



ABYAN

World's Largest 3DCP Water Tank

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COBOD CONNECT

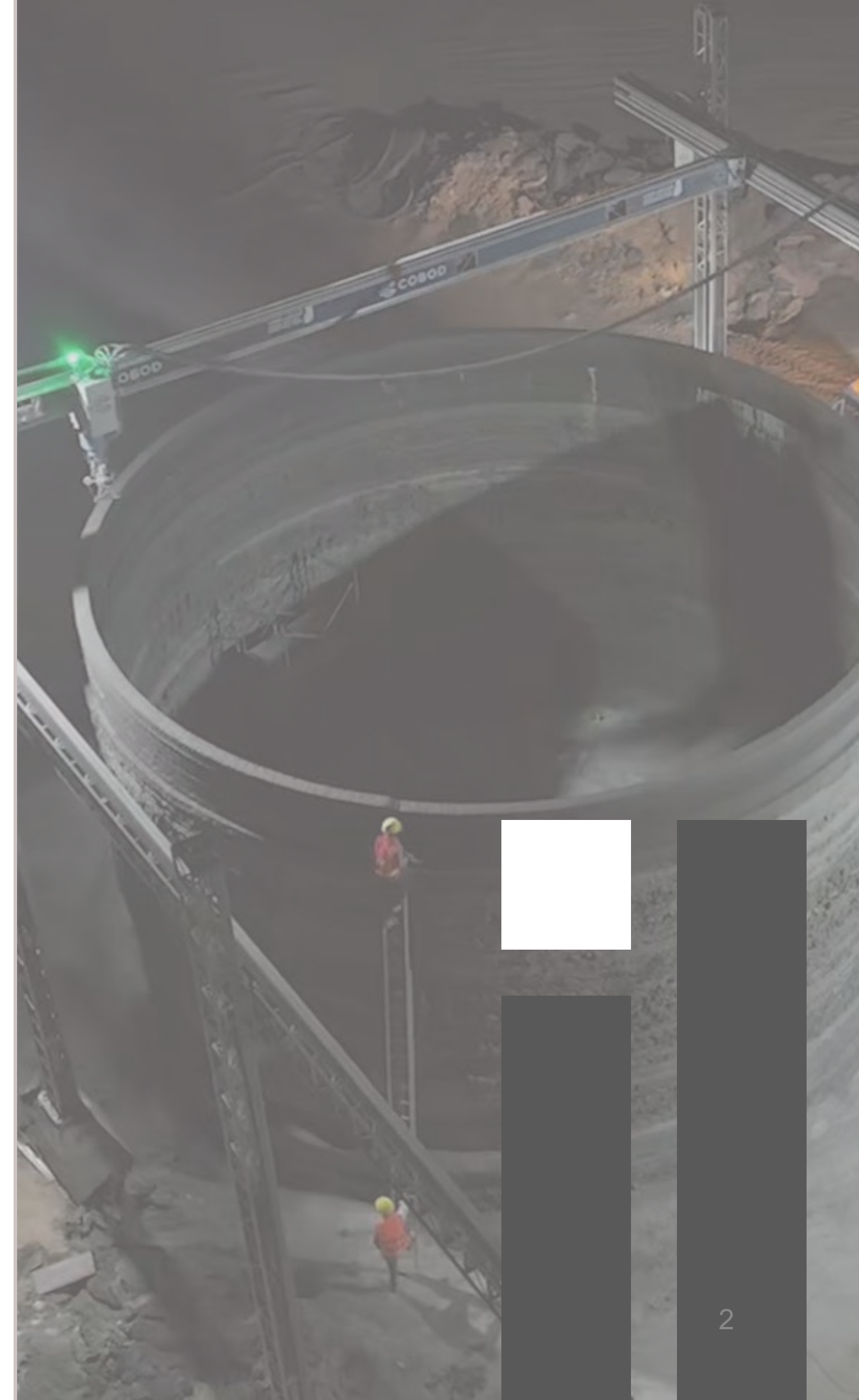
26/11/2024

Construction Transformed

COBOD Connect

Outline

- Previous Projects (Two Tanks)
- Overview of Project
- Construction Stages & Printing Method
- Ready Mix Steel Fiber Reinforced Printable Concrete (RM-SFRC)
- Design Challenges & Future Opportunities
- Video
- Acknowledgments



Previous Projects (Two Tanks)

- Project Printed in June 2023 (Collaboration Abyan-COBOD-CEMEX)
- Designed with reinforced base and corbel for structural integrity
- Capacity **175,000 Liters** of water
- Tank Dimensions:
 - Height: **4.5m**
 - Inner Diameter: **6m**
 - Wall thickness: **400mm (0-1.5m), 300mm (1.5-3m), 200mm (3-4.5m)**
- Printed with concentric circles (100mm wide layers)
- Using glass fiber reinforced MDS concrete

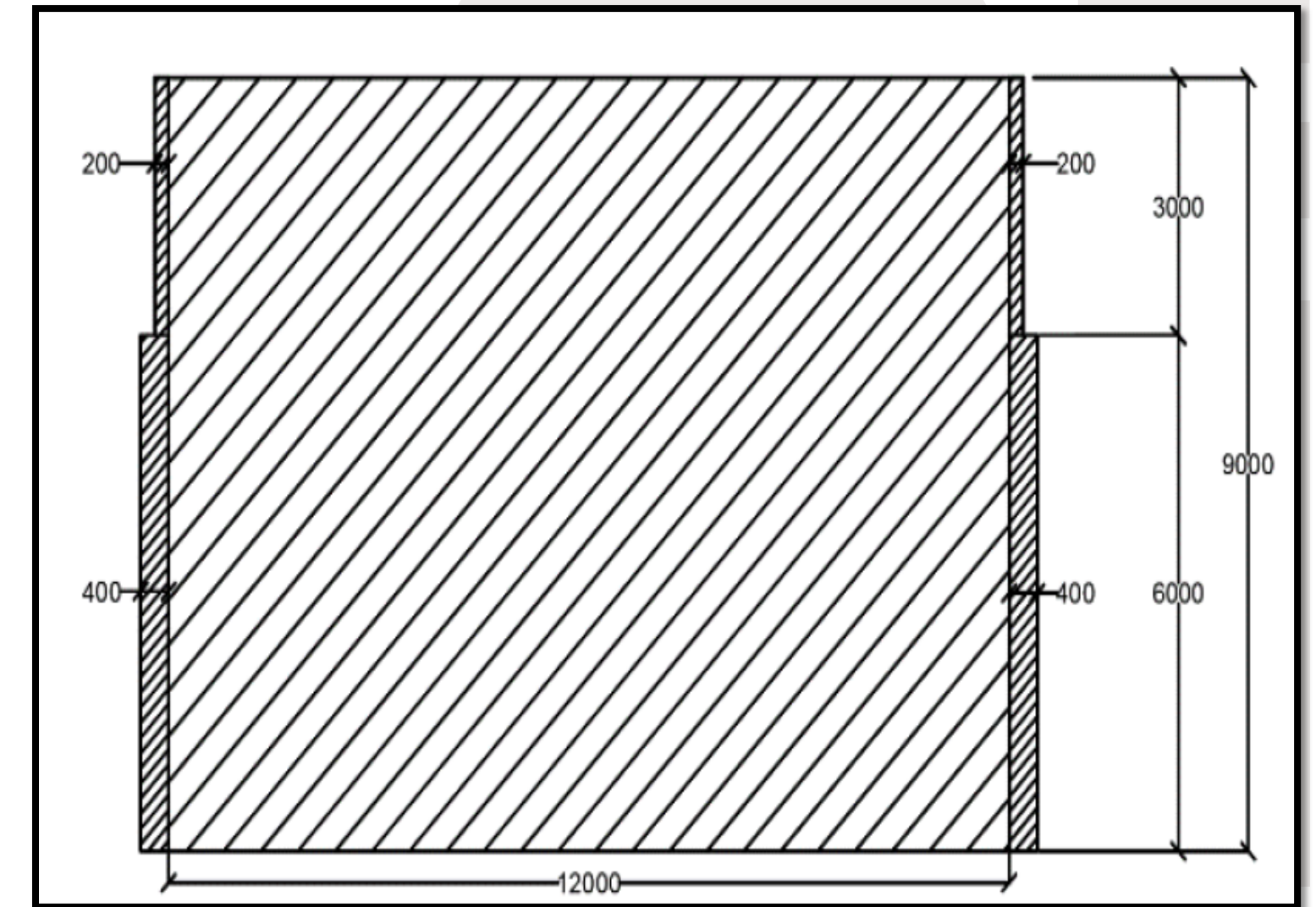
Drawbacks:

- Possible seepage of water through concentric layers
- Discontinuity of layers (proposed vase-mode printing for future)



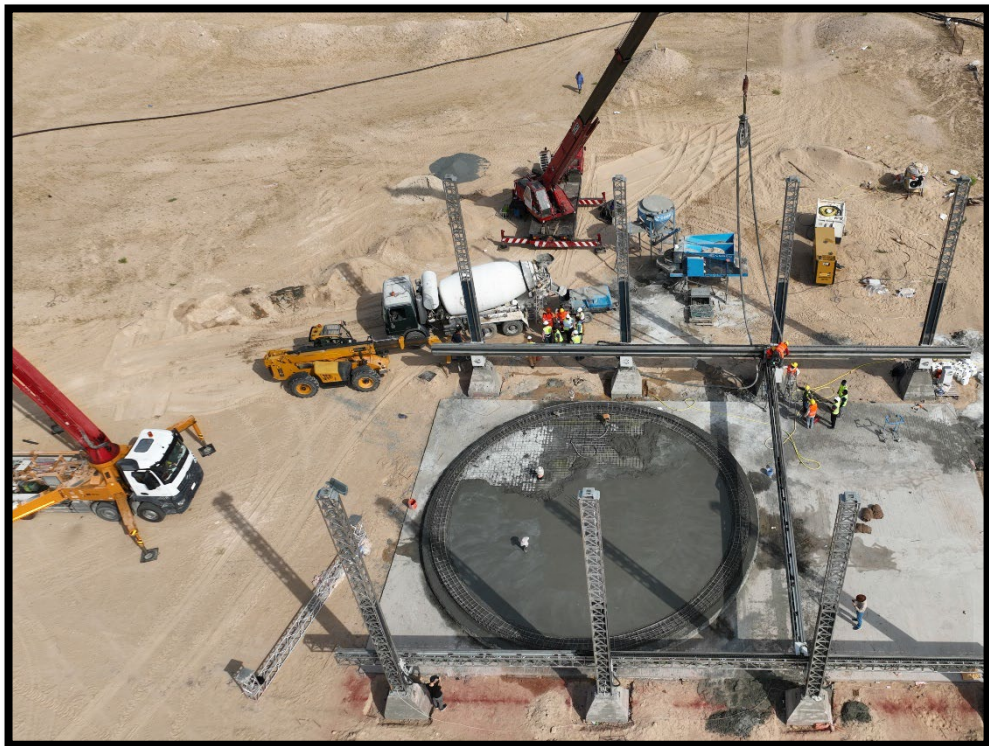
Overview of Project

- Project Planed in Oct 2023 (Collaboration Abyan-COBOD-CEMEX)
- Designed with similar design concept of smaller tanks
- Capacity **1,000,000 Liters** of water
- Tank Dimensions:
 - Height: **9m**
 - Inner Diameter: **12m**
 - Wall thickness: **400mm (0-6m) & 200mm (6-9m)**
- Custom designed nozzles for single layer wall printing
- RMC steel fiber reinforced concrete mix
- Attempted 24hr printing till end



Construction Stages & Printing Method

Step1: Clear Concreting & Foundation+Corbel work



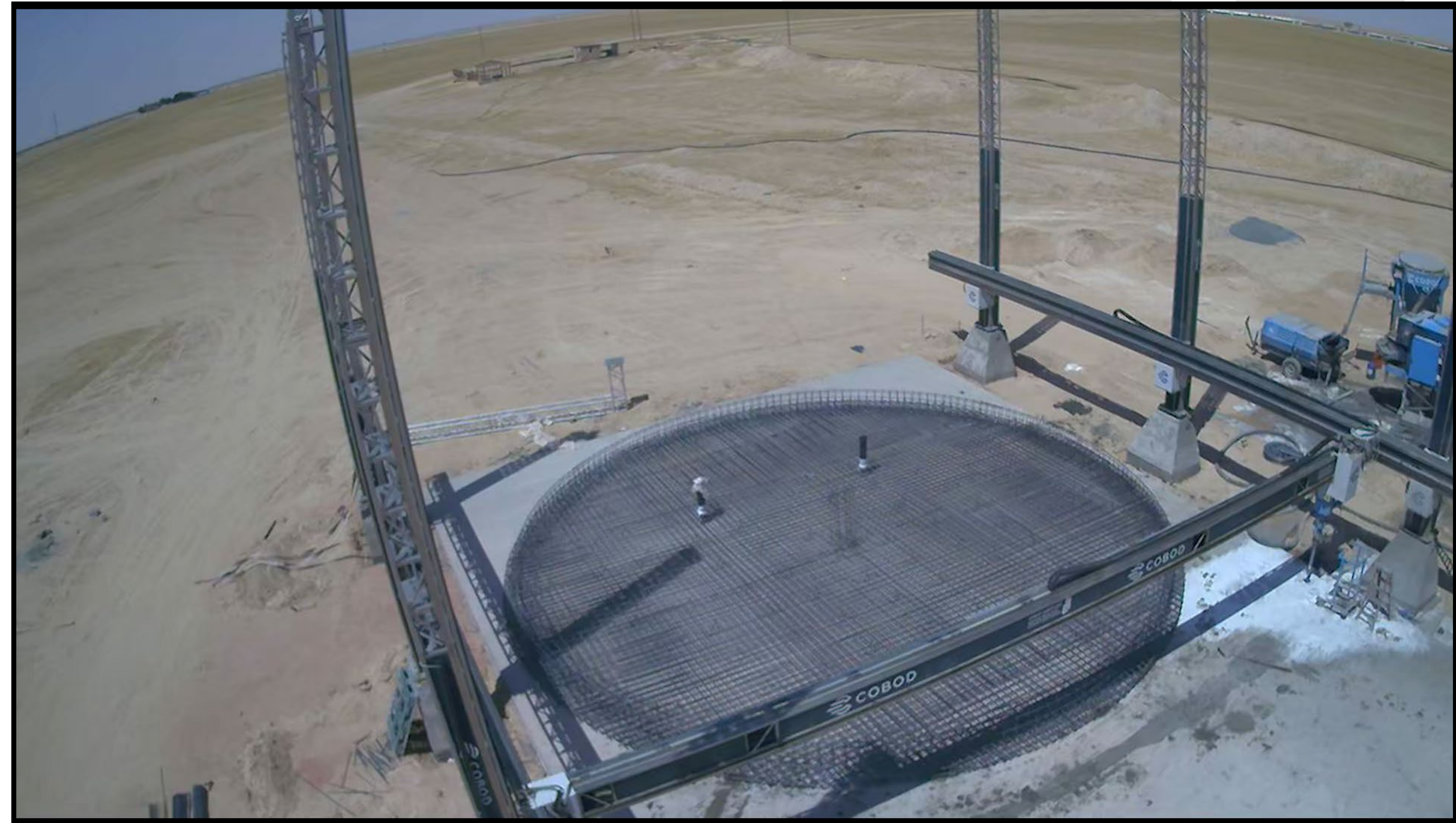
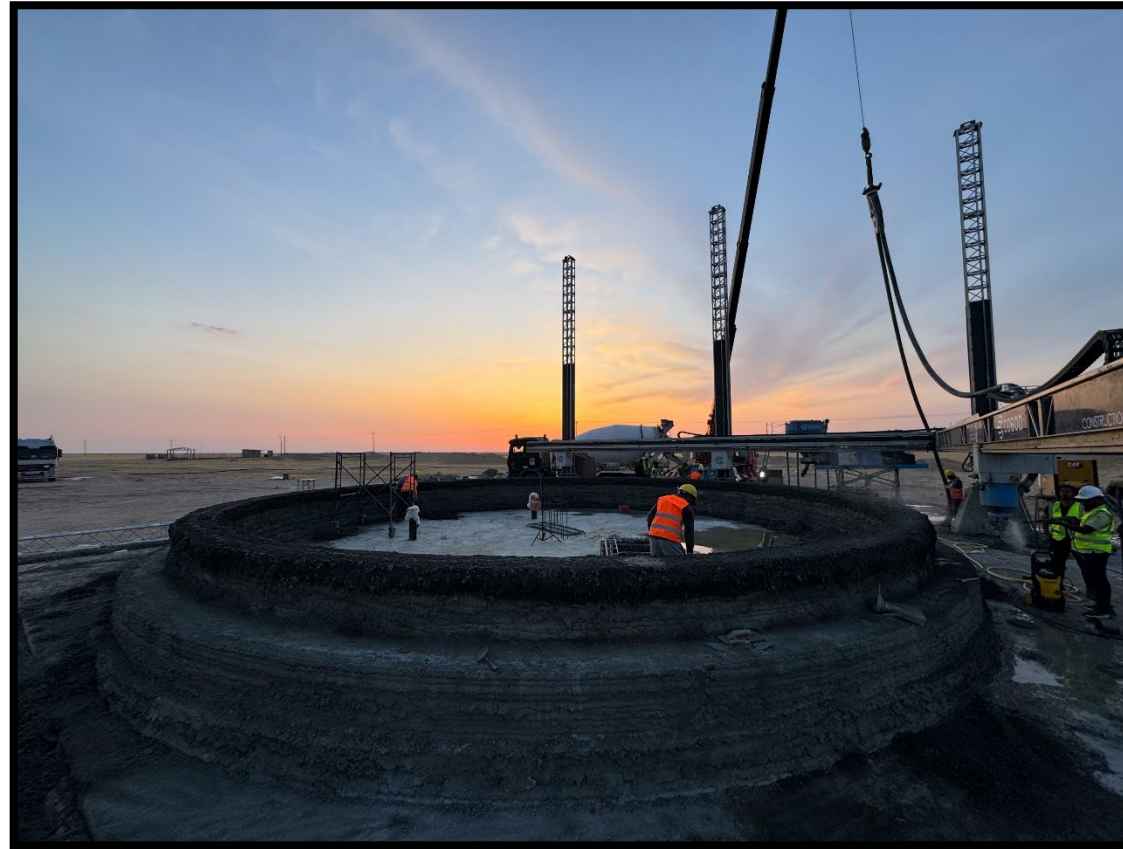
Construction Stages & Printing Method

Step2: Material Lab Testing, Test Batching & Site Delivery Testing



Construction Stages & Printing Method

Step3: Continuous Vase-mode Printing



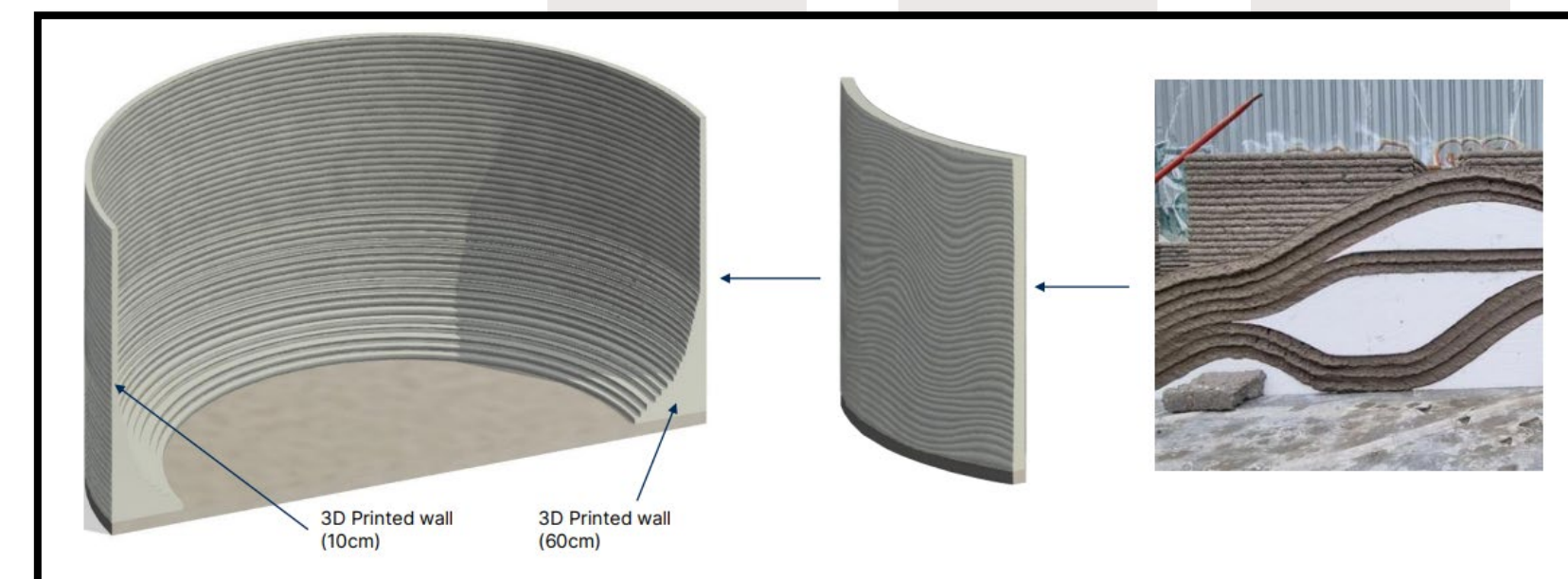
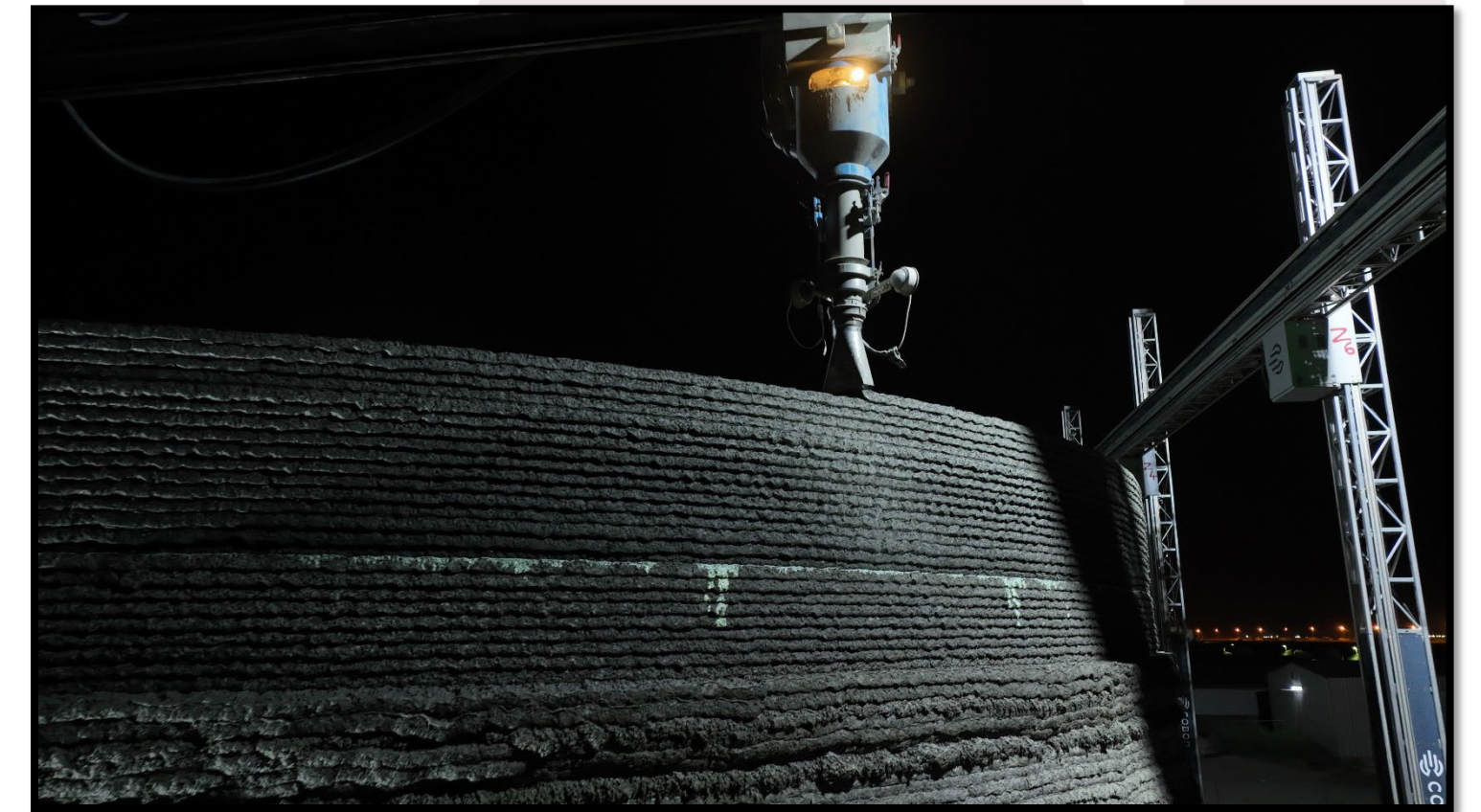
Material: Steel Fiber Reinforced RMC

- Material is D-fab base with added glass and steel fibers
- Steel fiber dosage up to **60kg/m³**
- Material workability was a challenge to keep consistent
- Site **1 hour and 15 min** away from RMC plant making retention challenging for printability
- Material design to have **45MPa cube strength**
- Material performed well reaching **60-65MPa strength**
- Slump turned out to be main factor for printability at approx. **35cm for ideal printing** at site



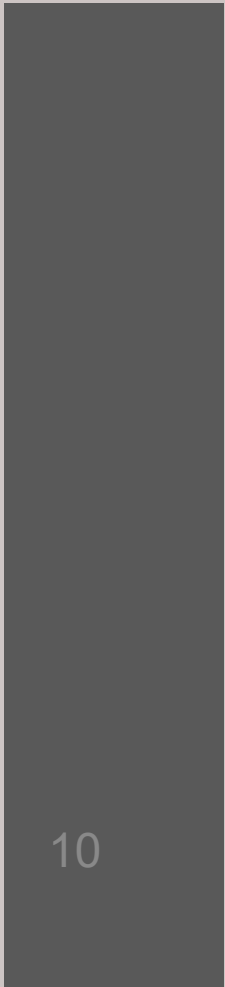
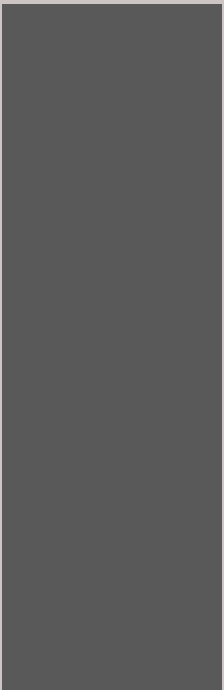
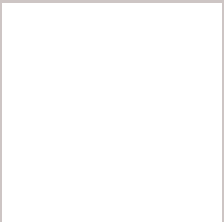
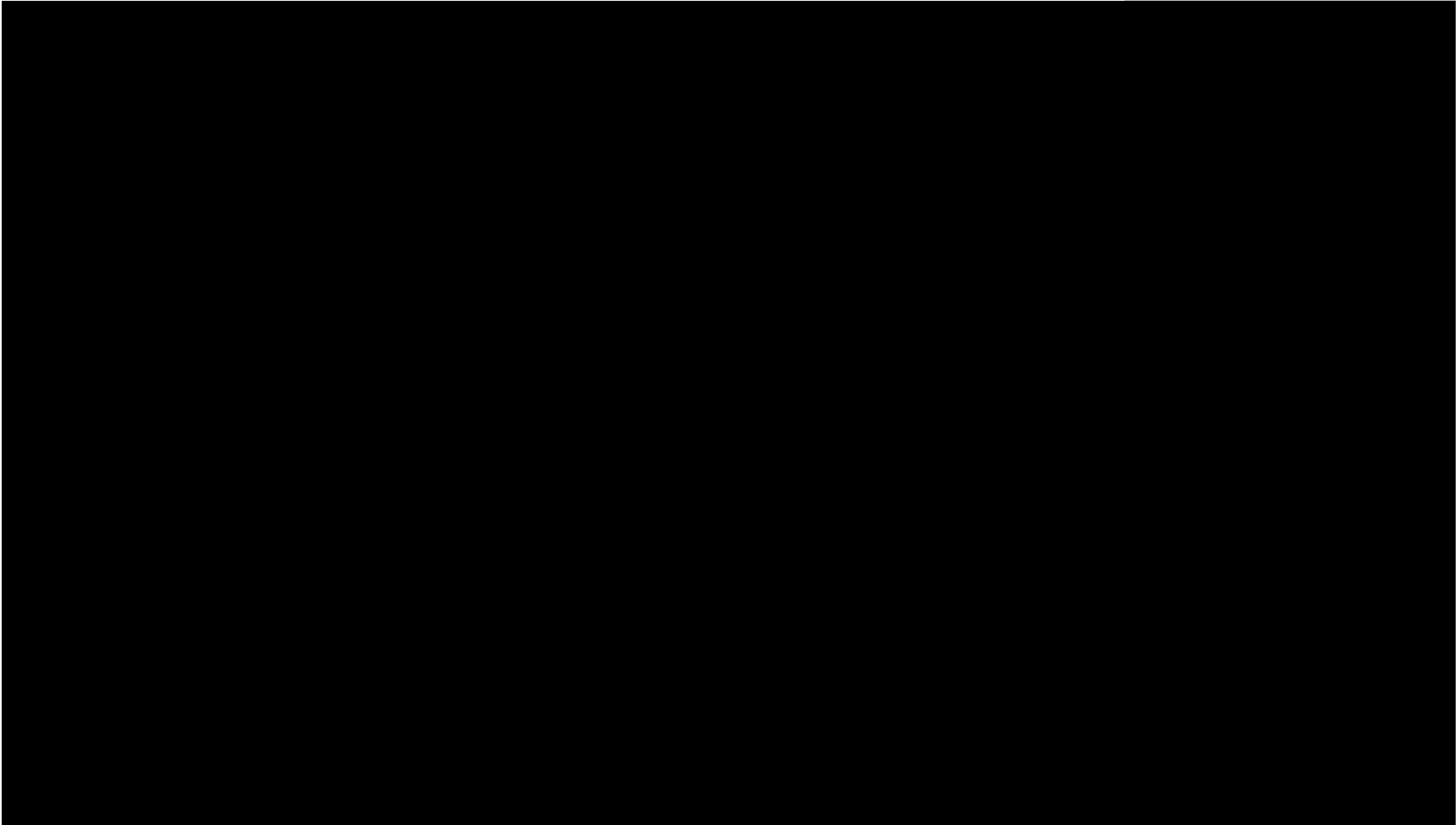
Design Challenges & Future Opportunities

- Inconsistency in mix workability in the beginning which was fixed
- Concrete strength and durability exceeded expectation
 - Consider lower steel fiber content (price reduction)
 - Reduce wall thickness
 - Redesign corbels and foundations
- Possibility of using vertical printing to increase stability



Courtesy of COBOD

Video



Acknowledgements

We would like to thank **COBOD** & **CEMEX** on their continuous support and generous contributions and technical on ground assistance.



Shoutout to Havelar team on assisting with operations in the last print segment and KBRC Kuwait for RMC plant support.





**Abyan will keep striving
for innovation**

Thank you