

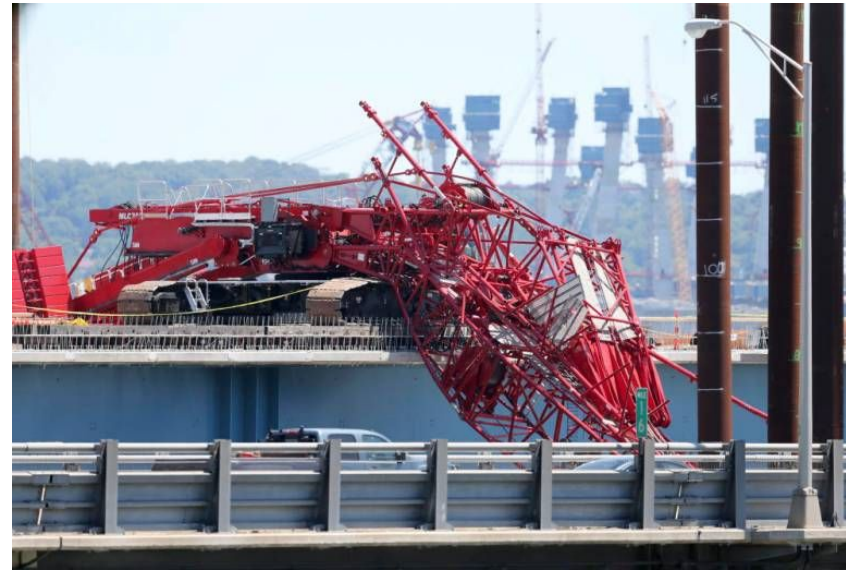
Safety Standards for Pile Driving

Draft 11 30 2023



July 2016

- Tarrytown NY
- Cuomo said the crane that collapsed had been using a vibratory hammer to drive in pilings when it "had an issue" that caused its boom to fall onto the existing bridge nearby.
- Manitowoc MLC 300



Soft spot for the pile?

OSH ACT of 1970 Section (5)(a)(1): The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that employees were exposed to being struck by a falling crane boom, load and/or components:

a) On or about July 19, 2016. A Manitowoc crane collapsed during pile installation operations. The boom of the crane fell and struck a cofferdam which employees were working from and it also struck an active bridge. A clamp with a corroded bearing plate which did not have jawed teeth was used as part of the vibratory hammer apparatus. The vibratory hammer unexpectedly released from the pile while the crane operator was attempting to partially extract and reposition a partially driven pile. The capacity of the crane that was used was lower than the required capacity of 5 times the load of the pile and the vibratory hammer during pile extraction. The vibratory hammer was used with leaky hydraulic hoses. A chain reaction failure of the crane mast followed by the breakup of the crane boom which occurred when it struck standing piles on its way down.

Among other methods, the following feasible and acceptable abatement methods to correct the hazard are:

- 1) Comply with ANSI A10.19 "Safety Requirements for Pile Installation and Extraction Operations".
- 2) Comply with the safety precautions and use contained in the Vibratory Hammer's Operations and Maintenance Manual.
- 3) Have the vibratory hammers operating/owners manual available on site.

Note: The employer is required to submit abatement certification for this item in accordance with 29 CFR 1903.19.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:

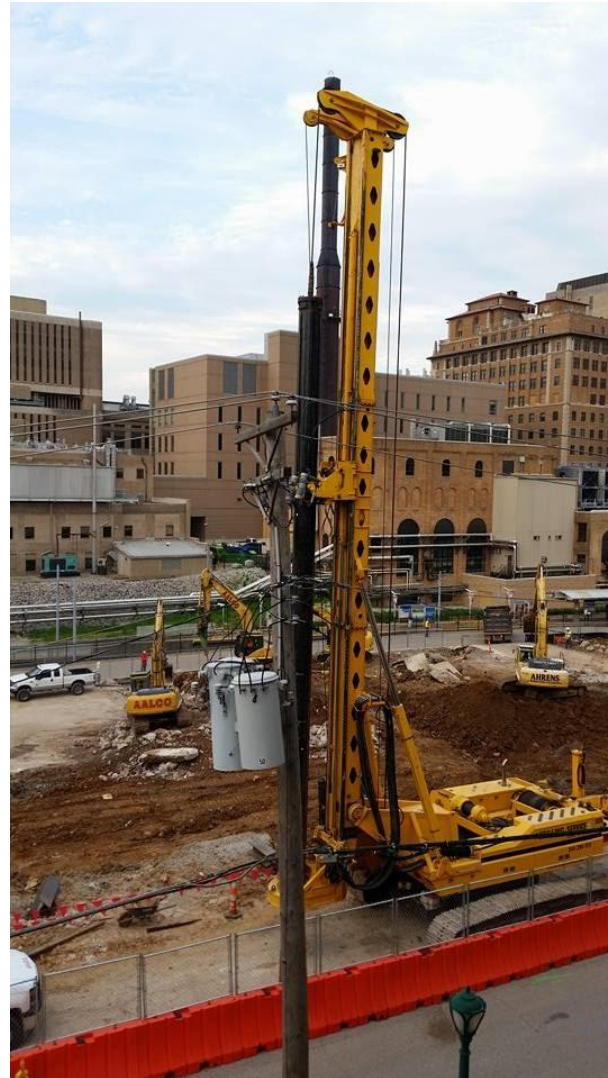
01/25/2017

Proposed Penalty:

\$12675.00

Pile Driving Safety

- Issue?
- Power lines!



St. Louis Aug 2015

reduction factor, ϕ shall be determined in accordance with applicable design codes

	<i>BR# 83040</i>			
Location	<i>West Abutment</i>	<i>Pier 1</i>	<i>Pier 2</i>	<i>East Abutment</i>
Foundation	Pipe Pile	Pipe Pile	Pipe Pile	Pipe Pile
Boring Used for Pile capacity analysis	T13	T13	T14	T14
Approximate Bottom of Footing Elevation	1190 ft.	1167 ft.	1167 ft.	1190 ft.

Table 2: Recommended Foundation Types and Assumed Footing Elevations.

ANSI A10.19

- 4.1 Prior to pile driving or extraction operations, a geotechnical report shall be developed to identify subsurface conditions and provide geotechnical conclusions and recommendations for design and construction of the project.

- Only allow employees to work with piles after they have been properly trained.
- Never allow workers under the hammer or core at any time.
- Always lift piles using proper slings or machinery.
- Pick up piles from the side opposite of other operations.
- Clear workers from the area when piles are hoisted into the leads.
- Do not undermine the rig or an adjacent structure when jetting or pre-excavating for piles.
- Clean augers of clods of earth and rocks as they are hoisted out of the ground.
- Cover or barricade holes made in advance to prevent a possible fall.
- Release the core sling on both sides when changing capblocks or a hammer cushion. Keep workers away from leads when capblocks or a hammer cushion is being changed.
- Keep the hammer under control during driving by keeping a slight pressure on the hammer drum brake.
- Shut off the hammer immediately if the pile breaks or start running into the ground.
- Watch the hammer hose closely when lifting the hammer at the end of driving, ensuring it does not catch.

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- 4.2 A site safety plan shall be prepared by the project constructor in conjunction with the pile driving contractor and shall be reviewed with all employees involved in or exposed to the pile driving operations on the project.

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- 4.4.1 The project constructor shall: 1. Inform the pile contractor of the depths and locations of subsurface hazards (such as voids, tanks, utilities) where pile driving equipment will be used.

Marathon Petroleum Company LP			
Pile Driving Procedure	Document No.: RSW-SAF-041-DT	Approval Date: 07-10-20	Page 1 of 6
	Revision No.: 6	Next Revision Date: 07-10-25	
	Document Custodian: Environmental, Safety and Security		

1.0 PURPOSE

- 1.1 This procedure provides the basis for safe pile driving operation.

2.0 SCOPE

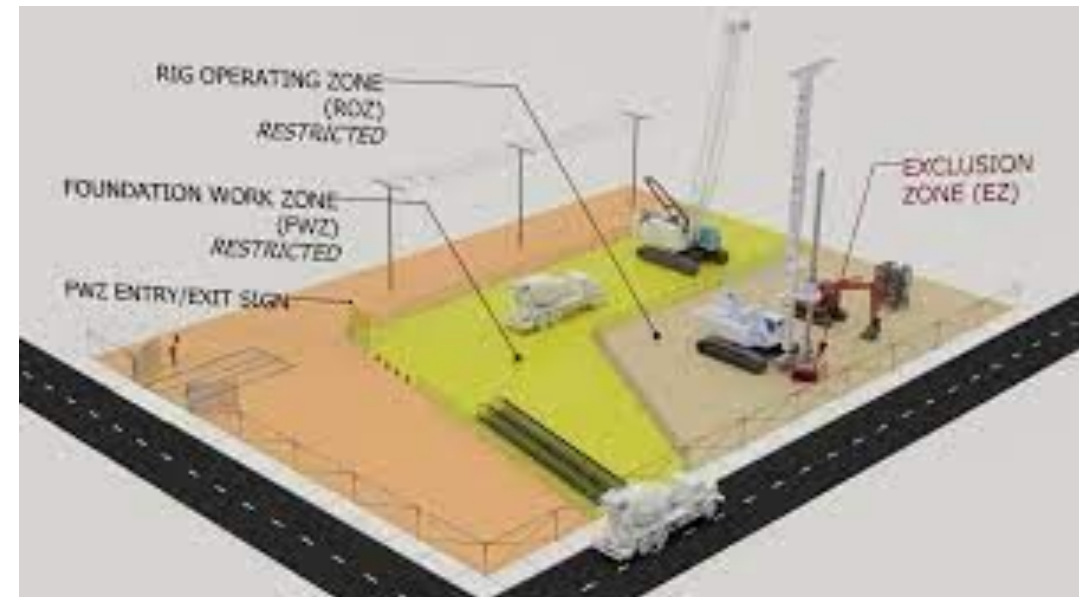
- 2.1 This procedure applies to all persons working on Marathon Petroleum Company, LP Michigan Refining Division property.
- 2.2 The following information is provided as a minimum level guide for safe pile driving operation.

3.0 GUIDELINE

- 3.1 Planning and Site Conditions
 - 3.1.1 Before commencement of pile driving operations site evaluations shall be conducted evaluating geological history including of prior excavations, geological hazards, environmental hazards, and groundwater conditions.

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- 4.4.1 .4 Organize and conduct a preconstruction meeting with the piling contractor to review the ground conditions, working platform design, installation, and maintenance, site access, location of laydown areas, delivery routes, and the site-specific safety plan.



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- 4.4.2 The piling contractor shall:
 1. Prior to initiating pile driving or extraction operations, develop a written site-specific safety plan and job hazard analysis (JHA) of the tasks involved with pile driving or extraction operations.



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- 4.4.2 .1 b Such site specific plans shall include, but are not limited to,
 - working over or near water,
 - fall protection,
 - rescue from heights,
 - water rescue,
 - emergency actions for fire,
 - severe weather, the location(s) of utilities (both above and below grade),
 - designated areas for equipment operations and materials storage,
 - assembly and disassembly sequences for pile driving equipment,
 - operation of pile driving equipment,
 - designated parties permitted within the restricted access zone,
 - the handling and storage of pile materials, equipment, pile cut off operations,
 - waste disposal,
 - mobile elevated work platform setup and use, and
 - project de-mobilization

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- 4.4.2.3 The piling contractor shall determine the ground bearing pressure generated by the pile driving/extraction equipment while under the maximum predicted load



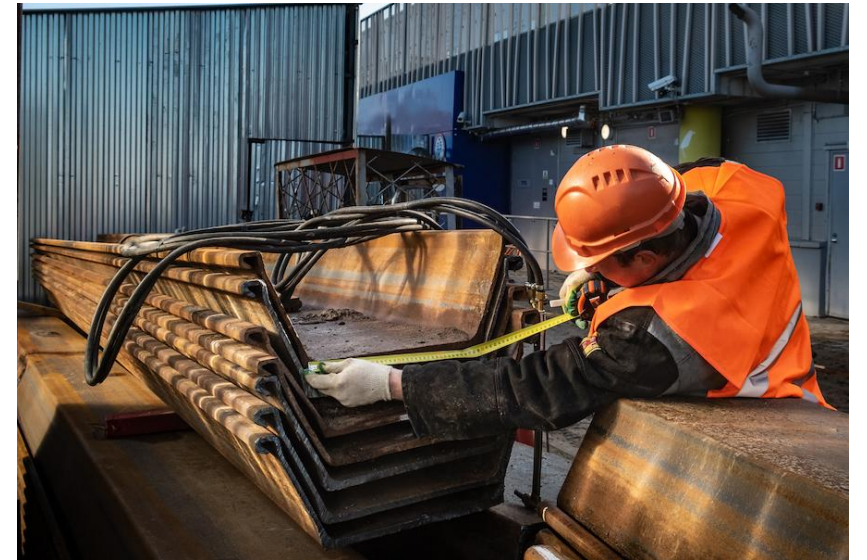
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- 4.4.2.4 Establish a restricted access or fall zone around the installation, driving, hoisting and/or extraction areas to prevent access by persons not directly involved in such operations (i.e., persons other than the piling contractor's personnel, and pre-approved personnel performing observation and testing services).



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- 4.4.2.5 Pile Selection
- Selection of pile types, lengths, bearing capacities, etc. is an engineering decision, made consistent with the geotechnical report, and shall be made by a registered professional engineer and not delegated to any other party.



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- 8.2 Only rigging in good condition and of adequate size, configuration, and capacity shall be used to handle piles.
- All rigging shall be inspected prior to use by a qualified person.



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- 8.3 Piles shall not be hoisted with open hooks or open sheeting shackles.
- Special custom grabs, hooks, clamps, or other lifting accessories shall be designed by a registered professional engineer, marked to indicate the safe working loads, and shall be proof tested prior to use to 125 percent of their rated load



ANSI A10.19

- 9. Power Equipment 9.1 All equipment used for pile driving or extraction shall be inspected by a competent person before use during each shift of work activities.
- Such inspections shall be documented.



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- 11.17 Where the boom, counterweight, or other structural part of a crane has been modified to accept equipment related to pile driving (e.g., leads, pile hammers, power supply), the user shall demonstrate that the modification(s) are designed by a registered professional engineer and will not affect the safe operation of the crane.



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- 11.24 The driving hammer and associated rigging shall be inspected at least once every shift by a competent person.
- All retaining bolts, cable clamps, cables, cushion pads and blocks, fuel lines, rail bolts, cocking and trip mechanisms, fuel pumps, injectors, drive head retaining pins, jaw assemblies, and/or other items required by the manufacturer shall be inspected and adjusted to maintain proper functional capacities.



ANSI A10.19

- 21.4 When piles are extracted with a vibratory or impact pile hammer suspended from a crane:
- 1. The piling contractor shall follow the crane manufacturer's required procedures for this operation.
- At no time shall the crane's lifting capacity for the full working radius of the extraction operation be exceeded.
- The rated capacity of the vibratory or impact pile hammer's suspension and rigging shall not be exceeded. The hammer manufacturer's recommendations for extracting piling shall be observed at all times.



ANSI A10.19

- 22. Training 22.1 Only personnel who have received instructions regarding the inspection, application, and operation of pile driving and extraction equipment, including recognition and avoidance of hazards associated with their operation, shall operate pile driving and extraction equipment.
- The training shall be documented



- 1. The purpose, and required compliance with, equipment manuals.
- 2. That operating manuals are an integral part of the pile driving and extraction equipment and must be properly stored in the equipment or made readily available for use.
- 3. A documented pre-start inspection.
- 4. Responsibilities associated with problems or malfunctions affecting the operation of the pile driving and extraction equipment.
- 5. Factors affecting stability.
- 6. The purpose of placards and decals.
- 7. Documented workplace inspection.

December 2018

- At 9:30 a.m. on December 13, 2018, an employee was in a work area when some pile driving equipment and crane boom collapsed.
- The employee was struck in the head by the pile driving equipment and was hospitalized with head trauma.
- OSHA Cited 1926.1417
- The equipment must not be used to drag or pull loads sideways.



September 2019

- At 2:00 p.m. on September 13, 2019, an employee was at a construction site conducting a quality check on a piling being driven into the ground.
- A 7,000 lb. pipe section rolled and struck the employee's legs.
- The employee was hospitalized to treat a fractured leg.



September 2014

- Melanie Lane Bridge over Whippany River, East Hanover, NJ On or about 9/9/2014 an employee sustained serious injury when struck by a 32 foot long by 42 inch wide steel sheet piling weighing 2,619 pounds.
- The employer failed to properly secure the sheet piling from falling during pile driving activities.
- Follow all manufacturer requirements for the installation and use of Dawson Construction Plant LTD EMV-450 JIC Excavator Mounted Vibrator Operators Instruction to include but not limited to: 1) Section 5.2 which requires the correct installation and use of a lifting chain and chain holder/lock during pile driving operations.



November 2010

- November 16, 2011, at the construction site of the Caminada Bay Bridge, Grande Isle, Louisiana.
- An employee was performing pile driving operations, and a small structural member of the pile driving leads broke loose and struck him.
- He was killed but the investigation was unable to determine for certain what caused the member to break from the leads.



- Employees were operating pile driving equipment that had been modified by the employer without the consent of the manufacturer and/or a Professional Engineer (P.E.).
- Employees were exposed to the hazard of being struck by falling equipment and materials in the event of a failure.
- Among other feasible methods to correct the identified hazard, one method would be to obtain the recommendations of a Professional Engineer (P.E.) and/or the manufacturer prior to removing portions of and/or modifying the structural members of pile driving leads



Questions?