CONVEYOR BELTS SAFETY PROCEUDRE

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1. OBJECTIVE:

To evolve uniform safety procedure in Operation and Maintenance of Coal Conveyors Belts for ensuring the safety in O & M in Coal Handling Plants.

2. SCOPE:

This procedure applies to different types of conveyors used in coal handling plants in all operating sites of Tata Power Group companies including JVs/subsidiaries.

Sl. No.	Description
2.1	SAFETY PRECAUTIONS DURING OPERATION WORK IN A CONVEYOR BELT (TROUGH CONVEYOR)
2.2	SAFETY PRECAUTIONS DURING MAINTENANCE WORK IN A CONVEYOR BELT (TROUGH CONVEYOR)
2.3	SAFE OPERATING PROCEDURE FOR PIPE CONVEYOR OPERATION
2.4	SAFE OPERATING PROCEDURE OF BELT JOINTING (PIPE CONVEYOR)
2.5	SAFE OPERATING PROCEDURE FOR RETURN ROLLER REPLACEMENT (PIPE CONVEYOR)
2.6	SAFE OPERATING PROCEDURE FOR IDLER REPLACEMENT (PIPE CONVEYOR)
2.7	SAFE OPERATING PROCEDURE LUBRICATION OF CONVEYOR ROTATING MACHINERY
2.8	STACKER CUM RECLAIMER

3. EXPECTED RESULTS:

3.1. Written down procedures for Operation and Maintenance of Coal Conveyors Belts.

3.2. Manage jobs being done in Coal Conveyors Belts safely

3.3. Control of incidents in Jobs related to O & M of Coal Conveyors Belts

3.4. Compliance to Regulatory requirements related to O & M of Coal Conveyors Belts

3.5. Safety awareness among workmen in Coal Handling Plant.

4. ACCOUNTABILITY & RESPONSIBILITY:

4.1. ACCOUNTABILITY: Concerned Division's Heads / Assets Custodian.

4.2. RESPONSIBILITY: Concerned Engineer in Operation and Maintenance of Coal Handling Plant

5. GLOSSARY/ DEFINITIONS:

Danger zone: Any area inside or around equipment that presents a hazard to a worker's health,safety or physical integrity.

Intervention area: The area in and around equipment and the moving load, including access points and integrated access ways.

loading and unloading zones: Areas where loads are picked up or deposited, either manually or automatically, after conveyance.

Maintenance tasks: Inspection, cleaning, unclogging, load un-jamming, greasing, adjustments,repairs or other maintenance.

Production operations tasks: Start-up, shut-down and other operations such as loading and unloading, assembly, fastening, labelling, coding, monitoring, etc.

Service way: An area around conveyor(s) reserved for access to equipment for operation and maintenance.

Work area: A place at a work site where a worker is, or may be, present during work or during a work break.

Job Safety Analysis (JSA): Job safety analysis is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.

Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage property.

Hazard Identification & Risk Assessment (HIRA): Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.

Inspection: Checking the work permit controls in practice using a prepared checklist.

Lockout: Placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment or material being controlled cannot be operated or moved until the lockout device is removed.

Lockout device: A device that utilizes a positive means such as a lock, either key or combination type, to hold an Electrical energy isolating device in a safe position and prevent the energizing of a machine or equipment

Tag out: Placement of a tag out device (Danger Tag) on an energy isolating device, in accordance with the applicable sections of this procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tag out device is removed. Tag out devices are placed in the same location as lockout devices.

Tag out device: A prominent Danger Tag, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device or source of systems containing hazardous materials in accordance with an

established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tag out device is removed. The tag is used only when the equipment is incapable of being locked out and the equipment is disconnected from its source of energy

SHE : Safety, Health & Environmental

Risk: Effect of uncertainty, Risk is a combination of the consequences of an event and the associated "likelihood" of occurrence.

Risk Assessment: A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized in order to reduce risks to acceptable levels.

ZSS Zero Speed Switch

LOTO Lock out Tag out

PPE Personal Protective Equipment

PTW Permit to Work

SAP System application product for data processing

6. STEPS OF PROCEDURE:

6.1. SAFETY PRECAUTIONS DURING OPERATION WORK IN A CONVEYOR BELT

6.1.1	**Belt sway (Belt Tracking)**
	1. Do not wear loose clothing or jewelry near the conveyor belt. 2. Do not put your hands on a moving conveyor belt. 3. Provide proper illumination at the working zone. 4. Insure the 'OK' condition of pull cord and emergency stop switch of the conveyor belt. 5. Keep one skilled person with 'walky-talky' near the pull cord. 6. Communicate with control room before aligning/tracking the running belt. 7. Move the trainer idler by pushing/pulling its frame from the ends only. 8. Do not try to move any damaged/jammed trainer idler.
6.1.2	**Spillage recovery/cleaning**
	1. Do not wear loose clothing or jewelry near the conveyor belt. 2. Do not put your hands on a moving conveyor belt. 3. Do not stand /walk on the belt. 4. The spillage material accumulated below the return side-belt or on the deck plate should be cleaned by hand scrappers only. 5. The spillage material should be collected in bucket and it should not throw down from conveyor gallery. 6. Throw the collected spillage material on belt, only from those positions, where the safety guards are provided on belts as per safety standard SS/ENG-18. 7. Never heap up the spillage material at the tail end of the conveyor. 8. If the spillage material is in large amount (more than one ton), the conveyor 9. Should be taken in local operation mode. Start the belt in empty condition. Keep one person at pull cord. Communicate with control room and start throwing the collected spillage material by bucket on the running belt from the safety guard positions only or station made for this purpose.
6.1.3	**Start/Stop of belt**

	1. If a conveyor belt needs stopping, it should never be stopped in load condition, except emergency. 2. If the high speed coupling in the drive is a fluid coupling, the number of start/stop of the conveyor belt should not be more than 4Nos/Hr, at the same time there should be a minimum gap of 15 to 20 minutes between two consecutive start & stop.

6.2 SAFETY PRECAUTIONS DURING MAINTENANCE WORK IN A CONVEYOR BELT

6.2.1	**Conveyor drive**
	1. Stop the conveyor belt, when it is empty. Never stop the belt in load. 2. Do the positive isolation of all the electrical power sources of conveyor system. 3. Before changing/replacing of any component of the drive (coupling, gearbox or motor), do the positive isolation of potential energy source (take-up unit) of the belt by holding it with a pair of suitable chain blocks. Select the chain blocks from table1. To hold take up, lift it by 6-8 inches to take GTU load by chain blocks. It is also desirable (although not a must) to place the 'I' beam/channel at correct position under the gravity take up. Internal inspection of gearbox components should be done through the provided inspection cover only and its top cover should not be opened at site. 4. Whenever the gearbox or/and motor is required to change, the factor of safety for the gearbox should not be less than 2.0 (Attention should be given at design/selection phase). 5. The oil level in fluid coupling should be maintained as per mentioned quantity in its manual. The slip in

	fluid coupling should be less than 3%. 6. In the pin-bush and gear couplings, the minimum gap between the flanges should be maintained as per the recommended value according to their size. All the moving/rotating components of the drive should be covered by standard safety guards
6.2.2	**Counter Weight**
	1. Stop the conveyor belt, when it is empty. Never stop the belt in load. 2. Do the positive isolation of all the electrical power sources of conveyor system. 3. Spillage material accumulated on counter weight should be removed on regular interval. 4. A counterweight and its pulleys suspended above the floor or ground, in an area where an employee could walk, shall have an enclosure around the area of impact or a catch pan under the counterweight of such strength and design to hold the counterweight and pulley from dropping to the ground, floor or platform. 5. The concrete slab type counter weight should be replaced by box type closed counter weight. 6. The rope of the counter weight should be checked on regular interval for its strands condition and bulldog grip looseness. When, two wire ropes hang the counter weight, the wire ropes should be of opposite hands. This will avoid twisting of counter weight about its vertical axis.
6.2.3	**Chute (Receiving or discharge chutes)**
	1.Stop the conveyor belt, when it is empty. Never stop the belt in load. 2.Do the positive isolation of all the electrical power sources of conveyor system as per the safety standard. 3.Before starting any job in receiving chute, power of the preceding belt or feeding device must be isolated. Similarly, before starting any job in the discharge chute, power of the succeeding belt must be isolated. In addition the chute must be

	checked for loosely held material inside and cleaned before entering. 4.The side skirt rubber should not be kept in contact with the belt. This may create longitudinal groove on belt top cover and increase friction also. 5.The inside space between side skirt boards (left and right sides) should be two third of belt width. 6.Never use metal plate or piece of belt as a side skirts it may damage the belt. 7.An inspection cover/window should be given in chute at the non impact-wall. The inspection window can be used for dislodging the jammed material on impact walls or inspection of inside condition of chute. 8.To protect the mother plate of a chute, the hard faced liner or wear resistant liner plate should be fixed at the impact zone of chute walls. 9.Before executing the welding or gas cutting job in chute, the belt below the chute must be covered by a fire resistant cloth. 10.There must be proper clearance between the pulley (discharge pulley or tail pulley) end face and the inside wall of the chute. If the dust content in the material handled is high, a dry fog or vacuum cleaning system should be installed at the receiving chute
6.2.4	**Belt joint (Vulcanized or mechanical)**
	1.Stop the conveyor belt, when it is empty. Never stop the belt in load. 2.Do the positive isolation of all the electrical power sources of conveyor system. 3.Fix the jam angle with deck plate/stringer at a sufficient free length (3 m to 5 m from the joint), towards head end of the conveyor belt. 4.To pull the loose belt, it should be clamped with a pair of angles (also called as pulling angles) at a distance of 3 to 5 m from the joint & towards tail end. 5.Pull the belt from the pulling angles with the help of suitable chain blocks & slings. 6.Clamp the belt with a pair of jam angles and hold it with deck plate/stringer. This should be at a suitable

	distance from the pulling angles & towards tail end of the conveyor belt. 7.Before applying the adhesive the joint surface must be cleaned thoroughly and the surface should made free from moisture. 8.In case of mechanical joints of belt, proper selection of fastener and bolt tightening should be done as per the conveyor belt standard MEG/TRANS/117/2007. 9.If there is pocket formation at joint or the edge of the joint is found uprooted, it should be repaired immediately. 10.Precautions: In case of short length belt where tilting of belt is not possible, exact length of belt to be spliced to avoid the dressing.
6.2.5	**Pulley**
	1.Pulley should be checked for its lagging condition (if lagging is present), axial shift and its bearing condition on regular intervals. 2. Weld-joint condition of the disc with hub and shell of the pulley should be checked at every six month. 3. Before starting the repairing or checking inspection work, where pulley is required to touch, the steps explained in section 6.3.1 must be followed. 4. Entrapment of material between tail pulley and return-side belt should be avoided by fixing an inclined plow/scrapper on the belt at return-side. 5. If the bearing temperature of the pulley is found above 70 oC, the grease quality, quantity and radial clearance of bearing should be checked. Always close the greasing points after completion of greasing. 6. The tail pulley of a conveyor belt should be guarded as per the safety standard. 7. Ceramic lagging on bend pulley should be avoided as it increases the friction and overall tension in the belt. If lagging is required, preferences to rubber lagging should be given.
6.2.6	**Idlers**

	1. The jammed or damaged idlers should be replaced immediately, as they have high potential of damaging the belt (specially the belt joint). 2. The space between two idlers should be maintained as per standards, based on belt width and bulk density of material. For example, for a belt of width 1200 mm and carrying material of bulk density 1.2 t/m3 the distance between two troughing idlers should be 1.0 m and that for return flat idlers should be 3.0 m. 3.Chute distance between two idlers to be 0.5 m to avoid belt sag which should not be more than 2%. The minimum distance between two trouging-trainer idler should be 15 m and that for return trainer should be 30 m. 4. For better control on belt sway, the 'tru-trac' idlers can be used, such as, In return side, fix the idler (i) at 4.0 m away from the tail pulley. (ii) At about 2.0 m towards head end from the bend pulley of GTU and (iii) In return side, at 4.0 m away from the head pulley
6.2.7	**Deck plate**
	1. Deck plate must be given below the troughing belt. It protects the entrapment of spillage material between the rotating pulleys and the belt. 2. The locations where the conveyor gallery is passing over the road or working area, the deck plate below the return belt must be provided. 3. For repairing or fixing of a deck plate, the safety standard on welding and gas cutting should be used.
6.2.8	**Belt safety switches (ZSS, belt sway switch, pull cord)**
	1.The ZSS switch should be cleaned thoroughly on a regular interval. 2.The length of lever of 'belt sway switch' should be in the range of belt during belt sway. 3.The 'pull cord switch' with LED indicator should be used. (Material No. 0380A0145 and 0713A0010) 4.Before repairing or changing of belt safety switches, Stop the conveyor belt, when it is empty. Never stop the belt in load. Do the positive isolation of all the

	electrical power sources of conveyor system as per the safety tagging system.

6.2.9	**Belt Changing job**
	1.Ref-Sketch 1 2.New belt roll should be put on a fabricated & heavy stand and roll shaft to be locked from top on supporting points. The stand should be sufficiently heavy or to be anchored with near by structure. This is required to avoid tilting of stand while the belt is being changed. 3.Belt changing area should be barricaded by safety ribbon and a safety observer should be deployed throughout the job. 4.Stop the conveyor belt, when it is empty. Never stop the belt in load. 5.Do the positive isolation of all the electrical power sources of conveyor system as per the safety tagging system. 6.Job must start after getting clearance in permit to work. Belt conveyor should be put under local mode for belt changing activity. Power cut off number may be given after complete belt changing). 7.Position the belt position (where the job has to do) at a suitable place and stop the conveyor belt. 8.Do the positive isolation of all the electrical power sources of conveyor system (including preceding and succeeding conveyors) as per the safety tagging system. 9.Before starting any activity in conveyor belt, do the positive isolation of potential energy source (take-up unit) of the belt by holding it with suitable chain blocks. Lift the Take-up by 6-8 inches (Refer Fig 1). 10.Take-up must be lifted and held with two numbers of suitable and tested chain blocks. Selection of chain block to be done as per the table 1. 11.It is also desirable (although not a must) to place the 'I' beam/channel at correct position under the gravity take up, to avoid the free fall of take up. (Refer Fig2).

12.Before cutting of old belt, it should be clamped properly with conveyor deck plate by 2 nos. of jam angles (refer Table 2) on both side of the cutting position. (Refer Fig 4).

13.To avoid slip or damage of conveyor belt, a rubber piece should be inserted in between the jam angle & conveyor belt.

14. The other end of old belt, which is supposed to be pulled out, should be clamped with holding T shape plates.

15. Release the jam angles and pull the old belt manually or by some external pulling device (Like winch or pay loader). The new belt to be pulled from reel by inching drive with local switch. (Refer Sketch-1).

The speed of pulling device should be very slow max. 15 meter/min.

If belt is longer (more than 250M and at height), three persons should coordinate through Walky-Talky/Mobile Phone. One with local switch operator, second with the pulling device and the third along with joint movement.

If belt gallery is at more than 15 m height from ground, when about 5 to 8 m of new belt remains in the wooden reel, pulling of belt to be stopped.

Belt to be held in gallery at any point to avoid any movement in the belt.

Open/un-wrap the new belt from reel and hold the free end of the new belt with 'T' shape plates & wire rope. (Refer Fig 5 & sketch-1). The rope length should be more than the height of gallery from ground.

- Wrap the rope with a fixed and robust structure.

1.Holding of the belt in gallery to be released. Now pulling the belt and releasing rope to be done simultaneously.

2.The old belt should be pulled slowly and after complete replacement of old belt, both ends of new belt to be joined with plate fasteners (Refer Fig 6) and the joint to be positioned in required place for vulcanizing by using belt drive.

3.After all these activities performed & complete belt

	changing, power cut off clearance to be taken and positive isolation locking to be done properly. (Follow Safety tagging system). 4.If there is excess new belt before cutting, it should be hold with rope and other end of rope should be fixed / anchored with robust structure at upper level. (Refer Fig7) 5.After vulcanizing, idlers to be set in their position release the take-up and put tension on the belt. Once again inspection to be done to see "Is any jam angle left intact with belt? ". If not, Job completion clearance to be given.

6.3 SAFE OPERATING PROCEDURE FOR BELT/PIPE CONVEYOR OPERATION

6.3.1	Belt/Pipe Conveyor
	1.DO ensure all START/STOP and emergency controls are clearly marked. 2.DO keep the area clean and tidy. Good housekeeping eliminates hazards, i.e. tripping, slipping and falling. 3.DO lockout, isolate, danger tag, or use some other control measure before working on a bogged or overloaded conveyor 4.DO isolate and danger tag the power source before working on a bogged or overloaded conveyor. 5.DO ensure persons working near a conveyor are aware of the location of STOP/START and emergency controls. 6.DO wear appropriate clothing-avoid loose clothing near moving conveyors. 7. Do not walk under a moving conveyor unless the access is guarded against the spillage. 8.DON'T clean belts, pulleys, drum, trough or return idlers while a conveyor is moving. 9.DON'T ride on a moving conveyor. 10.DON'T repair or maintain a conveyor while in motion

	11.DON'T sleep on the idle conveyor. 12.DON'T have a food on the idle conveyor.
6.3.2	**DANGER-NIP POINTS**
	The most important danger points on belt conveyors are the nip points marked with arrows (Refer Fig No: 1.12). Any nip point that is within 2.5 metres of any walkway or access way (ie. within reach) must be guarded to prevent accidental contact with nip points
6.3.3	**STARTING THE CONVEYOR OPERATION**
	1.The pipe conveyor must not be started until the downstream circuits are prepared to accept feed. 2.Pipe conveyor auxiliary equipment must be running before starting the conveyor, if any (ex. magnetic separator, etc.) 3.Whenever equipment is to be started, the operator must ensure that the equipment is ready and no personnel working in the area are too close to the equipment. 4.Ensure emergency stop switches working and clearly marked 5.Ensure Pull cards are fitted and other safety devices are working correctly. 6.Check the warning siren working condition 7.Ensure fire fighting devices in place ready for use. 8.Check the lights are working and clean. 9.Sufficient numbers of Warning siren / Hooter alarm shall be provided. The alarm voice shall be audible to entire conveyor corridor.
6.3.4	**Pre-Operational Inspection**
	Operators must inspect the plant visually before start-up after a complete shutdown. This inspection to check whether activities, such as maintenance tasks, must be performed before the start-up begins. Included in the inspection are: 1.Incomplete or omitted repairs. 2.Tools, slings, and ladders that have not been cleared away

	after maintenance. 3.Guards of rotating machineries are fixed properly 4.Locks left on equipment, and stop buttons that have not been reset. 5.General safety hazards, such as obstructions in walkways or stairways, slippery floors, or tripping hazards. 6.Material spills. 7.Lubrication spills.
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	13.Damage of belt in form of cuts, cracks, tearing or peeling 14.Excessive swaying of belts on idlers 15.Wearing out of belt scrapers 16.Abnormal sounds from idlers or pulleys indicating worn out or damaged bearings 17. Check oil levels in gearbox
6.3.5	**Start Up**
	Start-Up from Complete Shutdown
	1.Perform the pre-operational inspection. Alert other operators to the impending start-up. 2.Ensure that the appropriate downstream equipment is started and functioning properly. 3.Start the belt conveyor drive motor. 4.Start the belt conveyor feed system
	Start-Up from Power Failure
	The procedures for starting up from a power failure differ from those after controlled shutdowns. In the case of a power failure, the conveyor belts shut down under load. When authorized by supervision, proceed with the belt conveyor start-up. Ensure that any circuit breakers that may have tripped during the power outage have been reset. Start the belt conveyor using the appropriate procedure described in Start-Up Procedures
6.3.6	**Shutdown Procedures**
	There are two primary objectives of the shutdown procedure: • To secure equipment so damage is prevented. • To make start-up efficient and timely. After a complete shutdown, equipment should be inspected thoroughly and a list of maintenance and repair items prepared. After an emergency shutdown, a visual inspection of the equipment is required before start-up. This section contains procedures for shutting down the belt

	conveyor equipment. • Normal Shutdown • Emergency Shutdown
6.3.7	**Normal Shutdown** Equipment could be shut down when the following conditions are met: • Unit is shut down No more need of material for the downstream equipment.
	Normal Shutdown Procedure
	1. Raise alarm for two minute 2. Slow down the speed of the conveyor gradually 3. First stop the downstream the conveyor 4. Then stop the upstream conveyor
6.3.8	**Emergency Shutdown**
	Equipment must be shut down immediately if someone is in danger. More frequently, the emergency is caused by an equipment failure requiring all or part of the plant to shut down. Emergency shutdowns usually involve shutting down upstream equipment under emergency conditions, but downstream equipment may be shut down in a controlled manner. The downstream equipment may be allowed to continue operating so that the plant can return to normal operating conditions more quickly. If the potential for injury to personnel or damage to a piece of equipment exists, the equipment must be shut down immediately.
6.3.9	**Emergency Shutdown Procedure**
	1.Shut down the pipe conveyor using the STOP button/field safety switches. 2.Raise emergency alarm .
6.3.10	**During Operation**
	1.Only trained employees shall be permitted to operate conveyors. Training shall include instruction in operation under normal conditions and emergency situations. 2.Where employee safety is dependent upon stopping and/or starting devices, they shall be kept free of obstructions to

	permit ready access. 3.The area around loading and unloading points shall be kept clear of obstructions which could endanger personnel. 4.No person shall ride the load-carrying element of a conveyor under any circumstances unless that person is specifically authorized by the owner or employer to do so. Under those circumstances, such employee shall only ride a conveyor which incorporates within its supporting structure, platforms or control stations specifically designed for carrying personnel. Under no circumstances shall any person ride on any element of a vertical conveyor. Owners of conveyors should affix warning devices to the conveyor reading Do Not Ride Conveyor. 5.Personnel working on or near a conveyor shall be instructed as to the location and operation of pertinent stopping devices. 6.A conveyor shall be used to transport only material it is capable of handling safely. 7.Under no circumstances shall the safety characteristics of the conveyor be altered if such alterations would endanger personnel. 8.Routine inspections and preventive and corrective maintenance programs shall be conducted to insure that all safety features and devices are retained and function properly. 9.Personnel should be alerted to the potential hazard of entanglement in conveyors caused by items such as long hair, loose clothing, and jewellery. 10.Conveyors shall not be maintained or serviced while in operation unless proper maintenance or service requires the conveyor to be in motion. In which case, personnel shall be made aware of the hazards and how the task may be safely accomplished.
6.3.11	**While conveyor belts are in motion**
	Dos 1.Pull the cord in case of emergency

	2.Cover the tail end of belt and drum 3.Guard the nip point between the drum and belt 4.During maintenance obtain line clearance / work permit 5.Put the danger tags on switches when the persons working on the belts 6.If possible, walky-talky shall be used

	Don’ts 1. Lubricate 2. Clean 3. Clear / load fallen materials 4. Work close to tail end drums 5. Wear loose cloths 6. Stand close to belts 7. Sit on the belt 8. Stand below the belt 9. Weld or gas cutting near the belt 10. Do not touch the running belt, idlers etc.

6.4 SAFE OPERATING PROCEDURE FOR BELT JOINTING (HOT VULCANIZATION)

6.4.1	**Safe Procedures**
	1.Release to be taken from Control room and from operation dept. 2.Take the work permit from relevant authority 3.Risk assessment should be prepared and it should be explained to the all concerns before starting of the activity 4.Isolate the system electrically & Adopt LOTO system 5.Make sure that Breaker is in switch off condition. 6.Engage the emergency switch and Pull chord at working place. 7.Lift the counterweight up to 5 mtr with the help 10MT chain pulley block of suitable capacity to remove the tension of the belt 8.Provided physical stopper to arrest the counter weight 9.Clamp the belt at the required level. 10.Belt Clamps should to be checked & certified by site engineer 11.Make sure the belt clamps holding the belt properly. 12.Clamp to be tightened as per the torque suggested by the clamp manufacturer (160 N/M)
6.4.2	**Preparation of Working Surface**
	Prepare a working surface at least 3 meters long on both

	sides of the vulcanizer. The Material used (Ex. square timber panel) for working surface must be sufficient strength and stability to ensure that there is no danger of their breaking or turning over. Make sure that there is sufficient space and suitable power source.
6.4.3	**Splicing of belt**
	Refer Annexure-I
6.4.4	**Buffing (Grinding)**
	1.Grinding machine shall be ensured that the handle and body of the machine intact. 2.The machine should be provided with wheel guard. 3.Only Depressed Grinding wheel shall be used for grinding operation. 4.Each wheel shall be run up to its maximum operating speed on the machine under no load conditions for about 30 seconds before commencing the work. 5.The machine operator shall ensure that the machine is provided with wheel guard and hold the machine away from his body during this test run, as the wheel may break if there is any damage. 6.During Grinding operation excessive force shall not be used, as it would lead to wheel breakage. The wheel shall be held at angle between150 to 300. 7.Hand held grinding machine having it's body made of non conductive material is preferred. 8.It shall be ensured that the body of the machine is earthed, if it is made of conductive material. 9.Power supply for the machine shall be through ELCB / RCCB of 30 mA sensitivity. 10.Refer Figure No:01 for Safe handling & guard provision of

	grinding machine

6.5 SAFE OPERATING PROCEDURE RETURN ROLLER REPLACEMENT

6.5.1	**Safe Procedure**
	1.Release to be taken from Control room and from operation dept. 2.Take the work permit from relevant authority 3.Risk assessment should be prepared and it should be explained to the all concerns before starting of the activity 4.Isolate the system electrically & Adopt LOTO system 5.Raise the take-up weight to a appropriate height (if required). 6.Make sure that Breaker is in switch off condition. 7.Engage the emergency switch and Pull chord at working place. 8.Take return roller to the place where it is to be replaced. 9.Hang the chain pulley block (with the help of sling) to the place where it is to be replace of return roller. 10.Lift the belt with the help of belt sling and chain pulley block. (Hitch;- Single Basket hitch) 11.Remove the damaged return roller by opening bracket mounting bolts from frame. 12.Take the new return roller which is to be fixed 13.Place the return roller at its place & fixed the mounting

	bolt. 14.Tighten the mounting bolts. 15.Down the belt with the help of chain pulley block and remove the belt sling 16.Release & Remove the chain pulley block. 17.Make sure all tools tackles removed from work place. 18.Ensure all workmen are away from the vicinity of conveyor movement area 19.Close the work permit & hand over to the issuing authority with isolation tag 20.Issuing authority should check the workplace and Ensure its safe 21.Close & Give clearance to operation department 22.Take a trial run at low speed 23. If the performance of belt is satisfactory put the system in operation.

6.6 SAFE OPERATING PROCEDURE FOR IDLER REPLACEMENT

6.6.1	SAFE OPERATING PROCEDURES
	1.Release to be taken from Control room and from operation dept. 2.Take the work permit from relevant authority. 3.Risk assessment should be prepared and it should be explained to the all concerns before starting of the activity. 4.Isolate the system electrically & Adopt LOTO system. 5.Raise the take-up weight to a appropriate height (if required). 6.Make sure that Breaker is in switch off condition. 7.Engage the emergency switch and Pull chord at working place. 8.Take idler to the place where it is to be replaced. 9.Hang the chain pulley block (with the help of sling) to the place where it is to be replace of idle roller. 10.Lift the belt with the help of belt sling and chain pulley block. (Hitch;-Single Basket hitch) 11.Remove the damaged idler by opening bracket mounting bolts from idler frame. 12.Take the new idle roller which is to be fixed. 13.Place the idler at its place & fixed the mounting bolt. 14.Tightened the mounting bolts. 15.Down the belt with the help of chain pulley block and remove the belt sling.

	16.Release & Remove the chain pulley block. 17.Make sure all tools tackles removed from work place. 18.Ensure all workmen are away from the vicinity of conveyor movement area. 19.Close the work permit & hand over to the issuing authority with isolation tag. 20.Issuing authority should check the workplace and ensure its safe. 21.Close & Give clearance to operation department. 22.Take a trial run at low speed. 23.If the performance of belt is satisfactory put the system in operation.

6.7 SAFE OPERATING PROCEDURE LUBRICATION OF CONVEYOR ROTATING MACHINERY

6.7.1	**Safety Procedure**
	1.Release to be taken from Control room and from operation dept. 2.Take the work permit from relevant authority. 3.Risk assessment should be prepared and it should be explained to the all concerns before starting of the activity. 4.Isolate the system electrically & Adopt LOTO system. 5.Make sure that Breaker is in switch off condition. 6.Engage the emergency switch and Pull chord at working place. 7.Remove the guards if required. 8.Lubricate the system where ever required (all greasing points). 9.All the Safety guards should be replaced after completion of job. 10.All the tools should be cleared from the workplace. 11.Oil contaminated cotton wastage should collected in dust bin. 12.Please ensure that the oil / grease shall not be spilled over the movement areas. 13.Competent supervision should be ensure always. 14.Ensure all workmen are away from the conveyor movement area. 15.Close the work permit and hand over the permit to the

	issuing authority along with isolation tag. 16.Issuing authority should check the workplace and ensure its safe. 17.Close & Give clearance to operation department.

6.8 STACKER CUM RECLAIMER

6.8.1	**Checklist to be followed by Operator before going to operator cabin**
	1.Will ensure whether any releases have been taken for maintenance job in stacker, clearance from shift-in-charge he will switch on the followings (if previously switched (a) HT Isolator (b) PLC incomer MCB (c) All feeders (d) Control supply MCB (e) Main breaker 2. Operator will ask for permission signal for STACKING/RECLAIMING from CCR through shift in-charge. 3.Before running any components like boom conveyor, intermediate conveyor, long travel or vibro feeder, clearance to be taken for the same from shift-in-charge.
6.8.2	**Procedure of Operation**
	Basically there are two types of operation the machine is handling. 1.Stacking: (Coal comes from barge at coal berth jetty through several conveyors and deposited at either side of coal yard). 2.Reclaiming: (Coal will be sent to unit bunkers with the help

of bucket wheel and through conveyors).

1. Stacking Procedure:-

a) To start the STACKING, operator will go through the checklist mentioned above and will start BOOM conveyor in FORWARD mode from touch screen inside cabin after selecting STACKING mode in selector switch.

b) Then INTERMEDIATE conveyor and VIBRO FEEDER will be started sequentially.

c) CCR will receive the signal from the machine through radio modem that all the system in stacker are in running mode, so after that YARD conveyor will be started from CCR.

When coal will reach the stacker through YARD conveyor, Coal piles can be created in

either side of coal yard in two ways.

1. By LONG TRAVEL (Mostly used)
2. By SLEW OPERATION

2. Reclaiming Procedure:-

a. To start the RECLAIMING, operator will go through the checklist mentioned above and check the indication of YARD conveyor ON in operator cabin.

Then BOOM conveyor will be started in REVERSE mode from touch screen inside cabin after selecting RECLAIMING mode in selector switch.
Then BUCKET WHEEL will be started.
After that reclaiming will be started from either side of coal yard and discharge rate will be followed as per instruction from CCR.

	Reclaiming can be done in two ways. 1. By LONG TRAVEL (Mostly used). 2. By SLEW OPERATION.

7.RECORDS :

7.1 Standard Operating Procedure for Belt Conveyors and Pipe Conveyors.

7.2 Standard Maintenance Procedure for Belt Conveyors and Pipe Conveyors.

7.3 Hazard Identification & Risk Assessment (HIRA) for Operation and Maintenance of Belt Conveyors and Pipe Conveyors.

7.4 Inspection Checklist for Operation and Maintenance of Belt Conveyors and Pipe Conveyors.

7.5 Filled Permit to Work (SAP) PTW for Maintenance of Belt Conveyors and Pipe Conveyors.

8. TRAINING & COMMUNICATION

All workmen, Supervisors & Engineers who work on or in the vicinity of conveyors must be informed of the hazards they may encounter, and must receive training in established preventive measures and work procedures.

8.1 Workmen, Supervisors & Engineers Training (Operation):-

Only competent and authorized **Workmen, Supervisors & Engineers** must be allowed to start up, operate and interrupt the normal operation of a conveyor. Workers must be trained in:

- Conveyor start-up
- Normal shutdown and the use of emergency stop devices

- Required checks for restarting a conveyor after an emergency shutdown or accidental stoppage
- Proper loading procedures to prevent overload

8.2 Workmen, Supervisors & Engineers Training (Maintenance)

- Assign only competent Workmen, Supervisors & Engineers who have the technical skills to maintain conveyors. Assigned
- Workmen, Supervisors & Engineers must be informed of the conditions under which various maintenance tasks are to be
- completed. Workmen, Supervisors & Engineers must be trained in **" Permit to Work (SAP) System & Procedure**.

8.3 Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam

9. VERIFICATION

9.1. Verification of implementation shall be done during Permit-To-Work (SAP) (PTW) procedure audit, field safety visit, site inspection and Operation and Maintenance Checklist.

10. EXEMPTION:

10.1. Design of conveyor systems are not within the scope of this procedure

10.2. Any exception to this procedure need to be approved by Chief – Corporate Safety.

11. REFERENCES

11.1. O & M Manual of Belt Conveyors.

11.2. O & M Manual of Stacker Reclaimer

11.3. O & M Manual of Pipe Conveyors.

11.4. IS 7155-8 (1994) Code of recommended practice for Conveyor Safety

11.5. Permit to Work System

11.6. LOTO Procedure

11.7. Job Safety Analysis (JSA) Procedure

11.8. Hazard Identification & Risk Assessment (HIRA) Procedure (OHSAS 18001:2007)

12. REVIEW :-

12.1. Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Recommendation from OEM, Feedback from users of other Coal Fired Power Plants, Review of Incident Reports, Inspection & Audit findings, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

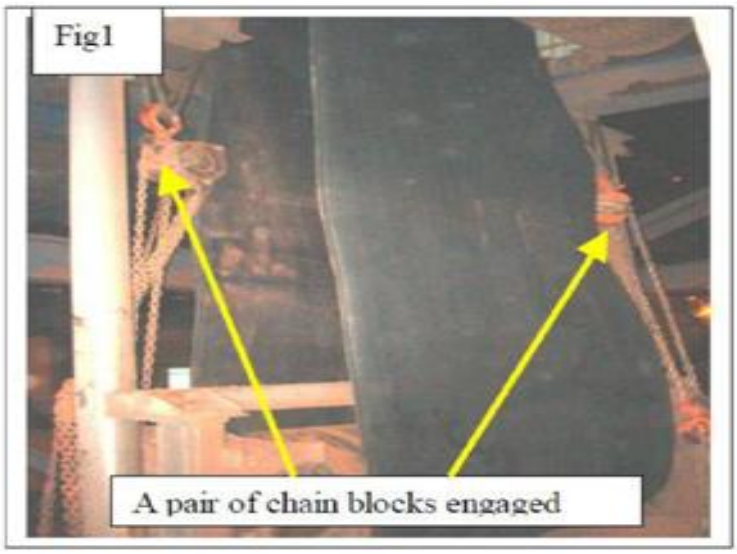
12.2. In case release of revised procedure gets delay due to obtaining feedback or any other reasons, safety advisory may be issued immediately to take precautions for the proposed changes in the procedure and revised procedure should be released subsequently.

13. ATTACHMENTS/APPENDIX :

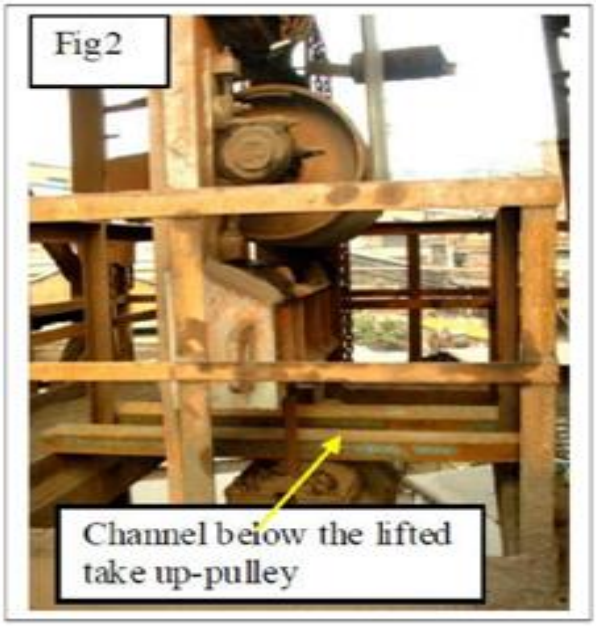
13.1 Annexure-1

ANNEXURE-1:

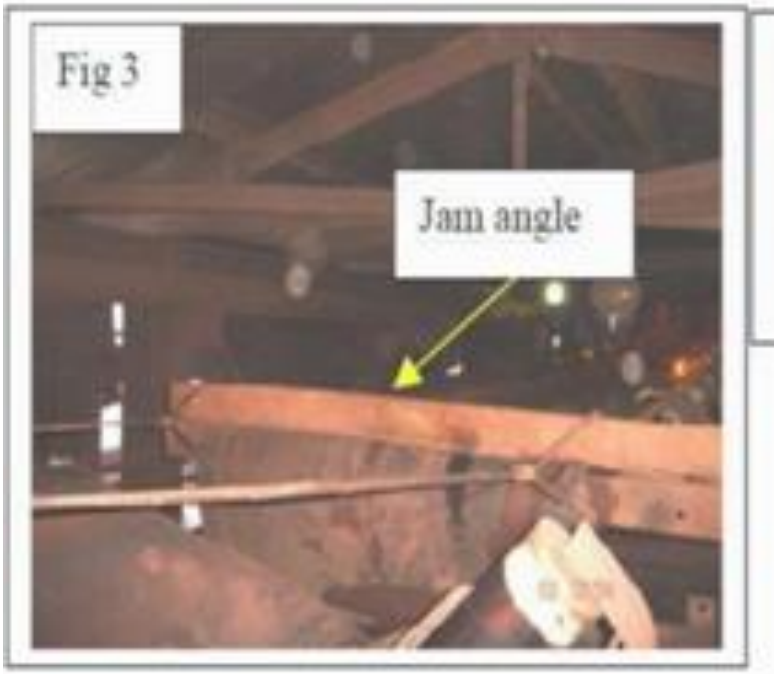
1.1) Belt Changing Job



1.2) Positioning of channel below take-up pulley to avoid chances of free-fall



1.3) Jam angle for cutting of belt

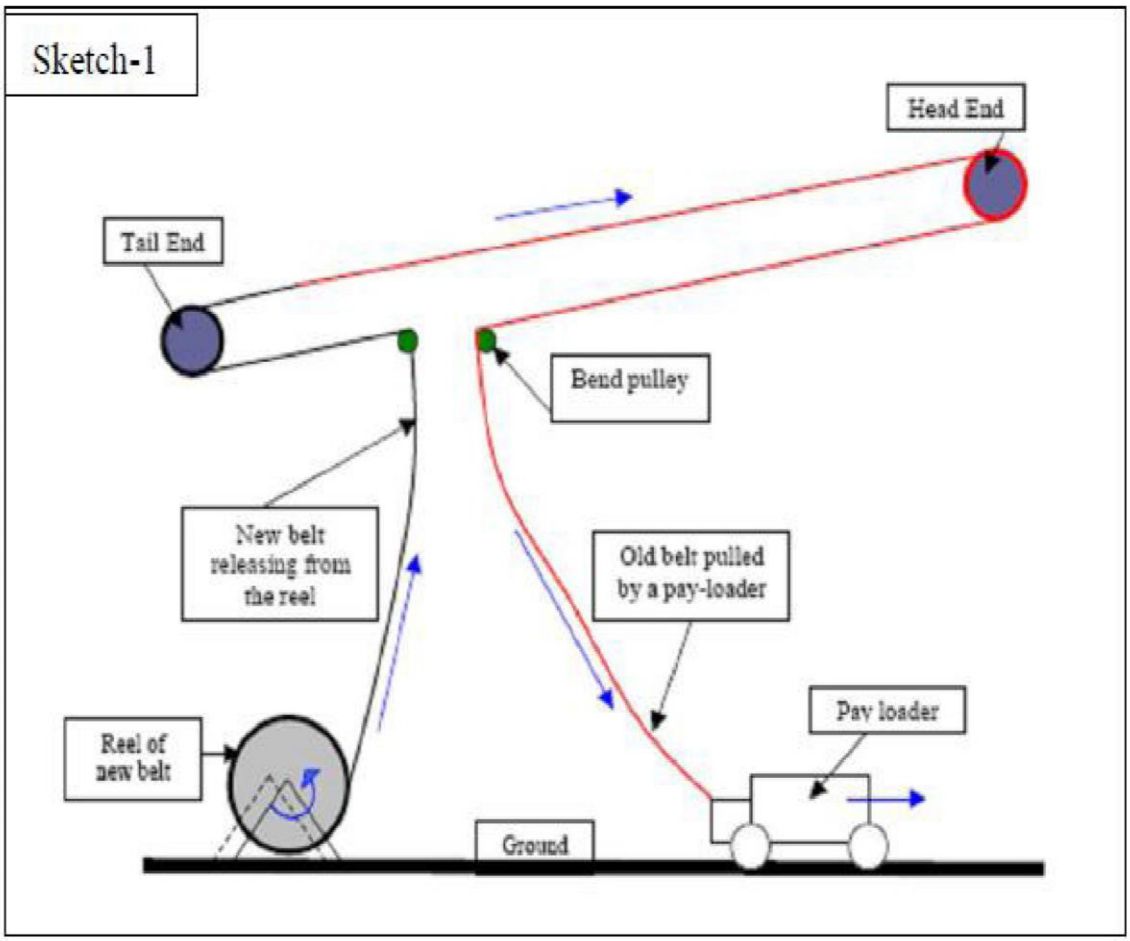


1.4) Clamping of belt with conveyor deck plate

1.5) Clamping of old belt with T-shaped plates

1.6) Sketch-1

Belt changing Job



1.7) Jointing of new belt with plate fasteners

1.8) Fig-7 Holding of extra belt with structure

1.9) Table-1 Table for selection of chain block

Belt width (mm)	Belt length (m)	Chain Block size (Ton)
Up to 800	Up to 600	2T + 2T
1000	Up to 300	2T + 2T
	Above 300 - up to 600	3T + 3T
	Above 600- up to 1300	5T + 5T
1200-1600	Up to 300	2T + 2T
	Above 300 - up to 500	3T + 3T
	Above 500- up to 800	5T + 5T

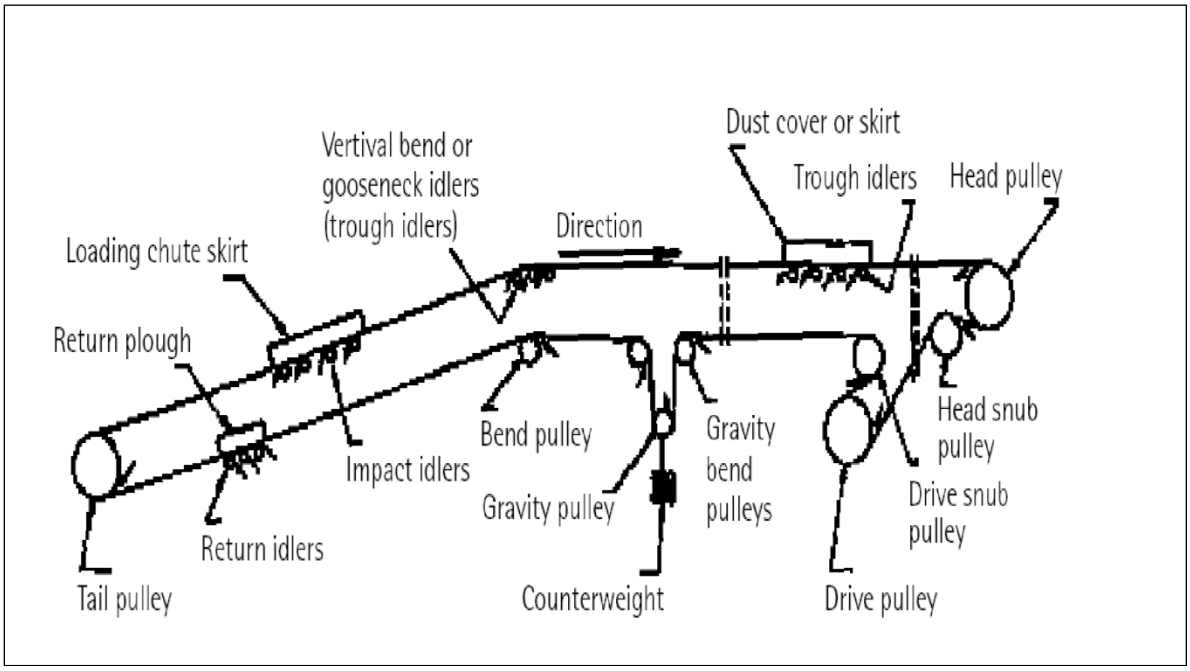
1.10) Table-2 Table for selection of Jam angle

Length of angle	Cross section of angle	Remarks
1.5 X Belt width (mm)	90 x 90 x 8 (mm)	1. Fasteners: Size-M20 grade 8.8, Quantity: 2+2 2. To avoid slip or damage of conveyor belt, at the point where jam angle has to be fixed, a rubber piece should be inserted in between the jam angle & conveyor belt.

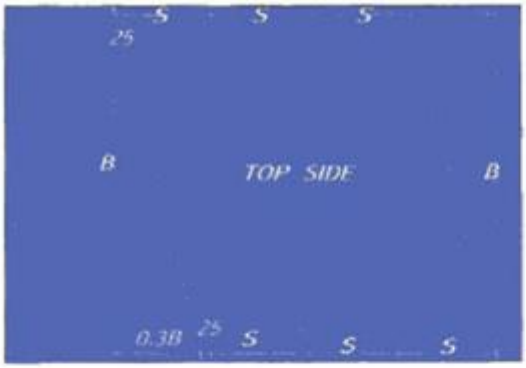
1.11) Table-3 Table for selection of belt fasteners

Belt width (mm)	Minimum No. of fasteners	Distance between two clip-fasteners
800	10	Approx - 75mm
1000	12	Approx - 75mm
1200	16	Approx - 75mm
1400	20	Approx - 75mm

1.12) Danger Nip points



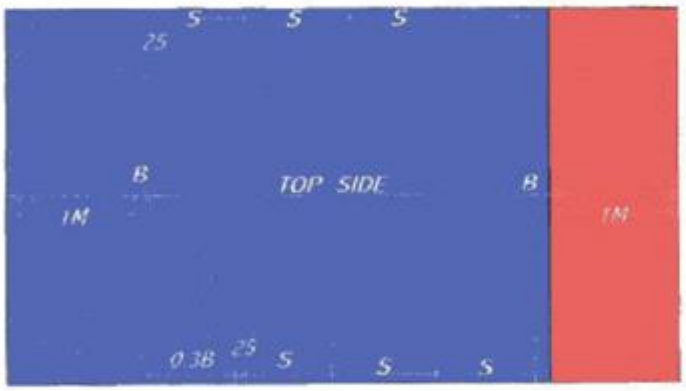
1.13) Splicing of Belt



1.

Mark the step length(s) and angles(0.3B) clearly with a white pencil or chalk at belt edges of one belt end according to the canvas.

B : BELT WIDTH
S : STEP LENGTH

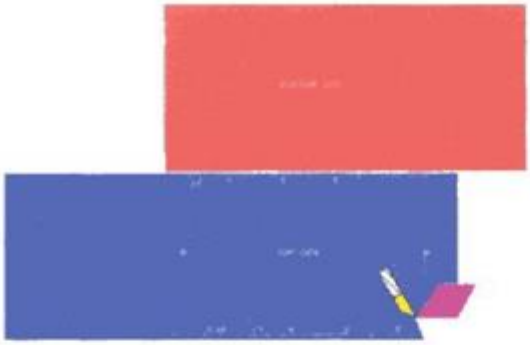


2.

Overlap the both ends of the belt to be spliced and fix the center line to maintain the straightness after splicing.
In this case, make two parallel lines each in the both ends of the center line.
And the distance of the parallel line must be longer than 1 meter.

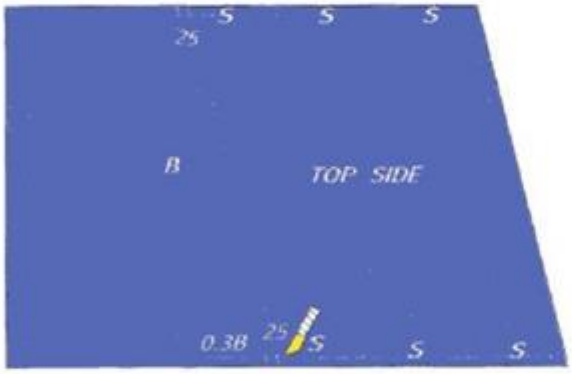
3.

Draw the step marks and angle marks correctly on the surface with a white pencil or chalk to be cut and/or peeled off.



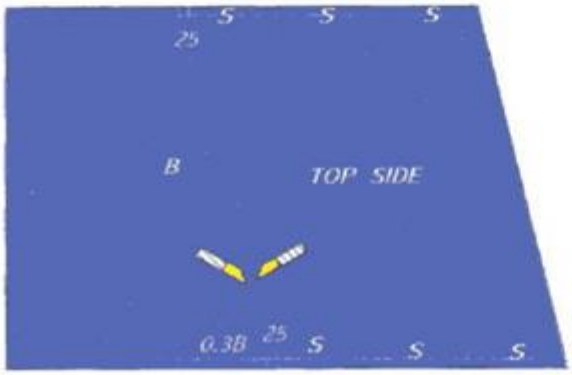
4.

Cut the ends of both belts correctly along the step marks.



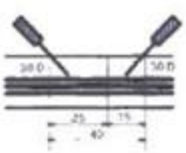
5.

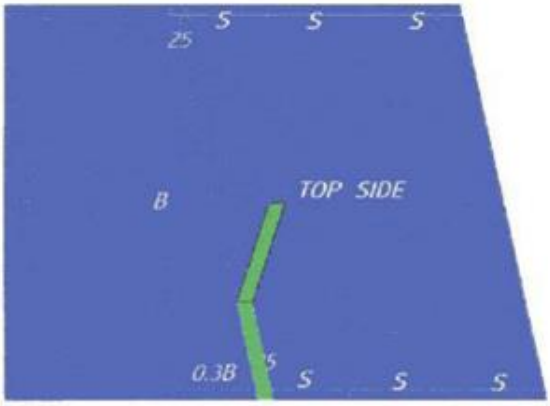
Cut the belt edges of the both sides by putting down the knife to the first ply.
The width of edge is 15~20 mm.



6.

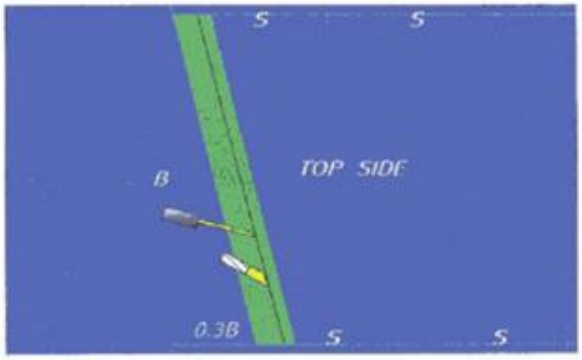
Cut the top cover by 40mm width the knife at 30° for both sides as indicated in the sketch.





7.

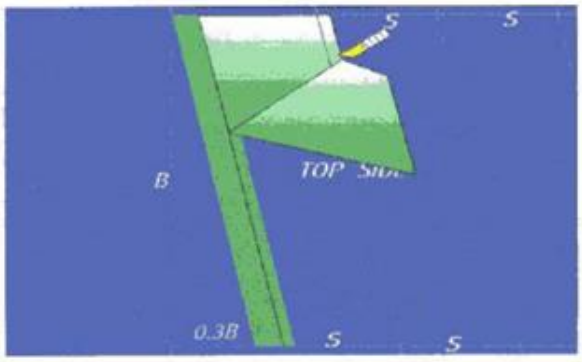
Cramp the cover rubber with a plier and peel it off.



8.

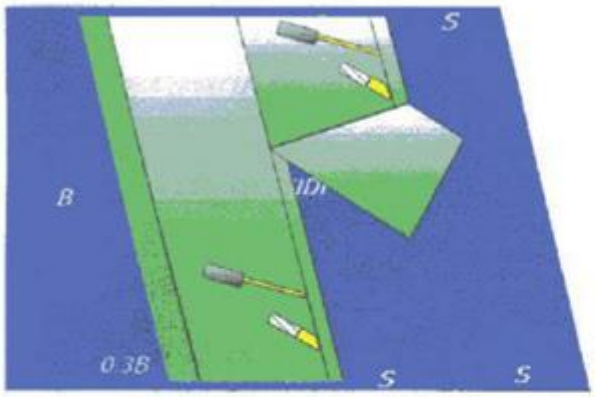
After peeling off the cover rubber, apply a line thread (equipped with chalk) to the marks of 25mm at the both belt edges and draw a line along the thread. And then cut the line with knife and driver naturally. Cut in the top ply canvas straightly along the line.

- Be careful not to damage the next ply.



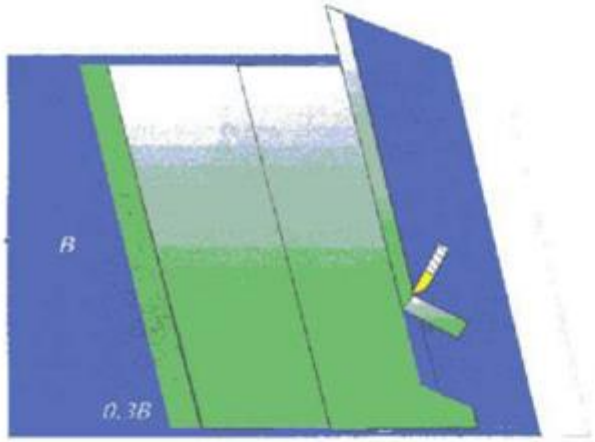
9.

After slightly peeling off the edge of the first ply with a hooked ply lifter and knife, pull it off with the peeler (winch) to the next step line and the excessive part of 25mm. After peeling it off completely, mark the step line with white pencil or chalk again.



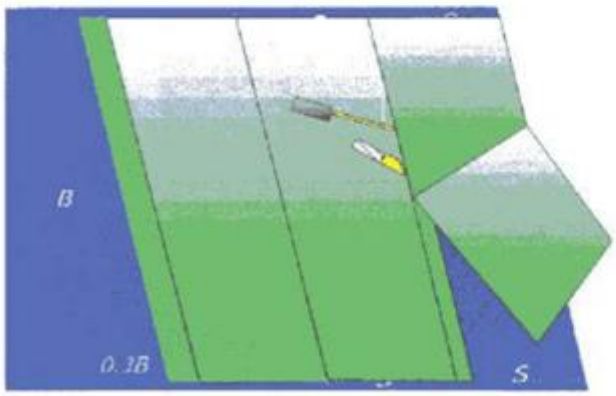
10.

Remove the second ply in the same method shown in the figure No. 8 and 9.



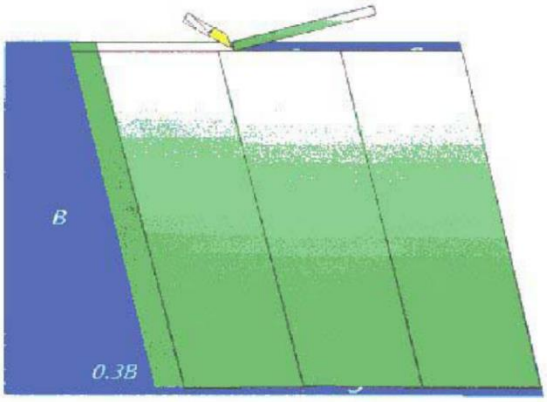
11.

Before peeling off the step(s) of the last ply, take off the bottom cover rubber of 25mm width in the same method shown in the figure No. 6 and 7.



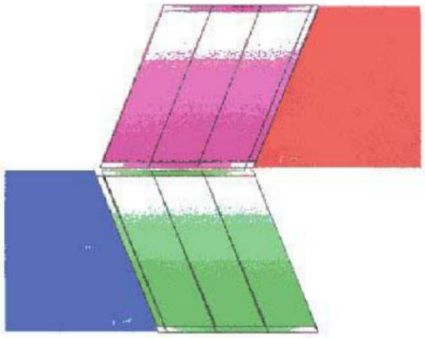
12.

Take off the step of the last ply in the same as the figure No. 10.



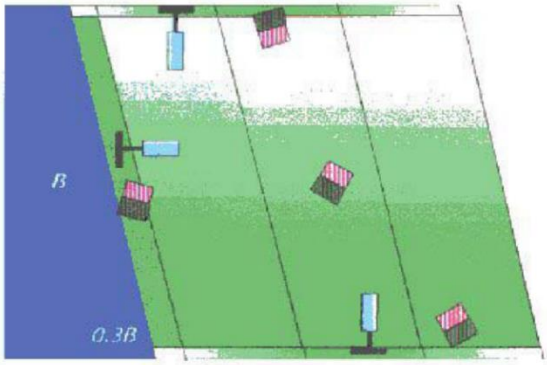
13.

Cut the remaining edge rubber of both sides horizontally to match each step thickness.



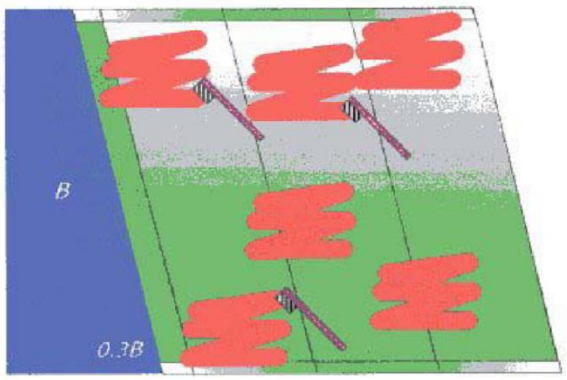
14.

Follow the same procedure to complete the preparation of the other side.



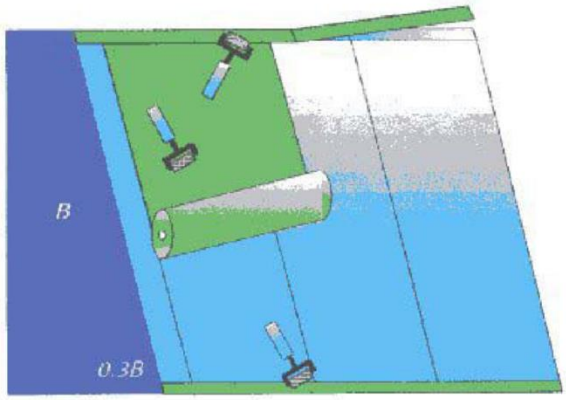
15.

After peeling off, give buffing thoroughly to the section of the top and bttom cover rubber and edge rubber with a grinder. And then after buffing, clean all exposed areas of the splice with an oval brush to remove the buff powder. And then a little amount TEC to a waste cloth or brush and remove stain of the surface of the splice.



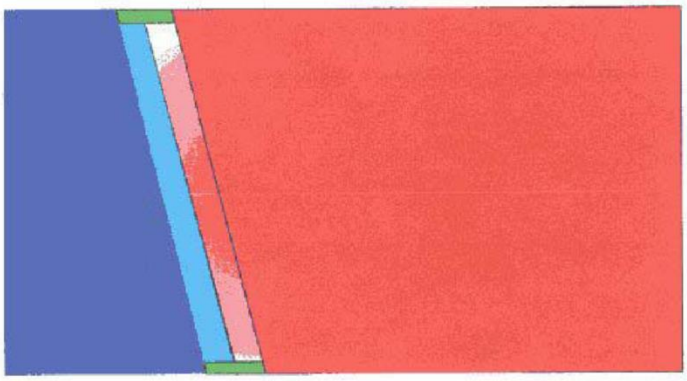
16.

Mix the rubber cement with brush for rubber cement. After mixing, stir well with a cement brush. And then spread the mixture evenly on the entire surface to be spliced the mixture and let it dry. And dry the cement mixture satisfactorily until it does not stick to fingers when touched. Spread the mixture 2-3 times in the same method



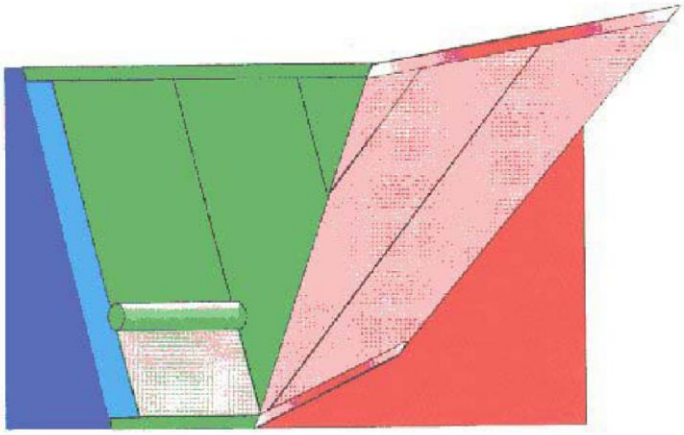
17.

After dry satisfactorily, apply edge rubber to tie gum and roll them down thoroughly to seal tightly with a hand roll. In this case, apply it without removing the polyethylene film over the entire surface of the tie gum of one end. And roll it down assuring removal of air bubble between the canvas and tie gum.



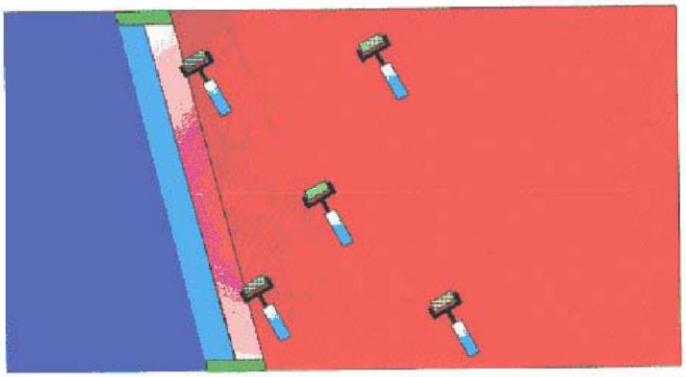
18.

Place another surface dried satisfactprily in the same method in the figure No. 2. And then make sure the center line of the area of splice and edge rubber line.



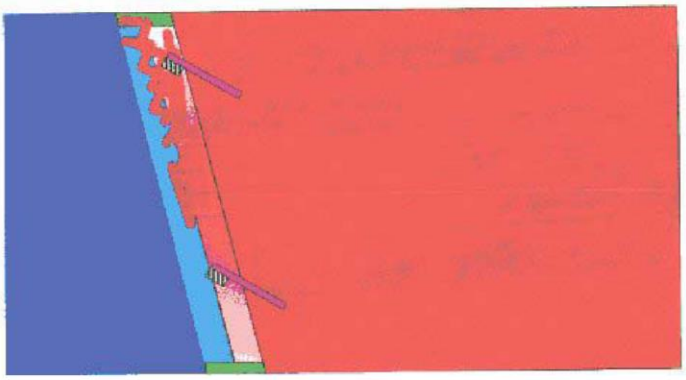
19.

After checking center & step line, remove the polyethylene film carefully.



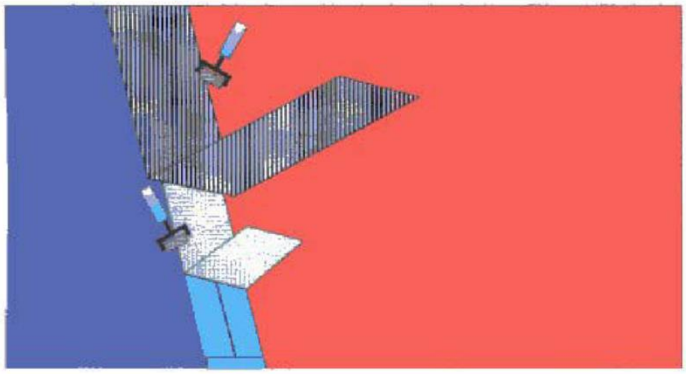
20.

Place the polyethylene film over the entire surface of the tie gum in the same method in the figure No. 18 and roll it down with a hand roll. Also it is good way to beat it with a rubber hammer.



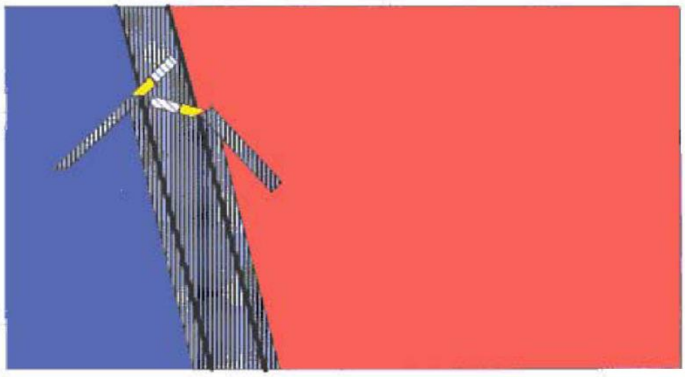
21.

Apply the cement mixture on the surface at final stage and let it dry. And apply the mixture evenly once again.



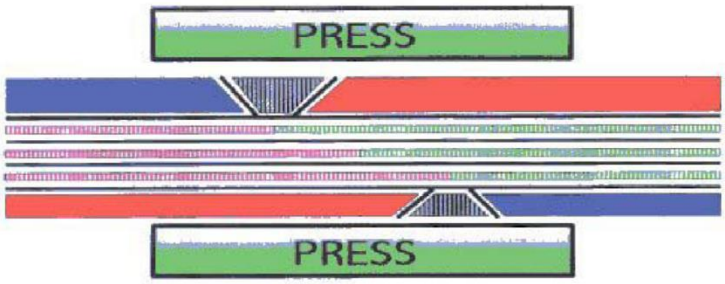
22.

After the cement is dry, apply a sheet of tie gum and roll it down with a hand roll. And then apply cover rubber and roll it down with a hand roll. In this case, it is important to remove air bubbles between the cover rubber and tie gum. If adhesive power is low as time goes by too much, wash it with TCE.



23.

Trim off excess cover stock all around with a knife to make the thickness of the part equal to the thickness of belt itself. For the bottom cover, the procedure is the same. Considering splicing situation, the cover rubber and tie gum are firmly fitted together and filled in before firmly before the figure(splicing) No. 20.



24.

Press the belt in compliance with curing time, temperature, and pressure. After curing, open the press if the temperature is under 60℃. And trim off burring rubber along both edges. In order to finish the spliced portion flat and smooth, buff the burring rubber along the cover rubber stock and edge rubber stock with a knife and discgrinder.

1.14) IS 7155-8 (1994) Code of recommended practice for conveyor safety

(Reaffirmed 1999)

भारतीय मानक

वाहक सुरक्षा के लिये सिफारिशी रीती की संहिता

भाग 8 उड़ान वाहक (स्क्रेपर वाहक)

(पहला पुनरीक्षण)

Indian Standard

CODE OF RECOMMENDED PRACTICE FOR CONVEYOR SAFETY

PART 8 FLIGHT CONVEYOR (SCRAPER CONVEYOR)

(First Revision)

UDC 621·867·133 : 6148 : 006·76

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

April 1994 Price Group 1

Continuous Bulk Conveying, Elevating, Hoisting, Aerial Ropeways and Related Equipment Sectional Committee, HMD 06

FOREWORD

This Indian Standard (Part 8) was adopted by the Bureau of Indian Standards after the draft finalized by the Continuous Bulk Conveying, Elevating, Hoisting, Aerial Ropeways and Related Equipment Sectional Committee, HMD 06 had been approved by the Heavy Mechanical Engineering Division Council.

There are two main variations of flight conveyors (scraper conveyors):

1) Conveyors with raised flights where the flight bar's level is above the material level. These conveyors work on purely dragging action of the chain to overcome the frictional drag between load and trough during conveyance.

2) Conveyors with submerged profile flights. In these type of conveyors, the conveyance of material is 'enmasse' which is due to the fact that the submerged flights, cutting their way through the material in which they are embedded, encounter a resistance that is greater than the frictional resistance of the material in contact with the bottom and the side of the trough.

In both cases screw take-ups are used for tensioning the chain.

These types of conveyors generally handle free flowing, granular, powdered or sorted material in small lumps. These shall be used with caution for any material that is sticky, abrassive, corrosive, wet or containing large lumps.

IS 7155 was first published in 1974 as code of practice for conveyor safety. Based on the experience gained in the field and to incorporate more specific safety requirements for various types of conveyors, IS 7155 was revised.

This part of the standard is one of the series of Indian Standards Code of recommended practice for conveyor safety. The other parts of the standard are:

Part 1 General information
Part 2 General safety requirements
Part 3 Belt conveyors and feeders
Part 4 Vibrating conveyor/feeder
Part 5 Apron conveyors/apron feeders
Part 6 Selection, training and supervision of operators
Part 7 Inspection and maintenance

In the preparation of this standard, assistance has been derived from AS CZ 15-1971 'SAA Conveyor safety code' issued by Standards Association of Australia.

Indian Standard

CODE OF RECOMMENDED PRACTICE FOR CONVEYOR SAFETY

PART 8 FLIGHT CONVEYOR (SCRAPER CONVEYOR)

(First Revision)

1 SCOPE

This standard covers specific safety requirements for flight conveyors (scraper conveyor). These requirements are in addition to the general information and general safety requirements given in IS 7155 (Part 1) : 1986 'Code of recommended practice for conveyor safety : Part 1 General information' and IS 7155 (Part 2) : 1986 'Code of recommended practice for conveyor safety : Part 2 General safety requirements' respectively.

2 SPECIFIC SAFETY REQUIREMENTS

Besides statutory and other requirements relating to safety in general, specific safety requirements shall be observed at the following stages:

a) During the construction stage (design and manufacture);

b) During the installation stage (design, commissioning and entry into service); and

c) During the utilisation stage (operation and maintenance).

2.1 During the Construction Stage (Design and Manufacture)

2.1.1 At the design and construction stage, among other parameters, capacity, speed of the flight, the pull on the chains and the power requirements for propulsion shall be given due consideration. These parameters shall be carefully selected and worked out.

2.1.2 The selection of chain, design and fabrication of casing, sprocket and the other functional components shall be done suitably keeping in view the respective duty factors.

2.2 During the Installation Stage (Design, Commissioning and Entry into Service)

2.2.1 As the chain (namely the pulling members) shall constantly be rubbing on the casing, renewable liners shall be provided for replacement in case of excessive wear.

2.3 During the Utilisation Stage (Operation and Maintenance)

The material fed into the conveying system shall be regulated as per the pre-determined quantities.

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