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.

3.1.2 The Civil Contractor will prepare the work site per the findings of the site evaluation and meet required ground conditions established by engineering for safe set up and movement of pile driving equipment. The Civil Contractor will inform the Construction Manager and the Pile Contractor of any subsurface hazards found during site preparation.

3.1.3 The Pile Contractor shall place a dig notice with Michigan One Call Center, MISS Dig, and comply with all applicable requirements of the Underground Facility Damage Prevention and Safety Act.

3.2 Pile Selection

3.2.1 The selection of pile shall be based on standard engineering practices and be clearly defined in scope or through for construction drawings provided to the Pile Contractor.

3.3 Pile Hammer Selection

3.3.1 The selection of the hammer shall be based on standard engineering practices or by load testing conducted by the Pile Contractor.

3.4 Material Delivery and Handling

3.4.1 Pile will be stored in an orderly fashion on stable ground capable of handling the load and in a manner in which the pile is unable to shift. Proper signage or other visible warning must be in place if located close to vehicle or pedestrian paths of travel.

3.4.2 Proper rigging and equipment capable of handling the load will be used according to manufacturers' specifications when moving pile.

3.5 Safe Work Procedure

3.5.1 Marathon required Work Permit(s) shall be obtained before pile driving work commences

3.5.2 Position crane to reach a pile and ensure that no worker operating pile driving equipment hoists piles in the leads when a worker not directly involved in the pile driving operation is on the superstructure of the pile driving equipment, or within range of the pile if it falls

3.5.3 Rig pile by attaching the whip line to the pile using a positive connection that must be manually disconnected. Hoist the pile into a vertical position. No worker may remain or ride on a load or part of a load being moved, raised or lowered by pile driving equipment. All personnel not directly involved in the pile hoisting must be beyond the range of the pile if it falls.

3.5.4 Swing the lead over the pile point and adjust spotter as necessary. Swing leads over pile point and adjust the spotter using moonbeam. Adjust boom if necessary. Hoist the hammer to a height that will accept the pile being driven and adjust the boom as necessary. Ensure the pile is adequately supported to prevent uncontrolled movement while being hoisted, moved, placed, cut, removed or withdrawn.

3.5.5 Loftsman can begin the ascent to loft pile. Loftsman must have fall protection while climbing the engineered ladder system on the lead. Only trained and permitted employees may climb the ladder system.

3.5.6 The pile is placed on the pile point and a proper signal is given to the loftsman to position the pile and lower the hammer. Ensure pile heads are trimmed to fit the follower on the pile-driving cap and are free from debris. Loftsman will descend the engineered ladder system and must have fall protection.

3.5.7 With the hammer in place and the pile secure the positive connection is disconnected from the pile.

3.5.8 Make final boom and spotter adjustment as necessary. Ensure employees in the area are protected from any risk to their safety or health that may result from the pile shattering. Ensure proper Personal Protective Equipment is worn by all employees including but not limited to hard hats, safety glasses, hearing protection, gloves, and safety toe work boots.

3.5.9 Begin driving pile.

3.6 Anti-two blocking devices do not apply to dedicated pile drivers during pile driving activities.

3.7 Pile driving operations should apply a double hearing protection zone of 115 feet around the Pile being driven.

3.7.1 Pile driving contractors should work with Marathon Site Safety representation to have double hearing protection zones reduced based upon Sound Level Measurements taken in field taken during time of work using NIOSH recommended methodologies.

4.0 DEFINITIONS

4.1 Anvil - The bottom portion of a pile hammer that receives the impact of the ram and transmits energy to a pile

4.2 Batter Pile - A pile driven at an inclination to the vertical to provide resistance to horizontal forces

4.3 Bounce - The hoisting of a load, momentarily releasing the brake, catching the load with the hoist line and braking again

4.4 Competent Person - One who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

4.5 Deflector Sheave - Sheave(s) used to change the direction of travel of a crane hoist line.

4.6 Drive Cap Adapter - A steel unit designed to connect a specific type of pile to a specific pile hammer, most commonly connected to the pile hammer by steel cables.

4.7 Drive Cap Insert - A steel unit that is shaped to fit over the top of various types and shapes of piling, and which positions the pile under the drive hammer and connects it to the drive cap adapter.

4.8 Drive Cap System - The assembly of components used to connect and transfer energy from a pile hammer to a pile.

4.9 Driving Head - A steel accessory placed over a pile to prevent damage from driving. A driving head is suspended beneath a pile hammer by cables; it contains a well or recess on its top for cushion material and for seating an anvil (if used). Its bottom is formed to accept a specific shape of pile, along with its cushion (if used). Its outside incorporates a lug or insert slot for attachment to the lead system. A driving head is also referred to as an anvil block, bonnet, cap, helmet, follow cap, rider cap, or shield.

4.10 Fall - A measure of a rigging component's vertical length.

4.11 Ground Conditions - The condition of the ground as it relates to its adequacy for support of pile driving equipment and stored materials, including the ground's slope, compaction, and firmness.

4.12 Guide Rail - That part of the pile hammer leads which forms a pathway for the pile hammer and which consists of parallel members that mate with the side channels of the pile hammer. Guide rails are also referred to as "Leads Rails" or "Hammer Guides"

4.13 Hammer, Drop Impact - A pile hammer (also referred to as "Drop" Hammer or "Hair Pin" Hammer). For purposes of this procedure, there is one type of drop impact hammer in use

4.13.1 Steam Drop Hammer - A drop impact hammer consisting of a cylinder which acts as the falling weight which is lifted by steam pressure

4.14 Hammer Energy - The amount of potential energy available to transfer from a pile hammer to a pile, usually measured in foot-pounds.

4.15 Kicker - The strut between the crane and the pile leads. (Also referred to as a "Spotter")

4.16 Leads - Two parallel members of a steel frame for guiding the pile hammer and piles in correct alignment. There are three types of leads:

4.16.1 Fixed Leads - Leads which are fixed to a pile rig at its top and bottom.

4.16.2 Swinging Leads - Leads which are supported at the top by a cable attached to a pile rig.

4.16.3 Semi-Fixed or Telescopic Leads - Leads which are allowed to translate vertically in relation to a pile rig's boom tip.

4.17 Lifting Bail - Rigging apparatus used to attach a crane hoist line to the pile driving equipment.

4.18 Loftsman - The individual in the pile driving crew who climbs the leads to secure the pile

4.19 Moonbeam - A device attached to the end of a lead brace, which will allow a pile to be driven with a side batter pile.

4.20 Penetration - The amount of downward movement of a pile measured in blows.

4.21 Pile - A concrete, steel or wood column, which is driven or otherwise, introduced into the soil, usually to carry a vertical load or to provide lateral support

4.22 Pile Butt - A term commonly used in connection with timber piles. The upper or larger end of a pile closest to the pile hammer

4.23 Pile Contractor - A contractor whose scope of work on a particular project includes the installation and/or extraction of piles

4.24 Pile Gate - A hinged section attached to the pile leads, at the lower end, which serves to keep the pile within the framework of the pile leads.

4.25 Pile Hammer - A device, which develops and expends the energy used to drive piles, the two main parts of which are the ram and the anvil. Also referred to as a "Pile Driver Hammer"

4.26 Pile Head - The upper end of a pile

4.27 Pile Rig - The crane or other type of equipment used to support the leads and pile driving assembly during a pile driving or extraction operation.

4.28 Power Plant - A prime mover consisting of an engine and generator, hydraulic pump or compressor used to provide electricity, hydraulic power, or compressed air to portable construction equipment such as a vibratory pile hammer/ extractor or impact pile hammer/extractor.

4.29 Project Constructor - A person, firm or corporation, i.e. the construction manager, general contractor, prime contractor or other entity, as designated in the project documents, responsible for supervising and controlling all construction work performed on the project.

4.30 Ram - The moving part of a pile hammer, consisting of a piston and a driving head, or driving head only.

4.31 Rated Speed - The number of blows per minute of a pile hammer when operating at its maximum rated efficiency.

4.32 Sheave - An assembly consisting of a pulley wheel, side plates, shaft, and bearings over which a cable or rope is passed. For purposes of this standard, there are two types of sheave:

4.32.1 Deflector Sheave - A sheave used to change the direction of travel of a crane's hoist line.

4.32.2 Turn-Around Sheave - A fixed sheave mounted to a pile hammer for increasing the mechanical advantage of a crane's hoisting capacity.

4.34 Spotter - The strut between the crane and the pile leads (also see "Kicker")

4.35 Spudding - The driving of a short and stout section of pile-like material into the ground to penetrate or break up a hard ground strata and permit pile driving, common in the driving of timber piles.

4.36 Stroke - The length of fall of a ram

4.37 Supporting Material - Blocking, mats, cribbing, marsh buggies or similar supporting materials or devices

4.38 Template - A fabricated guide of almost any shape, used to align piling before driving.

4.39 Tip - The first part of a pile to penetrate the ground, (also referred to as a "Pile Tip").

4.40 Trip Latch - A block in the leads of a drop impact hammer which causes the release of the pile hammer's weight at a predetermined height or a mechanical device used with a diesel hammer to pick up and release the piston to start the pile hammer. Also referred to as a "Trip Block" or "Tripping Device"

5.0 REFERENCES

5.1 29 CFR 1926.603 "Pile Driving Equipment"

5.2 Part 24 Government of Manitoba Canada "Pile Driving"

5.3 ANSI A10.19-2008 "Safety Requirements for Pile Installation and Extraction Operations"

5.4 Korneffel Job Safety Analysis

6.0 ATTACHMENTS – There are no attachments

7.0 REVISION HISTORY

Revision number	Description of change	Written by	Approved by	Effective date
2	Updated Document Number	E. Dvorak	L. Mazur	1-5-2010
3	Reviewed with no revisions	M. Taylor	L. Mazur	10-21-11
4	Reviewed, Updated company name. Edited Rev # to conform with Document Librarian	S. Windom	L. Mazur	07-30-12
5	Added MISS Dig requirement, Anti-two block not required, and hearing protection radius	S. Wolf	J. Rabideau	07-30-15
6	Scheduled Review with no revisions	T. Brown	A. Morales	07-10-20