INTER PLANT STANDARD IN STEEL INDUSTRY		
IPSS	**SAFETY PROCEDURE FOR ROOF SHEET CHANGING INCLUDING SIDE & LOUVRE SHEETING WORK**	**IPSS: 1-11-003-19 (SECOND REVISION)**
	Corresponding IS does not exist	Formerly- : IPSS: 1-11-003-12 (FIRST REVISION)

0. FOREWORD

0.1 This Inter Plant Standard prepared by the Standards Committee on Safety Appliances and Procedures IPSS 1:11, with the active participation of the representatives/ experts of all steel plants and associated organizations in the field, was adopted in June, 1998. This standard was first revised in March, 2012 and with **second revision in April, 2019.**

0.2 This is one in the series of Inter Plant Standards in the area of safety in steel plants with a view to provide guidance to all concerned in accident prevention.

1. SCOPE

1.1 This Inter Plant Standard provides guidance in carrying out roof sheet changing at height more than 2.0 m from ground level at site, involving the following activities, in a safe way to avoid accidents:

a) Climbing and movement of persons for working on roof.

b) Dismantling of existing sheets on roof.

c) Lowering of dismantled sheets from roof.

d) Lifting of new sheets from ground to roof top.

e) Laying and fixing of new sheets on roof.

f) Side & Louvre sheeting work

NOTE 1: The provision of the following standards shall be fully applicable in roof sheet changing:

i) IPSS-: 1-11-005-19 “Procedure for working at heights by contractor's workers (with Amendment No. 1)”, and

ii) IPSS-: 1-11-008-14 “Procedure for working at heights by regular employees of plants/mines.”

NOTE 2: Roof sheet could be galvanized corrugated (GC), galvanized plain (GP), corrugated asbestos cement (AC) or a sheet made of any similar material.

2. NECESSARY DOCUMENTATION

2.1 Height Pass - Height passes shall be issued to contractor's workers, as per clause 3.1 of IPSS:1-11-005-19.

2.2 Safety Requirements/Precautions - Checklist of requirements/precautions for working shall be as per :

i) Clause 3.2 of IPSS:1-11-005-19, for contractor's workers and

ii) Clause 3.1 of IPSS:1-11-008-14, for regular employees of plants/mines

2.3 Safety Talk - Before commencement of work in each shift, all workers shall be given a Safety Talk by Executing Officer or his representative and this shall be recorded by that person in a register.

2.4 Shut Down of Moving Equipment - Before commencement, all moving equipment under the roof sheet where work is to be carried out shall be shut down and shall be recorded by the executing officer or his representative.

2.5 Warning Signs - Sign boards in Hindi, English and local language shall be placed at conspicuous places indicating the following appropriately :

a) Fragile roof

b) Do not walk on roof without proper safety precautions.

3. REQUIREMENTS OF WORKERS FOR ROOF/SIDE/ LOUVRE SHEET CHANGING

3.1 Training and physical fitness standards shall be as per :

a) Clauses 4.1 to 4.3 of IPSS:1-11-005-19, for contractor's workers &

b) Clause 4.1 of IPSS:1-11-008-14, for regular employees of plants/mines

4. EXECUTION OF WORK OF ROOF SHEET CHANGING

4.1 The provisions as stated in the following shall be applicable :

a) Clauses 5.1 to 5.6 of IPSS:1-11-005-19, for contractor's workers &

b) Clauses 5.1 to 5.6 of IPSS:1-11-008-14, for regular employees of plants/mines

4.2 Area under the roof where the sheeting work is to be conducted shall be cordoned off with red tapes / ropes and flags.

4.3 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.

4.4 In addition, the following shall be followed :

a) 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.

b) 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)

c) 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.

d) 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.

e) 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.

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

g) 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.

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

i) 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.

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

k) 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 during construction/ replacement of transparent sheet.

l) Life line or fixed fall protection system (angles) should be provided for fixing lanyards. A lifeline preferably 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.

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

i) Three core flexible cable conforming to appropriate Indian Standard shall be used.

ii) Connection shall be provided by a competent person and routed through residual current devices (RCD) of 30mA sensitivity, with proper earthing.

iii) All plugs, sockets, etc, shall conform to appropriate Indian Standard and earthing shall remain continuous.

iv) The switch board shall conform to the provisions of the Indian Electricity Rules.

v) 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.

n) 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.

o) 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 hooked to a firm structure. Till the sheets are fixed, they shall be kept hooked for avoiding any accidental fall. No loose sheet shall be left on the roof top at the end of the shift.

p) 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.

q) 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.

r) 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.

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

t) Use of mobile Elevated working Platform (MEWP) should be encouraged wherever possible during the sheeting work**.**

5. EXECUTION OF WORK FOR SIDE SHEET CHANGING OF HIGH-RISE STRUCTURES/ BUILDINGS DURING/ AFTER CONSTRUCTION

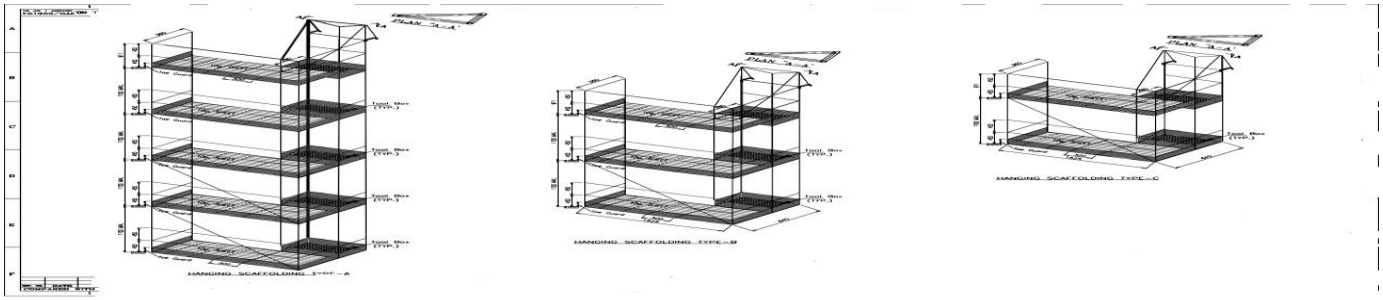
5.1 For sheeting at height, high rise man lifter may be used. Side sheeting at height may also be performed as per following procedures/precautions and requirements. The general standards as outlined in this standard are to be followed as applicable**.**

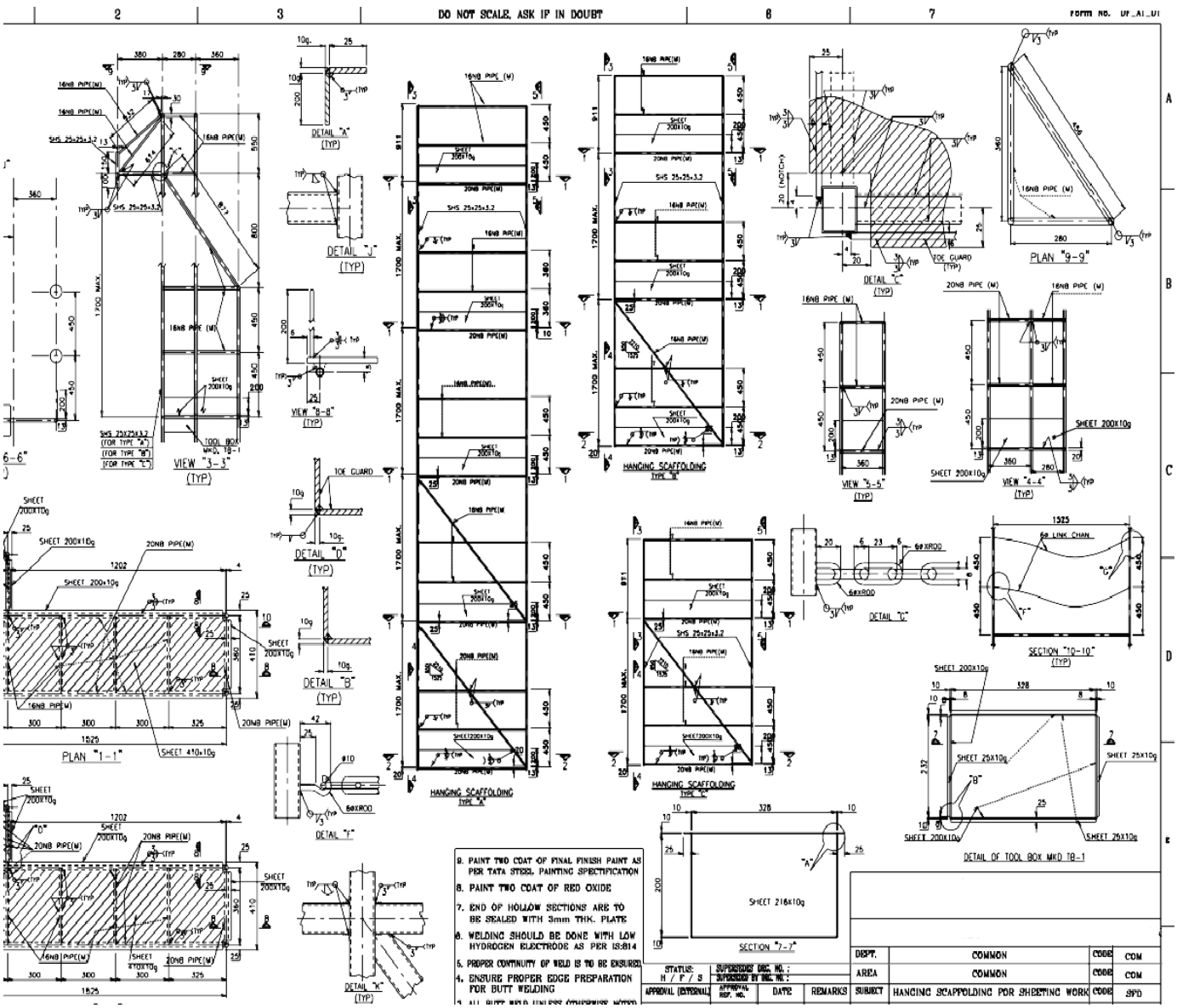
Sheeting work are to be done with cordless gun for fixing the self tapping screwed depending upon availability & site requirements. MEWP /man lifters are to be used for access.

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

5.1.1. <u>Working Cage</u>

Working lift cage shall be as per standard 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.

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.

DETAILED GUIDELINES – 1

SAFE METHOD FOR ANCHORING THE SCREW MACHINE, RIVET GUN, SHEET CUTTER ETC. WHILE WORKING AT HEIGHT

1. 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-02**)

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

3. 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**)

4. 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**)

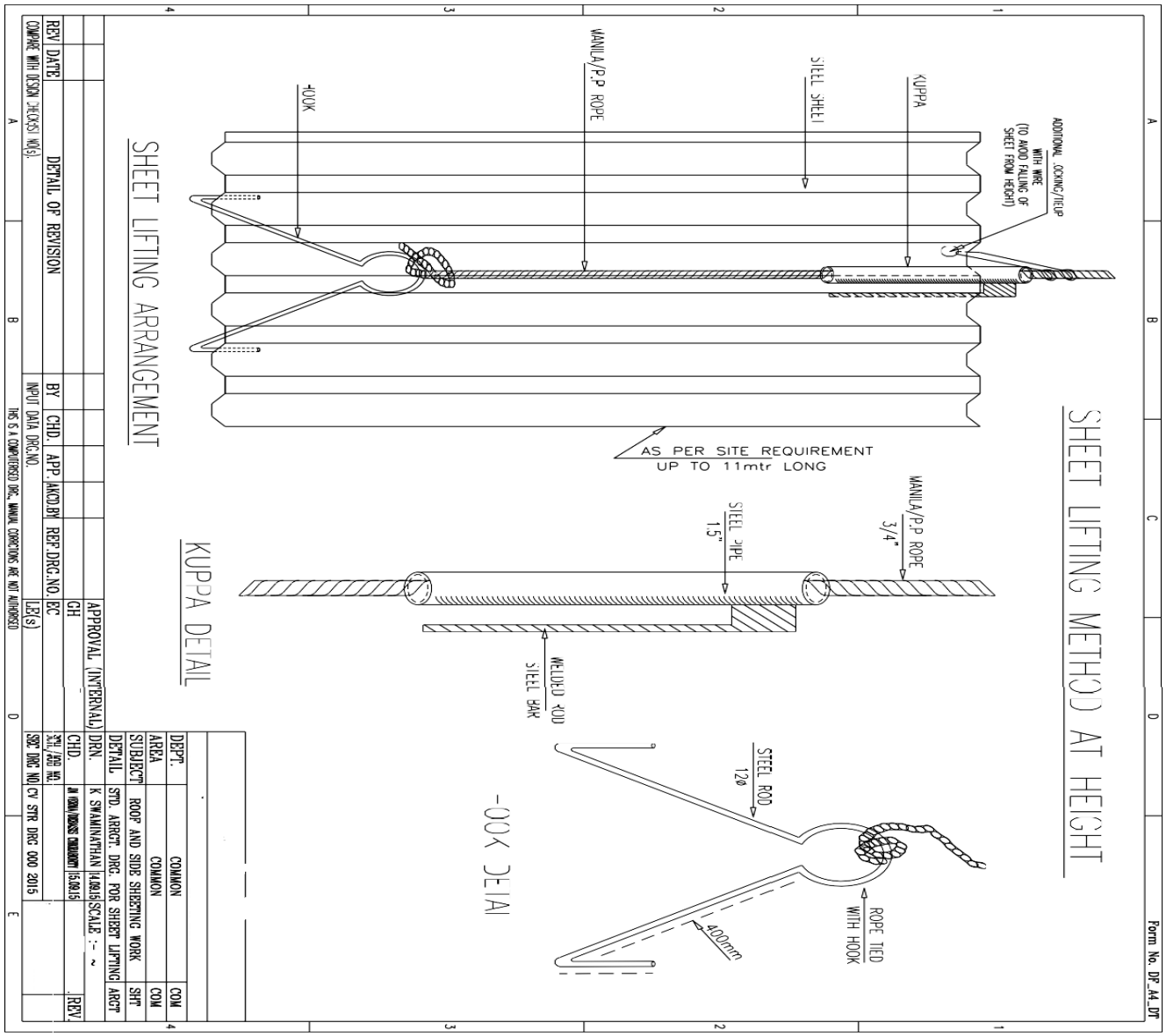
5. The other side of this PP Rope(s) will be anchored to the firm structure by using Self Locking Hook tied firmly to it. (**Refer sketches-02 & 03**)

6. The electrical extension fitted with 3 No., 5 Amp socket arrangement with electrical safety devices (like RCCB/ RCBO (Residual Current Circuit Breaker with Overload Protection (30 mA)) on/off switch, indicator lamp, 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**).

DETAILED GUIDELINES - 2

SAFE METHOD FOR LIFTING THE SCREW MACHINE AND OTHER TOOLS ETC. TO WORKING HEIGHT

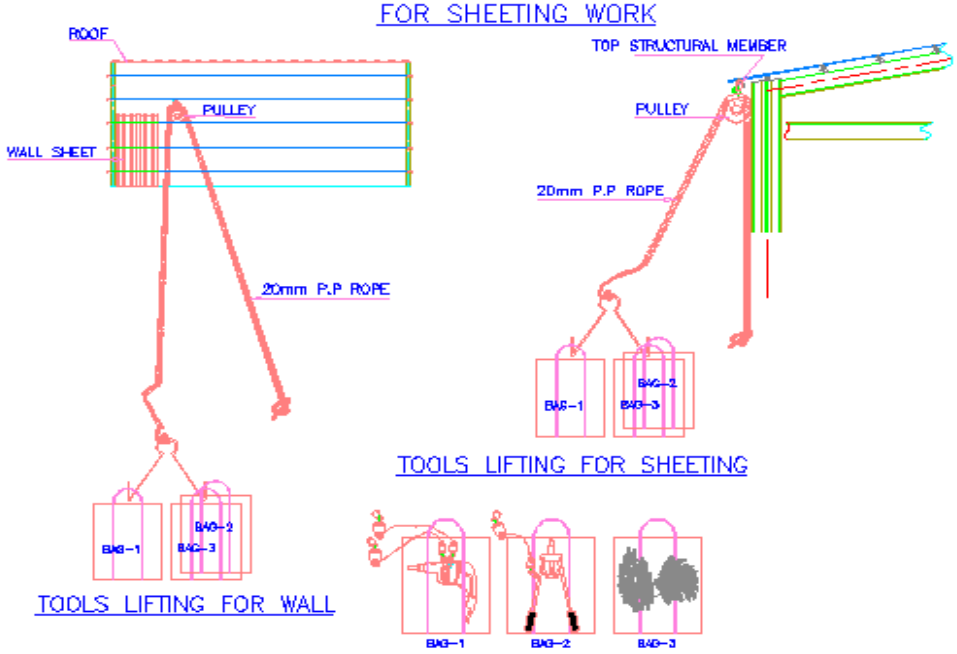
1. Each machine such as Screw Machine, Rivet Gun, Sheet Cutter etc. to be placed in Separate appropriate bags. The small portion of the open end of the PP rope, provided with the machine, is to be hung outside the bag to facilitate holding while fixing to structure.
2. These bags to be lifted to the required height by means of Rope and Pulley system used for lifting of machine.
3. When these 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.
4. After anchoring the machine to the structure the machine is taken out from the bag for use.
5. The same system has to be followed for lifting machines by all the people working at different levels of the portable scaffolding.
6. 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.
7. 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.
8. 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 -Standard Drawing . Similar other safe lifting arrangement may be used.

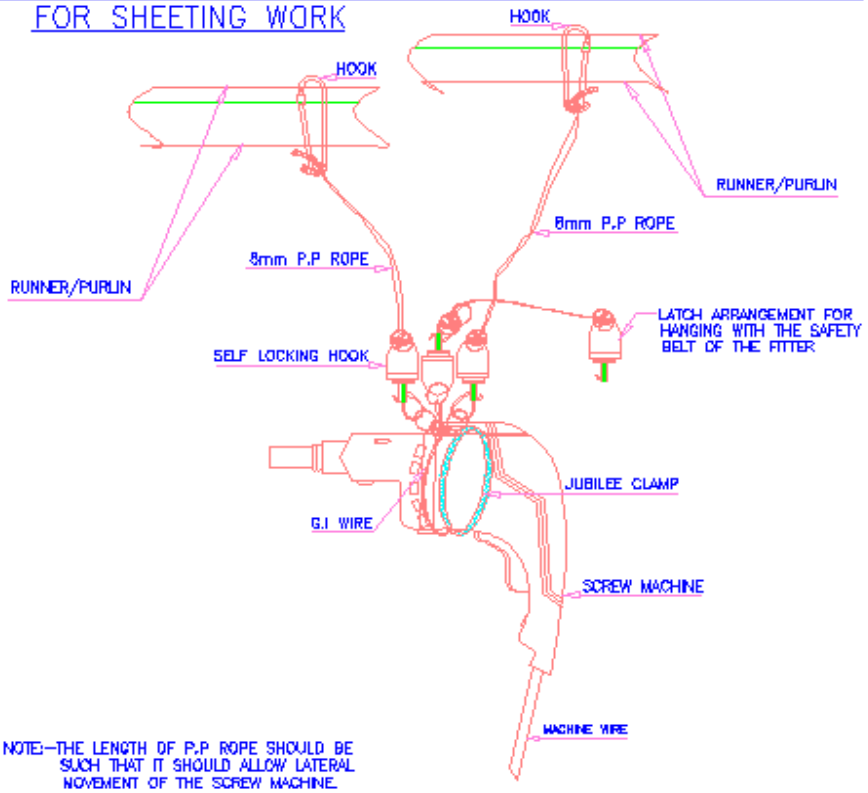
SKETCH–01

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



SKETCH–02

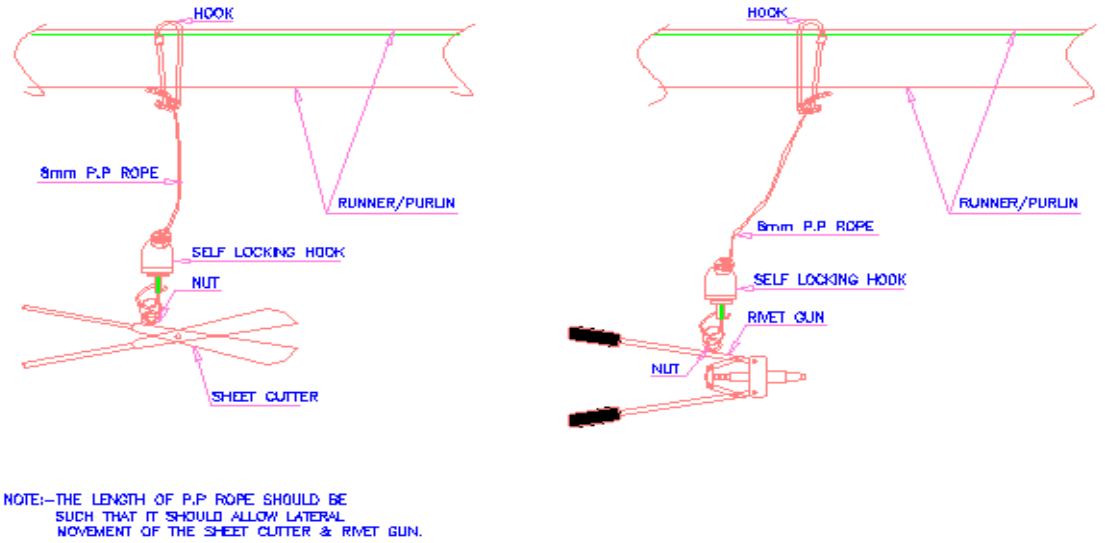
SAFE METHOD OF HOLDING MACHINE WHILE WORKING AT HEIGHT FOR SHEETING WORK



NOTE:–THE LENGTH OF P.P ROPE SHOULD BE SUCH THAT IT SHOULD ALLOW LATERAL MOVEMENT OF THE SCREW MACHINE.

SKETCH–03

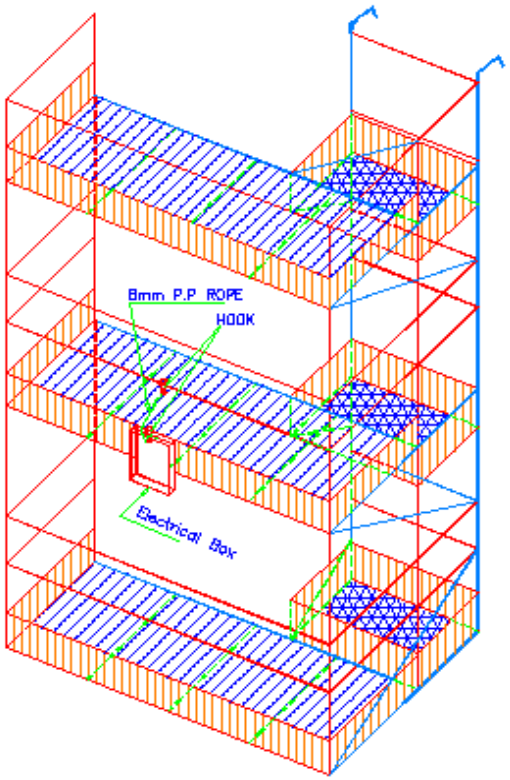
SAFE METHOD OF HOLDING SHEET CUTTER & RIVET GUN WHILE WORKING AT HEIGHT FOR SHEETING WORK

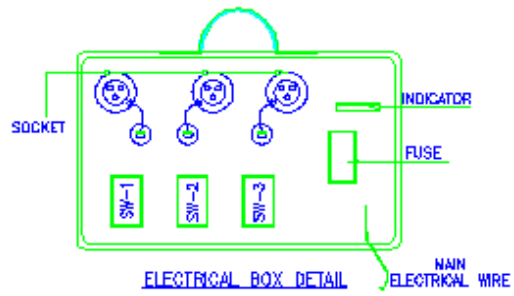


NOTE:–THE LENGTH OF P.P ROPE SHOULD BE SUCH THAT IT SHOULD ALLOW LATERAL MOVEMENT OF THE SHEET CUTTER & RIVET GUN.

SKETCH–04

ARRANGEMENT FOR ELECTRICAL BOX WITH HANGING SCAFFOLD FOR SHEETING WORK





ELECTRICAL BOX DETAIL

NOTE- In case of fuse in above drawing RCBO/ RCCB may be used.

5.1.1.1. **Detailed guidelines for side & Louvre sheeting work**

PROCEDURE FOR SIDE & LOUVRE SHEETING WORK-SPECIALLY AT CORNER PORTION

1. 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 louver, the sheeting area below the louver 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 w.r.t 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.

a. Fixing of rope pulley arrangement for cage lifting / anchorage

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

ii. 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.

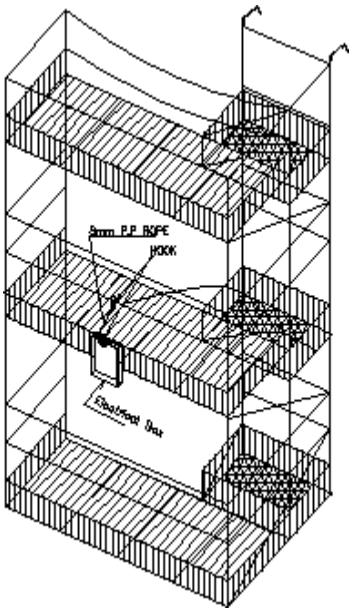
iii. Provide life line for fixing fall arrestor system..

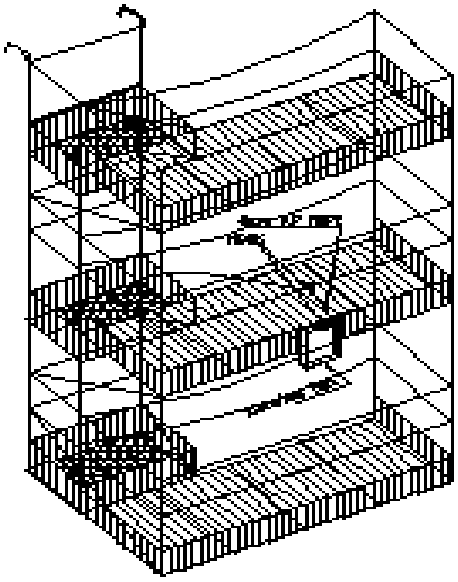
iv. For fixing rope pulley arrangement for lifting the cage, the workmen must use safety belt and fall arrestor system as protection to fall from height.

v. 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.

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

vii. 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)

b. Lifting of the cage

i. Provide guy rope of 3/4" dia. PP rope in the cage.

ii. 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.

iii. 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.

iv. Tie the cage at two intermediate locations with firm structure with ¾"dia PP rope.

v. Keep rope pulley arrangements intact till the sheeting work is completed for one vertical line.

c. Approach from ladder to cage.

i. 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.

d. 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.

i. 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.

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

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

e. <u>Lifting of the sheet</u>

i. The sheet lifting device must be fool proof.

ii. The sheet is to be lifted from inside the cage through the sheet lifting area.

iii. All people must be alert.

iv. 1 " dia. PP rope is to be to be used for sheet lifting

v. The PP rope and all other tools and tackles must be inspected thoroughly before use.

vi. Provide guy rope of 3/4" dia. PP rope must be used to control the movement.

vii. Sheet lifting must be stopped before the start of rain of storm.

f. Sheeting work

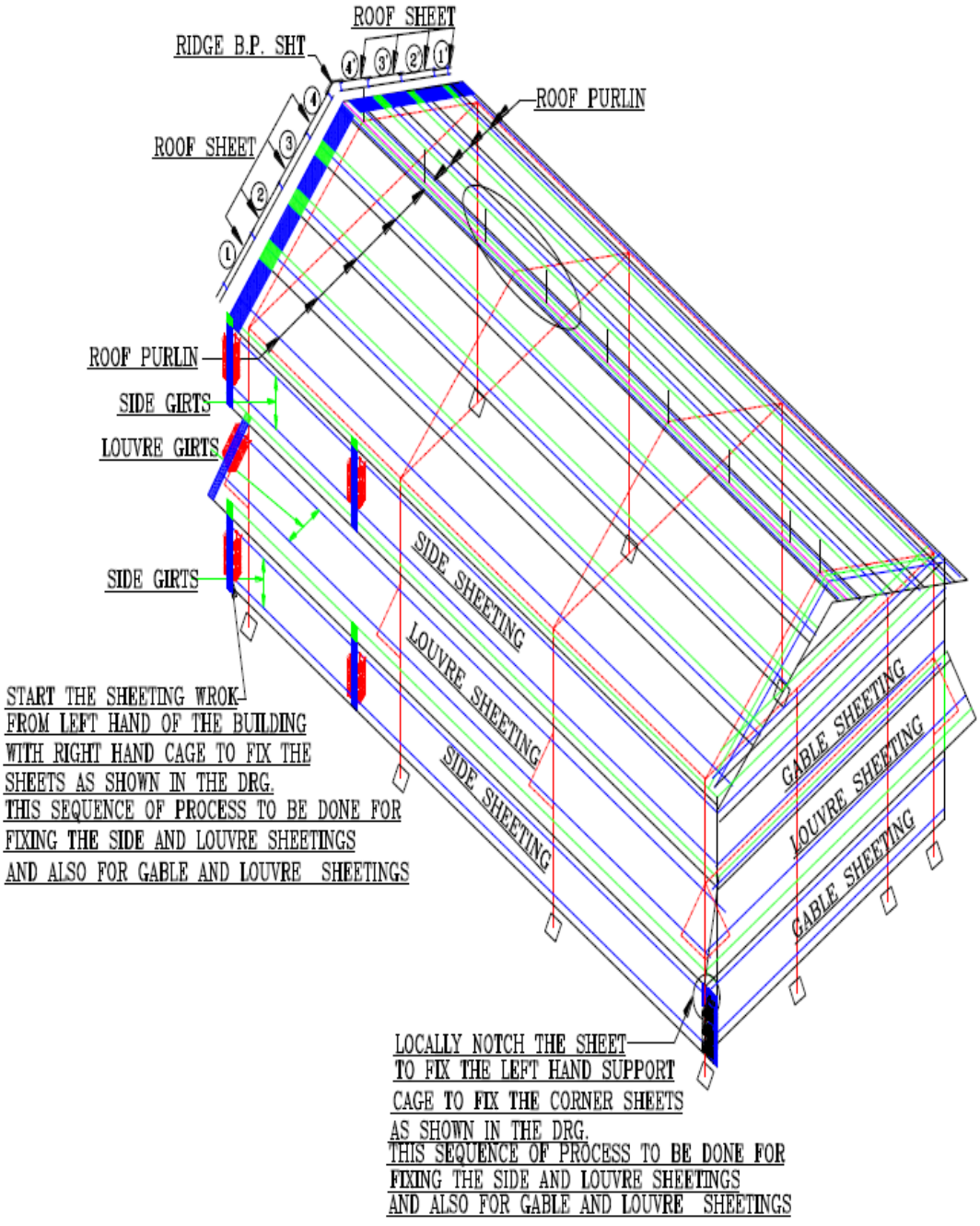
When one vertical line of sheeting work is completed line, all the rope pulley arrangements cage and sheets are to be lowered down for fixing next new location side wide. Repeat the above set of process for the new location sheeting.

g. Right Corner sheeting

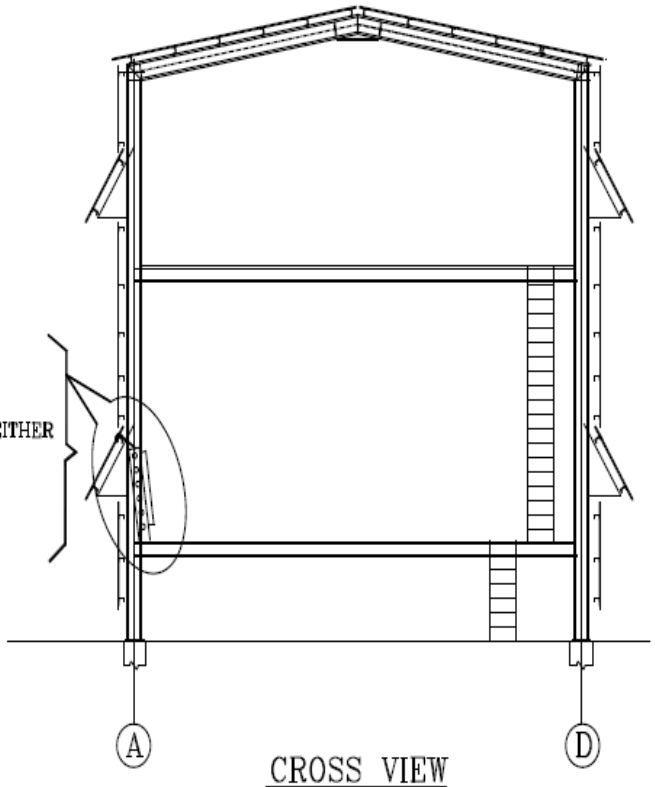
i. Repeat the above process for cage / sheet fixing and lifting methods for corner sheeting also.

ii. 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 w.r.t hook section) in the sheet above the side runner, for fixing cage with left side hook / anchorage arrangement.

iii. Continue sheeting and flushing work accordingly.


ROOF SHEET
RIDGE B.P. SHT
ROOF PURLIN
ROOF SHEET
ROOF PURLIN
SIDE GIRTS
LOUVRE GIRTS
SIDE GIRTS
SIDE SHEETING
LOUVRE SHEETING
SIDE SHEETING
GABLE SHEETING
LOUVRE SHEETING
GABLE SHEETING
START THE SHEETING WROK FROM LEFT HAND OF THE BUILDING WITH RIGHT HAND CAGE TO FIX THE SHEETS AS SHOWN IN THE DRG.
THIS SEQUENCE OF PROCESS TO BE DONE FOR FIXING THE SIDE AND LOUVRE SHEETINGS AND ALSO FOR GABLE AND LOUVRE SHEETINGS
LOCALLY NOTCH THE SHEET TO FIX THE LEFT HAND SUPPORT CAGE TO FIX THE CORNER SHEETS AS SHOWN IN THE DRG.
THIS SEQUENCE OF PROCESS TO BE DONE FOR FIXING THE SIDE AND LOUVRE SHEETINGS AND ALSO FOR GABLE AND LOUVRE SHEETINGS

FIX A SUITABLE LENGTH OF STANDARD LADDER WITH HANDRAIL AND ANCHORING HOOK AFTER POSITIONING OF THE LADDER, TIE THE LADDER WITH 3/4" P.P ROPE TO AVOID SLIPPAGE ON EITHER DIRECTION AT TWO PLACES. PROVIDE LIFELINE FOR FIXING FALL ARRESTOR SYSTEM OR, USE ROPE LADDER WITH FALL ARRESTOR PROPERLY TIED AT BOTTOM AND TOP LEVEL WITH FIRM STRUCTURE.



CROSS VIEW

2. <u>Inclined / louvre sheeting</u>

i. Repeat the above process for cage / sheet fixing and lifting methods for corner sheeting also.

ii. 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 w.r.t hook dimension of section used.) in the sheet above the side runner, for fixing cage with left side hook / anchorage arrangement.

iii. Continue sheeting and flushing work accordingly.