

SR 99 Tunnel Project

Tunnel Boring Machine Repair Plan Update

6/16/14

Objectives of repair plan:

- Replace seals with more robust seal system
- Install new main bearing
- Add steel repair pieces accommodate the new seal system and provide additional rigidity
- Configure TBM operation and performance monitoring enhancements

Update on Work in Progress

















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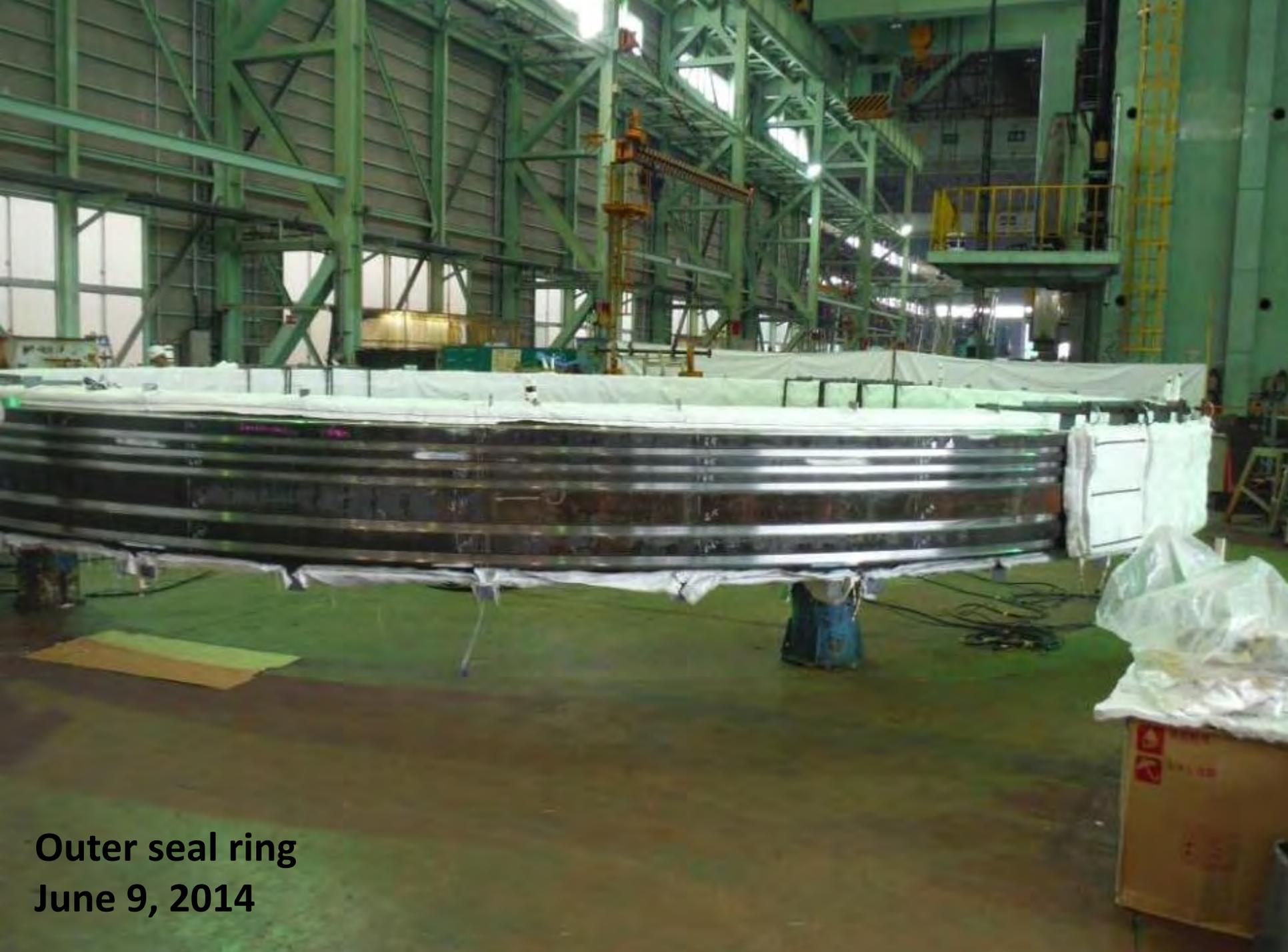
HITACHI ZOSEN CORPORATION

MANUFACTURING SCHEDULE

ITEM	Apr-14	May-14	Jun-14	Jul-14	Aug-14
SEAL SUPPORT FRAMES					
Subcontractor (Japan)					
Cutting/Welding	■	■			
Machining		■	■		
Subcontractor (Japan)					
Cutting/Welding		■			
Machining		■	■		
Subcontractor (Japan)					
Cutting/Welding		■			
Machining			■	■	
SEAL RING (FRONT)					
Hitachi Zosen					
Cutting/Welding	■	■	■		
Machining				■	■
BEARING BLOCK (FRONT)					
Hitachi Zosen					
Cutting/Welding	■	■			
Machining			■	■	
BEARING BLOCK (MIDDLE)					
Subcontractor (Korea)					
Cutting/Welding		■	■		
Machining			■	■	
THRUST SEAL RING					
Subcontractor (Korea)					
Cutting/Welding		■	■		
Machining			■	■	
MARINE TRANSPORT					■



Outer seal ring
June 2, 2014



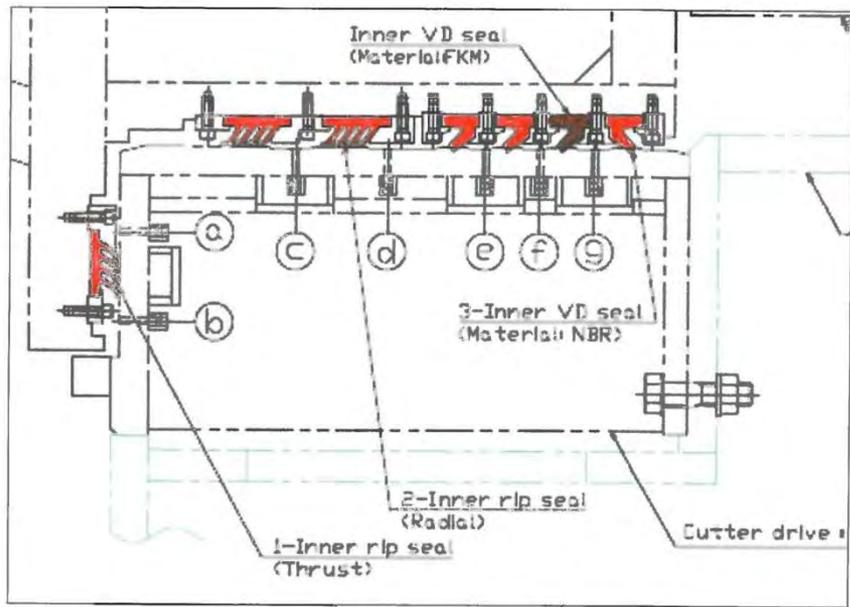
Outer seal ring
June 9, 2014



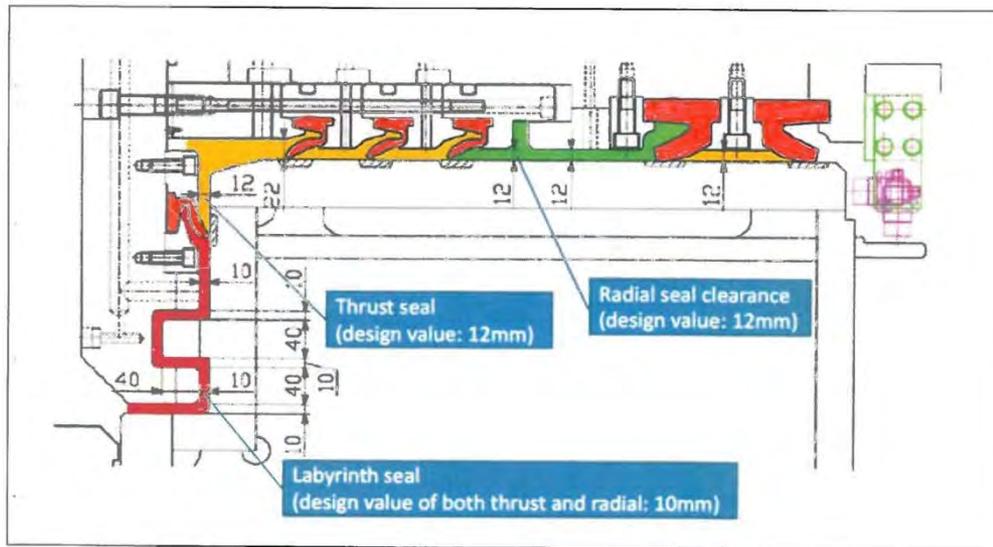
Bearing block
June 2, 2014



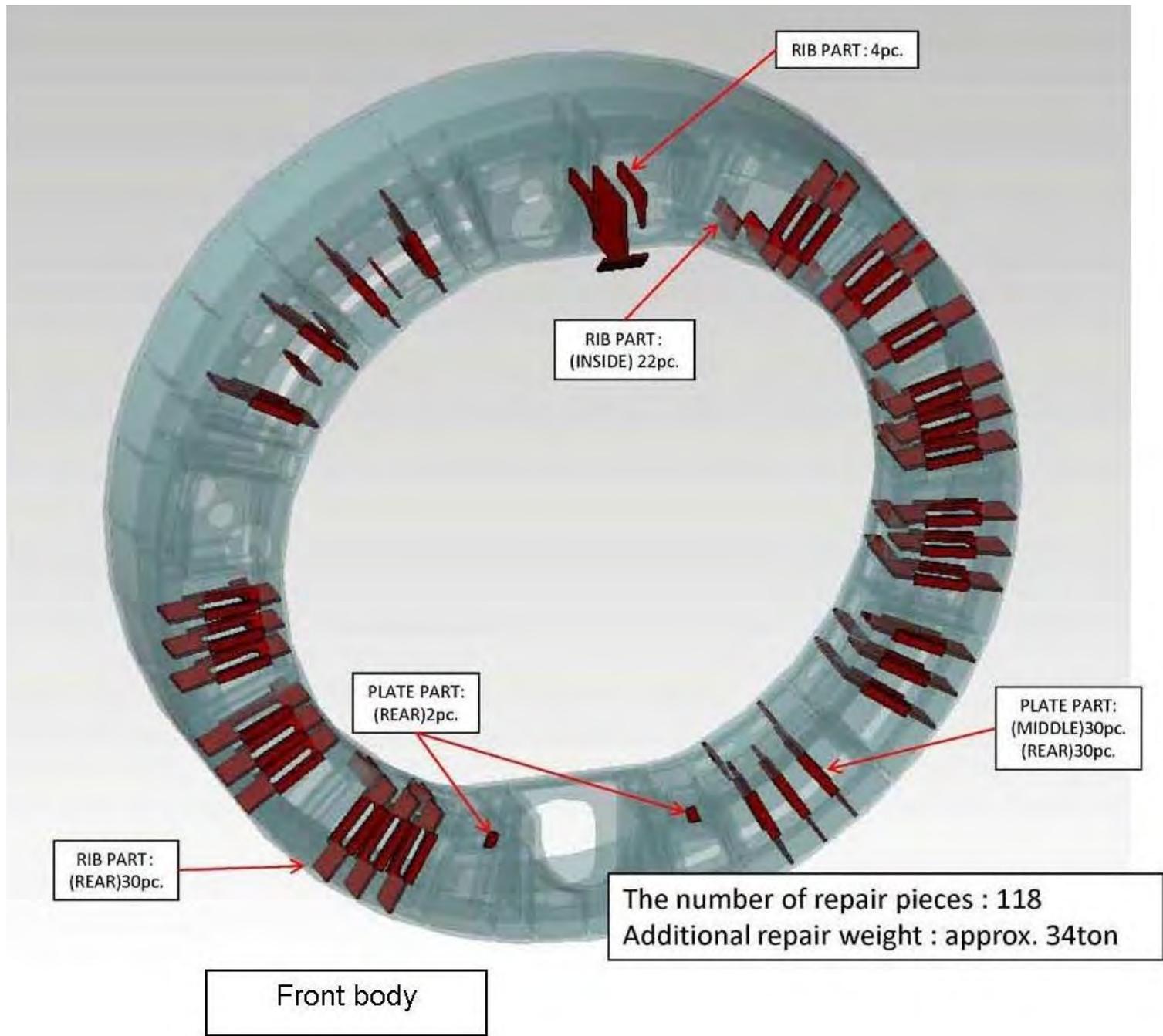
Bearing block
June 9, 2014

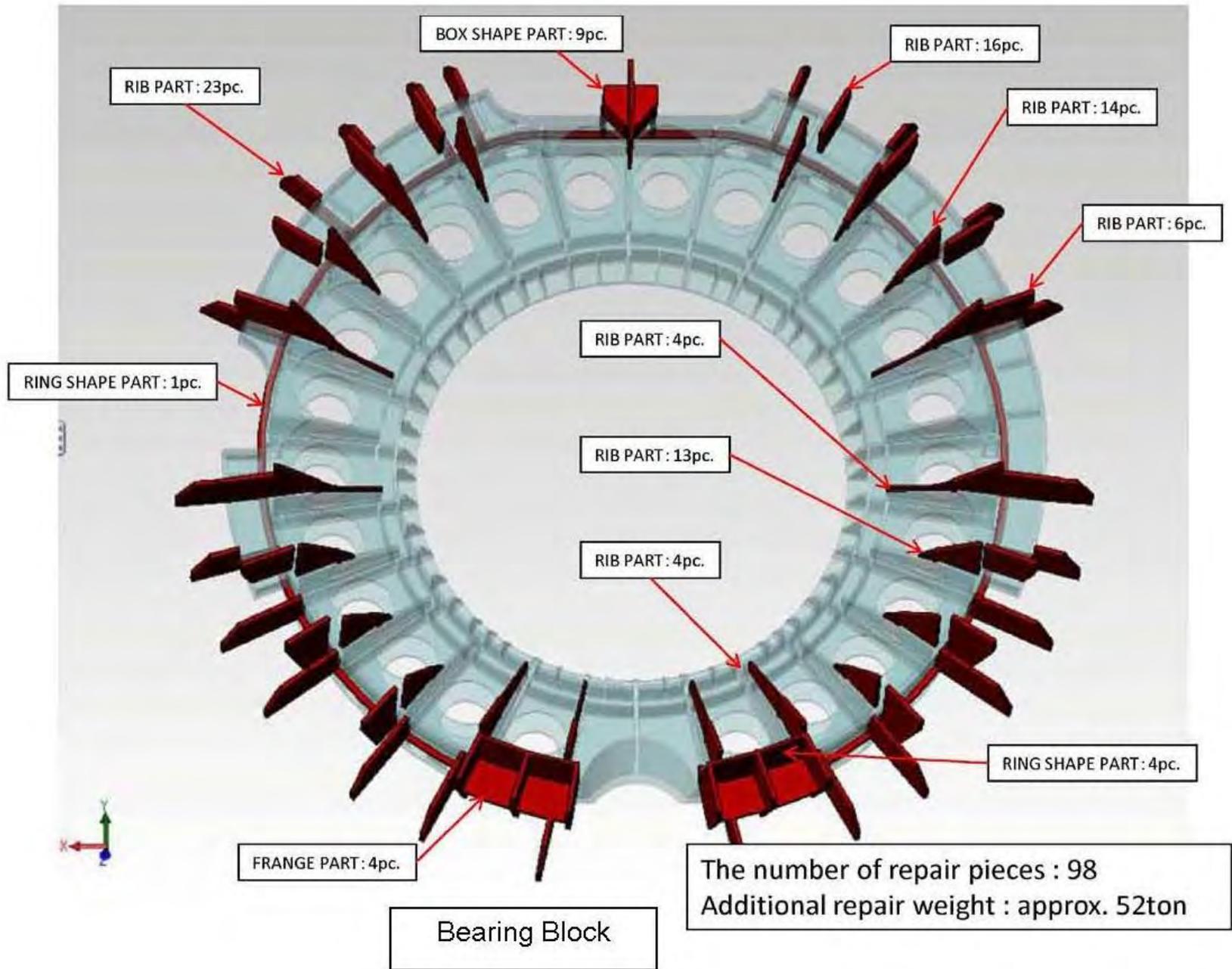


OLD SEAL SYSTEM



NEW SEAL SYSTEM







RADNO
LINK LIBRARY

SYSTEM CONTROL PANEL

OPERATION CABINET

0585

0632

0536

0624

0

Energizer

Hitachi Zosen

Tunnel Boring Machine Repair Plan

6/16/14

Video goes here

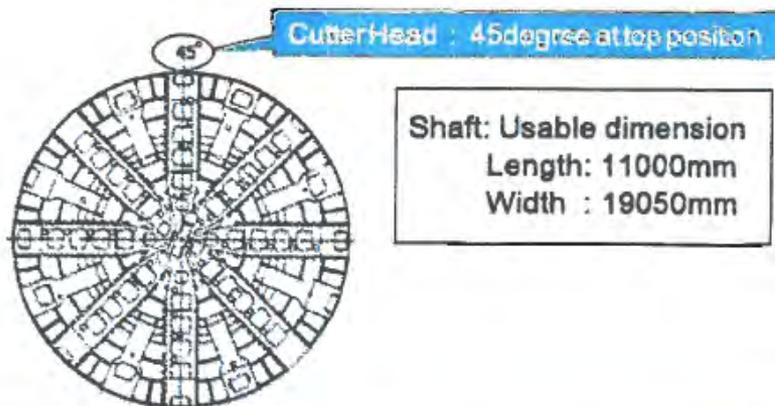
Hitachi Zosen

Tunnel Boring Machine Repair Plan

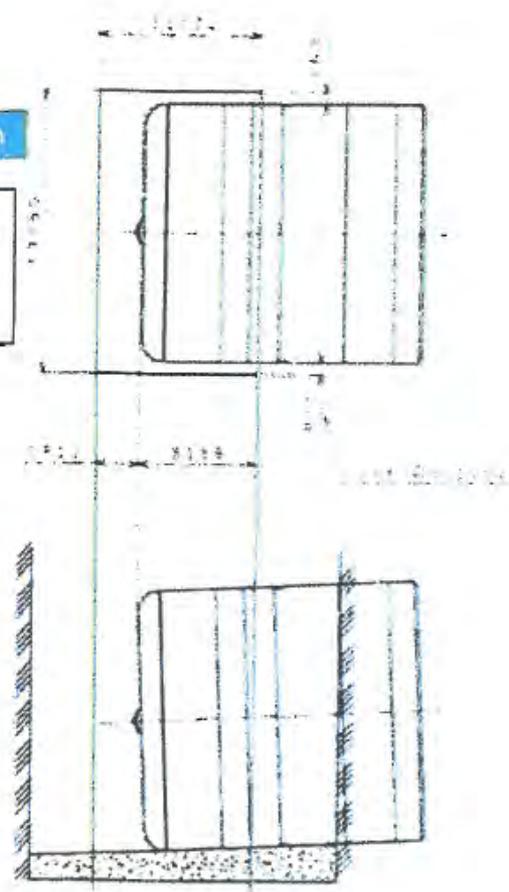
- A. Preparation work in the shaft – 12 steps
- B. Disassembly work in the shaft and lifting – 12 steps
- C. Preparation work on the ground – 2 phases
- D. Disassembly work on the ground – 10 steps
- E. Assembly work on the ground – 9 steps
- F. Lowering and assembly work in the shaft – 6 steps
- G. Final activities – 8 activities

A. Preparation work in the shaft

Steps 1 to 5

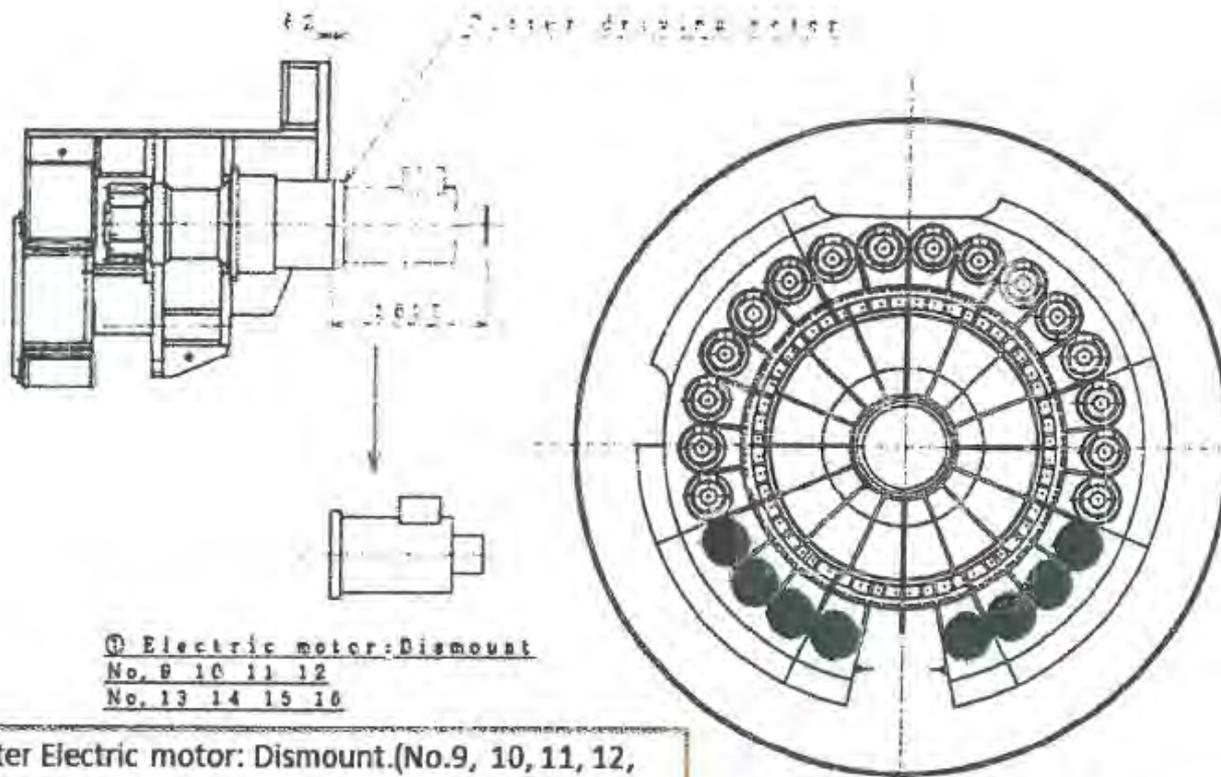


1. Cutter Head: 45degree at top position
2. Bearing block and Middle body: Fix at top position.
※Cutter support jack: Working.
3. Hose and Cable in the TBM: Disconnect.
※Put a counter-mark
4. Manlock : Support on the deck.
5. Fix plate for Passage way : Cutting the welding bead at Middle body upper side.



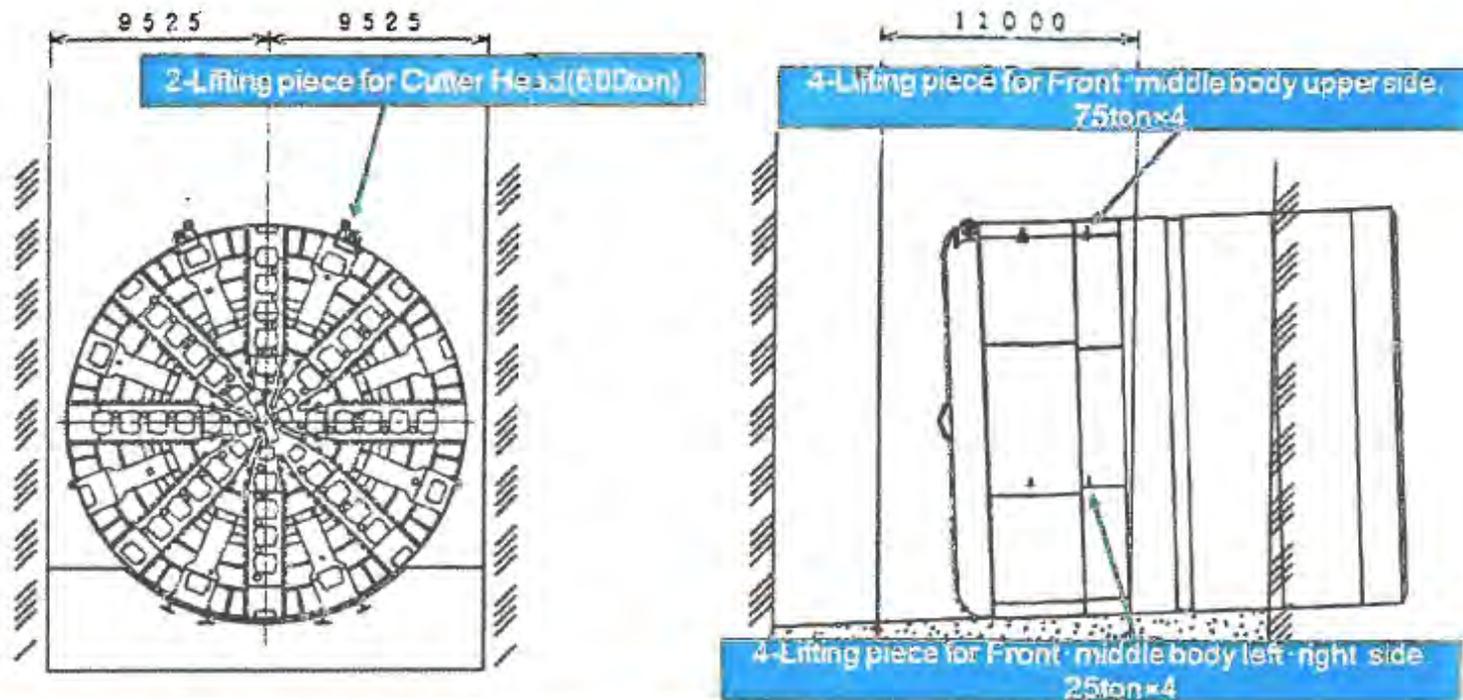
A. Preparation work in the shaft

Steps 6 to 9



A. Preparation work in the shaft

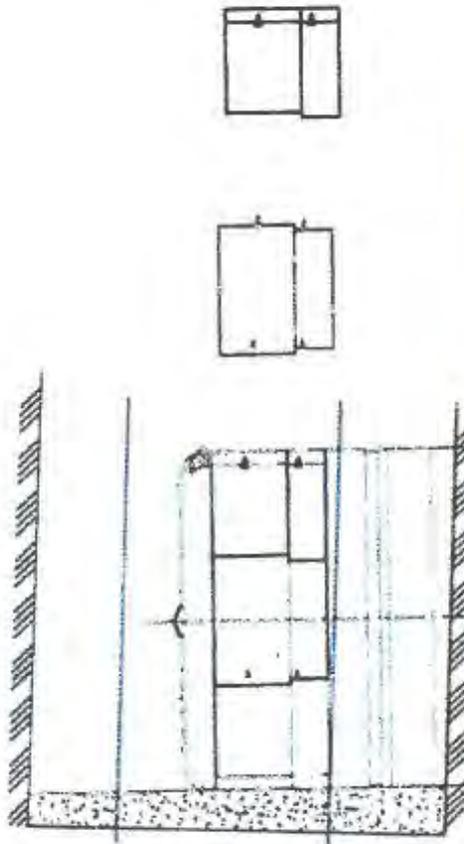
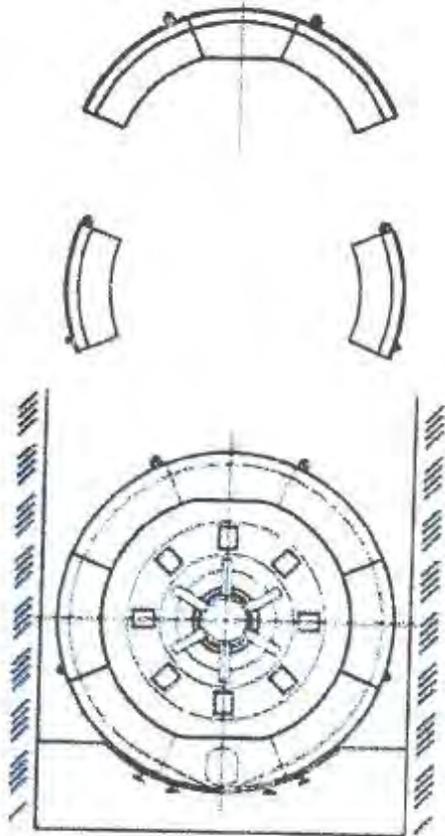
Steps 10 to 12



10. Bit and Wear resistant steel on the Cutter Head:
Take off for lifting piece.
11. Lifting piece on the Cutter Head: Welding.
12. Lifting piece on the Front-middle body upper, right and left side: Welding

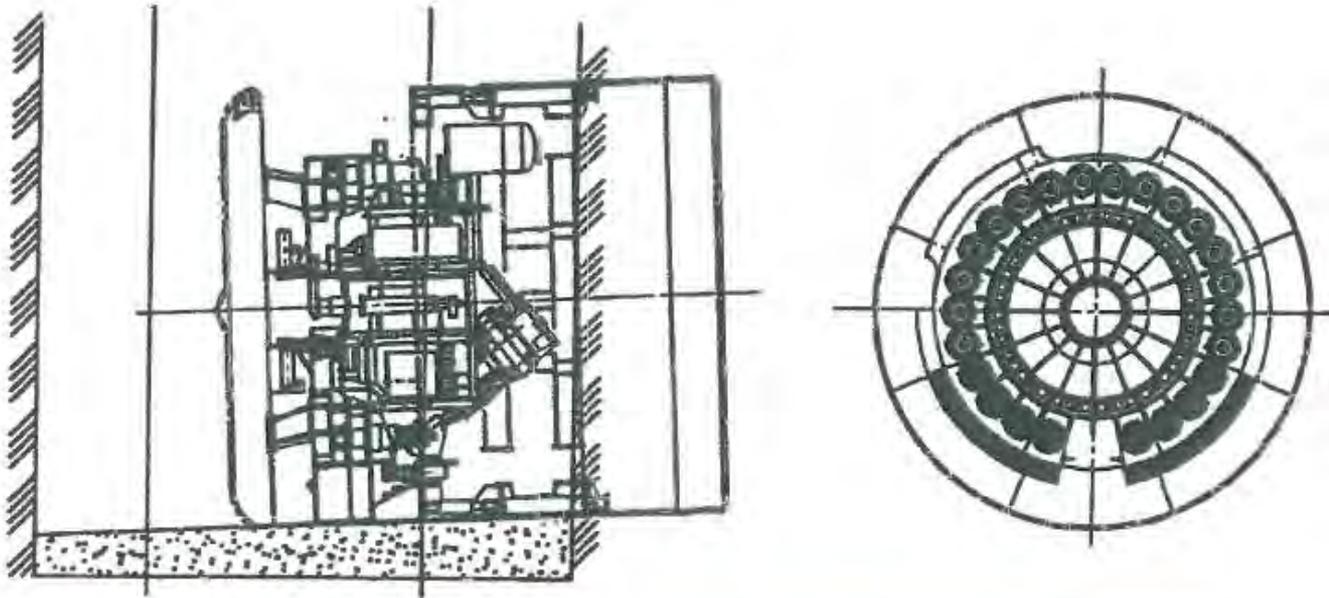
B. Disassembly work in the shaft and lifting work

Steps 1 to 5



1. Front body outer seal ring and Front body bulkhead : Cutting the welding bead.
2. Front body upper side: Disassembly and lifting to the ground.
3. Front body right and left side : Disassembly and lifting to the ground.
4. Passage way : Take off and lifting to the ground.
5. Front body outer seal ring : Cutting and lifting to the ground.

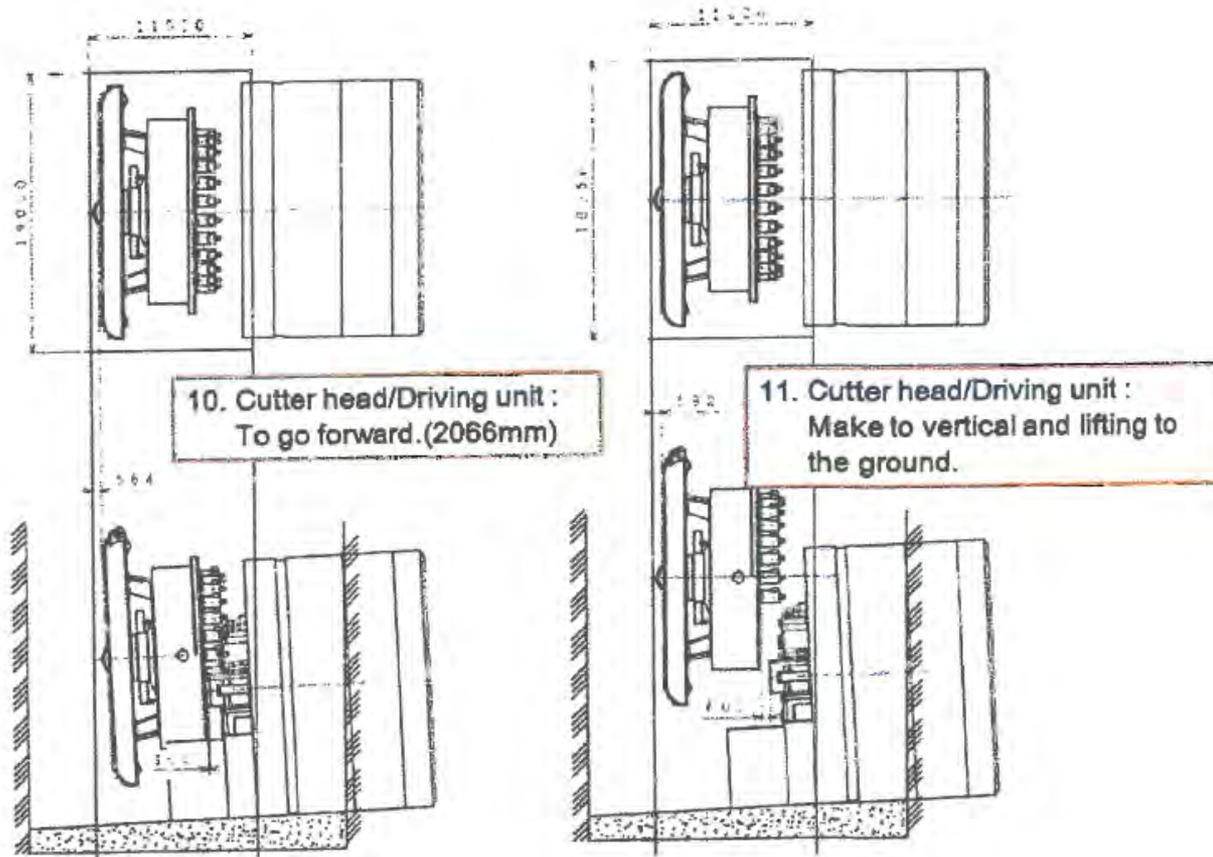
Disassembly work in the shaft and lifting work Steps 6 to 9



6. Cutter support jack mount: Cutting the lower right and left side.
7. Lifting trunnion : Set on the bearing block.
8. Cutter head/Driving unit: Lifting by MLT.
9. Bearing block and middle body's fixing and cutter support jack: Take off.

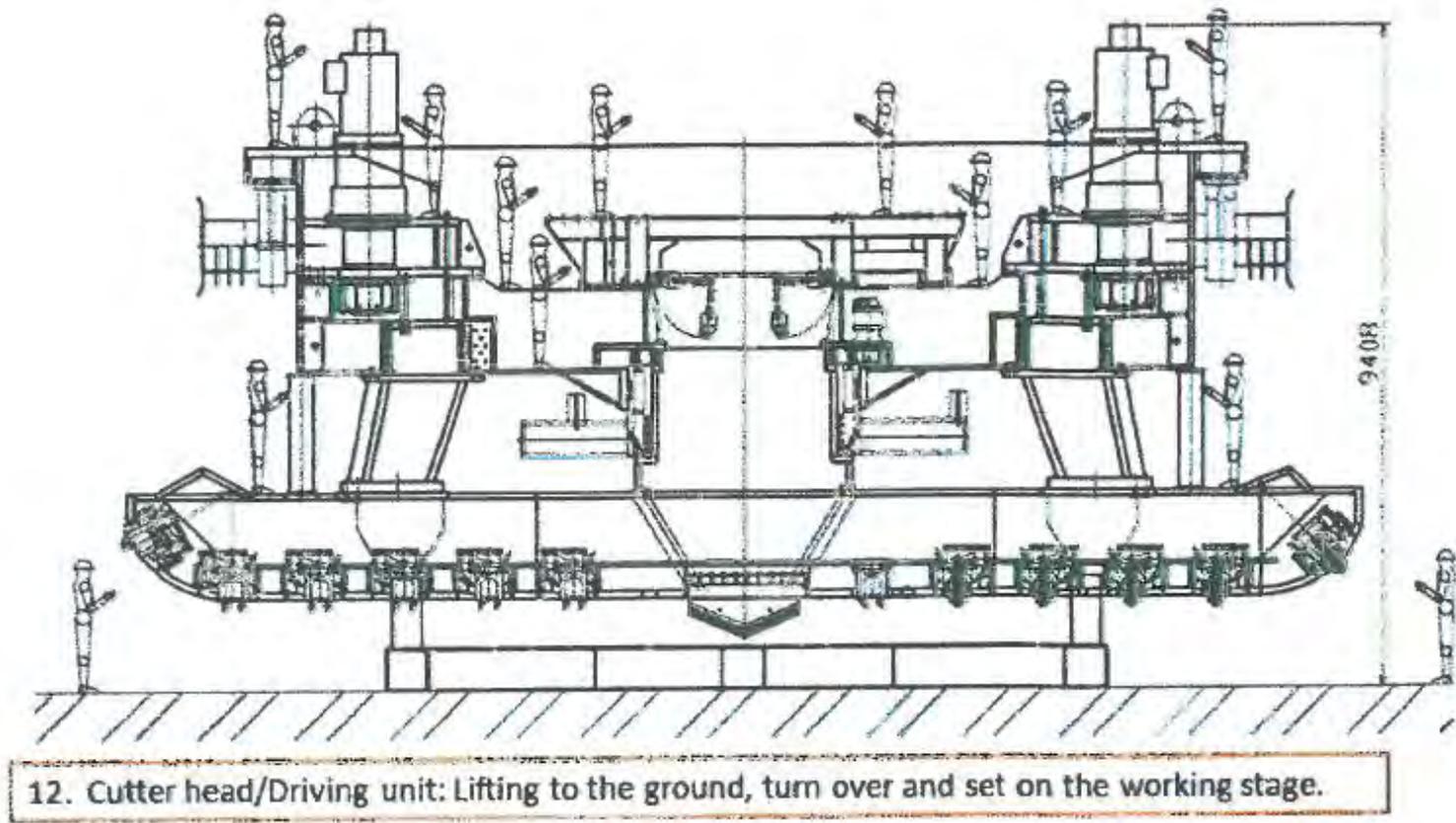
B. Disassembly work in the shaft and lifting work

Steps 10 to 11



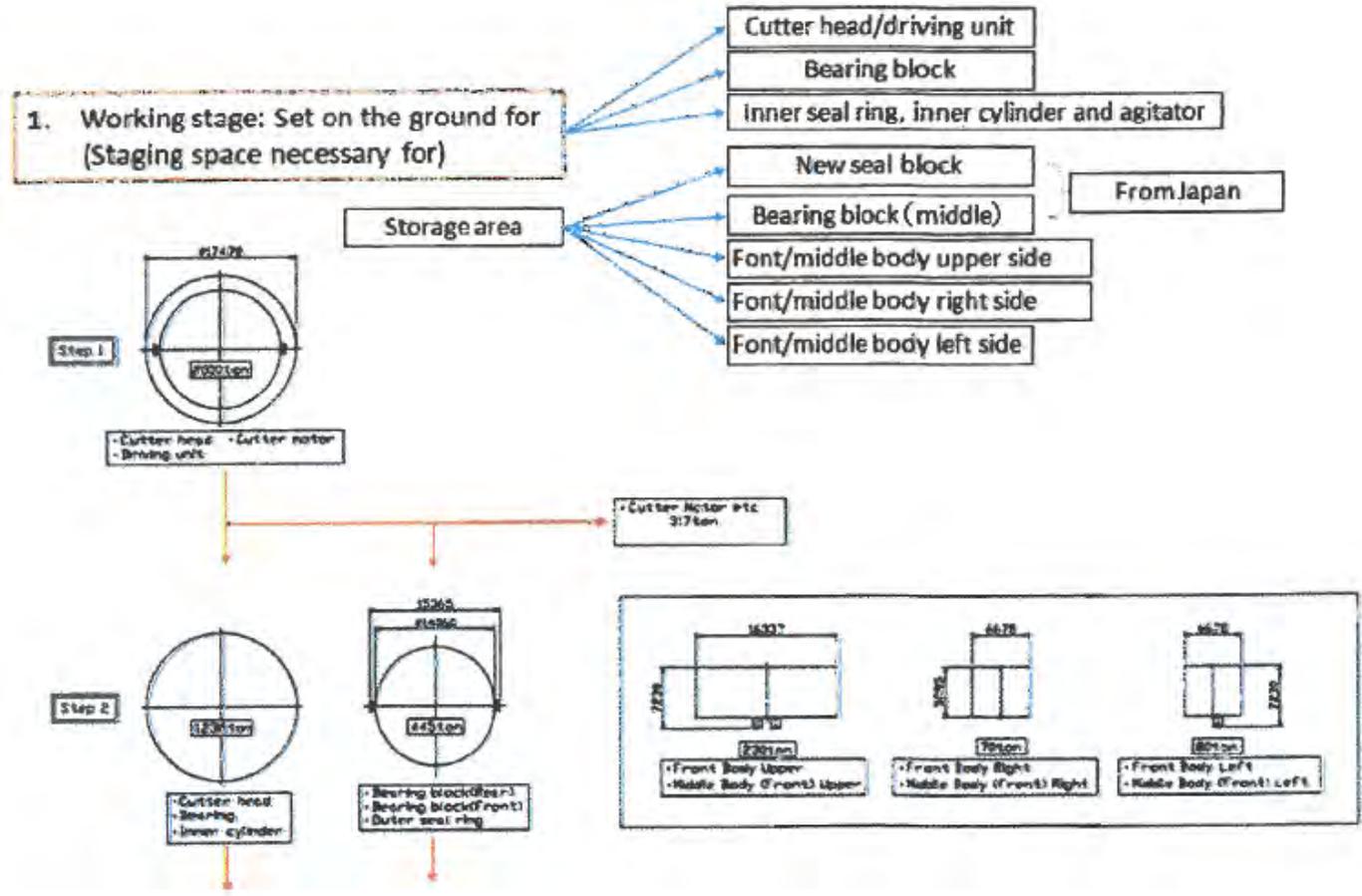
B. Disassembly work in the shaft and lifting work

Step 12



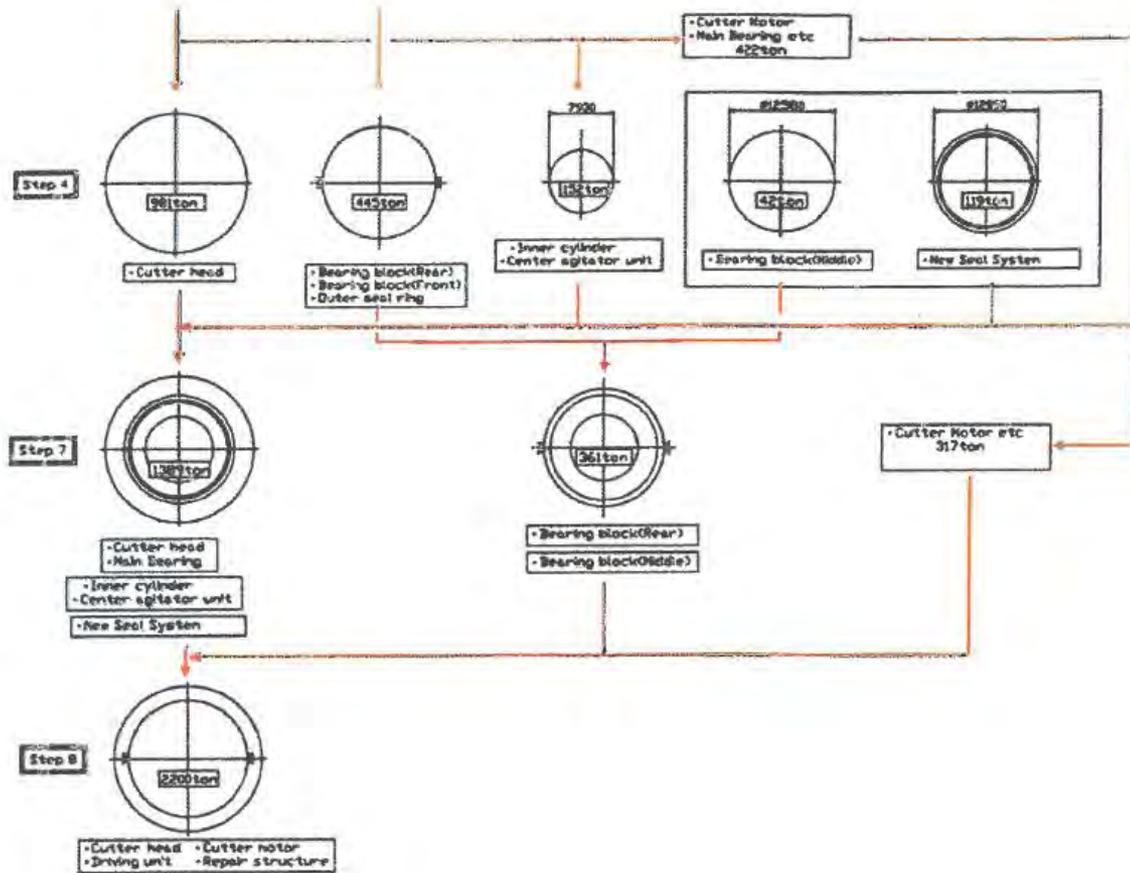
C. Preparation work on the ground

Phase 1 of 2



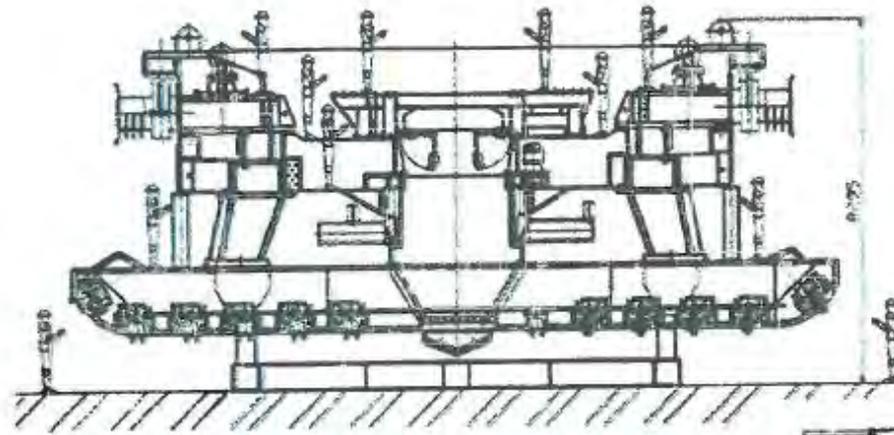
C. Preparation work on the ground

Phase 2 of 2

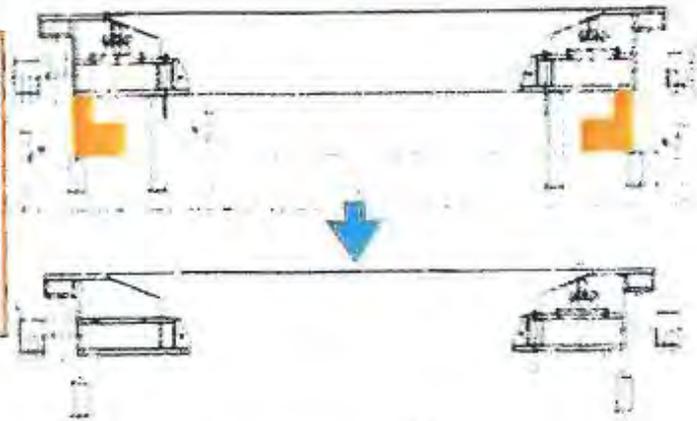


D. Disassembly work on the ground

Steps 1 to 4

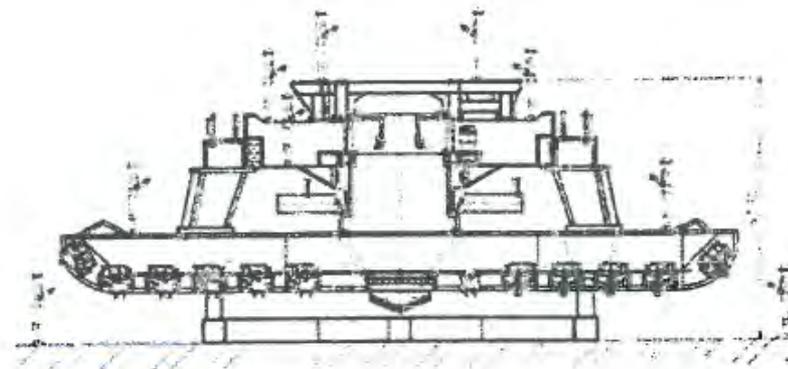


1. Cutter motor: Removal.
2. Bearing block: Disassembly, lifting and set on the working stage.
3. Outer seal and bearing block(front) : Cutting and removal from bearing block.
4. New bearing block(middle) : Install to the bearing block(rear).

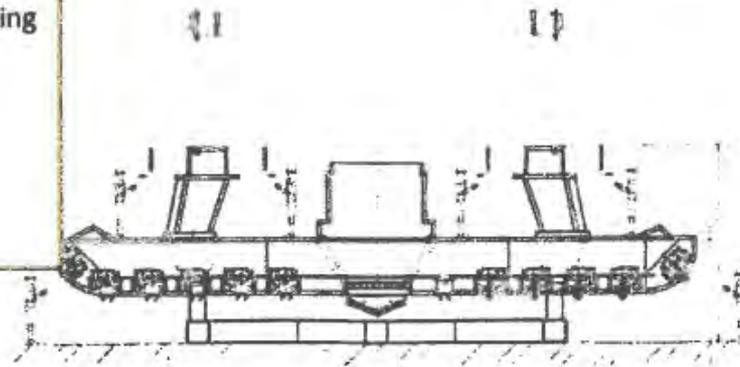


D. Disassembly work on the ground

Steps 5 to 10

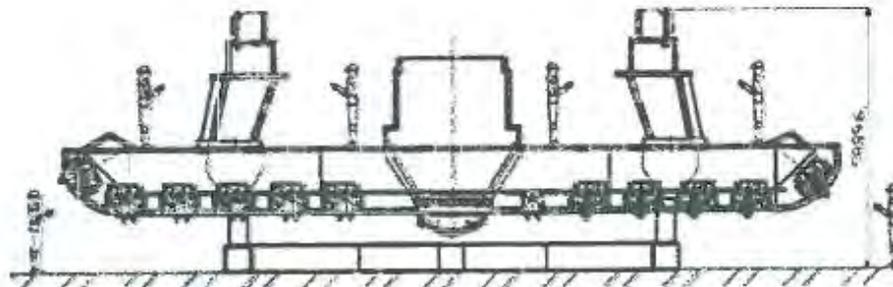


5. Inner seal ring, inner cylinder and agitator: Disassembly and lifting and set on the working stage.
6. Agitator: Extend the blade.(500mm)
7. Agitator: Exchange the new seal.
8. Main bearing: Disassembly.
9. Outer and inner seal: Take off.
10. Cutter column: Cleaning.

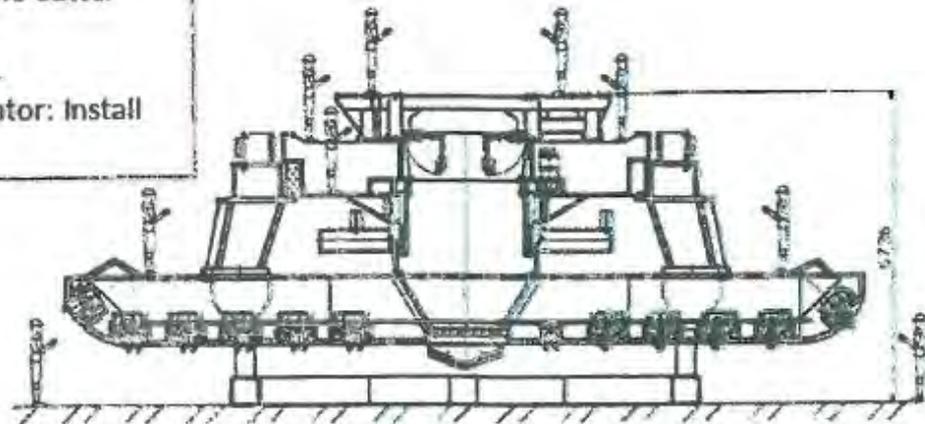


E. Assembly work on the ground

Steps 1 to 3

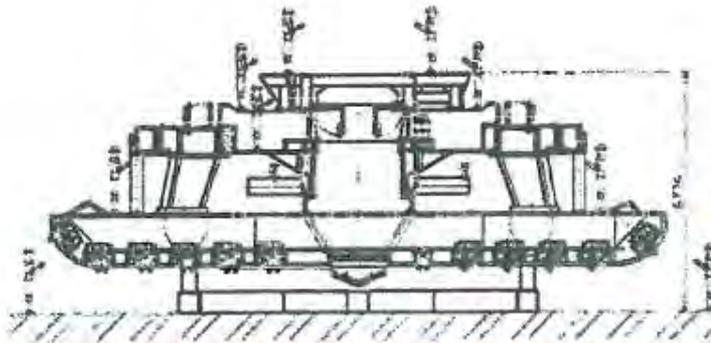


1. New main bearing: Assembly on the cutter column.
2. Inner seal: Exchange the new seal.
3. Inner seal, inner cylinder and agitator: Install on the cutter column.

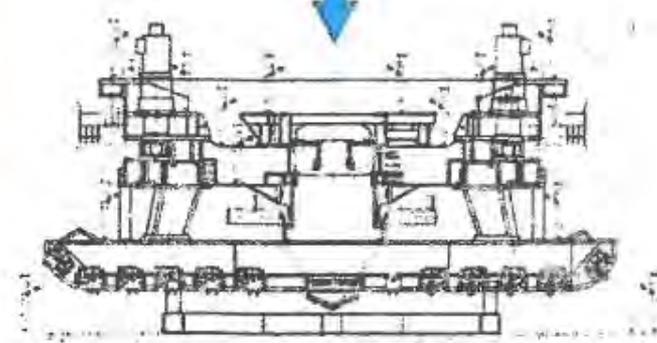
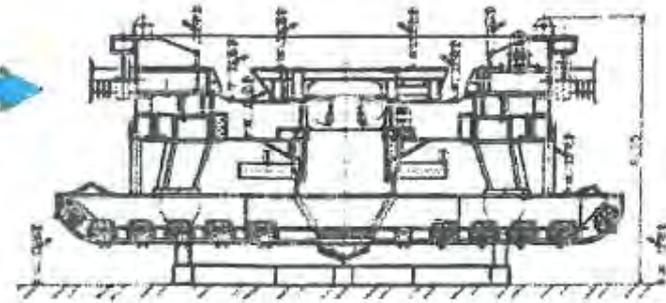


E. Assembly work on the ground

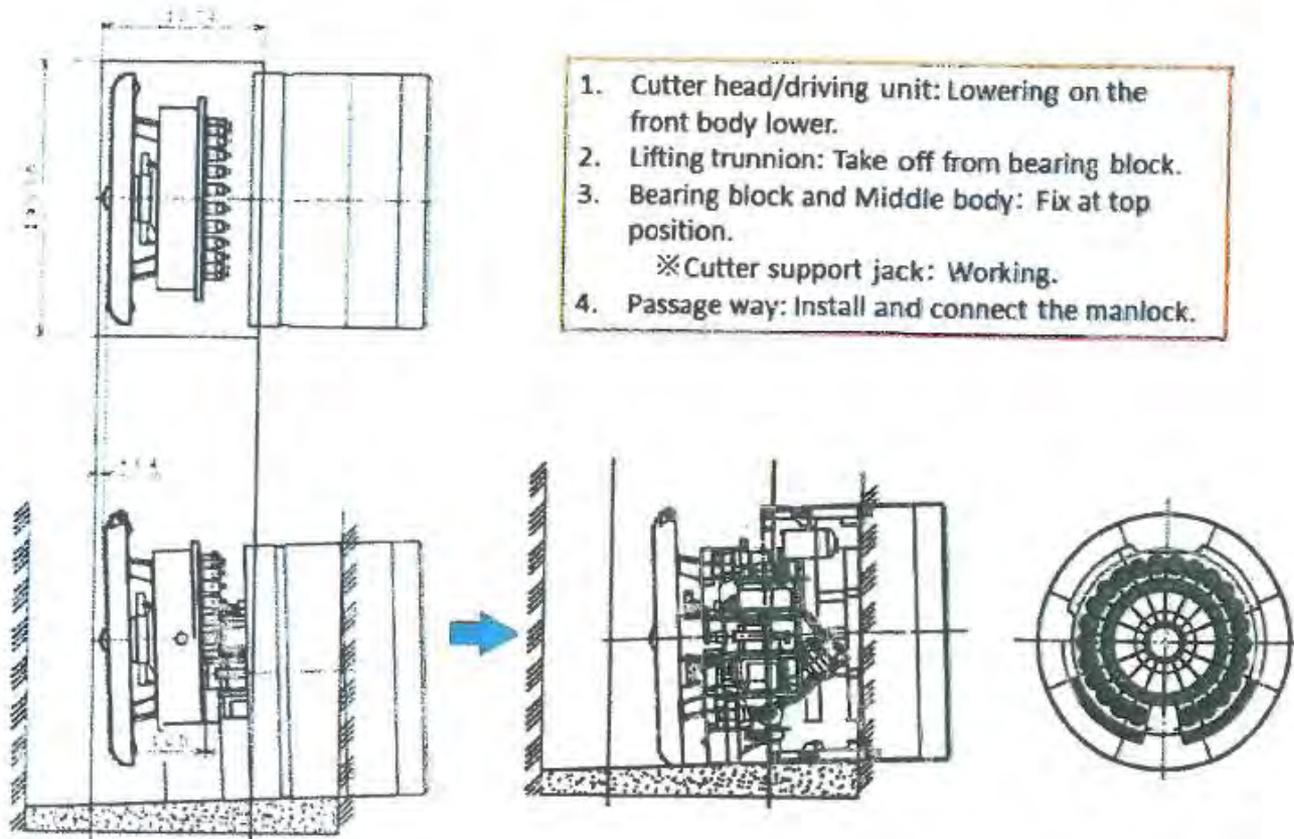
Steps 4 to 9



4. Outer seal ring, bearing block(front):
5. Bearing block(middle and rear) : Install on the cutter column.
6. Cutter motor: Install on the cutter column.
7. Pre cutting bit: Exchange the new bit.(Max 101PCS)
8. Cutter head slit baffle plate: Cutting.(64places)
9. Foam injection port: Exchange the new port. (22places)

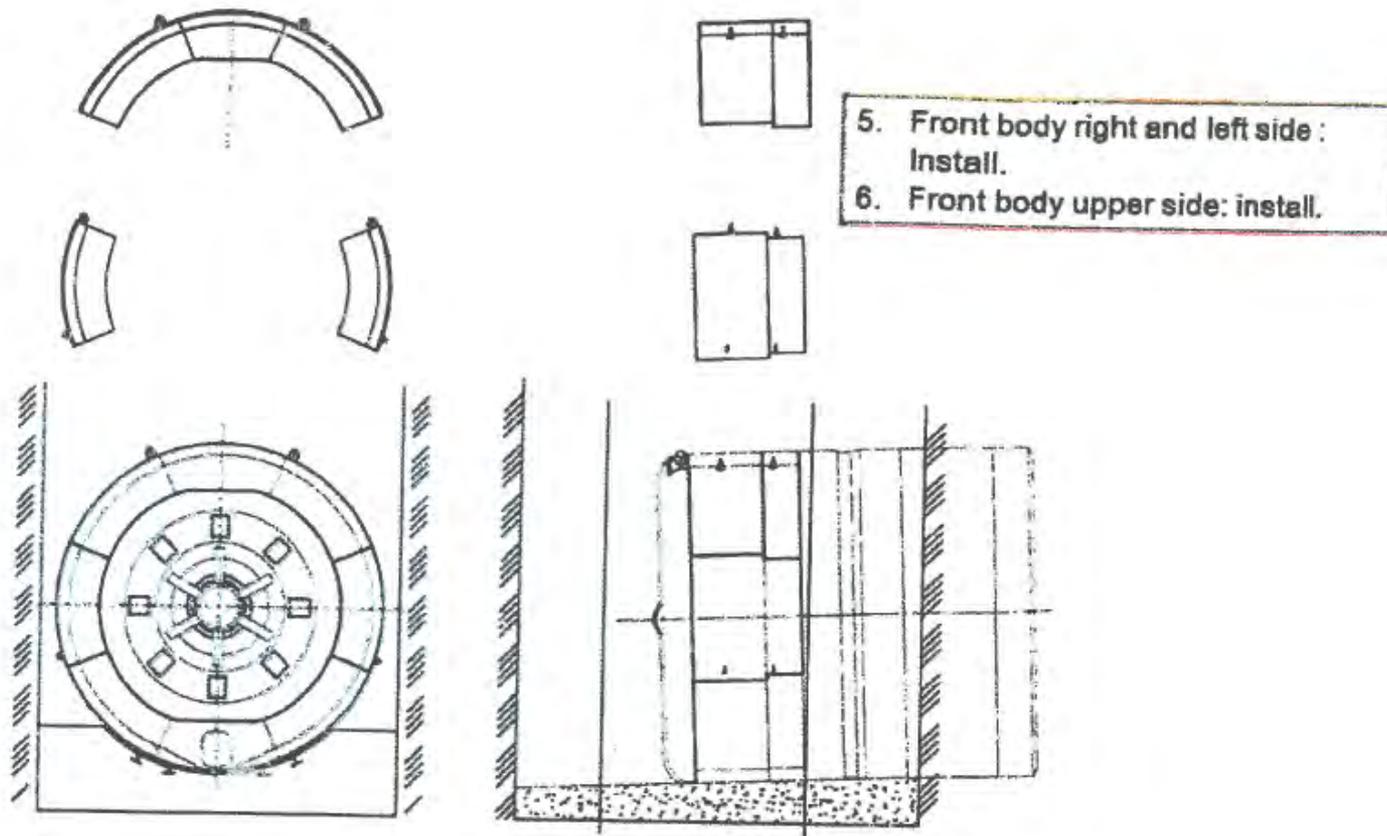


F. Lowering and assembly work in the shaft Steps 1 to 4



F. Lowering and assembly work in the shaft

Steps 5 to 6



G. Final activities

1. Lifting piece: Cutting and take off.
2. Bit and wear resistant steel on the cutter head: Mount and welding.
3. Cutter electric motor: Reassembly.
4. Inside deck: Reconnect to inner cylinder.
5. Rotary joint: Reconnect.
6. Pipe for drill: Reconnect.
7. Manlock and passage way: Reconnect to the Front body.
8. Hose and cable: Reconnect.

