



**PROJECT: REMOVING OF EXISTING 8" AND 10" STEEL PIPE USING GRUNDORAM PIPE PUSHING METHOD IN CALTEX REFINERY, SINGAPORE**

***Background:***

Caltex's engineer teams have been working on a few method of removing these existing pipes which contain mogas and diesel fuel. The 8" pipe is more critical than the 10" as it contained mogas. The shut down for maintenance for these two lines was from 28/6/2005 to 31/8/2005, any delay will cause disruption to the petrol kiosk. This will incur losses to Caltex.

In order to fight against time, Caltex's engineer managed to locate us in early Jan 2005 and required us to conduct a proposal on using our trenchless method to remove these 2 lines and concurrently insert a new one without causing disruption to the road surface and other utilities.

No open-cut was allowed because the existing pipes passed through others warehouse which contains high chemical solutions and explosives. We were limited to open only 3 pits for this 220m lines.

After consulting our expertise from TT UK, we decided to weld the new 8" pipe to the old one and doing likewise to the 10" pipe. Putting the Grundoram behind the new pipe and start ramming, the percussion will cause the pipe to move and forcing the old one to move forward. We will then cut away the old pipe at the receiving pit. The advantages of using this method were:

- 1) No damage to internal coating as no soil was entering the pipe.
- 2) The old pipe will guide the new pipe in. This will ensure accuracy of the bore hole.
- 3) No contamination to the ground as the old pipe will be pushed out and the new one was installed.
- 4) It was faster as no resistance to the pipe. The skin friction will be reduced by welding a collar in front of the new pipe.
- 5) Minimum destruction to the surface and traffic.
- 6) No damaging of other utilities services etc fire-water line, lamp post and fencing

With this Grundoram, KOLOSS, steel pipe ramming machine, open ended steel pipes up to ND 2000 can be rammed through the ground from a start to an exit pit. This system is suitable for most soil types but excluding solid rock formations. No risk of ground surface subsidence or the creation of voids whilst using the Grundoram technique.

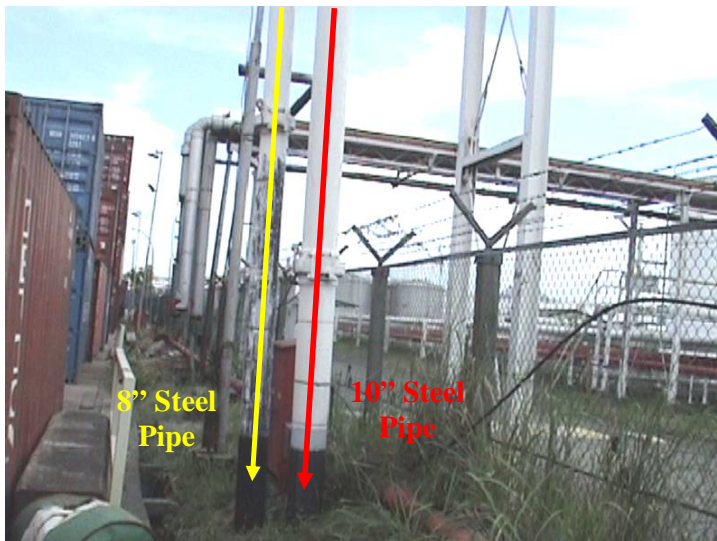


## PHOTO REPORT

ON

### REMOVING OF EXISTING 8" AND 10" STEEL PIPE USING GRUNDORAM, KOLOSS, PIPE PUSHING METHOD

<b>Client</b>	:	Caltex (Singapore – Penjuru)
<b>Country</b>	:	Singapore
<b>Equipment Used</b>	:	GRUNDORAM type KOLOSS Hammer Fitted with downsized Ram Cone
<b>Ramming Distance</b>	:	114m x 2, 72 x 2
<b>Pipe installed</b>	:	8-inch Steel pipe 10-inch Steel pipe
<b>Ground Condition</b>	:	Marine Clay, Soft
<b>Ramming Commencement Date</b>	:	13 <sup>th</sup> July 2005
<b>Ramming Completion Date</b>	:	30 <sup>th</sup> July 2005



**Photo 1:** Replacement of 2 fuel pipes covering a total distance of 240m. The total ramming distance is about 186m for each pipe.



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Photo 2



Photo 3

**Photo 2 & 3:** View of the 2 steel pipes under the drain before the excavation of the pit.

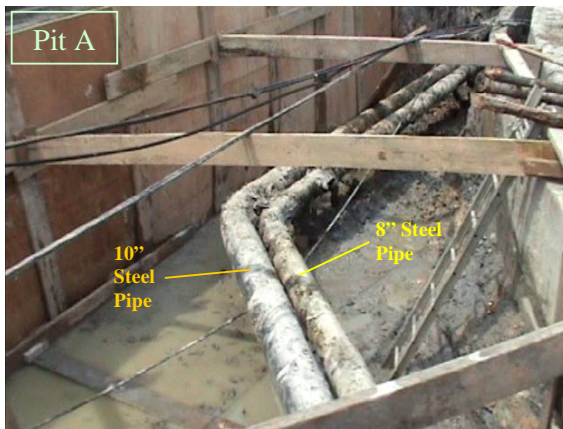


Photo 4

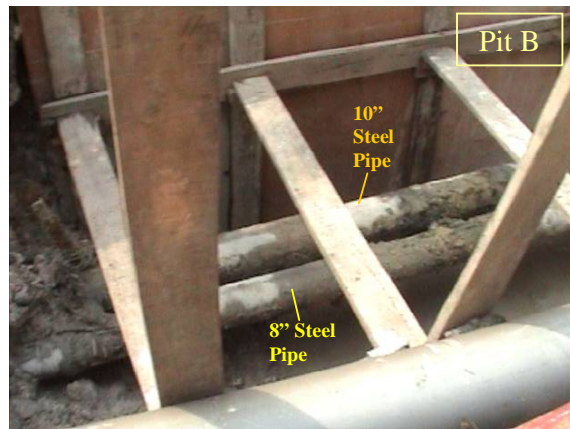


Photo 5

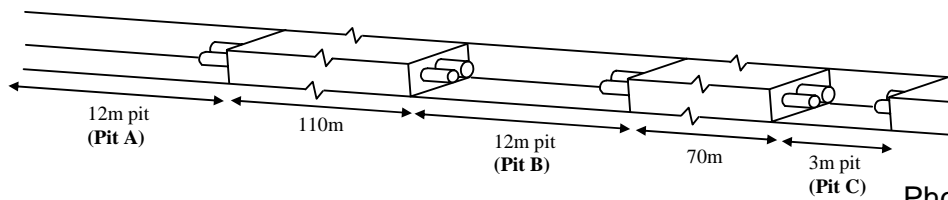


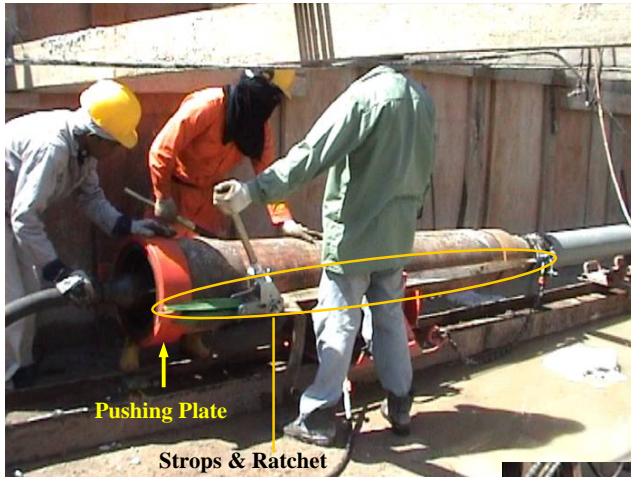
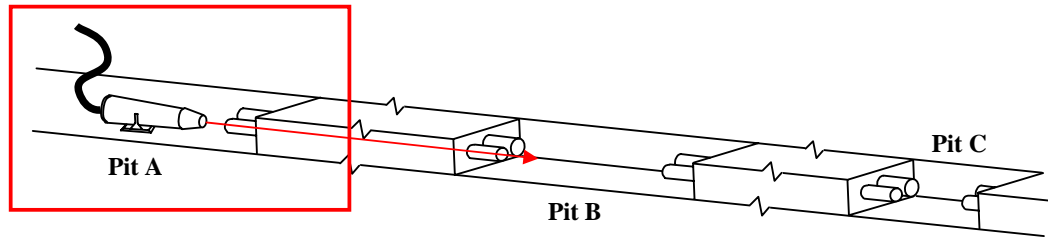
Photo 6

**Photo 4, 5 & 6:** Three pits were excavated along the path of the existing fuel pipes. The last pit, C, Photo 6, is only 3m in length due to the space constraint. This pit was used as a receiving pit. As seen, the 2 pipes run parallel with each other and they are very close apart.



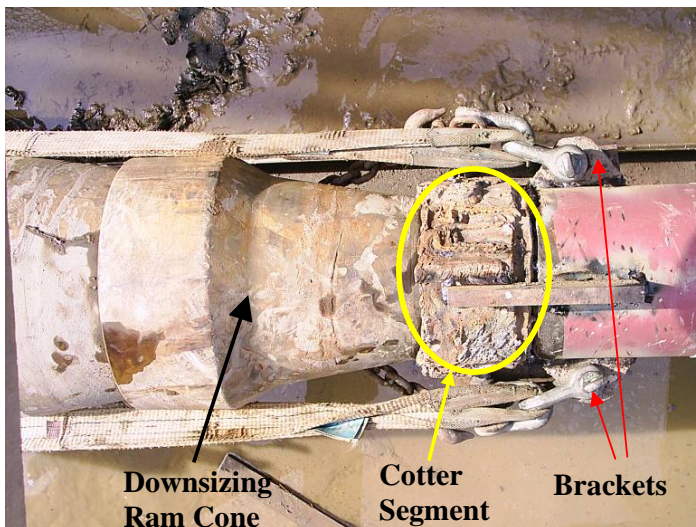


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**Photo 7:** Flexible tensing straps and ratchets were used together with the pushing plate to secure GRUNDORAM to the pipe.

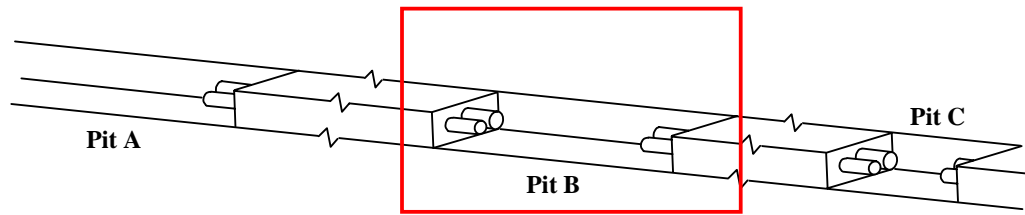
**Photo 7 & 8:** The cradle and the trolley of the GRUNDORAM are mounted onto an self-fabricated I-Beam with angle-bar welded at the bottom of the cradle. This is to allow the GRUNDORAM sitting on the cradle to move along the I-Beam. The trolley was used to support the steel pipe while ramming.



**Photo 9:** An improvised cotter segment is used to avoid the need to cut off deformed pipe-ends prior to joint welding. Two additional “eyes” are also welded onto the pipes for fastening of the tension straps.



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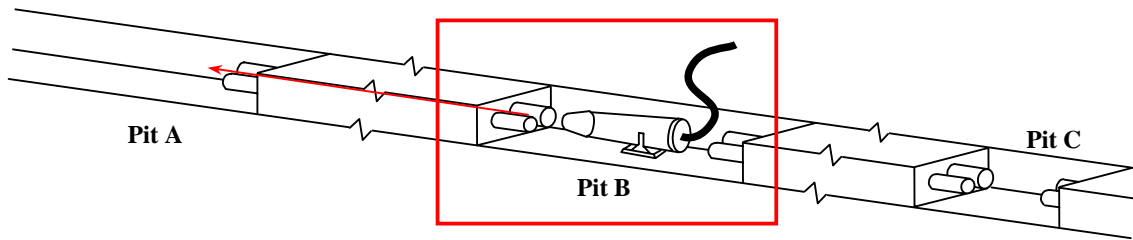
**Photo 10:** The old 8" Steel Pipe coming out at Pit B while the new pipe was being rammed in Pit A.



**Photo 11:** The new 8" Steel Pipe arrived at Pit B after 19 pipes were inserted. An improvised collar was welded onto the first pipe so as to act as a cutting shoe or prevent skin friction and also prevent the coating on the pipe being damaged.



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**Photo 12:** The GRUNDORAM was set up in Pit B for the ramming of the 10" Steel Pipe to Pit A.

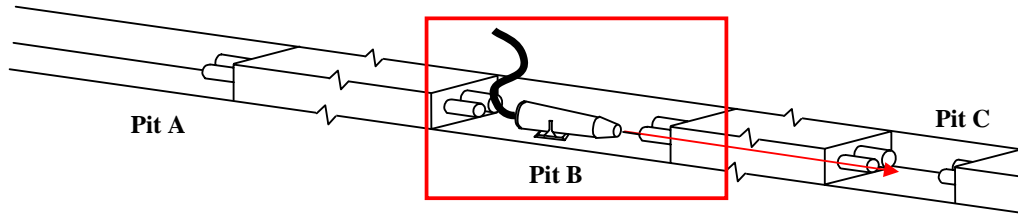
*Noted: This is done while the new 8" Steel Pipe is being welded and prepared at Pit A.*



**Photo 13:** The old 10" Steel Pipe exit at Pit A



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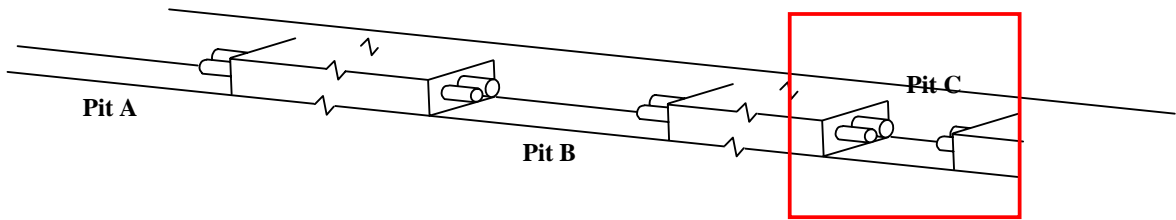


**Photo 14:** GRUNDORAM was being set up at Pit B for the ramming of 8" Steel Pipe to Pit C.



**Photo 15:** Another view of the GRUNDORAM in Pit B ramming the 8" Steel Pipe to Pit C.

*Note: The 10" pipe was rammed in after completion of the 8" pipe.*



**Photo 16:** Arriving of the old 8" Steel Pipe at Pit C. Simultaneously, a new 8" pipe was welded in Pit B.



**Photo 17:** A view both the 8" and 10" old pipes that had been removed from Pit C.



Photo 18



Photo 19



Photo 20

**Photo 18, 19 & 20:** Views of all the three Pits with the steel pipes completely replaced.