the work from an elevating work platform such as a cherry picker or scissor lift. Where possible, consider scheduling jobs requiring such a device together to reduce any hire costs.

- If work is required near a fragile section install either edge protection around it (e.g. barriers or guard railing) or install safety mesh underneath it before commencing work.

- If an elevating work platform cannot be used or is not reasonably practicable in the circumstance, use a travel restraint system if one can be used safely. (Note: a person using a travel restraint device must not be able to approach an edge where a fall is possible. These systems are not designed for the impact loads that occur in the event of a fall.)

- If a non-fragile sloping roof is stable and other measures cannot be used, use a specially designed roof ladder in combination with a fall arrest system to do the task.

- If the risk of a fall is still significant using other safety measures consider installing a catch platform or safety net to catch anyone who may fall.

- Scaffolding is not usually considered reasonably practicable for many small jobs, however, if none of the measures or in combination, then the task may require the installation of some kind of scaffolding. It for some reason scaffolding is not able to be installed, then the task is probably too dangerous to undertake. Contact Work Safe Victoria or a consultant for advice in this instance.

**Following visuals are self explanatory:**

Unprotected opening are sever hazards and must be covered
An example of personal fall arrest system for roof works.

The travel restraint system prevents the user from reaching the open side.

Use of MEWP to eliminate the need for workers to stand on fragile roof surfaces.

Warning signs to be fixed at points of access to fragile roofs.
3.6 Side Sheeting of High-Rise Structures / Buildings during/after construction

For sheeting at height, high rise man lifter may be used. Side sheeting at height may also be performed as per following procedures/precautions and requirements. The general standards as outlined in this standard are to be followed as applicable.

Sheeting work are to be done with cordless gun depending upon availability & site requirements. MEWP/man lifters are to be used for access.

In case of non-availability of one or both of the above following procedure to be followed.

i) Working Cage

Working lift cage shall be as per standard drawings given under and of good structural construction, sound material and adequate strength.
For fixing self-taping screws cordless self-taping screw machine, rivet guns are to be used etc. In case of non-availability of Cordless self-taping screw machine, screw / rivet guns following procedures / measures / precautions / requirements are to be followed. This is a guidelines. Similar / Other safe methods may also be used as per site feasibility.

ii) Safe method for anchoring the screw machine, rivet gun, sheet cutter etc. While working at height

- Fix a Jubilee Clamp of a reputed make on the machine. Tighten the clamp to the extent the clamp holds on the machine firmly. (Refer sketch-01)

- Another arrangement is to be made with a GI wire tied around the machine as additional anchoring support. (Refer sketch-02)

- A 10/12 mm dia PP Rope(s) is to be anchored firmly to this clamp by means of Self Locking Hook with item no (1) and (2). (Refer Sketch-02)

- In case of Rivet Gun, Sheet Cutter, A 8/10 mm dia PP rope attached with self locking hook is to be fastened with the Nut/Ring welded to the Rivet Gun, Sheet Cutter. (Refer Sketch-03)

- The other side of this PP Rope(s) will be anchored to the firm structure by using Self Locking Hook tied firmly to it. (Refer sketches-02 & 03)

- The electrical extension fitted with 3 No, 5 Amp socket arrangement with electrical safety devices (like on/off switch, indicator lamp, fuses, appropriate length, size and type of wire etc.). The extension box should be box type with lid to prevent water ingress during rain. All machines should be connected to this board hanging with the scaffolding by Plastic top (plug). (Refer Sketch-04).

iii) Safe method for lifting the screw machine and other tools etc. to working height

- Each machine such as Screw Machine, Rivet Gun, Sheet Cutter etc. each to be placed in Separate appropriate bags. The small portion of the open end of the PP rope, provided with the machine, is to be hung outside the bag to facilitate holding while fixing to structure.

- These bags to be lifted to the required height by means of Rope and Pulley system used for lifting of machine.

- When this bags reach the required height, the open end of the PP rope tied to the machine is to be anchored first to the structure above by means of self-locking hook.

- After anchoring the machine to the structure the machine is taken out from the bag for use.
• The same system has to be followed for lifting machines by all the people working at different levels of the portable scaffolding.

• When the machine is not in use, it is to be hung with the full body harness of the person with the 3rd latch provided with the machine or else it is to be kept in the covered box provided in the portable scaffolding.

• While lowering the Screw Machine, Rivet Gun, Sheet Cutter etc. the machines are to be placed in the bag first and then only the two safety hooks are to be untied from the structure.

• Now the bags are to be lowered sequentially to all levels of the portable scaffolding for collecting the machines and materials and finally lowering down to ground by rope and pulley system.

Sheet lifting arrangement
SAFE METHOD OF HOLDING TOOLS & TACKLES LIFTING WHILE WORKING AT HEIGHT FOR SHEETING WORK

SKETCH-01

RooF

Top Structural Member

Safes Lifting for SheetinG

Tools Lifting for Wall

20mm P.P Rope

SAFE METHOD OF HOLDING MACHINE WHILE WORKING AT HEIGHT FOR SHEETING WORK

SKETCH-02

Hooke

Runner/Purlin

Runner/Purlin

8mm P.P Rope

Safes Locking Hook

Jibble Clamp

Self Locking Hook

Screw Machine

D.I Wire

NOTE—The length of P.P Rope should be such that it should allow lateral movement of the Screw Machine.
SKETCH-03

SAFE METHOD OF HOLDING SHEET CUTTER & RIVET GUN WHILE WORKING AT HEIGHT
FOR SHEETING WORK

NOTE: THE LENGTH OF P.P. ROPE SHOULD BE SUCH THAT IT SHOULD ALLOW LATERAL
MOVEMENT OF THE SHEET CUTTER & RIVET GUN.

SKETCH-04

ARRANGEMENT FOR ELECTRICAL BOX WITH HANGING SCAFFOLD FOR SHEETING WORK
iv) **Procedure for side & louvre sheeting work—specially at corner portion**

**Vertical Sheeting work**

- The procedure has been prepared considering that the staircase is complete.

- The sheeting work is to start from bottom to top and from left to right corner. In case, the building has louvre, the sheeting area below the louvre is to be completed first and then it is to be done in the next upper level. For the right corner position of the sheeting, a new cage is to be fabricated similar to the existing cage but with hook / anchorage arrangement at left side so that the right side area of the cage is available for sheeting work.

- In the process of sheeting at the right corner of the building, two suitable notches are to be cut at top most location (with 10 mm clearance wrt hook section) in the sheet above the side runner, for fixing cage with left side hook / anchorage arrangement.

- All tools and tackles must be inspected thoroughly inspected on daily basis before use such PP rope, pulley block, latches of pulley blocks, hanging scaffolds, man lifter / Genie for welding and any damage, sheet cutter, rivet gun etc., Any violation is not acceptable.

**Fixing of rope pulley arrangement for cage lifting / anchorage**

- All workmen is to use staircase only for going to the desired floor where the sheeting is to be done. If the building has louvre, the people has to go to the floor just below the louvre.

- Fix a suitable length of standard ladder with handrail and anchoring hook. After positioning of the ladder, tie ladder with ¾ inch rope to avoid slippage on either direction at two places.

- Provide life line for fixing fall arrestor system.

- For fixing rope pulley arrangement for lifting the cage, the workmen must use safety belt and fall arrestor system as protection to fall from height.

- The rope pulley arrangement for lifting the cage is to be fixed in the firm structure of the building just above the cage anchorage point. Check that the side runners are properly bolted or erected before fixing the rope pulley block.

- Use 10 mm dia. (minimum) sling with D-shackle (cap 2T) for fixing the hook of rope pulley block.

- ½" dia. wire rope in the rope pulley for lifting cage.


**Cage with Right Handed Hook**
(for normal sheeting work)  

**Cage with Right Handed Hook**
(For right hand corner sheeting work)

### Lifting of the cage

- ✓ Provide guy rope of 3/4” dia. PP rope in the cage.
- ✓ Lift the cage with above arrangement to the point i.e. side runner where it is to be hung. In case of building with louvres, fix the cage to the side runner just below the louvre.
- ✓ Lock both the hooks / hanger arms of the cage by tying with ¾” dia. PP rope with the side runner to avoid slippage in any direction.
- ✓ Tie the cage at two intermediate locations with firm structure with ¾”dia PP rope.
- ✓ Keep rope pulley arrangements intact till the sheeting work is completed for one vertical line.

### Approach from ladder to cage.

- ✓ Workmen going into cage must use all PPE with safety belt. While going into the cage, it is to be ensured that he anchors both the lanyards onto a firm structure.

### Fixing rope pulley arrangement for sheet lifting

The rope pulley arrangement for lifting the sheet is to be provided in the centre sheet lifting area provided in the cage and is to be fixed with the firm structure by the side of the cage lifting arrangement. Check that the side runners are properly bolted or erected before fixing the rope pulley block.
Another rope pulley arrangement is to be provided for sheet lifting. It will be similar to cage lifting arrangement with a firm structure of the building just above the cage anchorage point in line with the area provided in the cage for sheet lifting through it. Check that the side runners are properly bolted or erected before fixing the rope pulley block.

- Use 10 mm dia. (minimum) sling with D-shackle (cap 2T) for fixing the hook of rope pulley block.
- ½” dia. wire rope in the rope pulley for lifting cage.

**Lifting of the sheet**

- The sheet lifting device must be fool proof.
- The sheet is to be lifted from inside the cage through the sheet lifting area.
- All people must be alert.
- 1 ” dia. PP rope is to be used for sheet lifting
- The PP rope and all other tools and tackles must be inspected thoroughly before use.
- Provide guy rope of 3/4” dia. PP rope must be used to control the movement.
- Sheet lifting must be stopped before the start of rain of storm.

**Sheeting work**

- When one vertical line of sheeting work is completed, all the rope pulley arrangements cage and sheets are to be lowered down for fixing next new location side wide. Repeat the above set of process for the new location sheeting.

**Right Corner sheeting**

- Repeat the above process for cage / sheet fixing and lifting methods for corner sheeting also.
- Right corner of the building, Cut two suitable notches (as required for fixing the arms / hook of the cage + 10 mm clearance, depth up to the side runner) are to be cut at top most location (with 10 mm clearance wrt hook section) in the sheet above the side runner, for fixing cage with left side hook / anchorage arrangement.
- Continue sheeting and flushing work accordingly.
Fix a suitable length of timber from left hand end of the roof sheet to the distance as shown in the detail. This sequence of process to be done for fixing the side and louver sheetings and also for gable and louver sheetings.

Locally notch the timber to fix the left hand slipring cage to fix the corner sheeting as shown in the view. The sequence of process to be done for fixing the side and louver sheetings and also for gable and louver sheetings.

Ladder Detail

Positioning of the ladder tie ladder with 3/4" P.P. rope to avoid slipping or ladder direction at two places. Provide laddering for using full hoist system only. Use rope ladder with full hoist properly tied at bottom and top level with full structure.
**Inclined / louvre sheeting**

- Repeat the above process for cage / sheet fixing and lifting methods for corner sheeting also.
- Right corner of the building, Cut two suitable notches (as required for fixing the arms / hook of the cage + 10 mm clearance, depth up to the side runner) are to be cut at top most location (with 10 mm clearance wrt hook dimension of section used.) in the sheet above the side runner, for fixing cage with left side hook / anchorage arrangement.
- Continue sheeting and flushing work accordingly.

**References:**

1. Tata Steel Limited Safety Standard on ‘Working at Height & Continuous fall protection’
2. IPSS: 1-11-003-19 ‘Safety procedure for Roof sheet changing’
3. IPSS: 1-11-005-19 ‘Safety procedure for Working at Height by Contractor employees’
4. NSC Manual on Construction Safety
5. OSHA 3146-05R 2015 ‘Fall protection in construction’
6. IS 3696 (Part 1 & 2), 1987 “Safety code for Scaffolds & Ladders”
## ANNEXURE-I

**(Clause 4.0)**

**CHECKLIST OF REQUIREMENTS/PRECAUTIONS FOR WORKING AT HEIGHT**

________ Steel Plant

1. Name of Department executing the job: ______________________
2. Name of Departmental representative(s): ____________________
3. Name(s) of Contractor's supervisor(s): ______________________
4. Name of Contractor
5. Exact location of work
6. Brief description of work
7. No. of persons deployed for the job.
8. Names of persons deployed to do the job at height
9. No. of persons issued height passes:
10. Ref No. of height passes issued
11. All persons have been imparted training for working at height by Safety Engineering Department
12. Head of Operation Deptt has been informed of this job: Yes/No
13. Shut down of following operating equipment have been obtained:
   - EOT Crane: Yes/No.
   - Belt conveyor: Yes/No.
   - Gas Lines: Yes/No.
   - Bus bars: Yes/No.
   - Pusher car: Yes/No.
   - __________: Yes/No.
   - __________: Yes/No.
   - __________: Yes/No.
   - __________: Yes/No.
14. Checking of scaffoldings/ladders: Done and found with required Strength: Yes/No.
15. Availability & Usage of full body harness ensured: Yes/No.
   Ensured.

17. Provision of lifeline/ anchorage points: Yes/No.

18. Provision of safety nets for arresting Fall of personnel: Made / Not necessary

19. Weather is clear to do the job: Yes/No
   (outdoor work)

20. Underneath area barricaded: Yes/No

21. Illumination is adequate to do the job: Yes/No
   (indoor work)

22. Safety Signage’s provided: Yes/No

23. Satisfactory house-keeping condition:
   Yes/No
   (Sharp objects, redundant cables &
    structurals, slippery objects like.
    oils and lubricants do not exist
    and shall not be allowed in the
    working-area)

24. Job to be started only after ensuring Compliance to all checklist points
   Special remarks
   a) This checklist is valid for today only.
   b) Job to start only after compliance to all checklist points

25. Safety Talk imparted and record kept: Yes/No

   Inspected the site and permitted to start the work.

Signature: Contractor or Executing Safety
His authorized officer officer
Representative

Name: ___________________ ___________________ ___________________
Desgnation: ___________________ ___________________ ___________________
Contact/ Mobile No. ___________________
Date: ___________________ Time: ______________
# ANNEXURE-II

## FALL ARREST SYSTEM CHECKLIST

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Question</th>
<th>Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Anchorage Points</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Do workers know appropriate anchorage points for each task that requires</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a fall-arrest or restraint system?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are all anchorage points capable of supporting at least 2000 kilograms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>per person attached and supervised by a qualified person?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are all anchorage points for body harnesses located at shoulder height</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and are anchorage points for self-retracting lifeline systems located</td>
<td></td>
</tr>
<tr>
<td></td>
<td>overhead?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are anchorage points independent of the working surface?</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Can a worker move from one station to another or climb up and down without</td>
<td></td>
</tr>
<tr>
<td></td>
<td>exposure to a fall?</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>If the lifeline, lanyard, or self-retracting lifeline is not permanently</td>
<td></td>
</tr>
<tr>
<td></td>
<td>attached to an anchorage point at the elevated work area, is the first</td>
<td></td>
</tr>
<tr>
<td></td>
<td>worker up or the last worker down protected while climbing and traversing?</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Vertical Lifelines</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Does the lifeline have a minimum breaking strength of 2000 kilograms?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Is the lifeline protected from abrasive or cutting edges?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Does the system provide fall protection as the worker connects to and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>releases from the lifeline?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is the lifeline arranged so workers never have to hold it for balance?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(A lifeline should never be used for balance.)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Is the vertical segment integrated with the horizontal segment to provide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>continuous fall protection?</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Horizontal Lifelines</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Has the entire horizontal lifeline system been designed and approved by</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a qualified person?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Have the anchorages to which the lifeline is attached been designed and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>evaluated specifically for a horizontal lifeline?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Has the designer of the system approved the number of workers who will</td>
<td></td>
</tr>
<tr>
<td></td>
<td>be using it?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is the rope or cable free from signs of wear or abrasion?</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Does the rope or cable have the required initial sag?</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Have the workers been warned about potential falls?</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Have the clearances been checked?</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Is the hardware riding on the horizontal lifeline made of steel?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Aluminum is not permitted because it wears excessively.)</td>
<td></td>
</tr>
</tbody>
</table>
### Fall Arresters (Rope Grabs)

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is the fall arrester compatible with the lifeline on which it is to be installed or operated?</td>
</tr>
<tr>
<td>2</td>
<td>Is the fall arrester in operational condition?</td>
</tr>
<tr>
<td>3</td>
<td>Is the fall arrester equipped with a changeover lever that allows it to become a stationary anchor on the lifeline?</td>
</tr>
<tr>
<td>4</td>
<td>Is the fall arrester equipped with a locking mechanism that prevents unintentional opening of the device and subsequent disengagement from the lifeline?</td>
</tr>
<tr>
<td>5</td>
<td>Is the fall arrester’s “up” direction marked properly so the equipment can be attached to the line correctly?</td>
</tr>
<tr>
<td>6</td>
<td>Is the fall arrester included in a regular maintenance program?</td>
</tr>
</tbody>
</table>

### Lanyards

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is the lanyard length as short as necessary and in no cases greater than 6 feet (1.8 meters)?</td>
</tr>
<tr>
<td>2</td>
<td>Are manually adjustable lanyards used when it is desirable to be able to take slack out of the lanyard?</td>
</tr>
<tr>
<td>3</td>
<td>Have you prohibited tying of knots from the lanyard to the lifeline? (Mechanical rope grabs or fall arresters must be used.)</td>
</tr>
<tr>
<td>4</td>
<td>Are double lanyards provided?</td>
</tr>
</tbody>
</table>

### Retractable Lifeline (RL)

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are workers properly trained to use an RL?</td>
</tr>
<tr>
<td>2</td>
<td>Is the RL under a regular maintenance and inspection program?</td>
</tr>
<tr>
<td>3</td>
<td>Is the end of the cable properly spliced? (thimble eye, Flemish eye-spliced, and swaged fitting/ferrule?)</td>
</tr>
</tbody>
</table>

### Body Harnesses

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are full-body harnesses selected for a particular job equipped with all necessary attachment points (for fall arresting, work positioning, descent control, rescue, or ladder fall-protection systems)?</td>
</tr>
<tr>
<td>2</td>
<td>Are body harnesses inspected regularly for wear, abrasion, broken stitching, and missing hardware?</td>
</tr>
<tr>
<td>3</td>
<td>Have workers been instructed in the use and care of body harnesses/body belts?</td>
</tr>
</tbody>
</table>

### Other Considerations

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Has the free-fall distance been considered so that a worker will not strike a lower surface or object before the fall is arrested?</td>
</tr>
<tr>
<td>2</td>
<td>Have pendulum-swing fall hazards been eliminated?</td>
</tr>
<tr>
<td>3</td>
<td>Have safe methods to retrieve fallen workers been planned?</td>
</tr>
<tr>
<td>4</td>
<td>Is all of the fall-arrest equipment free of potential damage from welding, chemical corrosion, or sandblasts?</td>
</tr>
<tr>
<td>5</td>
<td>Are all components of the system compatible according to the manufacturer’s instructions?</td>
</tr>
<tr>
<td>6</td>
<td>Have employees been properly trained in the following issues?</td>
</tr>
<tr>
<td></td>
<td>– Manufacturer’s recommendations, restrictions, instructions, and warnings</td>
</tr>
<tr>
<td></td>
<td>– Location of appropriate anchorage points and attachment techniques</td>
</tr>
<tr>
<td></td>
<td>– Problems associated with elongation, method of use, inspection, and storage</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Question</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><strong>Anchorage / support fixing Points</strong></td>
</tr>
<tr>
<td>1</td>
<td>Do location of the anchoring / support fixing points inspected for proper location of the support system?</td>
</tr>
<tr>
<td>2</td>
<td>Do the new support system for access/lifting system like winch, pulley, climber system, rope access system, cradles/cages etc. as per manufactures EOM?</td>
</tr>
<tr>
<td>3</td>
<td>In case of other support system, whether sketches are in line with Standard Drawings / method / procedure defined in the safety standards?</td>
</tr>
<tr>
<td>4</td>
<td>Whether the life line posts are adequately &amp; rigidly connected to the supports?</td>
</tr>
<tr>
<td></td>
<td><strong>Sheeting work</strong></td>
</tr>
<tr>
<td>1</td>
<td>Whether the schemes for roof sheeting work access system ready?</td>
</tr>
<tr>
<td>2</td>
<td>Whether sheet lifting system in line with the sketches shown in the safety standard?</td>
</tr>
<tr>
<td>3</td>
<td>Whether the sheeting cages are as per the Standard Drawings?</td>
</tr>
<tr>
<td>4</td>
<td>Whether the lifting system for tools, tackles, &amp; screw machines is in line with the sketch shown in this standard?</td>
</tr>
<tr>
<td>5</td>
<td>Whether the sheet fixing process is in line with the procedure defined in this standard?</td>
</tr>
<tr>
<td>6</td>
<td>Whether the sheet lifting is in line with the standard drawings?</td>
</tr>
<tr>
<td></td>
<td><strong>Painting Work</strong></td>
</tr>
<tr>
<td>1</td>
<td>Whether the existing ladders /staircases are adequate and inspected for wellness?</td>
</tr>
<tr>
<td>2</td>
<td>Suitability of a option of various methods or system studied?</td>
</tr>
<tr>
<td></td>
<td><strong>Anchorage / support fixing Points</strong></td>
</tr>
<tr>
<td>1</td>
<td>Structural support for winch, pulleys system, lifeline supports for fall arrester etc. are in line with the sketches shown in this standard?</td>
</tr>
<tr>
<td>2</td>
<td>Do capacity of winches, pulleys, d-shackles &amp; slings /steel wire rope ascertained for not less than 5000 Kg?</td>
</tr>
<tr>
<td>3</td>
<td>Do steel wire rope / sling as life line for fall arrester, suspended parallel to hanging cages/cradles?</td>
</tr>
<tr>
<td>4</td>
<td>Do all sketches, drawings, photographs, pictorials, etc. of this standard have been studied for their applicability as per site needs?</td>
</tr>
</tbody>
</table>