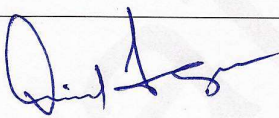



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**HINDUSTAN ZINC**
Zinc & Silver of India

STANDARD

“Material Handling and Storage Safety”

	Issued by	Approved by
Name	Chairman, SRP Sub Committee	Corporate Council Chairman
Sign.		
Date	27/01/2023	



**HINDUSTAN ZINC
LTD**

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Acknowledgement :- The management acknowledges the contributions of the following individuals for being a part of the location workgroup and for their assistance in preparing this procedure on Material Handling and Storage Standard.

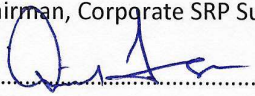
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DOCUMENT ISSUE

The “Material Storage & Handling” Standard is issued by the Corporate Safety Council on behalf of Hindustan Zinc Limited management and forms a part of the HZL Integrated Management System.

Name: Chairman, Corporate SRP Sub Committee

Signed:


Date:
27/01/2023

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Abbreviations

- CSRP – Corporate Standards, Rules and Procedures Subcommittee
- HZL – Hindustan Zinc Limited
- HSE – Health, Safety and Environment
- IMS – Integrated Management System
- LOTO – Lockout Tagout
- CSC – Corporate Safety Council
- UIC – Unit Implementation Committee
- ZSC – Zone Safety Committee
- SRPSC – Standards, Rules & Procedure Subcommittee
- PPE - Personal Protective Equipment
- FAI - First Aid Injury
- MTI - Medical Treatment Injury
- LTI - Lost Time Injury
- HIRA- Hazard Identification & Risk Assessment
- JSA- Job Safety Analysis
- SLI- Safe Load Indicator
- RTO- Road Transport Organisation.
- PUC- Pollution under control certificate
- HIRA – Hazard Identification and Risk Assessment
- SOP – Standard Operating Procedure
- WI – Work Instruction
- PTW – Permit To Work (also known as Work Permit)

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- OSHA – Occupational Safety & Health Association.
- SWL-Safe Work Load

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1. **Purpose:** To provide a guideline for Loading, Unloading and storing materials in safe manner at open yards and other storage places.
2. **Associated Hazards:** Toppling of Heavy Spares falling of materials during handling, damage to equipment,
3. **Applicability:** This standard is applicable for all location of HZL.
4. **Responsibility:** Line Management is responsible to implement this standard at all location.
5. **Procedure:-**

5.0.1 General Requirement:

➤ Planning of Storage Layout

For any site, there should be proper planning of the layout for stacking and storage of different materials, components and equipment with proper access and proper maneuverability of the vehicles carrying the material. While planning the layout, the requirements of various materials, components and equipment to be stored shall be considered.

Following points should be taken into consideration for storing the material:

- Materials stored at site shall not obstruct fire & smoke detectors and fire detection panels, fire extinguishers, fire hydrant points, first-aid equipment, lights, electrical switches, gas line drip pots, water seals and other emergency items.
- All spares shall be placed in such a manner so that leaving clear access of at least 1 meter from such emergency items.
- All spares shall be segregated and stored in respective designated places.
- Storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, fire or explosion.
- The permanent material storage area shall be hard barricaded and material stored temporarily may have indicative barricading provided the stored material is stable and fully secured. No material shall protrude beyond the barricade.
- No material shall be stored or lie on the pathway, to avoid tripping hazards. Aisles and Passage-ways shall be kept clear to provide for the free and safe movement of Material handling equipment and people.
- Any pipe line (water supply, gas etc.) or electrical installation should not be used for Supporting any material or hanging load.
- All material stored in tiers shall be stacked, racked, blocked or otherwise secured to prevent sliding, falling or collapse, toppling.

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- Incompatible material shall be stored in segregated manner so as not to cause fire/ other emergency situation.

Notes: All material should be stored in line with the requirement of local rules and regulation

It is strongly recommended that site should adhere to first in and first out principal while considering their usages.

Combustible materials such as packing boxes, fuel, lubrication and all kind of bags are to be kept separately on designated areas for disposal away from any ignition source to prevent fire (References Site/ Scrap Yard)

All materials shall be stacked tidily, firmly and maximum up to man height to prevent them from falling or causing some other pile to fall.

In case of big material (more than man height), extra precaution should be taken like restriction of unauthorized entry, securing of material for preventing it from displacing

- **Power lines:** Do not store materials under power lines or where materials may block access or emergency equipment.
- **Barricading:** Spare yard should be barricaded, named and gates should be provided with locking provision. Only authorized person should allow entry of materials for unloading and loading in the Storage place. The storage place should be locked rest of the times (Applicable for store/ Scrap Yard/ Fuel storage area).
- **Approved Drawing of the Yard/ storage place:** Departments have to make a layout plan or drawing covering total area, provision of access/ egress for free crane movement and movement of another emergency equipment.
- **SOP for material handling:** All Storage places/ yards should have approved SOP for handling and storage of materials (Area in charges to review existing SOP so as ascertain that all the material are being covered)
- **Training:** Only trained person on material handling SOP should be allowed to handle the material.
- **Test certificates of tools & tackles:** All the material handling equipment e.g. sling, D shackles, hook of the crane ,Forklift etc. should have valid test certificate readily available at the site for verification.
- **Location for Spares:** All the spares should be kept only at their designated locations with Material Code Numbers /Description of spares mentioned on a tag. And an inventory registers to be maintained for each storage place. (Reference from stores)

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5.0.2 Specific Requirements

5.0.2.1 Pipes and Conveyor pulley

Pipes and Conveyor pulley shall preferably be stored on appropriately designed sills or racks, and must be safety blocked to prevent rolling or spreading. (SSP should be available on conveyor and pulley handling and people need to be trained on that)

Alternately, pipes of diameter higher than 300mm may be stored on ground with maximum two layers high and with proper use of choker block and Dunn age, in order to prevent rolling. When stacked in such fashion, the top most pipes are to be taken out first for use.

When Many small diameter pipes/rods are stored on ground, the pipes/rods are to be bundled into 3-4 units. Proper guards are to be provided to arrest any accidental rolling of the pipes.

Stopping of rolling or sliding of pipes or Conveyor pulley with hands or feet is strictly prohibited.

5.0.2.2 Fabricated items:

Fabricated material shall be checked for stability at ground level. It is to be ensured that there is no chance of tilting, falling or rolling or slipping of material. The ground shall have sufficient strength to bear weight of the fabricated items. Fabricated items shall not be placed on loose. The storage area must be properly barricaded.

5.0.2.3 Sheet material:

All bundles shall be separated by strips of wood to facilitate handling when the material is needed, to lessen chances of shifting or sliding of the pipes of material.

5.0.2.4 Scaffolding Materials:

All Material and parts of scaffold, when not in use shall be kept under good condition at designed place. Good Scaffold materials should not be mixed with unsuitable materials and parts.

5.0.2.5 Scrap Materials

Scarp shall be removed from Storage Yard and disposed of promptly, Before Removal, scrap storage area shall be barricaded. Packaging material should be disposed of quickly and shall not be allowed to remain at storage yard. Wooden material with projected nail shall not be stored for future use. If the wooden materials are needed, all nails are to be removed, by appropriate means.

5.0.2.6 Fabrication Debris

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Debris shall not be thrown from upper stories, but be removed either by machinery or enclosed tilted passage / enclosed chutes. Accumulated debris shall be appropriately barricaded.

All waste material and rubbish shall be removed from the immediate work area as the work progresses.

All solvent waste, oily rags and flammable liquids shall be kept in metal containers with lid. These wastes shall be kept away from other combustible material (such as wood, papers, tyres etc.)& ignition source.

Waste bins shall be kept at designated places for collection of different wastes (ferrous / non- ferrous / other waste categories as relevant and categorized by the contractor.

5.0.2.7 Impeller Fan with its Shafts

Fan with Shaft should be kept at a rigid frame with saddle to avoid bending & rolling of the impeller fan shaft.

5.0.2.8 Heavy structure / Spares:

Stair should be provided for climbing on the spares more than 6 feet height for mounting of sling during lifting & lowering the heavy structure / spares in the yard/storage place.

5.0.2.9 Unbalanced Spares:

Proper support should be provided for all unbalanced spares (e.g. wheel mounted on a shaft at 1000 mm distance from one end whereas the total distance of the shaft is 7000 mm.)

5.0.2.10 Handling and Storage of Conveyor belts

Conveyor belts are generally supplied in cylindrical wooden or steel reels and in cases of overseas transportation, in fully enclosed steel reels, racetrack or similar. The reels are always equipped with a square center to take each company's winder shaft. Insert the shaft and make sure that it is protruding at least 200mm from each side to accommodate the slings or the forklifts tines. To avoid damaging belt edges you should use a spreader bar.

The best practice for running out the belt is to use a braked stand. Small roll can be pulled from a freewheeling stand; however care should be taken to avoid the belt from running away.

If the belt is to be dragged along the ground, then care should be taken to ensure that no objects are blocking the area and the dragging area should be barricaded with indicative barricading tape. In cases where there is a headroom limitation it may be necessary to remove the belt from its reel and store it in a flat position. If that happens make sure that large loops are maintained to prevent carcass fracture.

5.0.2.11 Storage of belts

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General recommendations for storage and handling of conveyor belts are given in ISO/DIN 5285. As substitution DIN 7716 (Rubber products, storage and maintenance) can be used also. In any case the conveyor belts have to be stored upright in the factory package until used, protected from direct sun light and permanent water. The storage area shall be prepared for stable putting down of the reels and preventing the belts from being damaged by foreign parts. A cool dry warehouse, free from direct sunlight, oil, ozone producing machinery or corrosive fumes is recommended.

Points of attention:

- Ensure the initial integrity of the wrapping.
- Do not lean the belt against walls as this can cause telescoping.
- Before lifting the belt ensure that facilities can handle the weight and the dimensions, which are always marked on the reel side.
- If prolonged intermediate storage is necessary, it is advisable to suspend the coiled belt with one axle in two movable stands. If this is not feasible, the coil should be turned at intervals to change the contact surface.

The location in the storage premises should be selected so as to avoid heat and direct sunlight. The belt should also be protected from contact with chemicals, grease or oil. Premature ageing, cracking, hardening or swelling would affect the service life of the conveyor belt (cf. DIN standard 7716, May 1982- Rubber products: Requirements for storage, cleaning and maintenance).

In case of prolonged storage in the open air (for steel cord belts) the cut edge at the start and end of the belt has to be protected from moisture. It may be advisable to coat the cut edge with cold splicing cement

5.0.3 Implementation checklist for material storage

Implementation checklist for material storage			
Sr No.	Description	Status	Remarks
1	Planning of the layout for stacking and storage of materials are done		
2	Proper access of the vehicles carrying the material is provided		
3	Gap between fire detectors & panels, fire extinguishers, first-aid equipment gas lines and another emergency equipment is more than One Meter		
4	Yard has designated place for stacking all kinds of materials/Spares		
5	All materials/spares are segregated and stored in respective designated Places		

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6	Proper access has been made to reach to every material/ spare		
7	Storage areas are free from accumulation of materials that constitute hazards from tripping, fire or explosion.		
8	Material storage area is appropriately barricaded, and no materials are protruded beyond the barricade.		
9	No Any pipe lines (water supply, gas etc.) or electrical installations have used for Supporting any material or hanging any load		
10	All material stored in tiers are stacked, racked, blocked or otherwise secured to prevent sliding, falling or collapse, toppling		
11	Designated disposal places and bins for scraps like packing boxes, fuel, lubrication and all bags are provided		
12	All materials are stacked tidily and up to a safe height to prevent them from falling or causing some other pile to fall		
13	No materials are stored under the power lines		
14	Spare yards are barricaded with controlled access		
15	Layout/ drawing of spare/ storage yard is available		
16	Spare yard has own SOP for loading / unloading process		
17	Employees engaged in material handling at spare yards are trained on material handling activity		
18	All the material handling equipment used at Spare yard is well tested and certified		
19	Appropriately designed sills or racks are provided to store Pipes and Conveyor pulley to prevent rolling or spreading		
20	Pipes of dia. more than 300mm is not stacked in more than two layers high		
21	All fabricated materials are tested for its stability at ground level		
22	Stacking place of fabricated material is tested for its supporting strength. During stacking the material all care of soil / ground quality has been considered		
23	There is a schedule of disposal of wastematerial from spare yards. Enough bins are provided for it		
24	All Impellers, motors, rotors, gear box etc. are stacked on rigid frame with saddle/ support stand.		
25	Proper access has been provided for safe access to heavy structures having height more than 6 feet		

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26	Sufficient support has been provided to prevent falling of any unbalanced material stacked in yard		
27	Proper visuals and cautionary signage are provided in spare yards with Emergency numbers, name of area owner.		

5.0.4 Checklist for Model Storage Place

Sl. No.	Description	Status	Remarks
1	Schematic diagram of the storage place is displayed at each Entry/ exit point indicating: <ul style="list-style-type: none"> a. 'You are here' at each entry point b. Layout for stacking and storage of different materials, components and equipment's with proper access and pathway directions. c. Location of Fire extinguishers, Fire hydrant & fire alarms & nearest First Aid Box d. Display of "Unauthorized entry prohibited "and access control system e. Area ownership board is displayed. 		
2	Hazards of the area, precautions to be taken and PPE required to be displayed at each entry /exit point.		
3	Emergency contact numbers displayed at prominent location and location of Emergency assembly point identified.		
4	Evacuation plan & rescue arrangement in case of emergency is displayed at a prominent location on Shop floor		

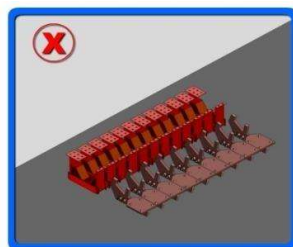
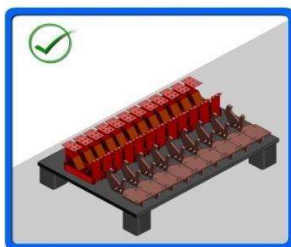
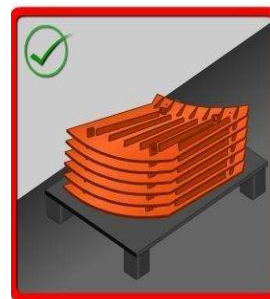
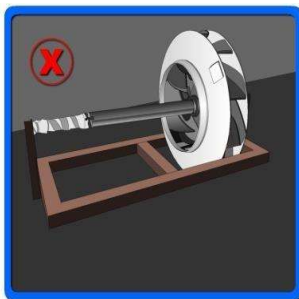
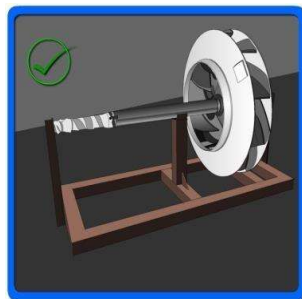
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5	The stored materials are stable and kept in safe manner.		
6	Proper access/ egress has been made to reach to every material/ spare		
7	Storage areas are free from accumulation of materials that constitute hazards from tripping, fire or explosion.		
8	Pathway is properly demarcated and floor is free from Slip/trip/ fall hazards and drains are properly covered.		
9	All material stored in tiers are stacked, racked, blocked or otherwise secured to prevent sliding, falling or collapse, toppling.		
10	Relevant Standard Operating Procedures (SOPs) for handling and storage of materials, training record of the concerned employees on the SOP are available at shop floor. Visual SOP should also be displayed.		
11	All materials are stacked tidily and up to man height to prevent them from falling or causing some other pile to fall. In case of big material (more than man height), extra precaution has been taken to p		
12	Materials stored at site shall not obstruct fire alarm boxes, fire extinguishers, first-aid equipment, lights and electric switches.		
13	The materials which cannot be kept on racks like cable drums, rolls etc. are properly supported with proper scotch blocks		
14	MSDS is available and displayed for storage of any hazardous chemical in the stores		
15	Proper visuals and cautionary signage are provided in spare yards		
16	Test certificate of all material handling equipment used at Storage places/ spare yard is available		
17	All spares are segregated and stored in respective designated places and tagged properly. All the spares should be kept only at their designated locations with Material Code numbers/name of the spares mentioned on a tag.		
18	An inventory register is maintained/ recorded for each storage place for incoming & outgoing material.		
19	All the electrical panels, DBs, switch board have proper nomenclature		

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20	Fire detection & alarm system is provided in all electrical maintenance storage area, oil barrels and other flammable liquids kept in closed room (All barrels should be kept in the closed room with adequate ventilation)		
21	Any pipeline (Water supply, gas etc.) or electrical installation has not been used for supporting any material or any hanging load		
22	All electronic spares should be stored in cool and dry atmosphere and other specific materials as per supplier guideline applicable regulation Gap assessment should be done wrt to this clause. (Air Conditioning Room Requirement)		
23	Monthly audit system of Storage places/ yards against the standard is in place		
24	The material on the racks should be placed in such a manner that the load is distributed uniformly (Avoid Point Loading)		
24	Racks used for storing of material should be design, tested and certified by the competent person it should be ensure that racks shall not be stored more than SWL and it be Point loading		

5.0.5 Signages which can be used



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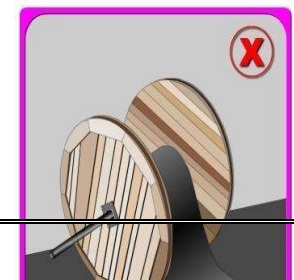
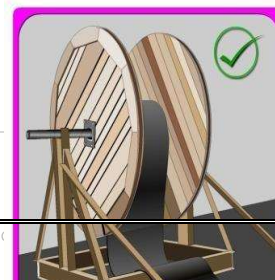
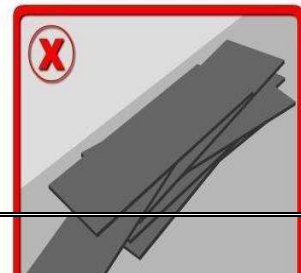
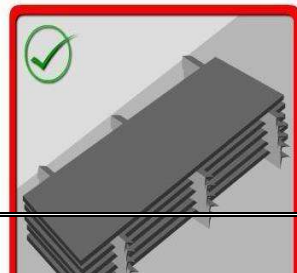
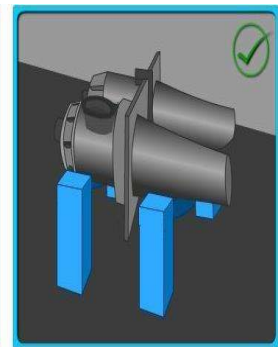
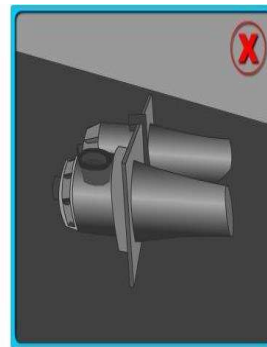
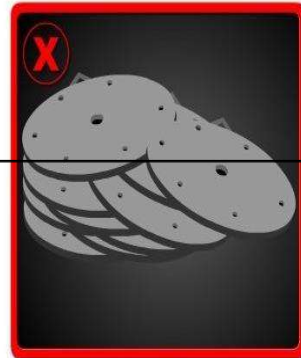
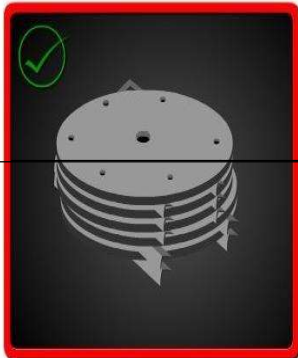
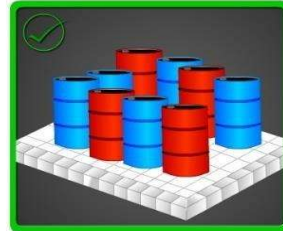
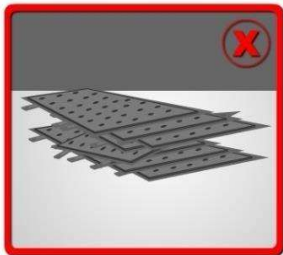
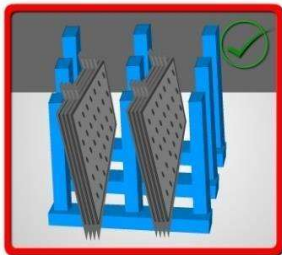
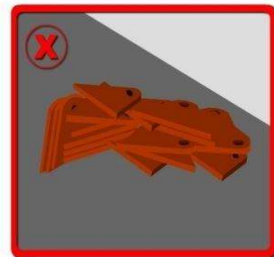
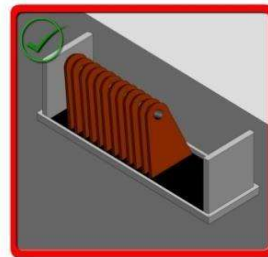
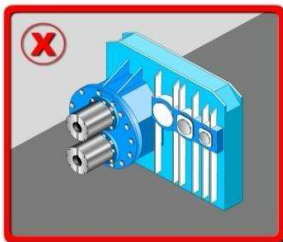
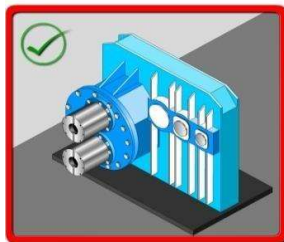
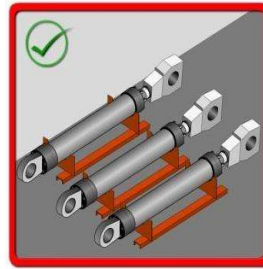
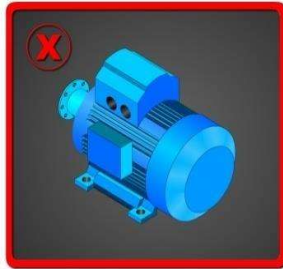
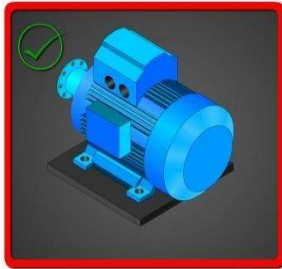
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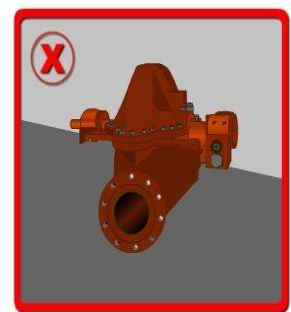
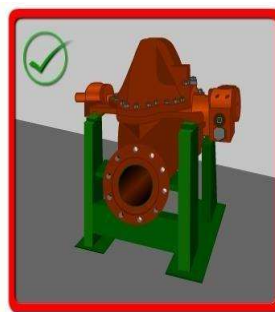
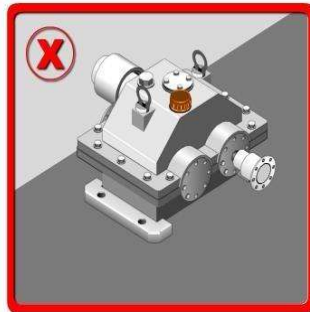
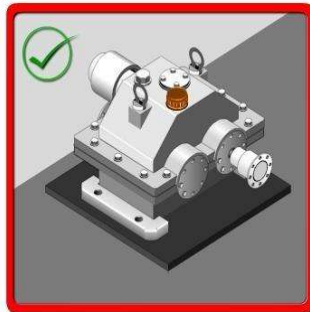
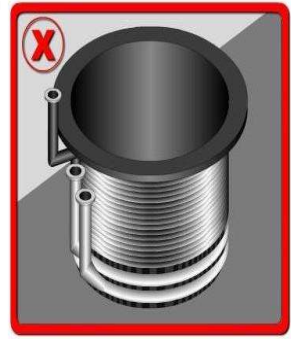
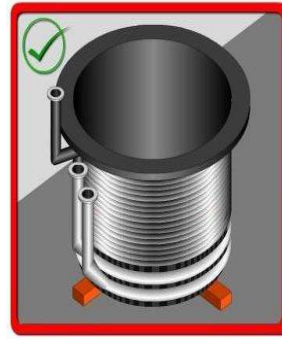
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5.1 Movement of vehicle inside Plant / Stock yard

5.1.1. **Responsibility:** Driver

5.1.2. **General instructions:** Display of board covering- Responsibility Plant / Stock yard /SPCs/ Group Companies safety supervisor

5.1.3. **Activity:**

1. Park the vehicle at the designated parking place as per instruction of department. Ref Fig 1.a (Plant safety supervisor to ensure display boards covering

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2. Vehicle movement road map including direction of movement (no reverse movement Advised), speed limit is max 16 km/hr. at entry /exit and turning points
3. Proper display boards indicating Parking area, “No parking areas” (e.g. In front of rest room, toilets, entrance route of mill etc. to be properly put in premises)
4. Go to material allocation section for informing about vehicle placement all the vehicle coming for loading/ unloading of material should not be parked on the road instead the vehicle should be parked on the pre-defined laybays if the parking on the road is inevitable then there should proper signages and display of Do’s & Don’ts.
5. Come back and wait at Drivers waiting area as designated by the department / Section



Fig. 1A

5.1.4 Dos :

1. Park vehicle in the marked parking place (as identified and guided by department/ Plant).
2. Parking should be in safe way i.e. vehicle should not be at inclined place.
3. Driver should apply hand brakes and remove key.
4. Drive to wear all PPE as Safety jacket (Florescent), helmet and shoes.
5. Apply wheel choke as per the VDDS standard Wait for vehicle call for loading.
6. Vehicle speed at entrance should not be more than 16 km/hr.
7. At turning slow down vehicles speed should be 16 km/hr. vehicle should follow the designated route assign by the site.
8. Follow road instruction displays and signal.
9. Be aware of vehicle /crane movement while crossing the roads/ dispatch area/ parking area

5.1.4. Don'ts:

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1. Driver must not roam at vehicle parking area as there may be chance of hitting from Incoming or outgoing vehicles.
2. Don't rest at unauthorized place.
3. During the wait time once the vehicle in the HZL boundary the drivers should not take rest inside the Cabin.



5.2 Checks for Driver & Vehicle to be loaded

5.2.1 Responsibility: Dispatch crew/ Loading/Unloading staff






5.2.2 Activity: Check vehicle as per Table

Note: Point no. 2,3, 6,8,9,10,11,13,14 should be self-certified by driver however it should be checked by Dispatch crew/ Loading/Unloading staff on random basis at frequency not more than a month





Notes: All the applicable requirement of HZL VDDS Standard should be adhere too.

Sl. No.	Check points	Reference	Remarks
1	Seat belt		Seat belt should be in good condition i.e. damage free.
2.	Driving License (and Crew member license if applicable)		DL should have validity
3.	Three Piece Mirror with proper adjustment		On left side three piece mirrors and on right one piece mirror should be in vehicle.

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5.	PPE for driver	  <p>Florescent Jacket Safety Shoe</p>  <p>Safety Helmet</p>	PPE must be in good condition
6.	Hand brake/parking brake	  <p>Hand Brake - Effective</p>	Hand brake should be working and must be in applied condition while checking or parking.



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7.	Wheel Choke		<p>Wheel choke to be placed on the wheel of the driver side and rear wheel of the helper side wheels should be diagonally on both direction to avoid movement of vehicle in parking.</p> <p>Refer Annex 1</p>
8.	No oil leakage	No oil leakage should be there from vehicle	
9.	Vehicle head light, back lights and blinkers	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Head Light</p> </div> <div style="text-align: center;">  <p>Back Light</p> </div> </div> <div style="text-align: center; margin-top: 20px;">  <p>Blinkers</p> </div>	<p>All lights should be in working condition and must have visible illumination.</p>
10.	Horn working condition	Horn should be in working condition and audible at a distance of <u>20m</u> .	
11.	Reverse horn working Condition		

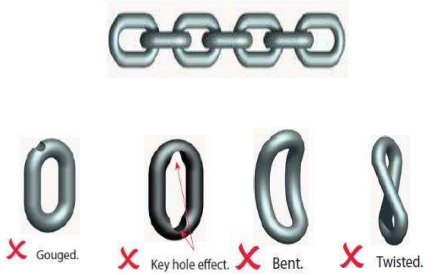



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12.	Number Plate	 <p>Number plate</p>	Should be Clear / Visible as per Motor Vehicle. Act
13.	Foot rest (physical condition)	 <p>Foot Rest</p>	Foot Rest should be in a condition to take the load of driver. No cracks or damages should be there.
14.	Fail safe brake. Brake should be in working condition.	 <p>Fail Safe brake</p>	Must check fail safe brake.
15.	Indicator Light With Audible buzzers are in working condition.		

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<p>16.</p>	<p>Tyre Conditions / Pressure and other.</p> <ol style="list-style-type: none"> 1. Rethreading wheel are not allowed 2. If central part is flat/thread depth less than 1 inch-not ok 3. Center part of the tyre should not be flat. 4. There should be no cut mark/sign of damage 5. Any kind of side cut not allowed-depth less than 1/2 inch not allowed. 6. Plain central part -not allowed 7. Pressure of the tyre should be okay(visibly) 8. Resoling /rethreading/surface plain not allowed. 9. Air pressure- as per OEM 		
<p>17.</p>	<p>RUPD and SUPD: Ground Clearance : Rear < 700mm, Side < 550mm</p> <ol style="list-style-type: none"> 1. It should be of good quality- 38 mm hollow square or L- 50*50*6 2. SUPG: Angle of 100mm 3. Distance from rear tyre- 100mm <p>Refer Annex 2</p>	 <p>Run Under Protection Guard</p>	
<p>18.</p>	<p>Lashing arrangements</p>	<p>Ref annex 3,4</p>	

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18.A	<p>Chain:</p> <ol style="list-style-type: none"> The chain shall be free from bent, twisted, damaged or cracked links. Chain should not be hammered. A chain in use shall be thoroughly examined before every dispatch It must be marked with grade or manufacturer's mark. ISI Mark chain 	<p>Refer annex 4</p> 	
B	D shackle:		
C	<p>Turn Buckle: It should be certified by the state rule</p>		
D	<p>Run under protection/side under protection guard- (550MM height from ground) /Angle of 100mm/distance from cabin-150 mm/distance from rear tyre-100mm) See annex 2</p>	 <p>Ref Fig 2.b</p>	

5.3 Vehicle placement at Loading Area

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5.3.1. Responsibility: Dispatch crew/ Loading/Unloading staff for intimation of parking, Driver for placement of vehicle at loading area.

5.3.2. Activity:

- a. Safely call the driver along with giving signal for vehicle placement.
- b. Use green/red flag while giving signal for vehicle placement.
- c. Vehicles to maintain a gap of 2 m from other vehicle from side and front.
- d. Workman giving signal/ instruction to vehicle must walk sideways at a safe distance (Minimum 2 m)and in eye sight of driver
- e. Workman giving signal/ instruction must wear all PPEs.
- f. Driver to keep vehicle speed less than 5 km/hr. while at parking zone.
- g. Driver must use indicator and blinkers while movement of vehicles.
- h. Area must be clear, no workmen should at the place of loading while vehicle placement. Ref fig 3.a
- i. Loader should ensure that there should not be more than one trailer at the loading bay.
- j. Loader should ensure that there is no material on the trailer path and no person is working on or near the loading path before giving green signal to the trailer



Fig 3.a

5.4 Vehicle parking at Loading area

5.4.1. Responsibility: Driver

5.4.2. Activity:

- a. Driver must apply the hand brake.
- b. He should come out of vehicle with keys and apply wheel choke as shown in the figure below. Ref Fig 4 a, b, c.
- c. Loading supervisor should finalize the distribution of load as per guideline (Refer annexure2) and inform driver. Driver should move to designated driver rest place while loading activities.





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Fig. 4a
Park Vehicle as designated

Fig. 4b
Apply Brakes:- Take out keys and hand over to lifter or Manitoe operator



Fig 4d

Driver should rest at designated place while loading (PPE free zone)

6.0 Loading, Unloading and Storage

6.1 Loading and Unloading of Zinc and Lead Bundle/ Jumbo ingots/ Cathode sheets

General requirement:

- Driver / Operator of material moving machinery shall possess adequate skill and Every documented training in the operation of the lifting appliance. Suitable sticker is to be pasted on the helmet of successful employees, as an easy way for supervisors to know if the person operating the equipment has been formally trained.
- Driver must fasten the seat belt while driving Vehicles .
- All Forklifts will be equipped with FOPS (Falling Object Protective Structure), fire extinguisher and back-up

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alarm.

- The operator will perform daily pre- and post-trip inspections.
- Passengers may not ride on any portion of a Forklift. Only the operator will ride Forklifts. "NO PASSENGERS" signage to be affixed on all vehicles.
- Operator will sound horn and use extreme caution when meeting pedestrians, making turns and cornering.
- Shall not be parked so as to block fire aisles, access to stairways, or fire equipment's
- All lifting machines and lifting tackles shall conform:
 - a) Identification Mark Number (as mentioned in the Test Certificate)
 - b) Safe Working Load
 - c) Date of Last Test -No chain, rope or lifting gear shall be used unless –
 - It is of good construction, adequate strength, suitable quality and free from any defects.
 - It has been tested and examined once in six months for lifting use by a competent person and issued a certificate.
 - d) Rigging equipment for material handling shall be visually inspected prior to use on each shift. Defective rigging equipment shall be removed from service.
 - Only steel chains and slings shall be used for securing / supporting heavy loads (≥ 70 kg) and use of Manila ropes, Fibre ropes in rigging activities shall be strictly prohibited for heavy loads.
 - Slings shall not be shortened with knots or bolts or other makeshift devices.
 - Shock loading is prohibited.
 - Suitable packing is to be provided to prevent contact with the sling to the sharp edge of the load.
- Operator shall leave no machinery unattended, while power is on or load is suspended to above machinery.
- No person shall ride on suspended load or any lifting machine.
- While material handling, following precautions to be taken:
 - The load is safe and secured while lifting.
 - Slings method is proper for the load.
 - Lifted load shall not exceed the safe working load of the slinging gear.
- All persons at the site shall strictly use helmet with chin belt and shoes.
- Hazard during Material handling via machine
- Capsizing/Toppling of Crane
- Collapse/Failure of Boom
- Failure of sling, rope, chain etc.
- Struck by the moving machine v) Object falling from height.
- Swinging & hitting of load to adjacent structure.
- Finger entanglement with rope, chain, sling etc. while lifting
- Electrocutions.
- Storm/ heavy wind

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A. Loading and Unloading of Zinc & Lead Bundle / jumbo ingots

1. **PURPOSE:** The purpose of this document is to give guidance to the personnel involved Zinc & Lead bundles loading, unloading & shifting,
2. **SCOPE:** All activities related with Truck / Trailers/ Containers unloading / loading I at HZL site (in plant or finished good yard) using hydra, cranes and fork lifts
3. **RESPONSIBILITY:** Loading crew, Head (S&D, operation) loading supervisor, Hydra, Fork lift & crane driver
4. **ACTIVITY:**
 - 1) Ensure training of all persons involved in Cathode shifting
 - 2) Ensure availability of required PPE
 - 3) Ensure training to all executive/ Line operator regarding ERP (Emergency Rescue Plan)
 - 4) Providing access control in working zone.
 - 5) Vehicles i.e. Truck, trailers, containers should be placed at designated place .
 - 6) No loading / unloading should be performed more than one at a time in same vicinity / place .
 - 7) Only stable or safely arranged bundle loads shall be handled. Caution shall be exercised when handling off-center loads which cannot be centered.
 - 8) After identifying right zinc / lead bundle, indicate the hydra / crane/ fork lift driver for bundle lift, Indication should from safe point to avoid falling of bundles on rigger / person.
 - 9) Only loads within the rated capacity of the Forklifts shall be handled.
 - 10) While lifting rigger should be at a safe distance and should not be in line of fire , material being lifted , shifted and loaded / unloaded
 - 11) The long or high (including multiple-tiered) loads which may affect capacity shall be adjusted.
 - 12) A load engaging means shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.
 - 13) Extreme care shall be used when tilting the load forward or backward by fork lift , particularly when high tiring. Tilting forward with load engaging means elevated shall be prohibited except to pick up a load. An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack. When stacking or tiring, only enough backward tilt to stabilize the load shall be used.
 - 14) Loading / unloading must not be operated between sunset and sunrise without adequate lighting provision. Proper illumination is to be ensured.

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15) Place where activities of loading and unloading being performed, should be barricaded, named and gates should be provided with locking provision. Only authorized person will allow entry of materials for unloading and loading.

16) Areas are free from accumulation of materials that constitute hazards from tripping / fall.

6.2 Loading and Unloading of Cathode sheet :

1. **Purpose:** The purpose of this document is to give guidance to the personnel involved in cathode shifting

2. **Scope:**

- All activities related with Truck / Trailers/ Containers unloading, loading HZL site using fork lifts

3. **Responsibility:** Loading crew, Head (Dispatch & Operation) loading supervisor and forklift driver



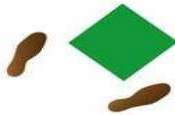
4. **Activity:**

- 1) Ensure training of all persons involved in Cathode shifting
- 2) Ensure availability of required PPE
- 3) Ensure training to all executive/ Line operator regarding ERP (Emergency Rescue Plan)
- 4) Loading / unloading must not be operated between sunset and sunrise without adequate lighting provision. Proper illumination is to be ensured.
- 5) Place where activities of loading and unloading being performed, should be barricaded, named and gates should be provided with locking provision. Only authorized person will allow entry of materials for unloading and loading.
- 6) Areas are free from accumulation of materials that constitute hazards from tripping / fall.
- 7) Vehicles i.e. Truck, trailers, containers should be placed at designated place.
- 8) No loading / unloading should be performed more than one at a time in same vicinity / place.
- 9) Only stable or safely arranged cathode sheet shall be handled. Caution shall be exercised when handling off-center loads which cannot be centered.
- 10) After identifying right cathode sheet bundle, indicate the fork lift driver for bundle lift, Indication should from safe point to avoid falling of bundles on person.
- 11) Only loads within the rated capacity of the Forklifts shall be handled usually less than 5 MT
- 12) While lifting other person should be at a safe distance and should not be in line of fire, material being lifted, shifted, loaded and unloaded
- 13) A load engaging means shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.






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14) Extreme care shall be used when tilting the load forward or backward by fork lift, particularly when high tiring. Tilting forward with load engaging means elevated shall be prohibited except to pick up a load. An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack. When stacking or tiring, only enough backward tilt to stabilize the load shall be used.


6.3 Handling/Storage/loading/unloading of Silver ingots

Sr no.	Check Point	Reference	Remarks
1	Before lifting an ingot, think:- Can you use a manual handling aid instead of manual handling? Where is the load to be moved? Are there any obstructions that may get in the way?		Use manipulator for lifting and placing the ingot
2	Use height adjustable trolley to shift the silver ingots from one place to another place		Scissor lift
3.	For manual handling adopt a stable position with feet apart and one leg slightly forward to maintain stability. Make sure that you are wearing suitable footwear		


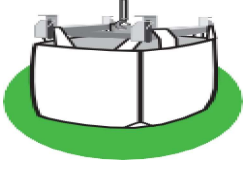
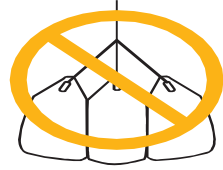
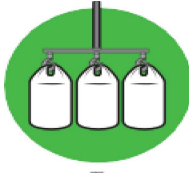
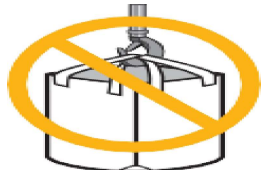
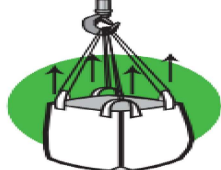


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4	Get a good hold on the ingot and hug it close to your body where possible. At the start of the lift, bending at the back, knees and hips is preferable to fully bending the back or squatting		
5	When carrying, keep the Ingot/load close to your waist for as long as possible. Keep your head up and look ahead, not down at the load, and avoid twisting or leaning sideways		
6	If you need to, put the Ingot/load down and adjust your grip before continuing the lift		
7	Stack ingot in such a way that larger part of ingot at upper side, so that easy to grab the ingot. Stack five ingots on each other only.		
8	Remove one by one ingots for dispatch or weighment with the help of pneumatic manipulator and stack it on wooden pallet then strap with strapping machine		



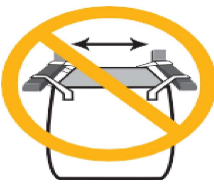
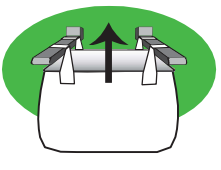




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9	Use lifter to load the ingot bundle in dispatch vehicle		
10	For unloading of ingots from vehicle use lifter and follow the above procedure as per job specific activity	Refer job specific fig.	

6.4.1 Loading/handling of Jumbo bags

Sr no.	Check Point	Don'ts	Do's	Remarks
1	Never suspend an JUMBO BAG using fewer lift loops, sleeves, etc., than have been provided.			
2	Never gather loops to lift with one hook, unless the JUMBO BAG is specifically designed and approved by the manufacturer for doing so			
3	If lifting with one hook, slings or other lifting devices must be used to keep the loops vertical and prevent damaging lateral forces			
4	Ensure all forklift tines, crane hooks, bars or handling devices used are free of sharp edges or protrusions. Edges must be rounded to at least the thickness of the lift loops, sleeves, etc., used to support the			

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	JUMBO BAG. The radius must be a minimum of 5 mm.			
5	<p>Never allow personnel to stand or place any appendage under a suspended JUMBO BAG.</p> <p>All personnel must be safely clear of any potential hazards when lifting, handling or emptying an JUMBO BAG.</p>			
6	The distance between the forklift tines must be adjusted to the correct width to ensure all lift loops or sleeves are vertical to prevent damaging lateral			
7	<p>Maintain a clear line of sight when moving an JUMBO BAG. Never move the JUMBO BAG if your line of sight is blocked.</p> <p>When handling by forklift, hold the JUMBO BAG close to the mast, as low as possible with the mast tilted back to an appropriate angle.</p>			
8	<p>Keep the JUMBO BAG clear of the floor so there is no contact with the floor or the wheels of the forklift. Never drag or push an JUMBO BAG.</p> <p>Never tilt the mast of a forklift truck forward when handling an JUMBO BAG.</p>			

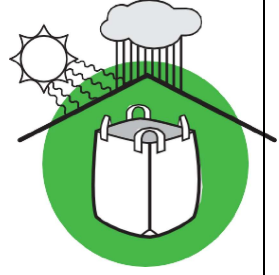
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9	Always use slings and all lift loops when righting an JUMBO BAG that has tipped over.			
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6.4.2 Storage of Jumbo bags

Sr no.	Check Point	Don'ts	Do's	Remarks
1	<p>Only stack JUMBO BAGs if they are designed to be stacked, you are sure of their stability and they are stacked using a "Pyramid" or "Supported" stacking method, maximum three bags only</p> <p>A. Pyramid Stacking</p> <ul style="list-style-type: none"> Each bag above the first layer must sit on at least four lower bags. Each layer is subsequently tiered inwards forming a pyramid structure. <p>B. Supported Stacking</p> <ul style="list-style-type: none"> bags are stacked against two retaining walls of sufficient strength 		<p>A. </p> <p>B. </p>	
2	Never approach or repair a damaged bag without first removing all bags stacked on top.			

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3	<p>Beware of water or moisture contamination inside storage facilities:</p> <p>Always try to store your JUMBO BAGs inside a covered facility or warehouse that is free from any water or moisture contamination that could come into contact with your JUMBO BAGs and damage them</p> <p>sunlight & UV rays:</p> <p>Always protect your JUMBO BAGs from sunlight and the harmful effects of UV rays.</p> <p>Exposure to UV rays will weaken the strength of an JUMBO BAG</p>		
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6.4.3 Unloading of Jumbo bags:-

Activity:- Lifting of Jumbo bag from Truck

Hazard :- falling from truck

Precautions :- Climb on truck/trailer using staircase and check the floor of the truck/trailer.



Place crane hook/ forklift fork inside lifting sleeves and take load in the hook and step down from truck

Hazard :- Falling of bag on person

Precautions:- Get down from truck/trailer using staircase



Hazard:- Falling of bag





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Precautions:- Lift the bag with hook and check the stability of hoisting. If crane or jumbo bag is not stable then release bag back and inform Foreman/Manager
Follow above handling steps.

Activity: Remove the staircase

Hazards: Damage to staircase

Precautions: Remove the movable staircase from behind the truck and keep the staircase away from parking point.

Activity: Removing of wheel choke

Hazards: Injury to truck driver

Precautions: Call the truck driver and ask him to remove the wheelchoke from the wheels

6.5.1 Loading/ Unloading/Storage of refractory pallet

1. Stacking pallets of the same size will produce an evenly distributed stack. This will reduce the chances of the stack shifting or falling. It also reduces the amount of empty space between stacks, making it the most efficient way of stacking.
2. When working with different-size pallets, always place the largest item on the bottom row. This also applies to the products on the pallet. Stacking items of uniform size and shape next to each other will prevent products from shifting and falling.
3. Do not exceeds height limitation of brick pallet as per OEM recommendation
4. Do not exceeds the weight limitation of refractory pallets as per OEM recommendation.
5. Put the heaviest Refractory pallets on the bottom of the stack. This will create a stable base with a lower center of gravity.
6. Center the load on the forks as close to the forklift mast as possible. This will help prevent tip-overs of the equipment or load.
7. Never overload a lift truck past its rated capacity.
8. Do not put extra weight on the rear of a counterbalanced forklift to allow an overload.
9. Adjust the load to the lowest position when traveling.

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10. When possible, correctly pile and cross-tier all stacked loads.
11. Ensure worker have the proper PPE's.

6.5.2 Do's and Don'ts

Sr No.	Check point	Don'ts	Do's
1	Proper packaging, delivery, handling and storage of bricks help to prevent breakage, cracking, chipping, spalling and other damages. Bricks should be stored on a flat surface and should avoid direct contact with the ground. They should be placed in a manner that facilitates easy handling and allows adequate air circulation around the bricks		
2	Bricks should not be stacked higher than 2 pallets. They should be hoisted in pallets or transported using a pallet jack		
3	Do not transport heavy pallets with manual trolley, chances of toppling		

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6.6 Loading and unloading of Bulk Material

1. Bulk material is generally comprising of material which can be dry powdery, granular or lumpy in nature and stored in heaps. It majorly includes minerals, ores, coal, chemicals, woodchips, sand, gravel, clay, cement, ash, by-products, dross, slag, waste generated during smelting etc.
2. Transportation of bulk material can be done via trucks, dumpers, bulkers etc.

6.6.1 Loading of Bulk Material:

- a) The movement of vehicle inside plant premise is to be done as per section 5.1 and its position at the loading zone to be done as Section 5.3.
- b) The transportation and loading vehicle/drivers must comply with the HZL Vehicle Driving and Safety Standard.
- c) The loading zone should be clearly marked with the position of the vehicle for loading and direction of vehicle motion. Display boards can be used for further detailing.
- d) There should be unidirectional route. Reversing of vehicle must be prohibited. The loading zone should be free from the movement of persons. A designated pathway for movement of person to be made. Loading Zone should be barricaded at the time of loading.
- e) The loading can be done directly from the Silos or with the help of loaders, excavators, tele-handlers etc.
- f) During loading from silo, a proper arrangement must be made for movement of the spout positioner (flexible hose/arm/loading chute) for even material filling into the container. The loading chute of silos must be provided with arrangement to maintain hygiene and not create any environment hazards.
- g) Loading with help of loaders or tele handlers, at least 6 feet gap to be maintained between the loaders and the trucks/dumpers. A designated place (ramp like arrangements) can be made for charging the material into transporting vehicles.
- h) A signal man must co-ordinate the activity of filling. The dumpers/trucks should not be filled up-to the brim. The height of the heap should be maintained within loading volume of vehicle.
- i) There should be no spillage from the hauling vehicle during transportation. The transported material should be covered by tarpaulins (covers) to avoid fly-off while material handling. In case of bulkers, the top covers to be closed before the bulker leaves the loading Zone.
- j) Individual site specific procedure/ SOP to be made for every material handled under bulk material handling. The vehicles carrying hazardous substances should comply with the statutory requirements of Chemical handling and Waste Disposal Management. It should not create any HSE incident during handling.

6.6.2 Unloading of Bulk Material:

- a) All vehicles in which material received from outside or handled within the plant premise must comply with HZL Vehicle Driving and safety Standard.
- b) A designated unloading station to be defined where material is to be emptied.
- c) The unloading station should not be a hindrance in the main route or road of the plant and do not restrict the

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movement of other vehicles in the plant.

- d) The vehicle movement at unloading station should be unidirectional. Reversing vehicle is strictly prohibited.
- e) In case of pneumatic unloading, vehicle parking to be marked. All high pressure lines used for pneumatic conveying must be free from the cracks and damages. Trained persons must do the unloading of vehicle and a site procedure or SOP to be made for pneumatic unloading of Bulkers.
- f) While unloading the material directly into bays and waste disposal site, the area must be kept solid and straight ground. Unevenness in the ground might result in toppling of the transporting vehicle.
- g) There should be no HEMM movement at least 10 meter of the vehicle when the vehicle is unloading the material at bays or sites.
- h) Material transported in bags which require manual unloading, the weight of each such bag should not exceed 50 Kgs.

Activity: Loading, Handling & unloading of acid/Chemical/hazardous material tanker

Associated Hazards:

- Toppling of Hazardous material carrying Tanker
- Minor/Heavy leakage from tanker body
- Hazardous material tanker valve damaged /failed
- Hazardous material Filling cover may open /loose
- Collision of Hazardous material tanker - Completely destroyed/ruptured
- Fire in Tankers cabin and tanker failed to move
- Hazardous material overspill while loading
- Person may have injured due to entanglement /acid burn
- Hazardous material may have spilled over the ground
- Public may have injured due to acid burn
- Environmental issue due to Hazardous material spillage



Precautions:

- Hazardous material tanker physical inspection prior & after loading of hazardous material as per check list
- Hazardous material transportation in authorized tankers only
- Use of standard gasket for flange & valve
- Hydraulic test certified & third party approved tanker to be allowed for Hazardous material handling
- Flange of pipelines to be guarded to avoid Hazardous material spray & overspill sensor of loading arm must in working condition
- Tanker earthing to be provided while loading of material Each tanker driver must have Transport Emergency Card (TREM CARD)
- Use of appropriate PPE's as per chemical handling standard
- V & D standard to be followed for vehicle movement
- Only hazardous material handling certified drivers allowed for Hazardous material transportation

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- Acids and caustics (i.e. bases) must be stored separately from each other. Secondary containers or trays must be used to separate acids and bases or other incompatible corrosives within a corrosive cabinet.

Emergency Plan

Be ready to handle emergencies safely. In emergencies like chemical fires, leaks and spills, act fast.

- Evacuate the area at once if you are not trained to handle the problem or if it is clearly beyond your control.
- Alert other people in the area to the emergency.
- Call the fire department immediately.



- Report the problem to the people responsible for handling emergencies where you work.
- Obtain first aid if you have been exposed to harmful chemicals.
- The MSDS and container label for a particular corrosive should give specific first aid instructions in case of exposure by skin or eye contact, inhalation, or swallowing.
- Unload leak/damage tanker at unloading point as soon as possible

Basic safety procedures concerning corrosives material

Following these basic safe practices will help protect you from the hazards of corrosive materials: -

- Obtain and read the Material Safety Data Sheets (MSDSs) for all of the materials you work with.
- Be aware of all of the hazards (fire/explosion, health, chemical reactivity) of the materials you work with.
- Know which of the materials you work with are corrosives.
- Store corrosives in suitable labelled containers away from incompatible materials, in a cool, dry area.
- Store, handle, and use corrosives in well-ventilated areas.
- Inspect containers for damage or leaks before handling. Never use containers that appear to be swollen.
- Handle containers safely to avoid damaging them.
- Dispense corrosives carefully and keep containers closed when not in use
- Stir corrosives slowly and carefully into cold water when the job requires mixing corrosives and water.
- Handle and dispose of corrosive wastes safely.
- Practice good housekeeping, personal cleanliness and equipment maintenance.
- Wear the proper personal protective equipment for each of the jobs you do.
- Know how to handle emergencies (fires, spills, personal injury) involving the corrosive materials you work

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with.

- Follow the health and safety rules that apply to your job.
- Flush contaminated eyes or skin with water for at least 20-30 minutes, sometimes longer, in case accidental contact. Call immediately for medical assistance.
- Know where to closest eyewash station and safety showers are located, and how to use them.

Note: For more detail regards chemical handling please refer **Standard for Chemical Handling and Storage (HZL/SRP 09)**

Activity: Handling & unloading of boiler bundle/Heavy machinery at site:

- Unloading & handling of boiler bundles from trailers
- Unloading of heavy machinery spare from trailer

Associated Hazards:

- Toppling of Boiler bundle carrying Trailer
- Boiler bundle lifting crane may toppled
- Boiler bundle may fall down
- Collision of Boiler bundle trailer - Completely destroyed/ruptured
- Fire in Trailers cabin and trailer failed to move
- Bursting of tires
- Boiler bundle lifting tools, geared & slings may have got damaged
- Person may have injured during lifting & shifting activity
- Load hitting any plant facility
- Nearby structure /machine may have damaged due to fall down
- Crane boom failure while lifting bundles
- Crane tipping over

Precautions:

- Boiler bundle trailer physical inspection prior & after loading/unloading of
- Boiler bundle as per check list
- Boiler bundle transportation to be carried out with appropriate trailer
- which can handle load of bundle & size.
- Use of appropriate PPE's for handling of boiler bundle
- V & D standard to be followed for vehicle movement
- Only certified riggers & signalman perform duty while bundle lifting & shifting work
- All lifting tackles must be third party certified and color coded with valid
- certificate available.

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- All lifting tackles must be visually checked before use for any damage.
- Crane must be third party certified with valid inspection certificate. & crane check list also filled before lift.
- Check the swing radius of the crane and ensure that it is unobstructed by any facility. Ensure that crane is positioned correctly.
- Always follow load chart for lifting any load.
- Correct lifting angle must be used for lifting 60 degrees is the best lifting angle.
- Crane positioning must be checked via site visit and marked on plot plan of the plant to ensure that ground is stable for bearing crane weight.
- Always provide barricades and proper signage to keep unauthorized personnel away from the lifting area.
- No critical lift allowed so lift plan must be in place for unloading & handling of boiler bundle/heavy machinery
- No person is allowed under crane boom movement area

Emergency Plan

Be ready to handle emergencies safely. In emergencies like bundle toppled/boom failure/structure damage etc. act fast.

- Evacuate the area at once if you are not trained to handle the problem or if it is clearly beyond your control.
- Alert other people in the area to the emergency.
- Call the fire & rescue department immediately.
- Report the problem to the people responsible for handling emergencies where you work.
- Basic safety procedures concerning corrosives It is important to check the equipment regularly to ensure that it is well maintained
- All professionals using the equipment should be properly trained to ensure not only their own safety but also of others at the site
- All heavy lifting machines have load limits. It is imperative that the load
- Operators who are using the equipment to transfer heavy machinery should be constantly communicating with the people on-site
- It is essential to recognize any blind spots
- Ensure that employees are aware and alert
- Practice good housekeeping, personal cleanliness and equipment maintenance.
- Wear the proper personal protective equipment as per work perform
- Know how to handle emergencies & whom to contact first
- Follow the health and safety rules that apply to your job.

Note:

For more detail regards Lifting & Shifting please refer **Standard for Lifting & Shifting of Equipment & Material Standard (HZL/SRPSC/10)**

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Crane Position



Lifting of bundle after all checks



Stand for bundle on plane surface



Lifting of bundle after all checks



Signal for Crane



6.7 Unloading and Storage of Bars

6.7.1 Unloading :

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- Permit to Work shall be taken before starting the work along with JSA.
- Proper isolated area shall be provided for bar stocking, cutting and bending with proper barricading of the area
- During handling (shifting, loading or unloading) tag lines shall be used to control the movement of the load of reinforcement or structural steel when a crane is employed.
- The workmen shall stand away from Line of fire of material being moved/unloaded by crane. The slings and ropes used shall be of adequate load carrying capacity, to avoid accidents as per HZL Lifting & shifting standard.
- Manual movement/unloading/shifting of reinforcement bars specially of large diameter shall be avoided.
- During manual handling of bars proper support/manpower should be provided along with shoulder pad .
- While being loading or unloading from motor vehicles it shall be properly blocked with wheel chokes, brakes alone shall not be dependent upon to hold them.
- When motor vehicles are being loaded or unloaded near passageways or walkways, adequate warning signs shall be placed on each end of the vehicle to warn pedestrians and the drivers of the other vehicles.
- Loading of projected/over hanging bars from the vehicle length is not allowed
- Ladder shall be used to climb up/down the vehicle.
- Unloading shall always start from top.
- All vehicles used for reinforcement bar loading, unloading & shifting shall be VDSS certified only
- When power hoisting equipment is not available, the bundles of reinforcing bars may be skidded from the truck over timbers or rails extending from the truck bed to the ground. Timbers (dunnage) should also be located on the ground to support and elevate the bundles and keep them free from mud on the jobsite.
- When a bundle is opened and some of the reinforcing bars are removed, the bar with the tag should remain with the bundle
- Reinforcing bars (rebar) are shipped from the fabricator for specific parts of the structure. When conditions at the jobsite permit, reinforcing bars are delivered to a storage or laydown area and unloading will be as directed by the Ironworker Foreman.
- Bars are most economically moved from the truck to an area close to where they are to be used. When the reinforcing bars are unloaded to the storage area, it is important that the location of the area be selected for easy access by truck and re-handling of the bars to the area of placement in the structure.

6.7.2 Reinforcement Stacking and Unstacking

- Stacking reinforcements maximizes space utilization and facilitates control. When planning reinforcement stacking, the following points must be considered:
- The permissible floor loading and the design load-handling capability of storage racks.
- The site layout with adequate walkways and aisles.
- Materials routing in and out.
- Method of stacking to be used.
- Available or required materials handling facilities and equipment.
- Area lighting with avoidance of shadow areas.
- Pallet design and load bearing capacity.

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Stability of stacks must be determined by:

- A safe ratio of height to base area.
- Sound interlocking of the materials, either naturally or artificially.
- Good placement of every component in stack, with no overhangs.
- Steel reinforcement bars and structural steel shall be stored in a way to prevent distortion, corrosion, scaling and rusting. Reinforcement bars and structural steel sections shall be coated with cement wash before stacking, especially in humid areas. In case of long-time storage or storage in coastal areas, reinforcement bars and steel sections shall be stacked at least 300 mm above ground level with adequate wooden packing. Steel sections shall be stacked upon platforms, skids or any other suitable supports. Bars of different types, sizes and lengths shall be stored separately to facilitate issues in required sizes and lengths without cutting from standard lengths. Ends of bars of each type shall be painted with separate designated colors.
- Whenever the rebars are ordered, the area where it must be unloaded must be moisture and dust free. Also at the time of unloading, use timber beds in order to avoid contact with dirt and water. Bars shall not be kept in moist area or laydown area
- Covering the steel rebars with polythene sheets will protect the reinforced bars from moisture. Alternatively, a covered shed can be used.
- Maintain the stockpiles orderly and store them according to their sizes and lengths separately for easy identification.
- Optimize the stacking height for the reinforced bars. The more the stacking height, the more load bars will have to endure at the lower layers. The excessive load may damage the Ribs on the surface of the rebar, which in turn reduces tensile strength.
- Stack area of reinforcement steel shall be free from overhead electrical line & grasses.
- Tag lines shall be used to control the load in handling reinforcing bars or structural steel when a crane is used. Heavy steel sections and bundles of reinforcing bars shall be lifted and carried with the help of slings and tackles.
- Stack and block poles as well as structural steel, bar stock, and other cylindrical materials to prevent spreading or tilting unless they are in racks.

6.7.3 Un-stacking:-

- The majority of incidents involving the collapse of stacked reinforcements occur when a stack is being taken down. During this activity, the following must apply:
- One person only is responsible for the way the stack is reduced.
- If the person in charge had no part in the erection of the stack, he is to familiarize himself before work begins.
- The reinforcement stack is to be taken down tier by tier without “taking bites” out of it.
- The area around the stack is to be kept clear of tripping hazards.

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Stacking of Reinforcement at Construction site

6.8 Loading /Unloading /Storage of Gas cylinders

6.8.1 Placing of cylinders

- a) Compressed gas cylinders shall be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried.
- b) When cylinders are hoisted, they shall be secured on a cradle, sling board, or pallet. They shall not be hoisted or transported by means of magnets or choker slings
- c) Cylinders shall be moved by tilting and rolling them on their bottom edges, they should not be transported by rolling down. They shall not be intentionally dropped, struck, or permitted to strike each other violently.
- d) When cylinders are transported by powered vehicles, they shall be secured in a vertical position.
- e) Valve protection caps shall be in place and secured. The same should not be used for lifting cylinders from one vertical position to another.
- f) A suitable cylinder truck, chain, trolley or other steadying device shall be used to keep cylinders from being knocked over while in use. Such cylinders are not considered to be “in storage.”
- g) Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 6.0 m or by a non-combustible barrier at least 1.5 m high having a fire-resistance rating of at least one-half hour.
- h) Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or

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flame will not reach them. When this is impractical, fire resistant shields (GI sheet, Metal Cap, Ceramic Clothing etc. shall be provided.

- i) Cylinders shall not be placed in a location where they would be subject to open flame, hot metal, or other sources of artificial heat.
- j) Cylinders shall be placed where they cannot become part of an electrical circuit. Electrodes shall not be struck against a cylinder to strike an arc.
- k) Cylinders containing oxygen or acetylene or other fuel gas shall not be taken into confined spaces.

6.8.2. Treatment of cylinders

- a) No person other than the gas supplier shall attempt to mix gases in a cylinder. No one except the owner of the cylinder or person authorized by the owner shall refill a cylinder. No one shall use a cylinder's contents for purposes other than those intended by the supplier.
- b) No damaged or defective cylinder shall be used- See valid date of cylinder on arm (of LPG) or on collar of compressed cylinder, generally there are two round about one indicates the month while other indicates the year.
- c) No flammable material should be stored in the close vicinity of this cylinder or in the same room in which it is kept
- d) Prohibition of employment of children and intoxicated persons.- No child under the age of eighteen years and no person who is in a state of intoxication shall be employed in-charge of loading or unloading or transport of any compressed gas cylinder or in any premises licensed under these rules
- e) No person shall smoke and no fires, other than blow pipe flames for repairs, or no articles or such other substances of flammable nature or liable to spontaneous ignition or to cause or communicate fire or explosion shall be allowed at any time in proximity to a place where any cylinder for flammable gases is being filled, stored or handled

Cylinders shall be adequately supported during handling.

1. Conveyors, trolleys and cradles of adequate strength shall, as far as possible, be used when moving the cylinders.
2. The cylinders shall be handled carefully and not be allowed to fall upon one another or otherwise subjected to any undue shock.
3. Sliding, dropping or playing with cylinders is prohibited.

LPG gas cylinders and cylinders containing liquid gases shall always be kept in an upright position and shall be so placed that they cannot be knocked over.

1. Cylinders used in horizontal position shall be secured that they cannot roll.

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- Open flames, lights, mobile phones, lighting of fires, lights, mobile phones, lighting of fires, welding and smoking shall be prohibited in closed proximity to any cylinder containing flammable gases expect those while in use for welding, cutting or heating .
- Working places shall not be classified as storage places for the purpose of licensing.

6.8.3 Storage

- Cylinders shall be stored in a cool, dry, well ventilated place under cover, away from boilers, open flames, steam pipes or any potential sources of heat and such place of storage shall be easily accessible.
- The storage room or shed shall be of fire resistant construction.
- Thin wall cylinders such as liquefied petroleum gas cylinders and dissolved gas cylinders shall not be stacked in a horizontal position.
- The DA should be storage separately from Acetylene cylinder not less than 6m
- Cylinders containing flammable gases and toxic gases shall be kept separated from each other and from cylinders containing other types of gases by an adequate distance or by a suitable partition wall.
- Cylinders shall not be stored under conditions, which will cause them to corrode.
- Cylinders shall not be stored along with any combustible material.
- Empty cylinders shall be segregated from the filled ones and care shall be taken that all the valves are tightly shut

7 Material Storage in Central Store:

7.0.1 Do's:

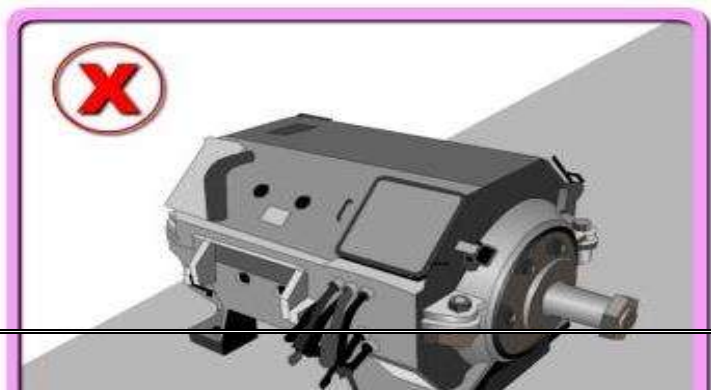
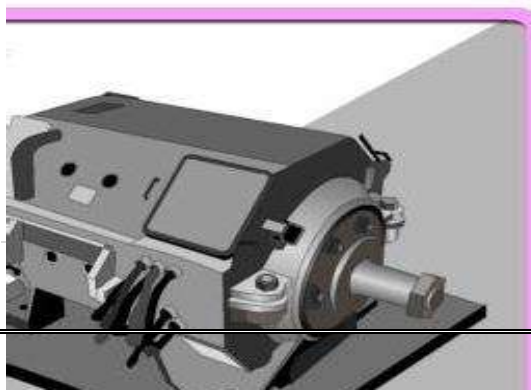
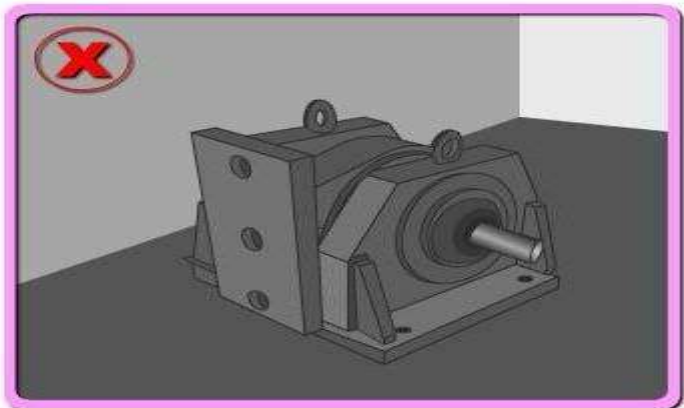
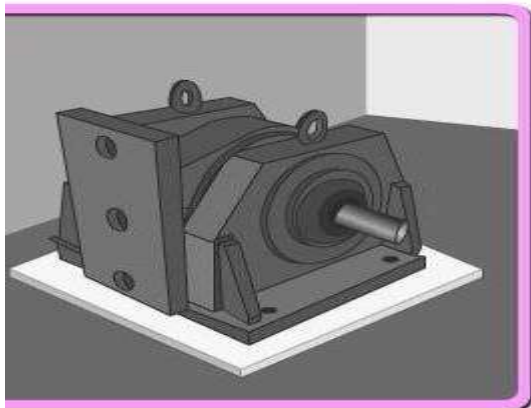
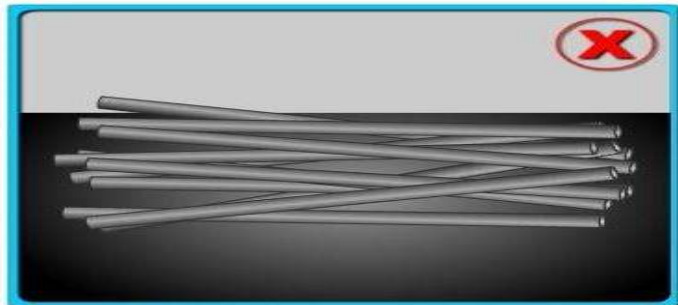
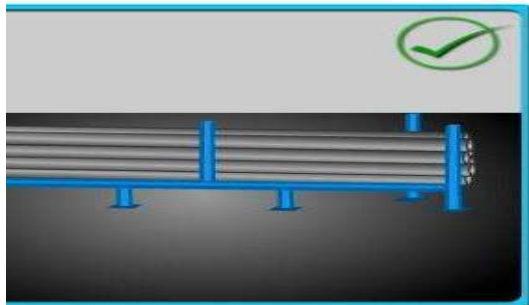
- Keep all storage containers and area dry.
- Material in stored must be categorize.
- Always Keep heavy items at the bottom of the shelves/ racks.
- Pipes, sheets and plates should be stored in bundles or stacked accordingly.
- Lubricants must be stored in a closed place. Lubricant barrel/drums/cans must have secondary containment to avoid spillage.
- First-In-First-Out (FIFO) system must be followed while storing material.
- Items must be kept on designated space as per there volume and weight.
- Remove all nails from the packaging before stacking in the racks.
- Emergency exits of storage area to be clearly marked and easily accessible.
- Use ladders to excess material stores at height.
- Material to be kept properly sealed.
- Always cover the bulk material with tarpaulins/sheets to avoid emissions.

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7.0.2 Don'ts:

1. Don't allow anyone access the storage area.
2. Don't keep inflammable materials near to each other
3. Don't stack loose material like bags, bricks, wooden planks above 7 feet in height.
4. Don't place material in the walkways/ guideways and emergency exits.
5. Don't store the compressed gas cylinders with open/ loose cap.
6. Smoking, eating and drinking is not permissible in storage areas.

7.0.3 Symbols for storage



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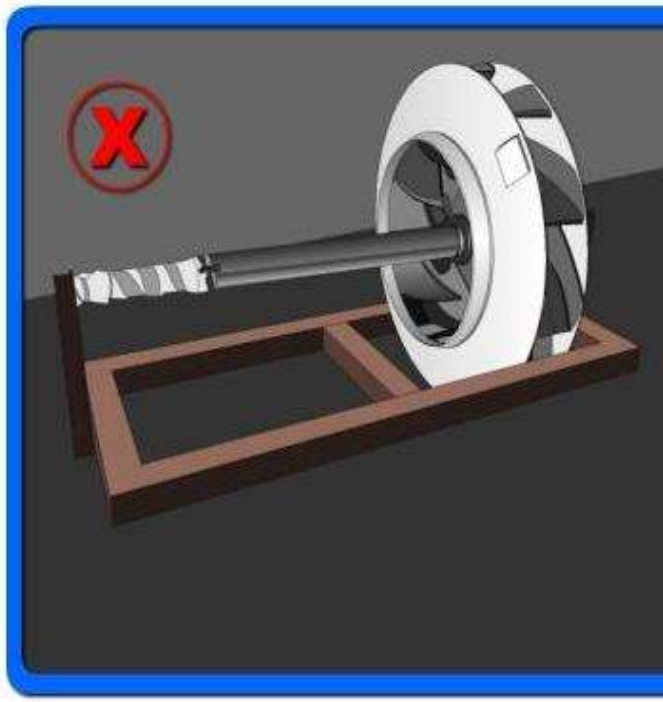
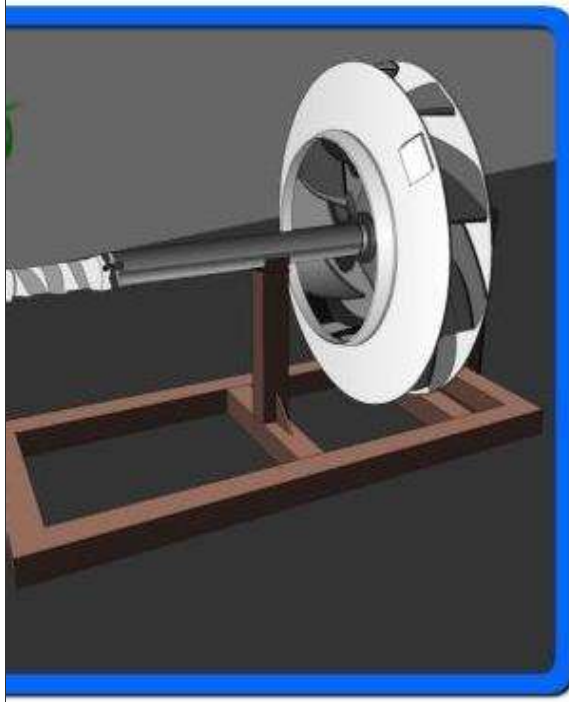
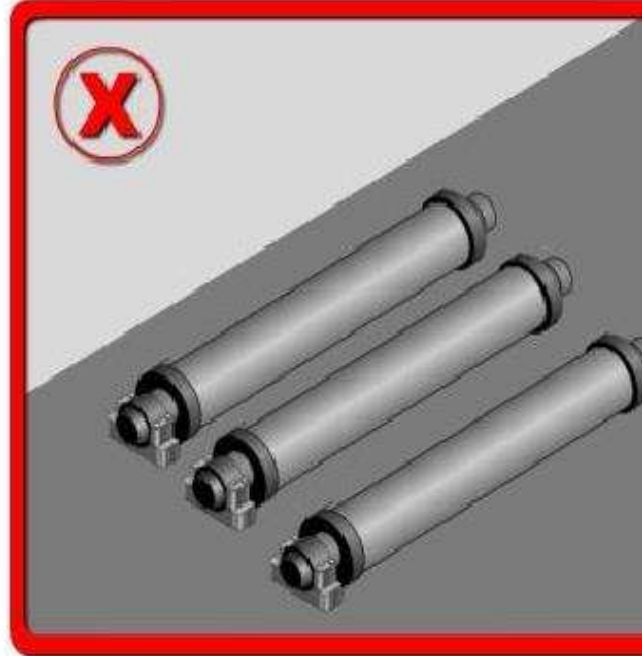
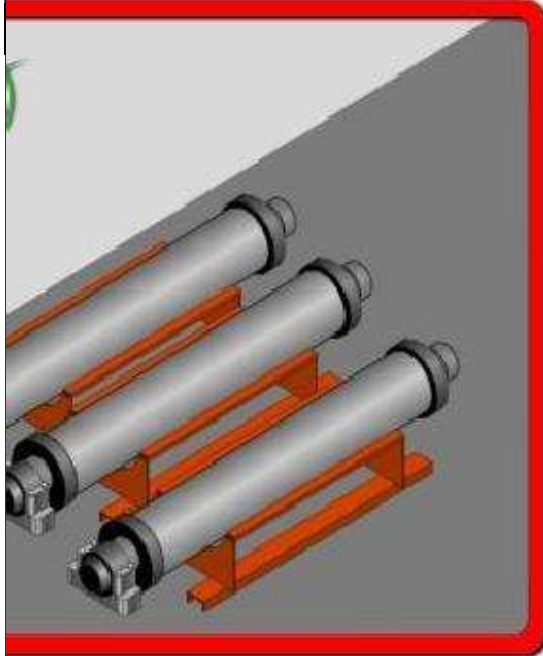
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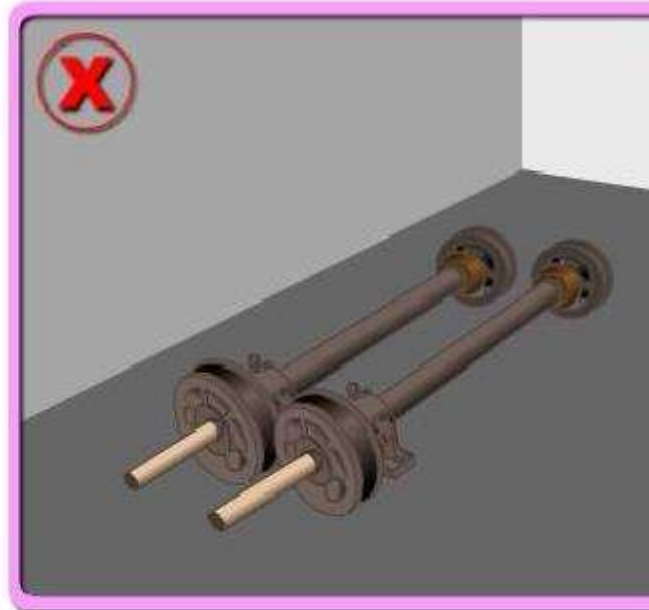
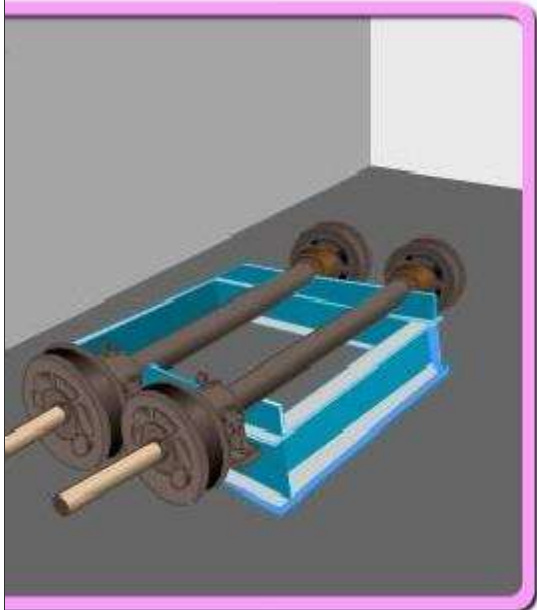
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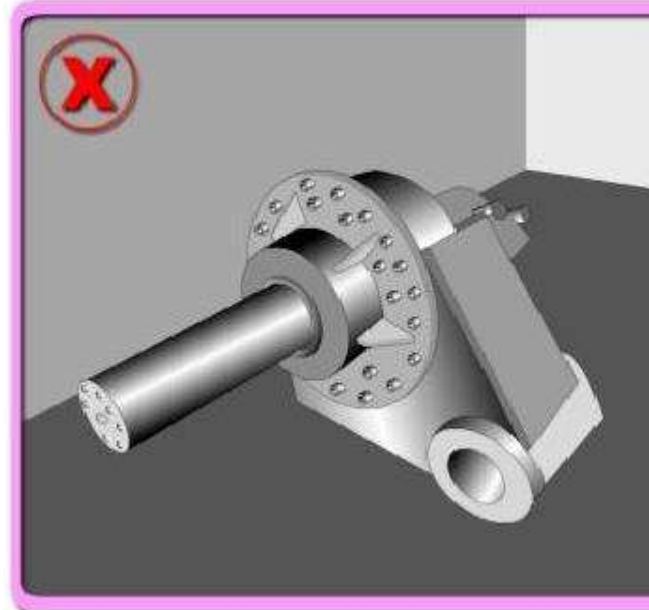
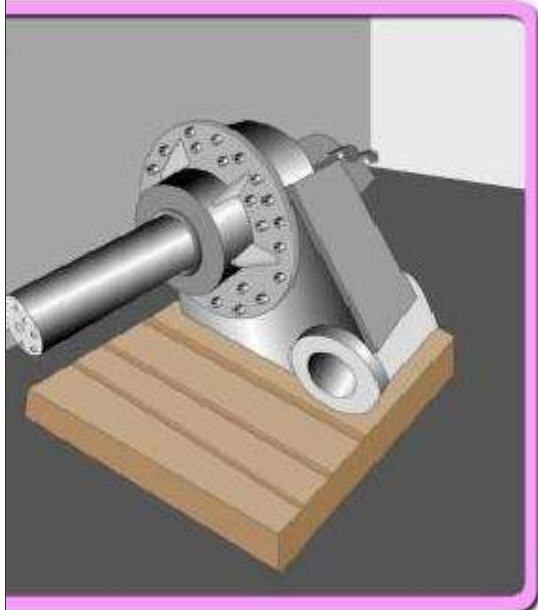
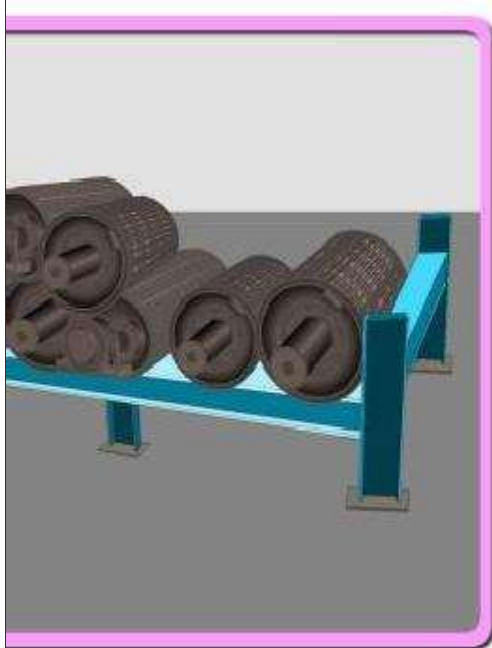
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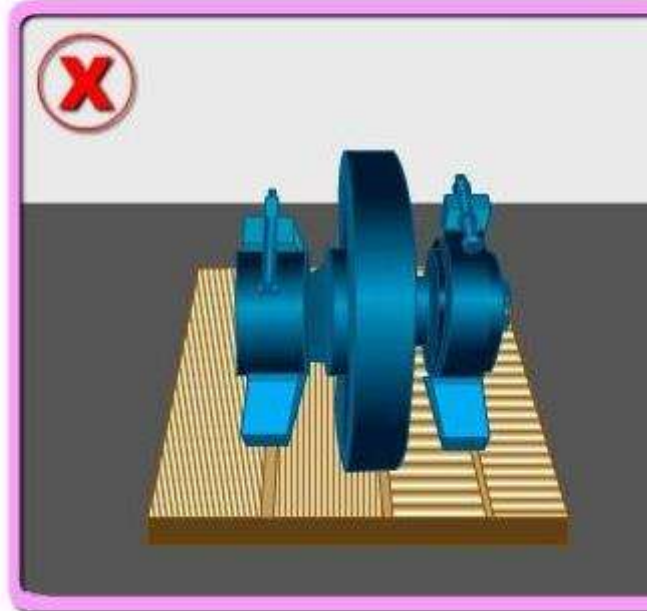
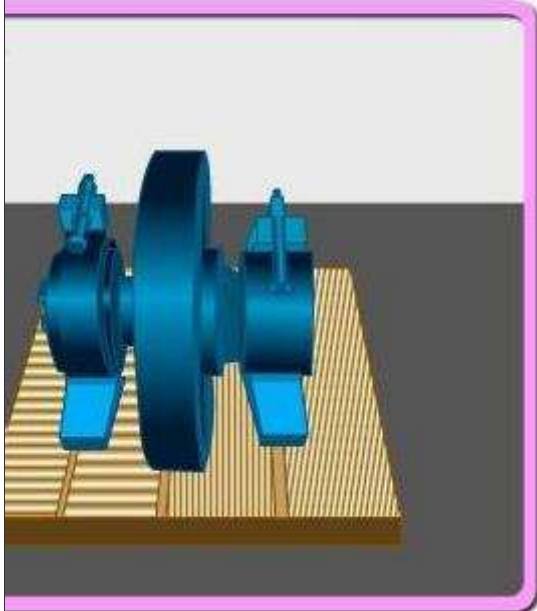
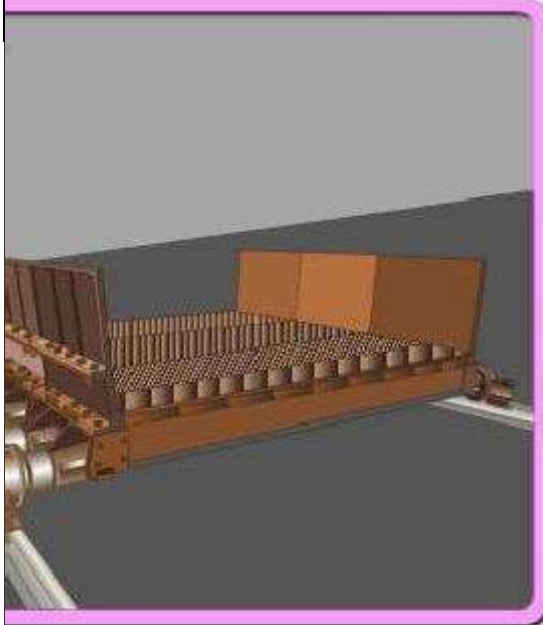
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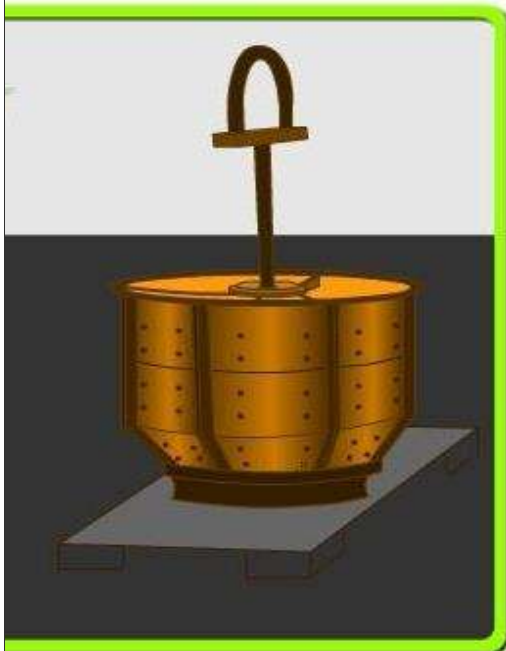
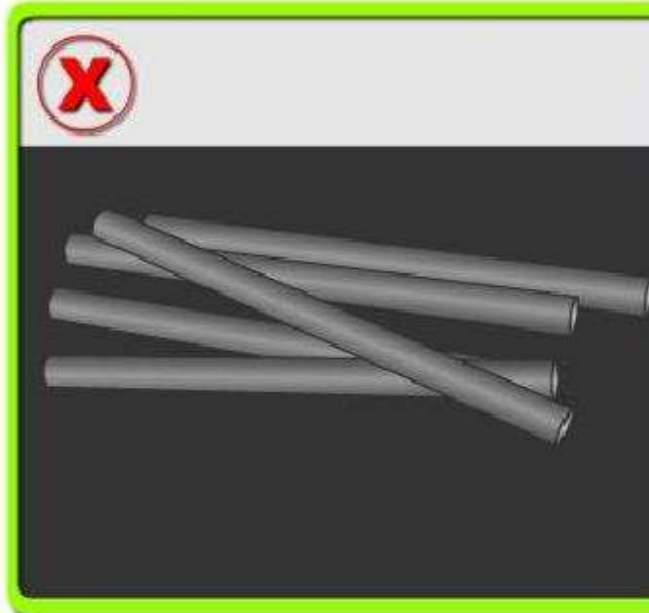
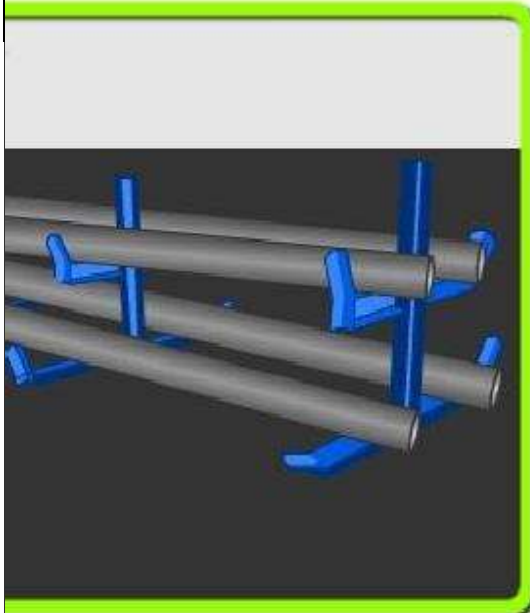
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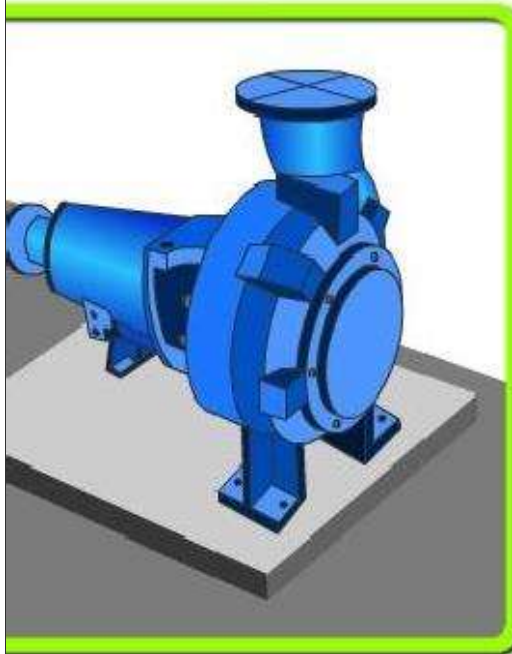
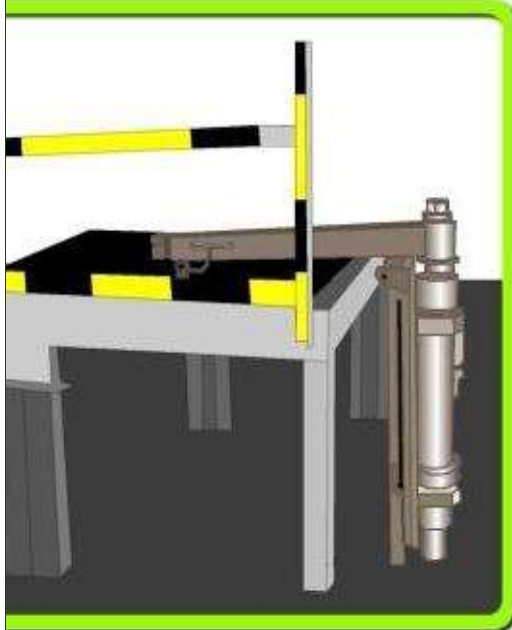
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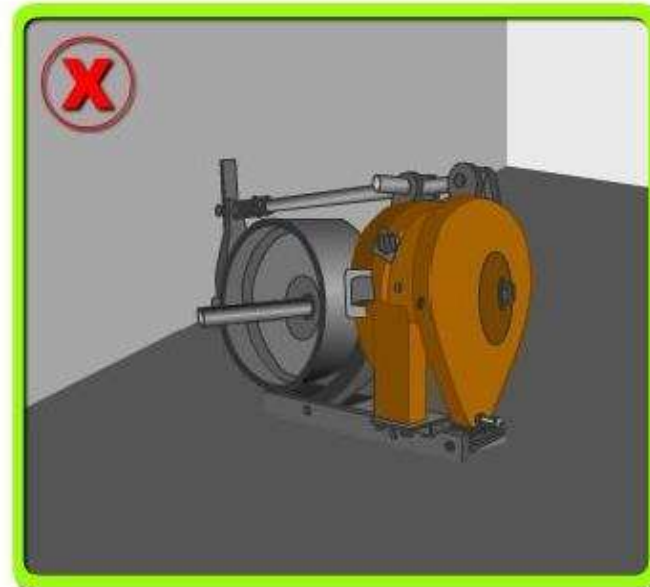
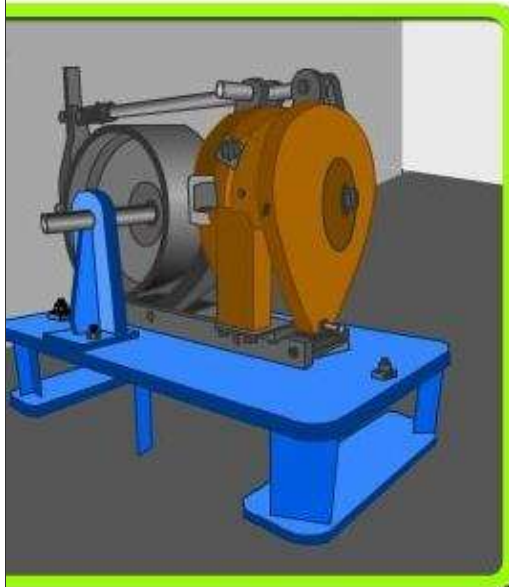
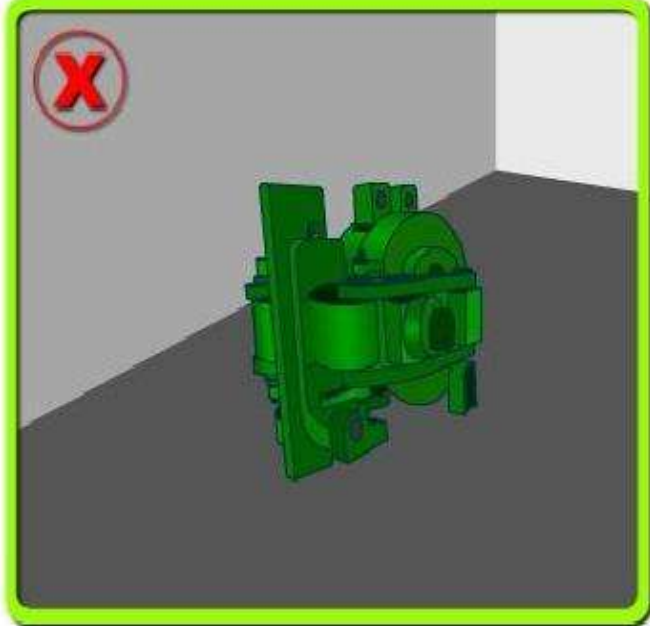
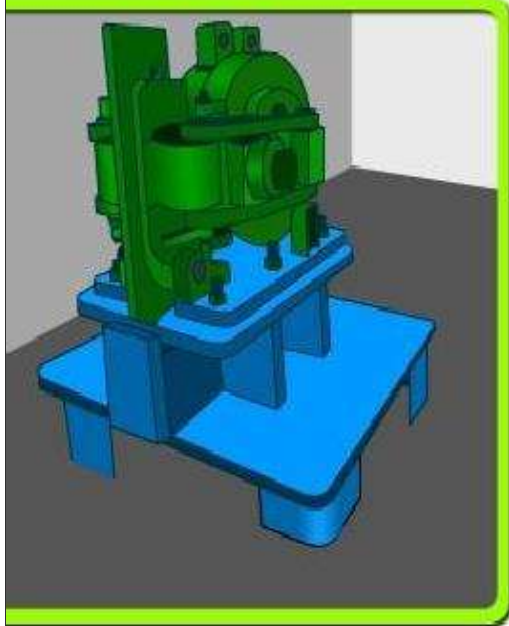
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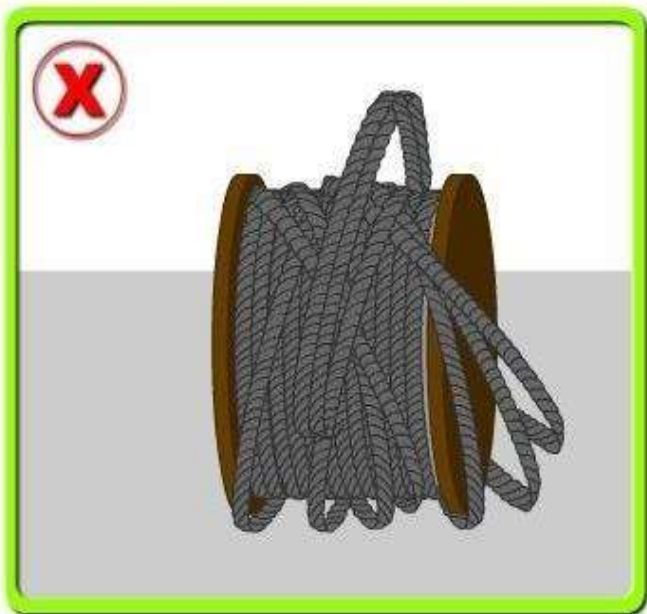
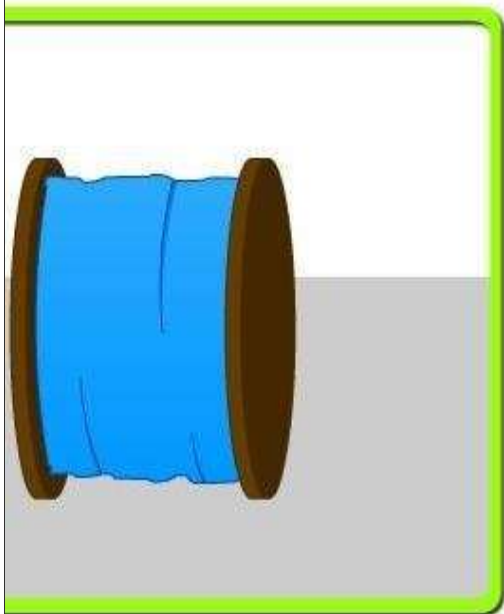
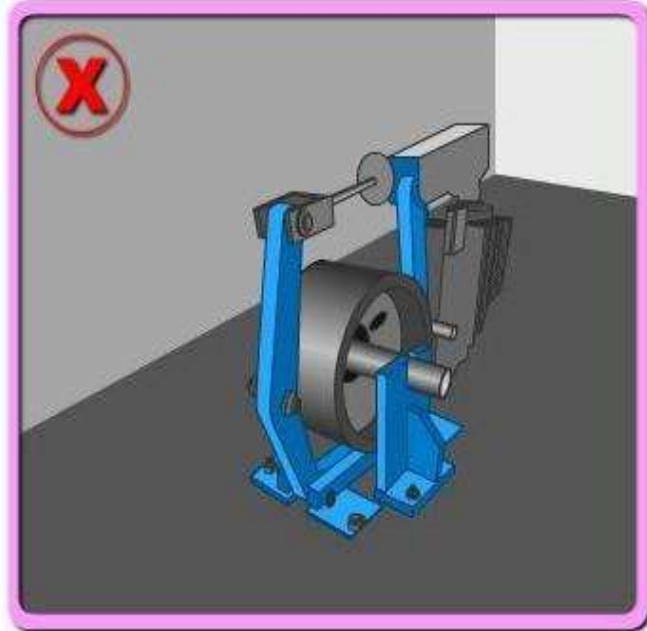
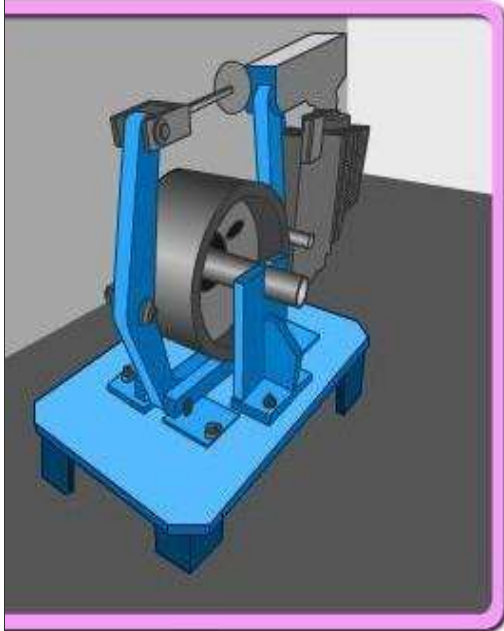
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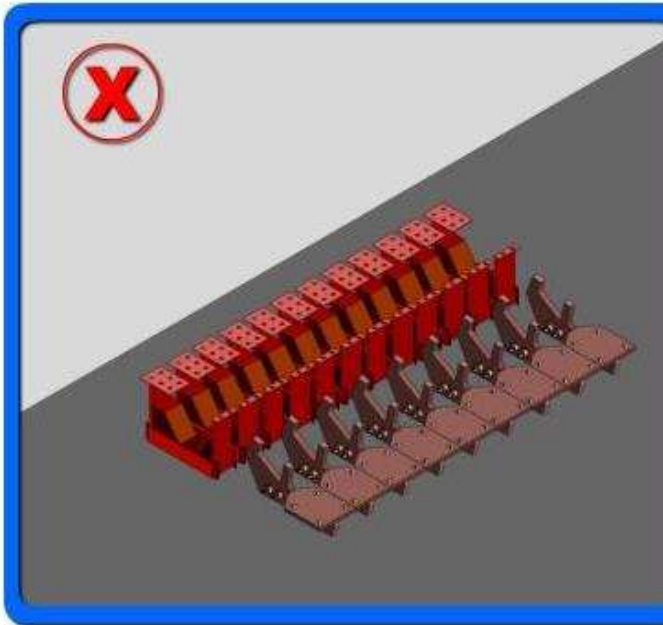
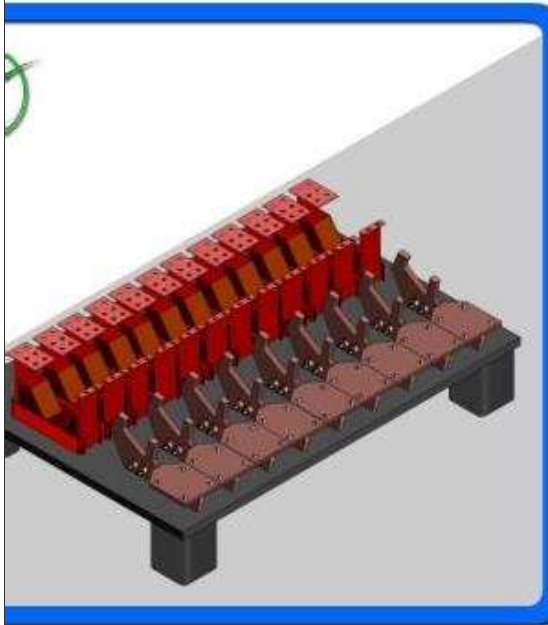
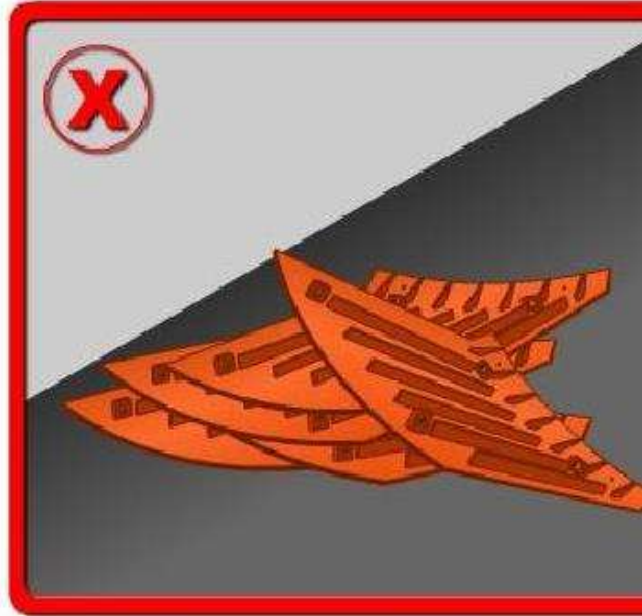
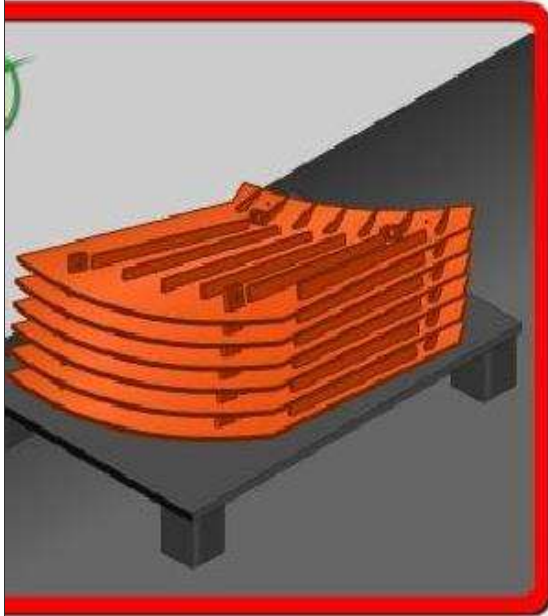
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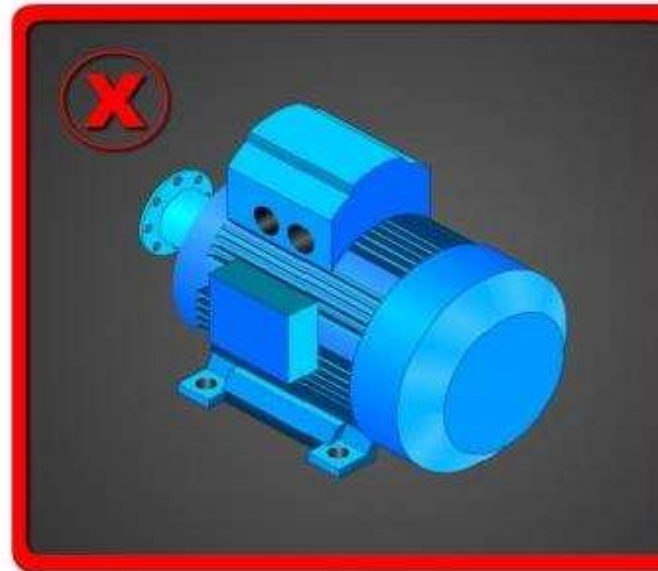
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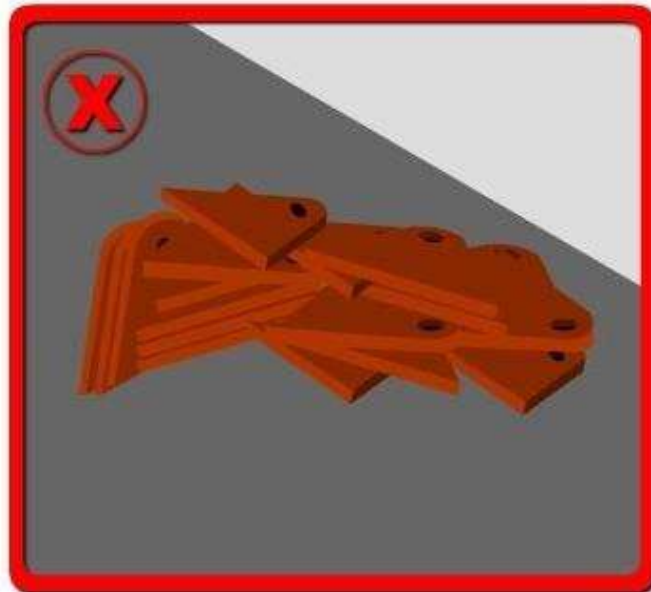
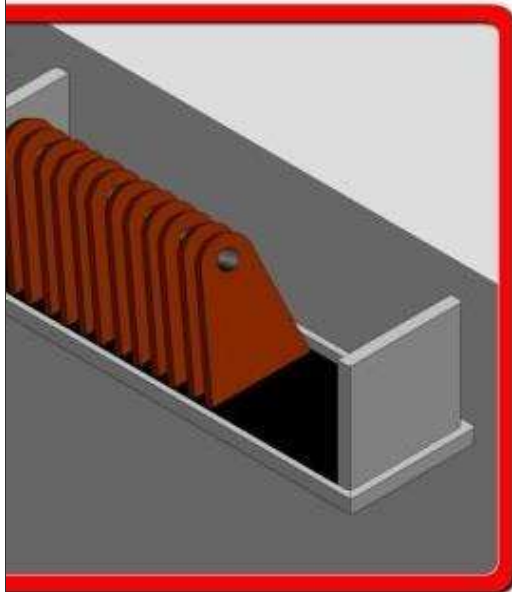
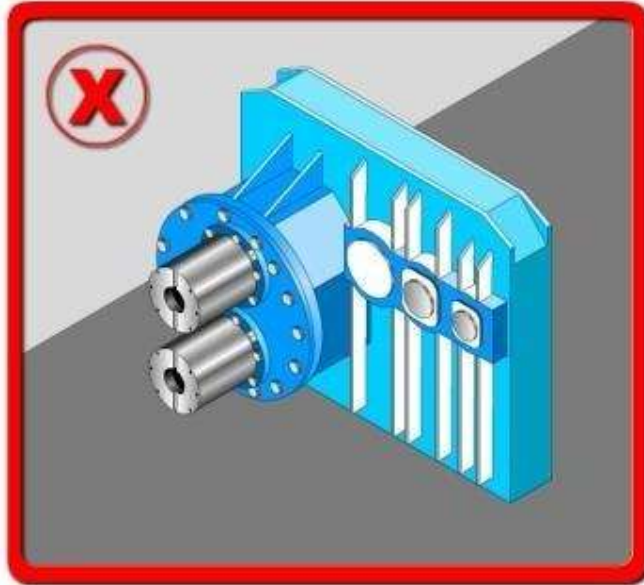
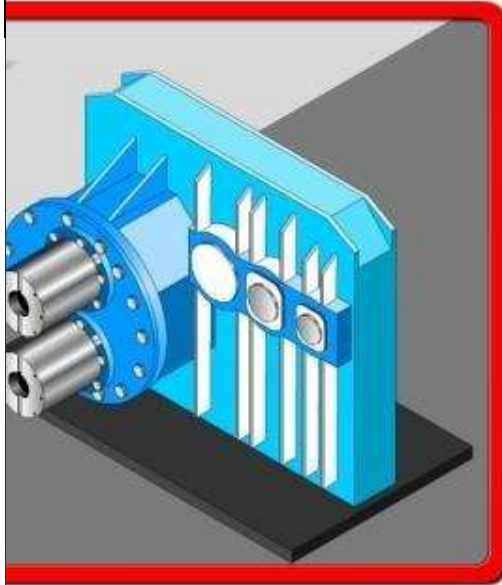
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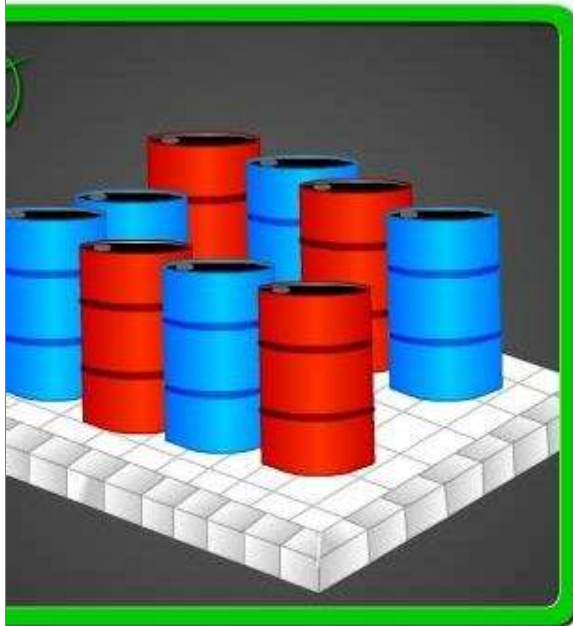
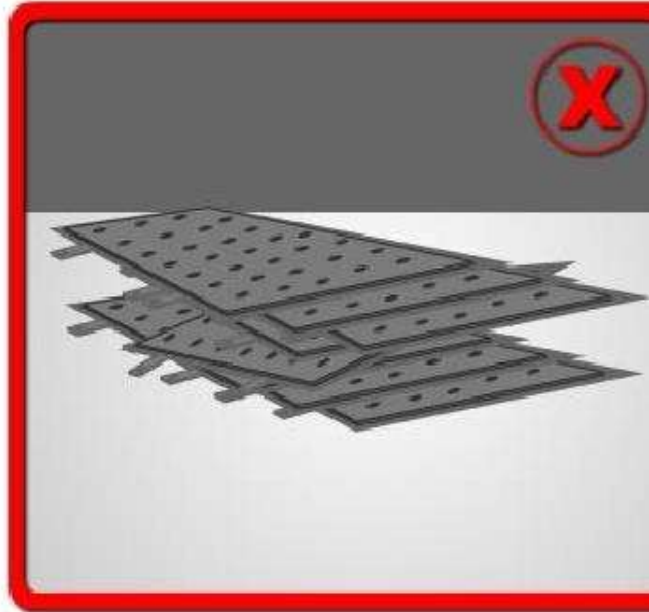
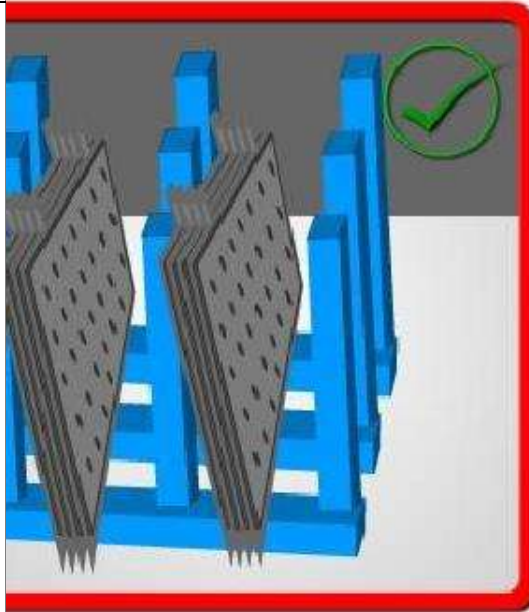
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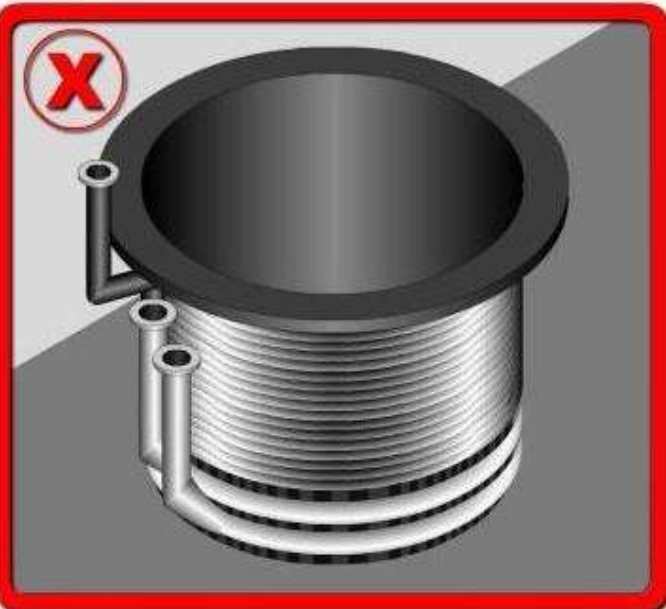
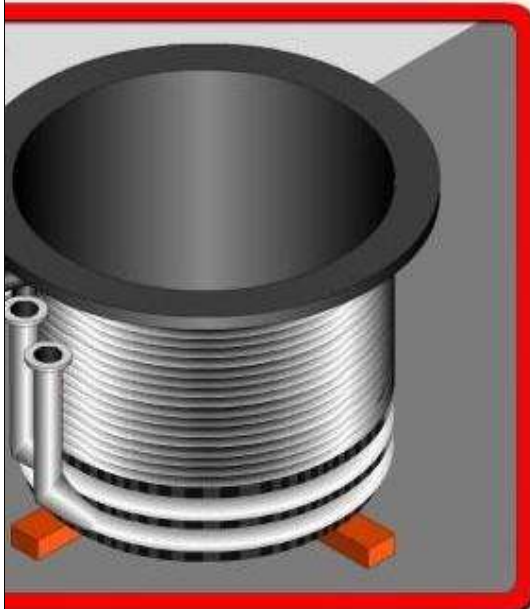
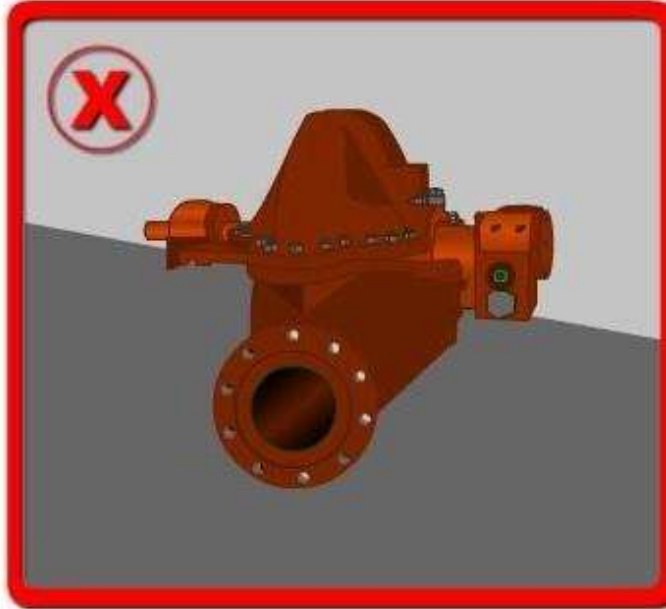
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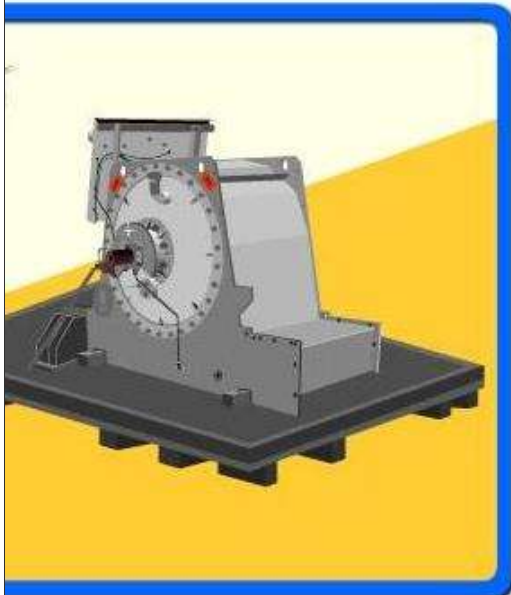
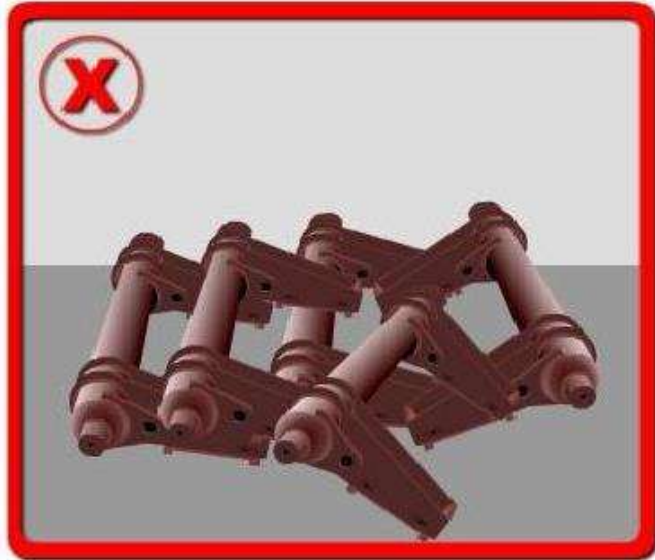
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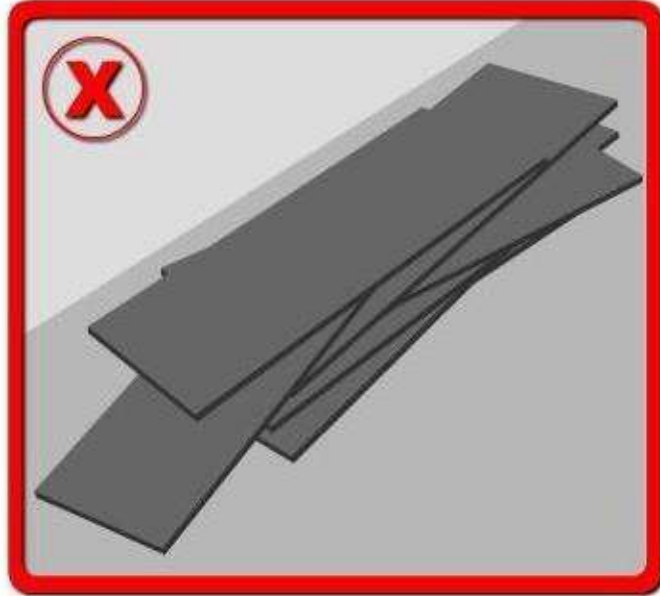
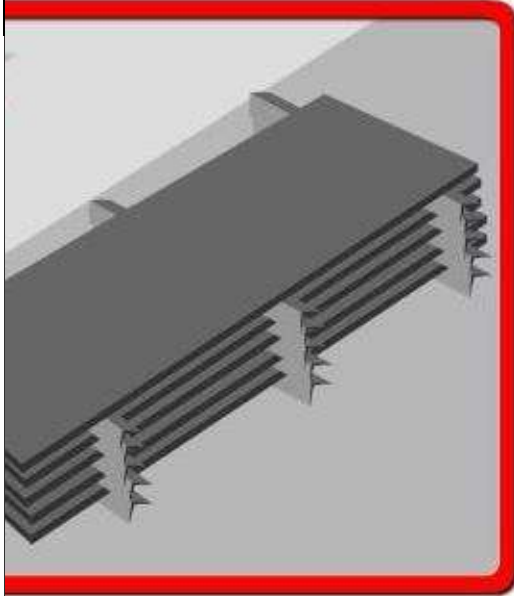
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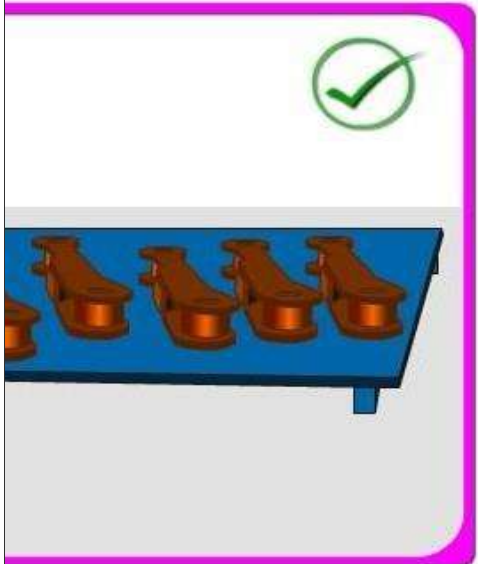
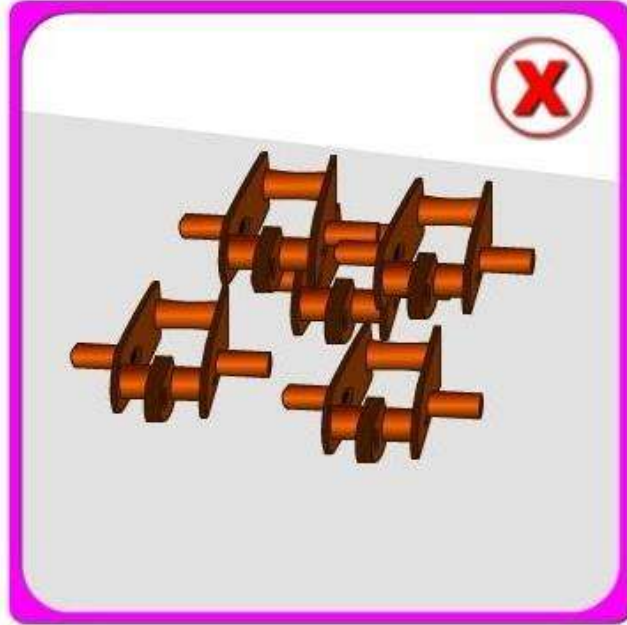
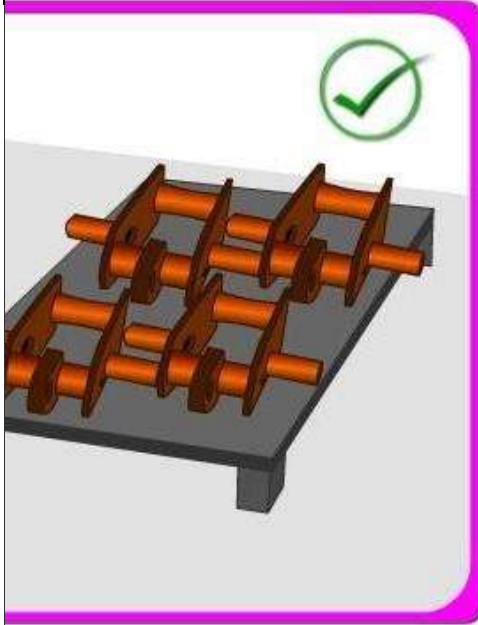
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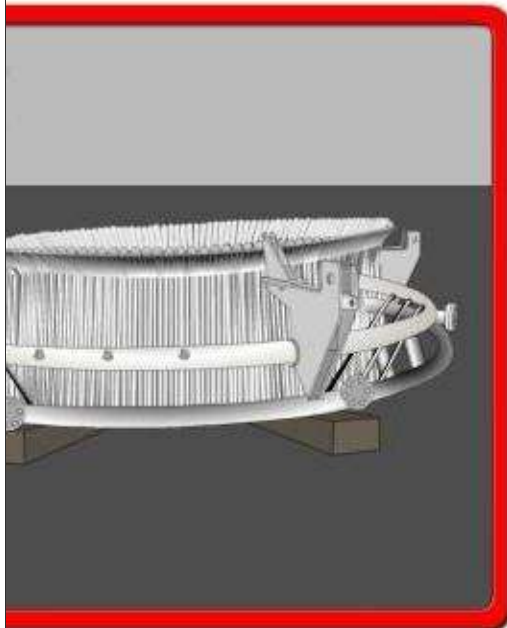
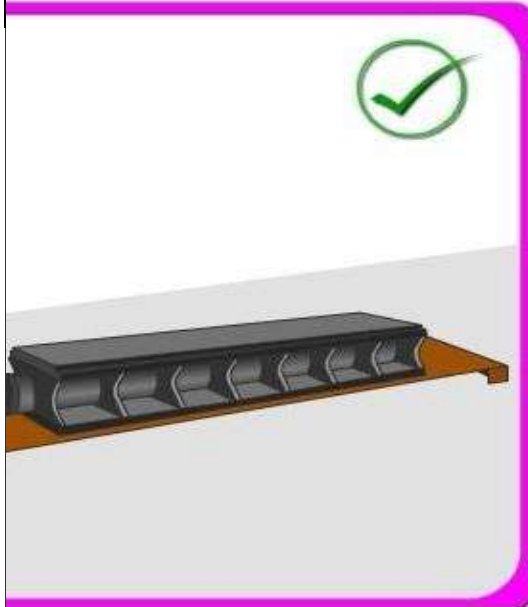
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