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Massachusetts Drill Foreman Dies In Fall When Portion of Offshore Marine Rockdrilling Rig Resettles in Ocean Floor

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SUMMARY

On July 20, 1992, while working on an ocean based jack-up barge, a 47 year old marine rockdrilling shift foreman died in a fall of approximately thirty-one feet when a two hundred and six foot casing that supported the surface on which he and two co-workers were situated, unexpectedly resettled in soft ocean bed sediment before coming to rest. Although the three men were propelled from their positions as a result of the drop, the co-workers survived their ordeal while the victim died of more serious injuries the following day. The Massachusetts FACE Investigator concluded that to prevent similar occurrences in the future, employers should:

- **ensure that hazardous exposures which may arise from any portion of an operation be fully evaluated prior to project phase engagement**
- **establish effective employee safety methods and work practices**

INTRODUCTION

On July 22, 1992, the MA FACE Investigator learned through a major daily newspaper, that a 47 year old marine rockdrilling shift foreman had died as the result of an unusual incident at sea two days prior. On July 23, 1993, the MA FACE Investigator traveled to the Massachusetts seacoast and was transported by personnel helicopter to the incident site nine and one-half miles offshore where he met with employer representatives and Massachusetts Department of Labor and Industries personnel. Multiple incident accounts, personal injury reports, sketches, graphs, photographs, death certificate and other associated materials were obtained during the course of the investigation.

Two company's pooled resources as a joint venture employer in this incident and acted as a general marine construction company specializing in marine rockdrilling on this $77 million dollar project phase. At the time of the incident, the joint venture employed twelve drillers and 3 shift foremen. Each crew consisted of four drillers and one shift foreman that worked one of three shifts in an around the clock operation.

The joint venture employed a designated safety person, had written safety and emergency response policies and procedures and held tool box safety meeting at least weekly. The victim was a union journeyman whose training was primarily on the job.

The victim was one of fifteen joint venture employees on the project and one of three shift foremen in charge. He was employed by the joint venture for approximately fifteen months at the time of his death. He was a union journeyman whose primary safety training was on-the-job.

INVESTIGATION

On July 20, 1992, at approximately 6:30 a.m., a shift crew of four marine drillers and one marine drill foreman were based on a jack-up barge nine and one-half miles off the Massachusetts coast. The employer, comprised of two different company's pooling resources, engaged in a $77 million dollar joint venture as a general marine construction company specializing in offshore marine rockdrilling.

The joint venture's contract with the project owner called for the installation of 55 fiberglass reinforced pipe risers, measuring 30 inches in diameter and two hundred and fifty feet in length, to be lowered and grouted in pre-drilled shafts in the ocean floor. All fifty-five pipe risers would eventually be connected at designated intervals to the last 6,600 feet of a 24 foot diameter, 9.5 mile outfall tunnel being horizontally bored through bedrock 240 - 250 feet below the ocean floor. Once completed, the outfall tunnel would carry treated wastewater on its 9.5 mile journey out and up through the 55 pipe risers where it would then be discharged through pipe riser diffuser caps on the ocean floor.

Due to a design change, the project construction manager requested pipe riser R1 to be installed 6 feet higher than shown in existing specifications. As a consequence, the previously prepared seabed dredge site was backfilled from a dredge barge with an approximate 5 foot layer of sand and gravel. Next, a 221 foot x 6 foot diameter steel casing was positioned from the jack-up barge which settled approximately 2 feet into the seabed under its dead load. As the drill unit was placed on top of the casing, an additional settlement of approximately 2 feet occurred. It was believed that the casing did not settle any further even when tapped by the weight of the drill unit on top of the casing.

The drill unit was then removed to cut 15 feet of the casing away to facilitate the crane to gain sufficient vertical clearance to install the bottom hole assembly (BHA) into the casing. The drill unit was then re-installed and no additional settlement took place. At this stage, the bottom of the casing was still within the sand and gravel backfill layer.

The bottom hole assembly was then picked up and lowered into the casing. When the bottom hole assembly was entirely inside the casing, the drill platform doors and it's locks were closed to support it. The bottom hole assembly was slowly lowered until the top flange could be supported on the locks of the platform doors. The tension of the hoist of the crane was slowly released in order to monitor any additional settlement of the casing under the load of the bottom hole assembly and finally to let the bottom hole assembly rest completely on the locks.

When the hoist lines from the crane to the bottom hole assembly were slightly slack, the casing had slowly settled approximately 3 feet. At this point, as the total weight of the bottom hole assembly was being released on top of the drill unit, a sudden drop of the casing and the drill unit of approximately 25 feet occurred. At the same instance, the weight of the bottom hole assembly was immediately supported again by the crane hoist lines which kept the bottom hole assembly near stationary. Consequently, the drill platform doors were pushed upwards by the wider part of the bottom hole assembly below the doors. The victim and his two co-workers were positioned on the drill unit to operate the platform doors, close the locks, remove the bolts of the hoist flange on the bottom hole assembly and to perform other

activities. Prior to the incident, the victim was standing on the platform doors to provide signals to the crane operator. He was thrown upwards when the platform doors were suddenly pushed open. When falling back, he fell with his head down between the casing and the bottom hole assembly approximately 6 feet below the top of the platform level which resulted in severe injuries. The victim fell approximately 31 feet and suffered multiple trauma including a fractured skull, broken back, broken leg, et al. The two co-workers, standing on the fixed part of the platform landed beside over each other resulting in minor injuries to each.

The incident was caused by the drop of the steel pipe support casing into the soft sediment layer when the casing, having penetrated through the 5 feet of granular backfill, suddenly lost its bearing support. The sudden loss of bearing support occurred when the dead load of the bottom hole assembly was imposed on the casing in a total load in excess of the ultimate bearing capacity of the soft sediment.

Within seconds of the incident, a barge based EMT immediately went up to the drill platform to administer first aid, stabilize the victim and assist with the evacuation. In the ensuing 50 minutes, the victim was strapped into a Stokes basket and lifted by crane onto the deck near the helideck where he was airlifted by personnel helicopter to a mainland heliport and transported to a regional hospital where he died from his injuries on the following day.

CAUSE OF DEATH

The medical examiner listed the cause of death as pulmonary saddle thromboembolus associated with craniocerebral blunt trauma.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that hazardous exposures which may arise from any portion of n operation be fully evaluated prior to project phase engagement.

Discussion: The sudden and fast drop of the supporting casing with the drill unit could have been expected to occur based on geotechnical information available to the contractor before the incident and the installation experience gained earlier in the project. In other words, the employer could have reasonably expected the supporting casing to penetrate through the entire thickness of the soft sediment under the weight of the casing, the drill unit and the bottom hole assembly. In addition, the employer could have fully evaluated the impact of the granulate backfill...a known factor on the installation procedure. Pipe riser R1 was the final of 55 installations. It remains imperative that employers not become complacent and they fully evaluate the potential hazards associated with their tasks prior to project phase engagement. They must ensure that virtually all available information and past experience is considered at all times.

Recommendation #2: Employers should establish effective employee safety methods and work practices.

Discussion: Not only were employee's exposed to the serious hazard of striking or crushing from the drill rig doors while the supporting casing was not adequately founded on solid footing, yet they were also permitted to work and stand on the drill rig while suspended from the crane when used as a " hammer " to drive the supporting casing deeper into the ocean floor. These were both unsafe methods and practices. Had employee's not been permitted to be situated on the drill rig platform at all during these times, the incident outcome may have been different. Safe work methods and sound work practices must be continuously developed and implemented.

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