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Construction of Dead Shuttering Block Work in Cable Duct Bank

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ABSTRACT

In modern day of construction industries, like many other methodological innovations, dead shuttering block work shoring has been used in constructions for underground basement across in all areas. Little research has been done to explore the dead shuttering block works at the future duct bank openings which is performed after completing the entire projects for underground services (Mechanical, Electrical and Plumping). This paper analyses about the two type of block work uses in basement wall, type 01 - Continues blockwork without an opening at duct banks and type 02 - Block works with opening at duct bank areas. As the deep foundations has inevitable concerns pertaining high water table, principle of demonstrating both type of block works justifies the materials requirements, methodology of water proofing, block works constructions and which type is suitable for successive implementation in current projects.

Keywords : Technical Writing - Civil Engineering.

I. INTRODUCTION

Construction of Shoring is mandatory if incase any structures located proximate to the proposed structures. In order to support the existing unsafe structure, shoring provides support laterally. There is multiple type of shoring available in construction industry, wherein this article illustrate the work method especially narrates the duck bank dead shuttering block works adjacent to Soldier pile wall using H-beam shoring, which is most commonly used in constructions.

One of the important note, if the area consisting the high water table, adequate dewatering must be done continuously until completing the entire basement and back filling works.

II. MATERIALS AND TEST REQUIREMENTS

A. 200mm (8") Solid block works used.
B. Dubai Municipality (DM) approved vendor shall deliver the materials with test certificate of compressive strength and dimension of blocks.
C. Once materials received, blocks shall send to DM approved laboratory for verification.
D. Precast Concrete Masonry Unit and laboratory test shall comply BS 6073 - 1981.

E. Precast concrete blocks shall be in accordance with BS 6073 and shall have a compressive strength of 7N/sq. mm average for 10 blocks calculated on the gross area of block. Minimum strength of individual block 6N/sq.mm.

III. LABORATORY TEST REPORT – COMPRESSIVE STRENGTH AND DIMENSION

Specimen No.	Crushing Strength (N/mm²)
1	22.7
2	22.0
3	22.0
4	19.7
5	22.4
6	24.2
7	23.0
8	23.0
9	22.9
10	24.4

COMPRESSIVE STRENGTH (N/mm²) : 22.6
STANDARD DEVIATION (N/mm²) : 1.3

Spec. No.	Dimensions (mm)																
	Length				Thickness							Height					
1	400	400	400	400	200	200	200	200	199	200	200	200	199	200	200	199	200
2	399	400	400	399	200	200	200	200	200	200	200	200	200	200	199	200	200
3	400	400	400	399	200	200	200	200	199	200	200	200	200	200	200	200	200
4	400	400	400	400	200	200	200	200	200	200	200	199	200	200	200	200	199
5	399	400	399	399	199	199	200	200	200	200	200	200	200	200	199	200	200
6	400	400	400	400	200	200	200	200	199	199	199	200	199	200	200	200	199
7	400	400	400	399	200	200	200	200	200	199	200	199	199	200	200	200	200
8	399	400	400	400	199	199	200	200	200	200	200	200	200	200	199	200	200
9	400	400	399	400	200	200	200	199	200	200	200	199	199	200	200	200	200
10	400	399	399	400	200	200	200	199	199	200	200	200	200	200	199	200	199

IV. WORK METHOD

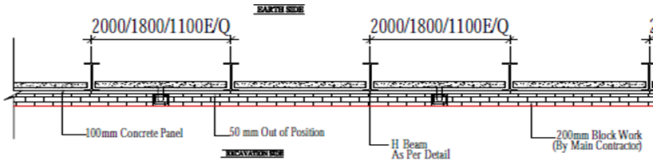
Dead shuttering block work starts after completing the main shoring and foundation excavation. Due to space constrains most of the cases, the block works laid next to the building basement. Main key benefit of dead shuttering block work is

A. To nullify the external basement wall formworks

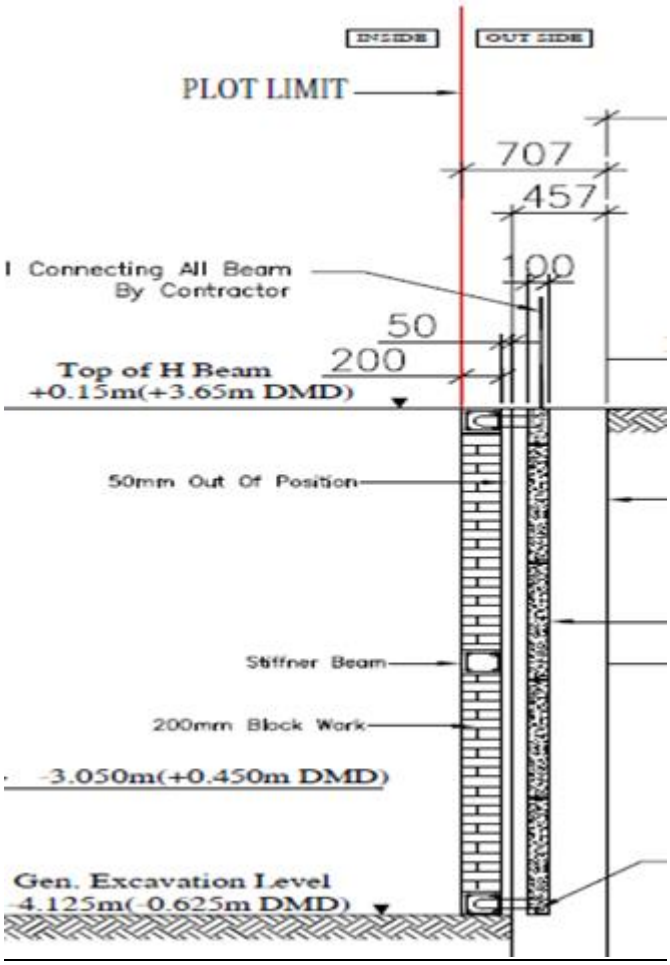
B. Benefits to receive the external wall waterproofing works.

C. Ease of entering future underground services without compromise the waterproofing damages.

A. Figures



TYPICAL HORIZONTAL SECTION FOR H BEAM



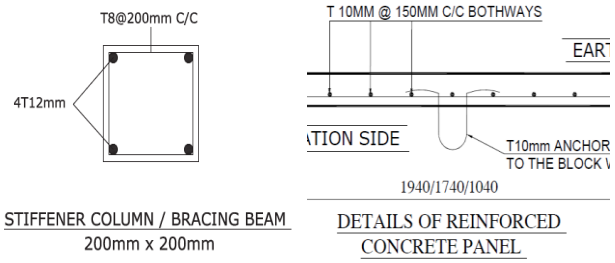
SECTION

Once the excavation completed up to the foundation level, C20 blinding concrete laid at the raft bottom level. Required dry and curing time must be completed to start the stiffner beam which shall be made the entire length of dead shuttering block works, while perfoming the horizontal stiffner, veticle stiffner dowel shall be provided with the Centre to Centre distance of 4m.

All the horizontal and verticle stiffner made by 12mm dia rebar with the minimum size of 200mm X 200mm. Ensure the area of blockwors within stiffners not morethan 12 Sqm.

As the block work made vertically between the raft bottom and ground level, in order to make proper anchor and avoid collision, 10mm dia anchor rod placed inside the shoring concrete panel which is

projected until the stiffner column for better bonding and support.



STIFFENER COLUMN / BRACING BEAM
200mm x 200mm

DETAILS OF REINFORCED CONCRETE PANEL

There are two type of dead shutter block work arranged at duct bank areas.

Type 01: (Continues blockwork without an opening)

Once the block works with adequate stiffners completed, entire block works shall be plastered with thickness of 15mm (Rush coat 06mm + Rendering coat 12mm) with smooth surface. Blinding and blockwork join shall be made 50mm fillet arrangement for receiving the water proofing works without any damage.

A. Sub-Structure water proofing works

After attaining the curing and drying time, 4mm thick torch applied Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements (ASTM D6164 / D6164M – 16) with protection board system shall be applied.

Due attention shall be paid in design, material selection and application of waterproofing considering high complexity involved in substructures. The design, material and installation shall provide highly effective impervious barrier to prevent the penetration of water into the structure.

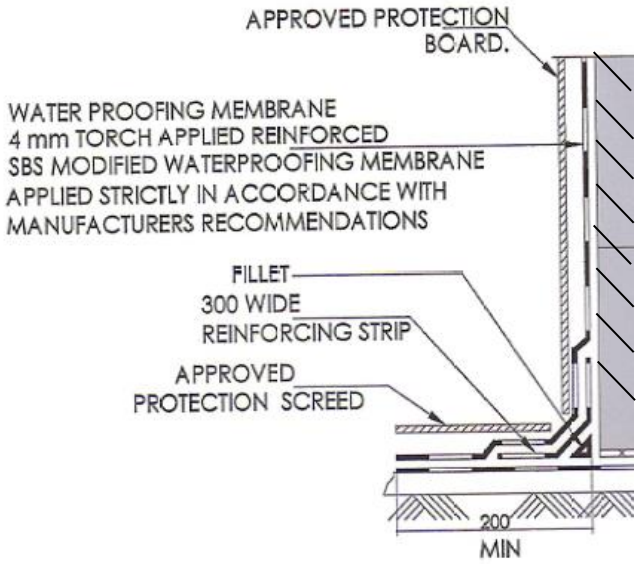
External waterproofing tanking system shall be provided for all sub-substructure. The material used in this system fulfills highly effective impervious barrier to prevent the penetration of water into the structure, shall have an excellent resistance to tearing, breaking and puncture. It shall also prevent concrete from Sulphates and Chlorides attacks that are present in soil.

Step 01 : 02 coat of water proofing primer shall be applied over plastered surface with adequate interval between each coat.

Step 02 : Torch applied SBS water proofing membarane reinforced strip (300mm minumum) applied in all corners to make extra protection and avoid damages during bending of water proofing membarane.

Once reinforced strip completed, water proofing membarane shall be applied with torch and lap between each membarane side area 100mm and end 150mm. Application and lapping shall comply the manufacturer recommendations. Ensure, no bubbles are allowed during the torch application.

Step 03 : 4mm thick protection board shall be laid over the water proofing membarate to protect the membarane and avoid any damages during site construction activities.



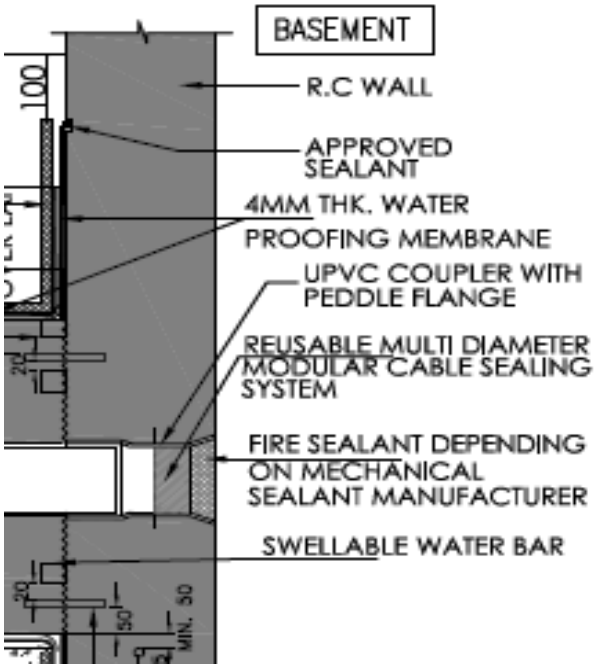
B. Basement wall and duct bank works:

After completing the dead shutter block work with adequate water proofing works, during main basement Reinforced wall works required duct bank sleeves with fuddle arrangement shall be fixed as per approved design drawing which is for incoming / outgoing underground services. As the distance between the RC basement wall and dead shutter

block works is zero, sleeve shall be closed with end cap and it is touch to the water proofing membarane.

Later, during underground service works, required duct area block work to be demolized to make entry of the Under ground services.

Advatages : Completion of water proofing is easy and overall block work until basement wall works are exepdited. Less stiffner are requried to complete the works.



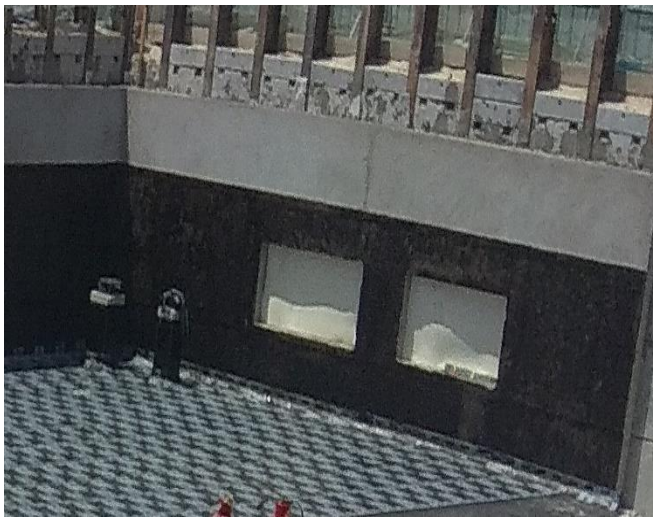
Type 02 : (Block works with opening in duct bank areas)

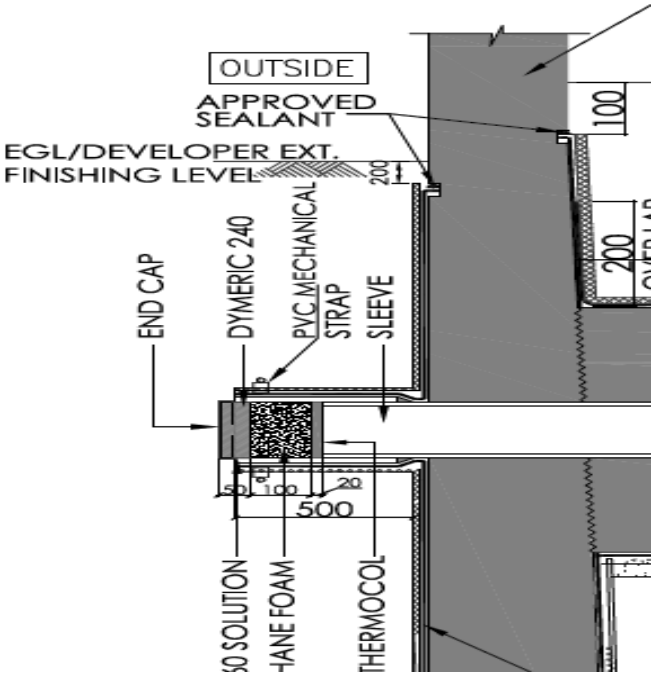
While performing the dead shutter block works, adequate opening shall be provided in line with underground service drawings. Each opening shall consist alaround stiffner beams/column with size of 200mm X 200mm. Ensure location of opening and size shall exactly matching with approved technical drawings.

Once the required blockwork and plastering completed, water proofing activities shall be performed as stated in Type 01.Ensure the water proofing termination around the opening and sides are completed without any discontinuity.

After completing the dead shutter block works with adequate water proofing works, during main basement reinforced wall works required duct bank sleeves with fuddle arrangement as per approved design drawing for incoming/outgoind underground services. As we have provided the opening in blockwork, basement wall duct sleeve shall be closed with end cap and it shall extended inside the opening and touch upto the shoring panel.

Later, during underground service works, duct bank sleeve shall be connected with the existing sleeves for continutity at external side.





Advatages : Necessisity of breaking the block works during service cable entry not required. Water proofing not damaged. Chances of water penetration inside basement is zero.

V. CONCLUSION

Considering the importance of substructure water proofing and avoid damages during underground services, even though contains the simple construction methodology, type 01 dead shuttering block works not feasible as it is allowing the water proofing damage during breaking and it shall lead further water penetration inside the basement due to breach of water proofing system. The same system leads the delay of underground services entry after completing the whole project.

Type 02 dead shuttering blockwork is initial time taking activity, however the durability of water proofing system shall not be disturbed as we are providing adequate opening with water proofing terminations. This shall lead the underground service entry without difficulty even after ages of completing whole project.

This method has been implemented and thrived in current projects.

Further safety of construction practice shall be properly maintained for both type of dead shuttering blockworks.

No vibration or excavation allowed near to the dead shuttering block works as it shall cause of collapse in vertical block work and may lead the series accidents. Continues monitoring of dewatering is also essential to maintain excavation dry and stable conditions below natural ground water level.

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