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Various Construction Machinery Analyses

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Abstract: ***Construction is the various hazards available industry. At the same time these hazards make more reportable or non – reportable accident in the construction field. Most of the accidents are arrived due to the construction machinery. Now, in the modern construction field the usage of machinery is quite high. Maintenance and it will also focusing on calculating the overall equipment effectiveness. Utilization of machine properly and match their capacities to specific project requirements. Current practices and observations made in Indian construction industry. The effectiveness of construction machineries is a major factor that differentiates construction companies in terms of heavy construction and light construction. The objective of the work is to enhance the equipment effectiveness at a construction company. So we need to save the time in the construction field at the same time the machine related safety also important as well as reduce the accident.***
Keywords: Construction Industry, Equipment Machinery, Hazards, Time Series.

I. INTRODUCTION

Paver or asphalt paver is pavement laying equipment which is used in road construction. Paver contains a feeding bucket in which asphalt is continuously loaded by the dump truck and paver distributes the asphalt evenly on the road surface with slight compaction. However a roller is required after laying asphalt layer for perfect compaction.

1) *Compactors:* Compactors or Rollers are used to compact the material or earth surface different types of compactors are available for different compacting purposes. Smooth wheel rollers are used for compacting shallow layers of soil or asphalt etc. sheep-foot rollers are used for deep compaction purposes. Pneumatic tired rollers are used for compacting fine grained soils, asphalt layers etc.
2) *Tele Handlers***:** Tele handlers are hoisting equipment used in construction to lift heavy materials up to required height or to provide construction platform for workers at greater heights etc. It contains a long telescopic boom which can be raised or lowered or forwarded. Different types of arrangements like forklifts, buckets, cabin, lifting jibs etc. can be attached to the end of telescopic boom based on the requirement of job.
3) *Feller Bunchers:* Feller bunched is tree cutting heavy equipment used to remove large trees in the construction field. They cut the tree and grab it without felling, likewise gathers all the cut down trees at one place which makes job easier for loaders and dump trucks. DUMP TRUCKS: - Dump trucks are used in construction sites to carry the material in larger quantities from one site to another site or to the dump yard. Generally, in big construction site, off-road dump trucks are used. These off-road dump trucks contain large wheels with huge space for materials which enables them to carry huge quantity of material in any type of ground conditions.
4) *Pile Driving Equipment:* Heavy equipment used in construction site is pile driving equipment in case of pile foundation construction. This equipment lifts the pile and holds it in proper position and drives into the ground up to required depth. Different types of pile driving equipment are available namely, piling rigs, piling hammer, hammer guides etc. in any case the pile is driven into the ground by hammering the pile top which is done hydraulically or by dropping.

II. FUNCTIONS OF THE CONTROLS AND DISPLAY INSTRUMENTS

A. Starting Up

Starting the engine, the traction drive, the conveyor, the auger, the screed or the lifting devices can cause injuries or even the death. Make sure before starting any of these devices that no-one is working at, in or beneath the paver or within its danger area. Do not start the engine and do not actuate any controls when this is expressly forbidden. Unless otherwise specified in the operating instructions, the controls may only be actuated when the engine is running. Never crawl into the auger tunnel or step into the hopper or onto the conveyor when the engine is running. A moving auger or conveyor can cause severe injury or death. Never start this machine in an environment where it is believed explosive gases may be present, and never work in enclosed, unventilated rooms below ground level / underground. Always remember that the engine emits toxic and potentially lethal gases. Always ensure that the working area is well ventilated. Only mount or dis-mount the machine while the machine is stationary. Use the handles and retaining fixtures provided.

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Never adjust the driver's seat while the vehicle is in motion because the seat position may alter accidentally in the process. After setting the backrest position, check that it is properly secured in this position. When driving, always remain seated on the driver's seat.

B. Starting At Low Ambient Temperatures

Follow the instructions for starting at low ambient temperatures. When using starter gas, always follow the manufacturer's instructions for the type of gas being used. When starting the engine with the help of jumper cables, follow instructions precisely. Otherwise there is a risk of serious injury and damage to the machine, electrical damage and damaged electronic equipment resulting from a battery explosion, corrosive acid etc. Remove all the cell covers and place a cloth over the openings on the battery cells (this does not apply to zero- maintenance batteries). Ensure that no sparks can be caused when connecting the cables.

C. Conduct During Travelling

Always make sure during operation that no-one is endangered by the machine. Ensure that all protective covers and hoods are fitted and secured accordingly. When damages are detected, eliminate them immediately. Immediately stop operation when the paver finisher is defective. Do not let any persons ride on the paver finisher or on the screed. Remove any obstacles from the road and the work area. Always try to choose a driver position that is opposite to the flowing traffic. Lock the operating panel and the driver's seat. While travelling,

1) Do not allow arms and legs to hang out of the driver stand,
2) Do not lean beyond the outer edges of the paver finisher,
3) Do not climb from one vehicle onto another or onto permanent structures.

Keep a sufficient safety clearance to overhanging objects, other machines and points of danger. Be careful when travelling on rough terrain to keep the paver finisher from slipping, tipping or turning over. Never use the paver finisher beyond its capabilities to avoid losing control over the machine. Whenever the machine is operating, someone must always be in the driver's seat at all times. Where necessary, wear a seatbelt.

D. Visibility

The driver must look in the direction of travel and must always have a clear view of the route ahead. Especially when driving in the reverse direction, he must ensure that his path and the working area are clear. The machine must be equipped with the specified lighting equipment to suit prevailing working conditions. Check that all equipment operates in accordance with specifications. All headlights must be adjusted in such a way that other road users are not blinded by glare.

Table 1: Checks To Be Carried Out Before Starting Daily Work

CHECK	HOW
Emergency stop buttons on the operating panel and on the two remote controls	The diesel engine and all drives that are switched on must immediately stop.
Service brake	Step on the pedal while travelling at slow speed in the transport gear (with screed lifted). The paver must stop immediately and Must not pull to one side.
Parking brake	Pull the lever as far as possible while travelling at slow speed in the transport gear (with screed lifted). The paver must stop Immediately.
Steering system	The paver must immediately follow all Steering movements in a precise manner.
Horn- on the operating panel,- on the two remote controls.	Briefly press the horn button. The horn must be sounded.
Lights	With the ignition switched on, check the following lights by switching them on: - Parking/rear lights, low/high beam; - Stop lights; - Direction indicators, hazard warning lights.
Hazard warning lights of the screed (with various screeds)	With the ignition switched on, press the switches for extending/retracting the extendable parts of the screed. The rear lights (if equipped) must flash.
Gas heater system: - Bottle holders - Bottle valves - Pressure reducer	Firm seating - Cleanliness and tightness - Operating pressure (1.5 bar) - Proper functioning
Auger cover	For larger working widths, the width of the walkway plates must be increased and the auger tunnels must be covered. Hinged walkway plates must be folded down. Check that the side shields and plates and the covers Are firmly seated.

III. STANDARDS AND REGULATIONS OF CONSTRUCTION MACHINERY

A. Occupational Safety and Health Administration (OSHA)

No current OSHA standards apply specifically to compacting and baling equipment. However, current OSHA regulations on the control of hazardous energy sources (lockout/ tag out) [29 CFR 1910.147], and machine guarding [29 CFR Part 1910.212] are applicable to these types of equipment. In addition, the confined space standard [29 CFR 1910.146] may apply to entry into compacting and baling equipment. An OSHA publication, Concepts and Techniques of Machine Guarding , describes and illustrates methods that can be used for providing safeguards for balers and compactors [OSHA 1992].

B. American National Standards Institute (ANSI) Standards

ANSI publishes voluntary standards addressing safety requirements for a variety of equipment, including compactors and balers. These standards were last revised in 1997. Stationary compactor safety requirements are outlined in ANSI Z245.2 1997 [ANSI 1997a], and baling equipment is addressed in ANSI Z245.5 –1997 [ANSI 1997b]. The key points of the ANSI standards state the following:

C. Indian Standard Codes

Following are the Indian Standard Codes on Pile Foundations:

1) IS 2911 : Part 1 : Sec 1 : 1979 Driven cast in-situ concrete piles
2) IS 2911 : Part 1 : Sec 2 : 1979 Bored cast-in-situ piles
3) IS 2911 : Part 1 : Sec 3 : 1979 Driven precast concrete pile
4) IS 2911 : Part 1 : Sec 4 : 1984 Bored precast concrete piles
5) IS 2911 : Part 2 : 1980 Timber piles
6) IS 2911 : Part 3 : 1980 Under reamed piles
7) IS 2911 : Part 4 : 1985 Load test on piles
8) IS 5121 : 1969 Safety code for piling and other deep foundations
9) IS 6426 : 1972 Specification for pile driving hammer
10) IS 6427 : 1972 Glossary of Terms Relating to Pile Driving Equipment
11) IS 6428 : 1972 Specification for pile frame
12) IS 9716 : 1981 Guide for lateral dynamic load test on piles
13) IS 14362 : 1996 Pile boring equipment – General requirements
14) IS 14593 : 1998 Bored cast-in-situ piles founded on rocks – Guidelines
15) IS 14893 : 2001 Non-Destructive Integrity Testing of Piles (NDT) – Guidelines

D. AS 2159- 2009

The Australian Standard (AS 2159-2009) sets out the minimum requirements for the design, construction, and testing of piled footing for building structures on land or immediate inshore locations. It has excluded offshore or deep-water construction.

IV. RESEARCH METHODOLOGY

A pilot study was undertaken in which five site engineers were interviewed in order to identify the problems faced by construction machinery users. As the outcome of the interviews, thirty eight problems were identified that were classified under table 1 & 2.

Table 4.1: Risk Assessment For Construction Machinery

HAZARD	RISK LEVEL	CONTROL MEASURES
Injury or ill health due to exposure to exhaust or fuel fumes	Medium/Low	Do not operate in confined space. Use in well ventilated area, preferably with fume extraction ventilation. Avoid breathing or coming into contact with fuel.
Explosion or fire from fuel vapours	Medium	Stop engine before refuelling. Do not refuel while hot. Avoid spillage of fuel when refuelling. Ensure the fuel cap is properly secured after

		refuelling. Carry out visual checks for fuel leaks and repair before operation. Keep flammables away from the engine. Do not smoke while operating, servicing or refueling this machine.
Burn hazard	Medium/Low	Wear protective clothing during operation. Avoid contact with hot components. Allow engine to cool before attempting any maintenance (the muffler is fitted with a heat shield). Note warning label on engine.
Manual handling hazard	Medium/Low	Always use the proper lifting crane to move or load the equipment
Exposure to ultraviolet radiation if working outdoors	Medium	Wear sunscreen, hat, long sleeves and long pants.
Hearing Damage	Medium/Low	Hearing protection with a rating of 20Db must be worn. Note warning label on unit.
Injury from contact with moving parts	Low	All moving parts are protected. Do not remove guards or covers.

Table 4.2: PILE BORING / DRIVING

HAZARD	RISK LEVEL	CONTROL MEASURES
Sequencing of piling work (Conflict with other parts of the project construction creating unsafe working conditions)	High	Economic working, not just for time. Avoid return visits for piling rigs if possible.
Inadequately designed / constructed / maintained working platforms (Rig overturning, unsafe working conditions for operatives)	High	Ensure working platform is designed, constructed and maintained in accordance with published guidance or other appropriate best practice. Specify site investigation works to take account of the need for measuring near surface soil properties required for design. Construct platform according to specification, inspect regularly and maintain to original specification. Operate proper procedures for excavations (e.g. for removal of obstructions) and reinstatement.
Racking of/damage to reinforcement cages while lifting (Injury to operatives from falling steel bars)	High	Consider design of reinforcement cages to ensure adequate robustness for temporary lifting stresses. Consider provision of lifting rings etc
Contaminated spoil (Infection of piling operatives, contamination of the site and the surrounding area.)	Low	Use displacement piling methods unless these are technically unsuited to the site soil conditions or performance requirements of the foundation
"Immediate" environmental impact (Unacceptable levels of noise and/or vibration, hearing damage to operatives)	Very high	Determine acceptable levels of both effects that can be tolerated by the nearest receptors (both human and non-human). Compare these with predicted levels from piling techniques suited to the ground conditions and load bearing requirements, remembering to take account of anticipated programme periods and all ancillary operations. Enforce hearing protection zones. Use quiet hammers or alternative non- percussive installation methods (e.g. contiguous flight auger

Safety Precaution During Operation Of Equipment

1) The workers employed in the vicinity of pile drivers shall wear helmets conforming to accepted standards.
2) The pile shall be prepared at a distance at least equal to twice the length of the longest pile from the pile driver.
3) Piles being hoisted in the right should be so slung that they do not have to be swung or whip-round.
4) A hand rope shall be tied to a pile that is being hoisted to guide and control its movement.
5) When a pile is guided into position, workers shall not put their hands or arms between the pile and the inside guide, but shall use a rope for guiding.
6) A pile shall be provided with an iron ring or cap over the driving end to prevent grooming before the pile is hoisted.
7) When creosoted woodpiles are being driven, necessary precautions shall be taken to prevent workers from receiving skin or eye injuries from splashes of creosote.
8) No air or steam shall be blown down until all workers are at a safe distance.
9) The developer should also demand that the building contractor use standard scaffolding. This measure would be even more viable if the use of such equipment were stipulated in the final project design.

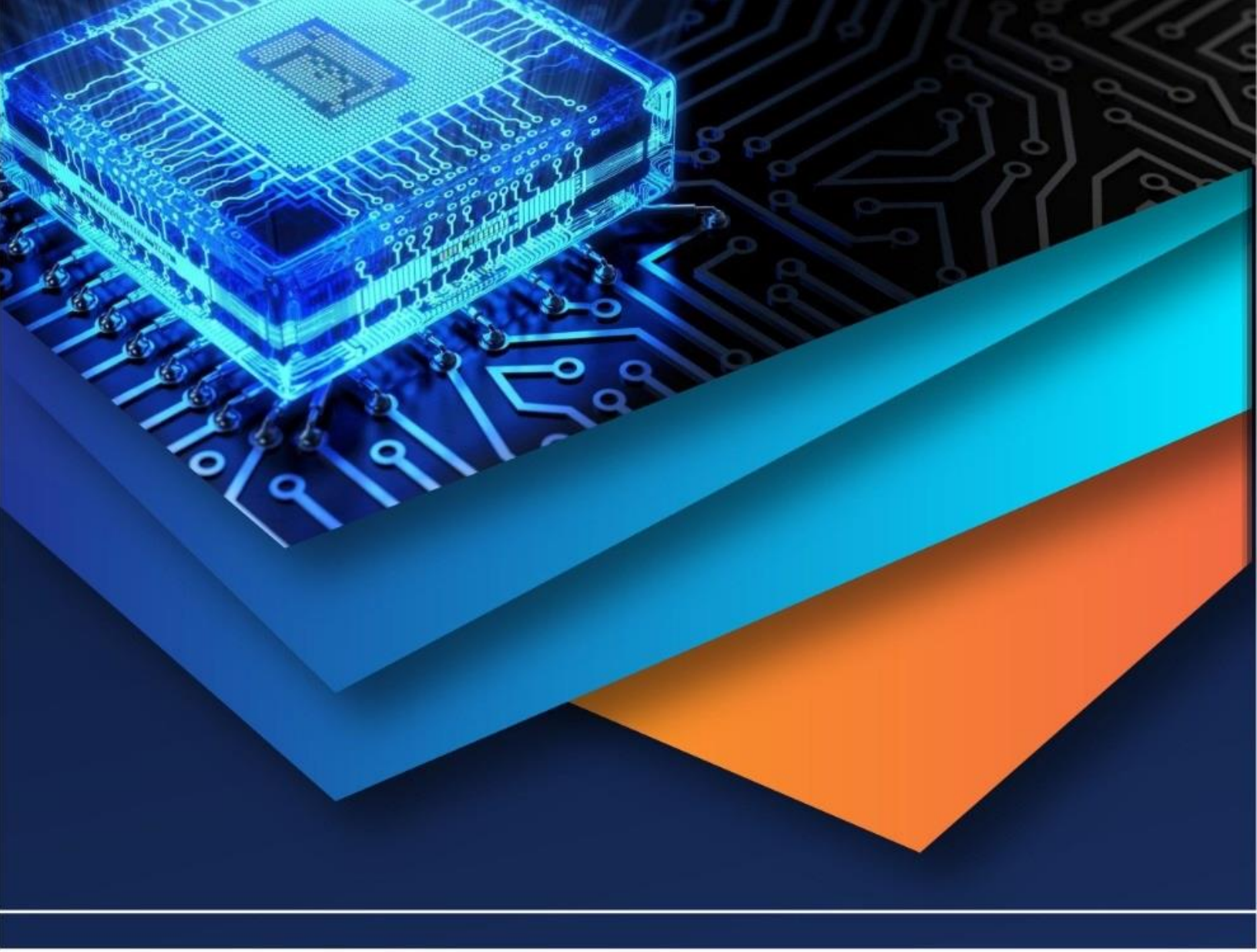
V. CONCLUSION

Construction is one of the highly hazardous industries in the world. In India around 5 million workers directly and indirectly depends on the industry. At the same time lot of reportable and non-reportable accidents also occur in the site. In construction industry the time is very important, that`s why the heavy machineries are mainly used. But it also makes some accidents. As a result, their preventive maintenance and repairs have become complicated. It was observed that, mostly, machinery hiring firms do not operate as pure hiring firms and hence do not consider satisfying the customers as an important requirement to stay competitive in machinery hiring the main cause of accident is unsafe act.

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