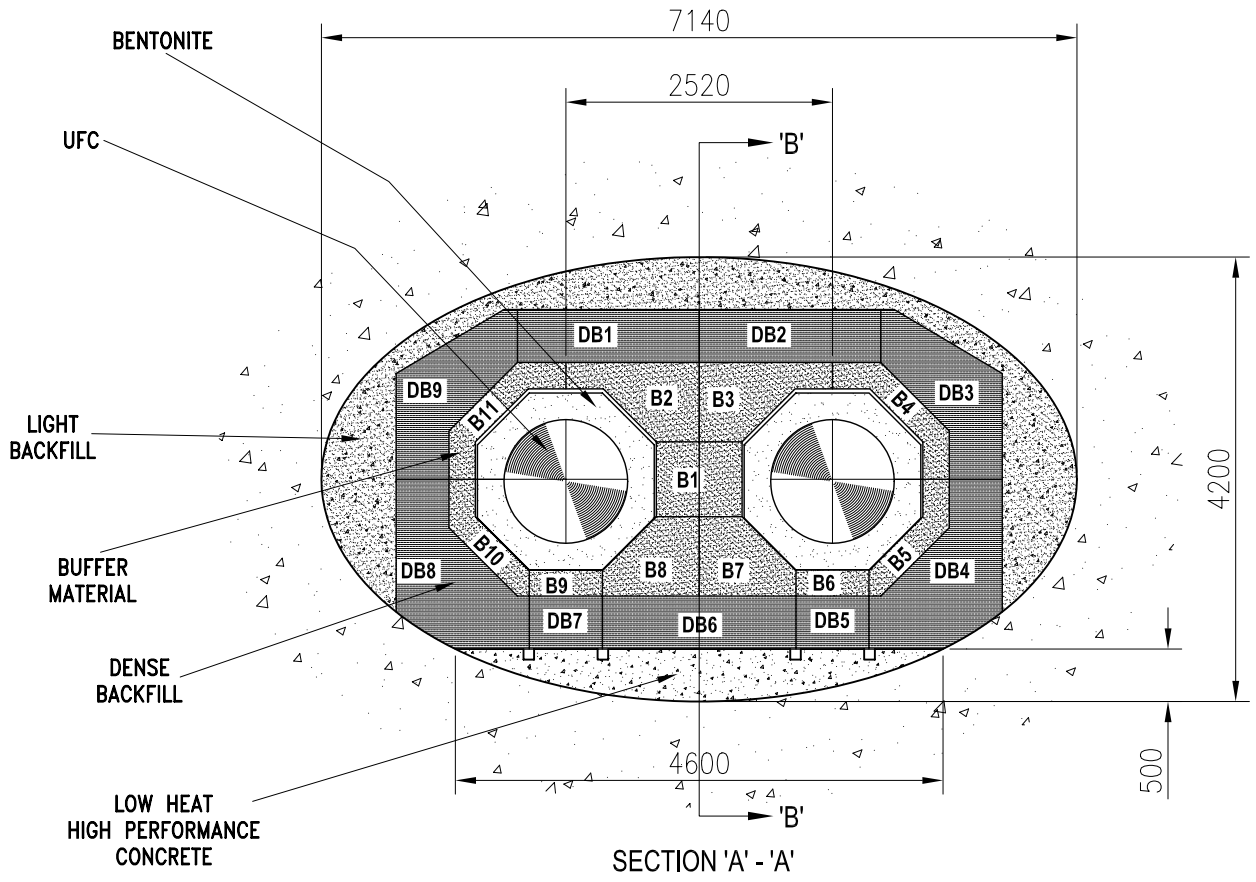
Figures - Main Report



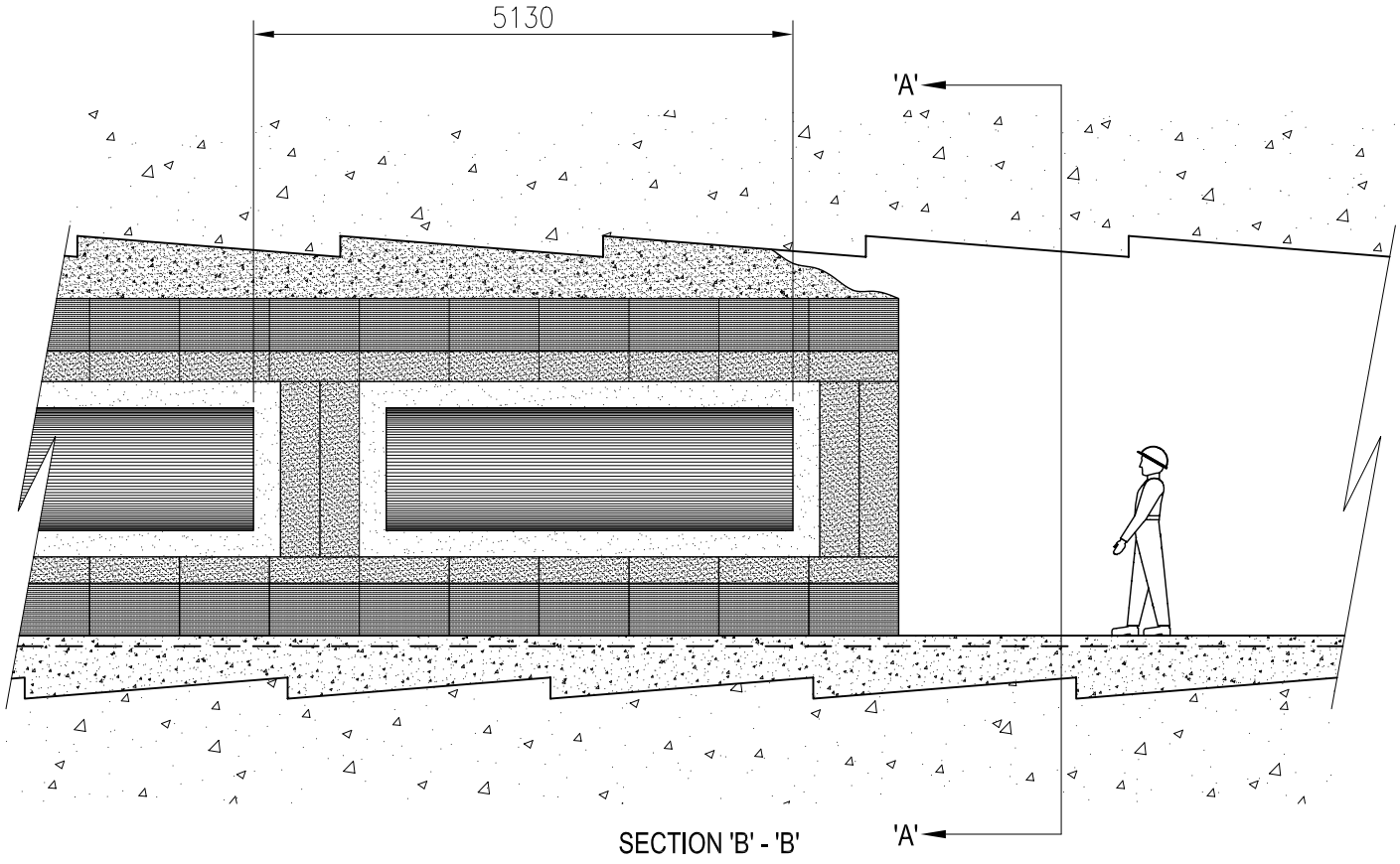


FIGURE 1 DGR EMPLACEMENT ROOM SHOWING GENERAL ARRANGEMENT OF EMPLACED BLOCKS AND UFCs

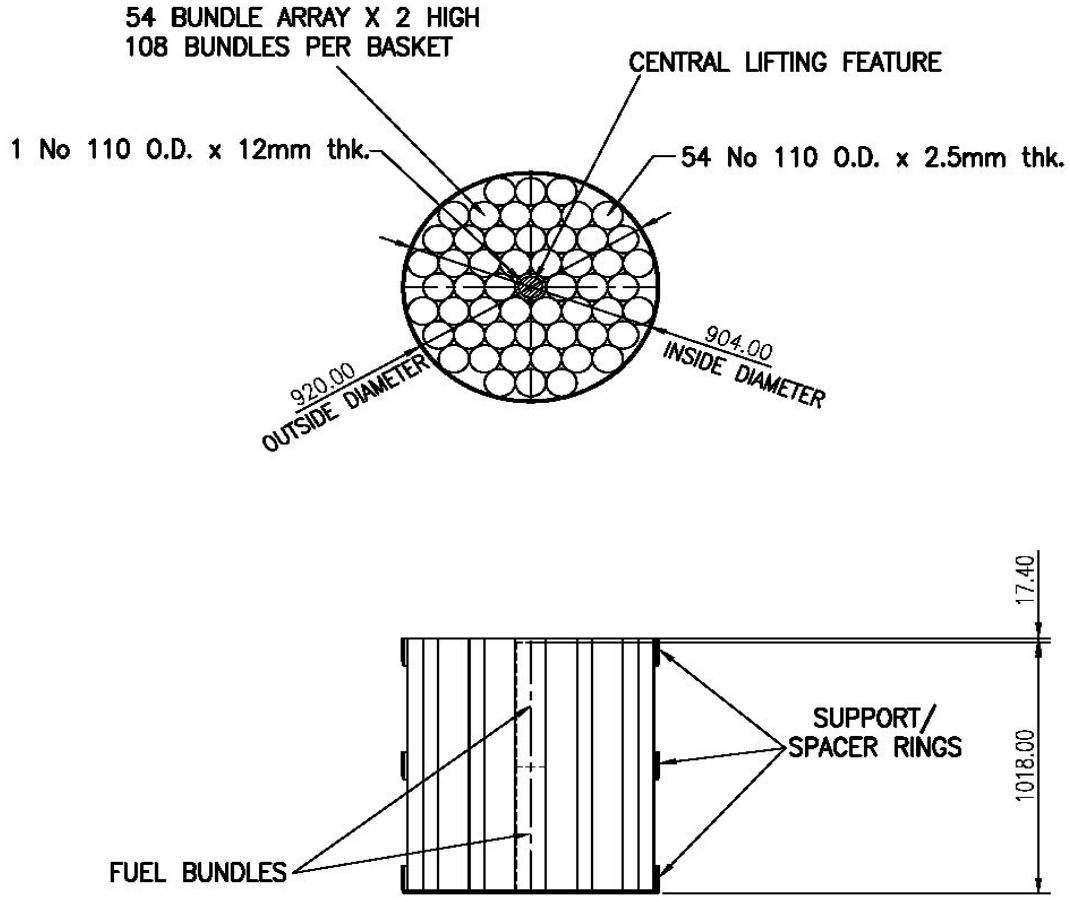


FIGURE 2 108 BUNDLE USED FUEL BASKET

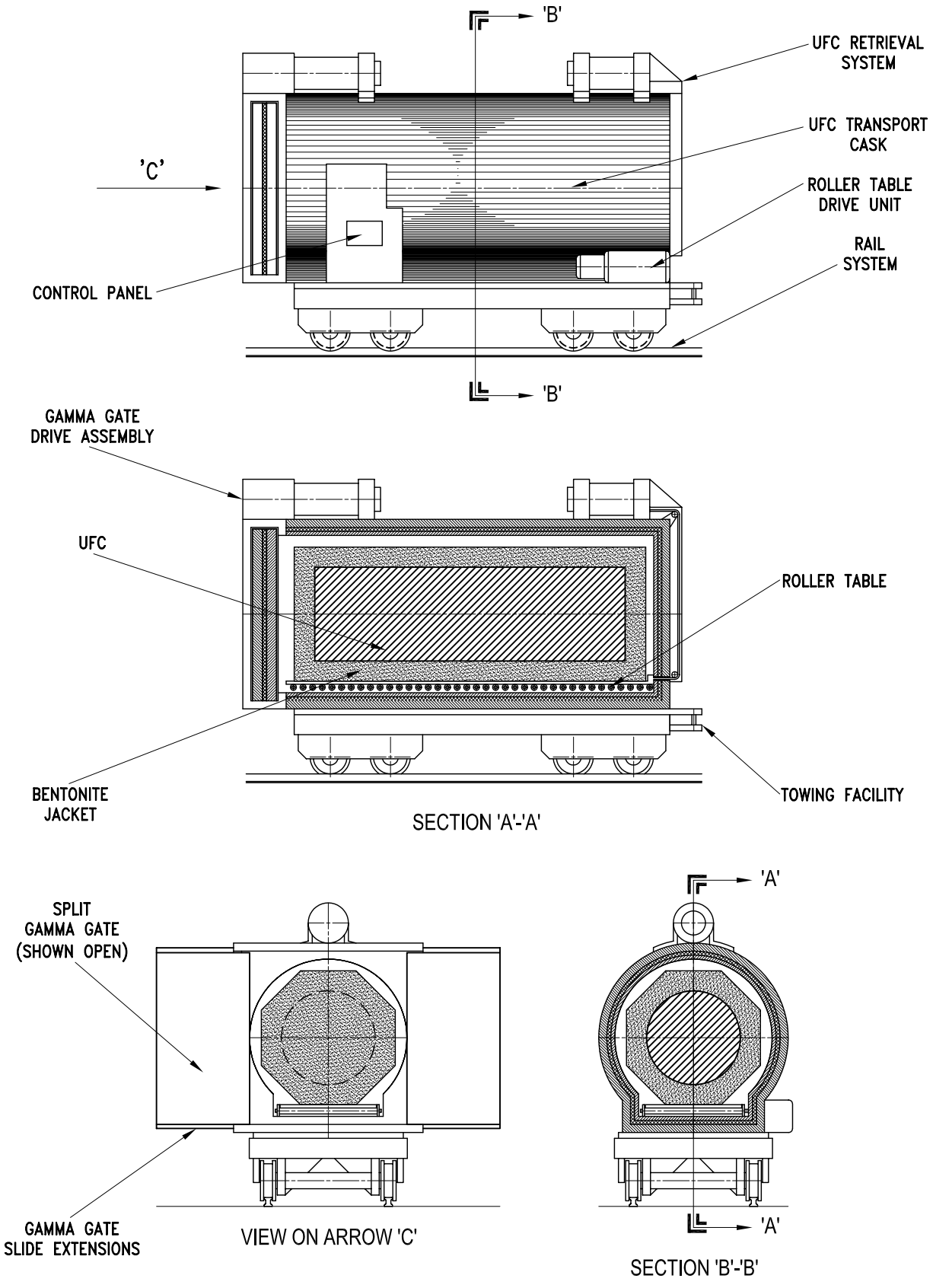


FIGURE 3 GENERAL ARRANGEMENT OF UFC TRANSPORT CASK

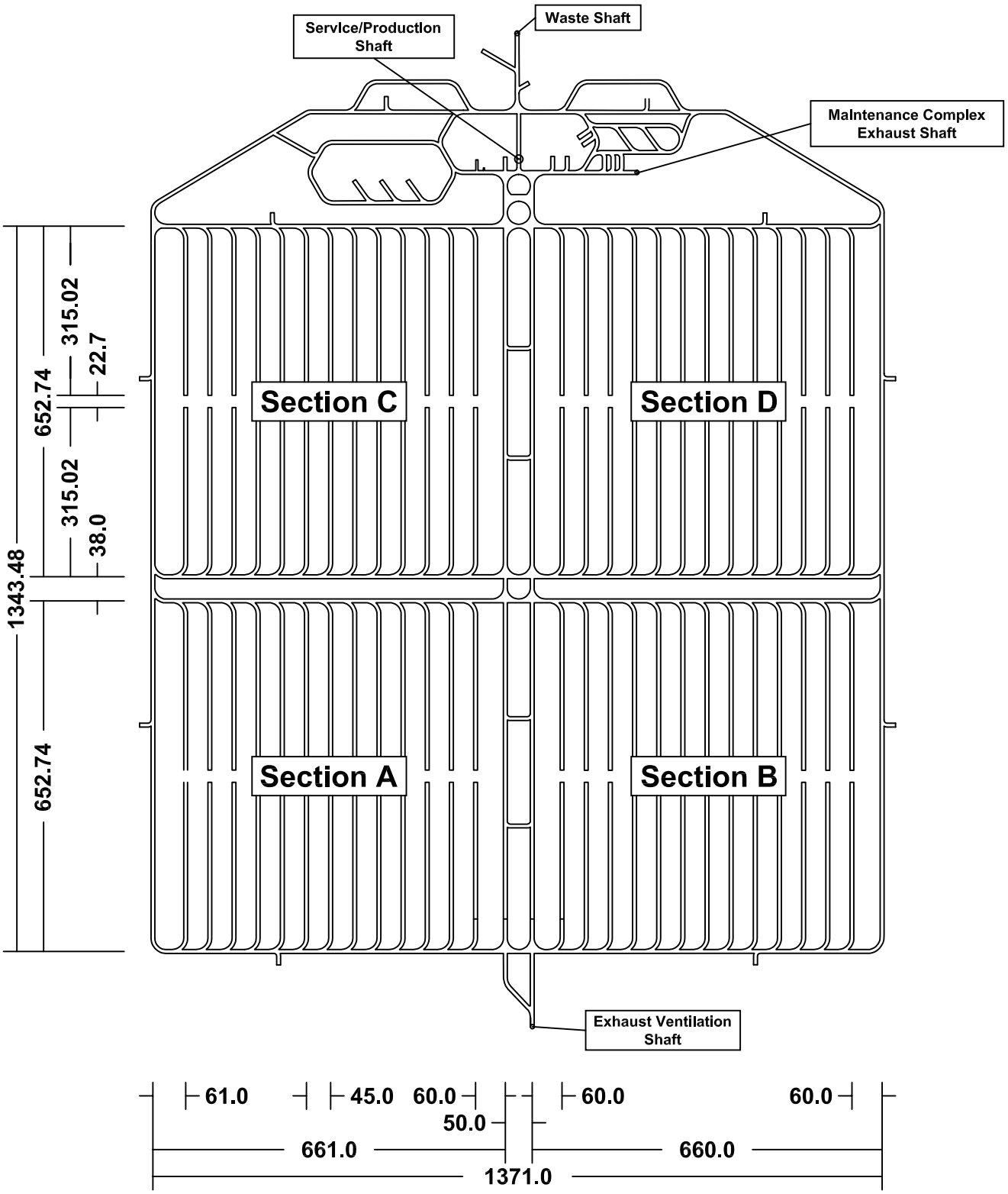


FIGURE 4 - GENERAL LAYOUT - PROPOSED PLAN OF DEEP GEOLOGIC REPOSITORY

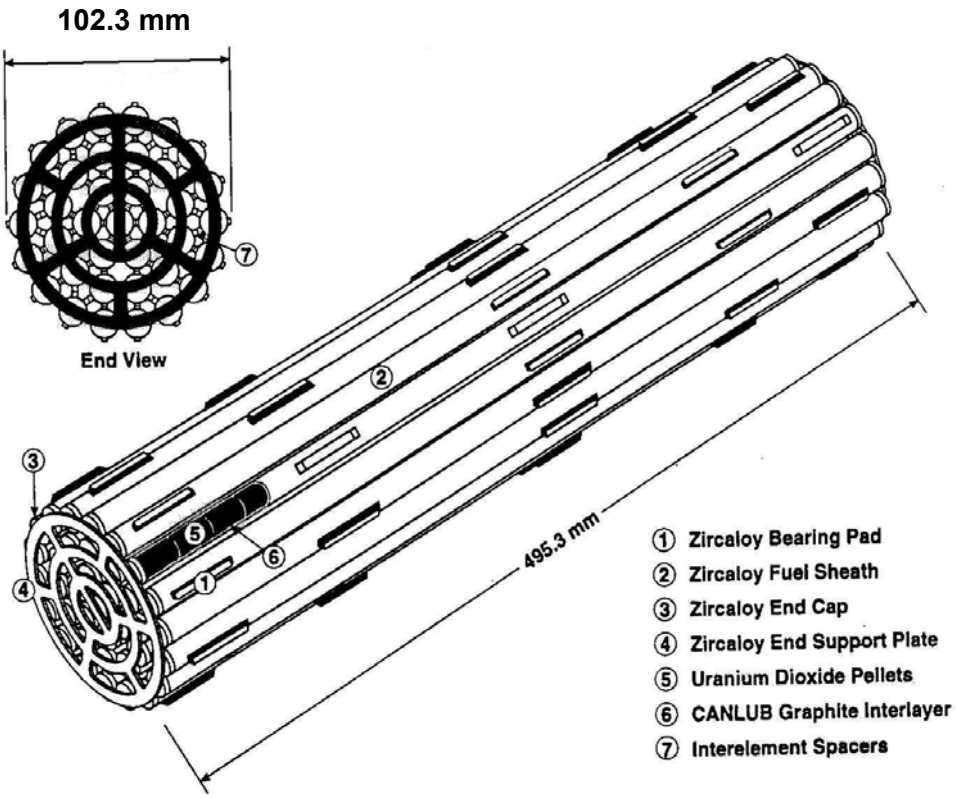


FIGURE 5 TYPICAL CANDU FUEL BUNDLE FOR BRUCE NUCLEAR GENERATING STATION

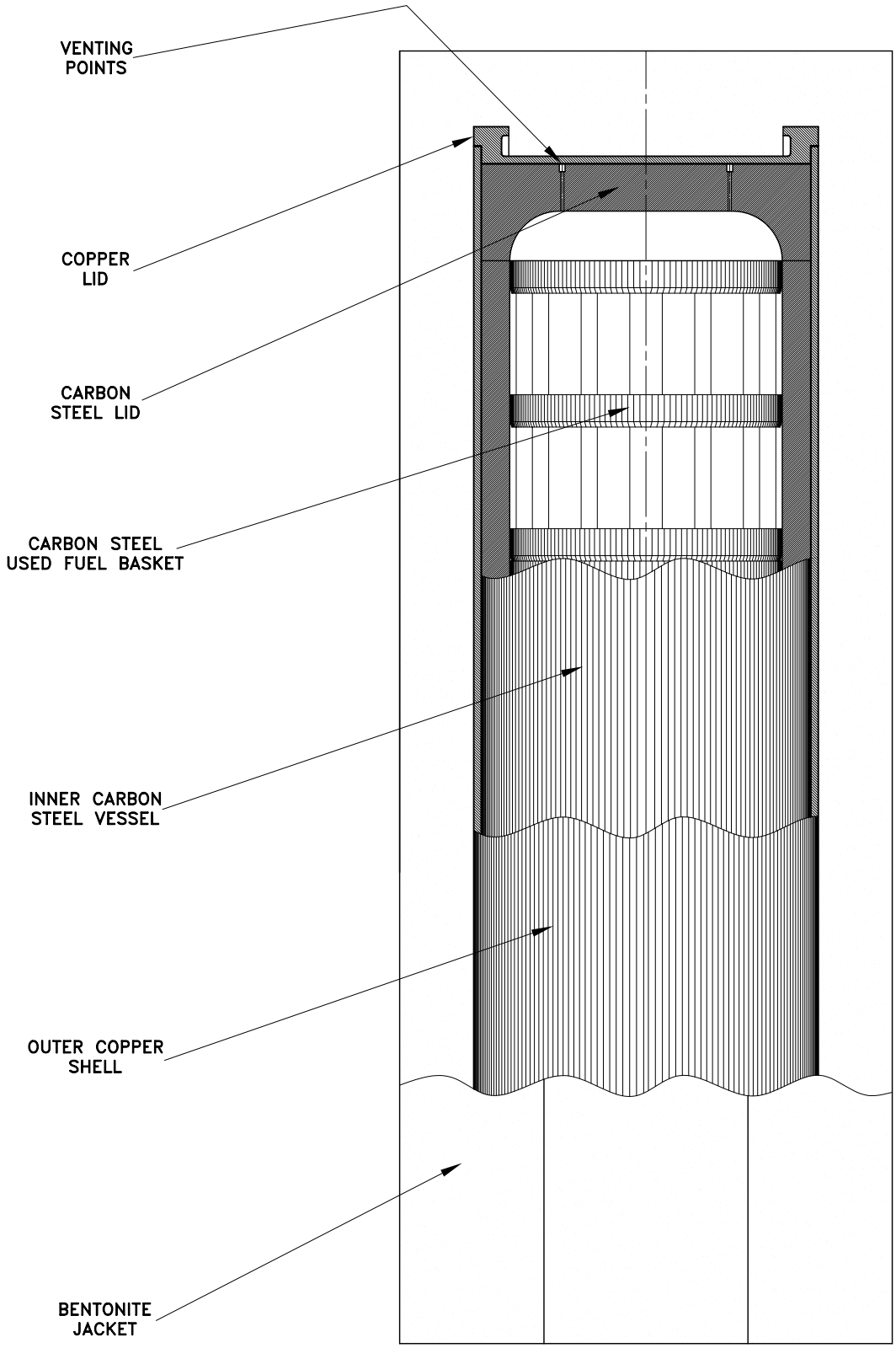


FIGURE 6 ASSEMBLY OF JACKETED USED FUEL CONTAINER (UFC)

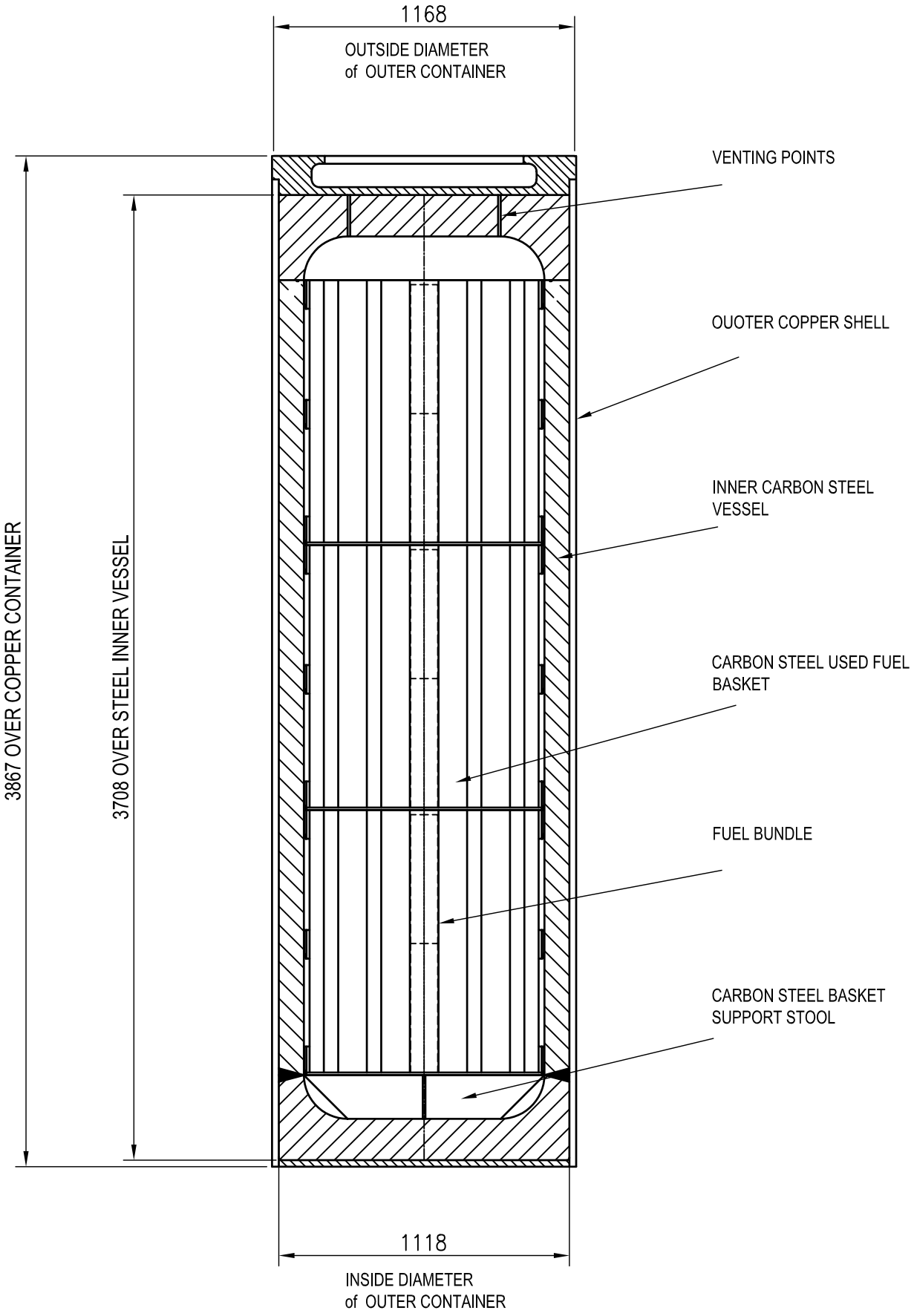


FIGURE 7 ASSEMBLY OF USED FUEL BASKETS AND CONTAINER

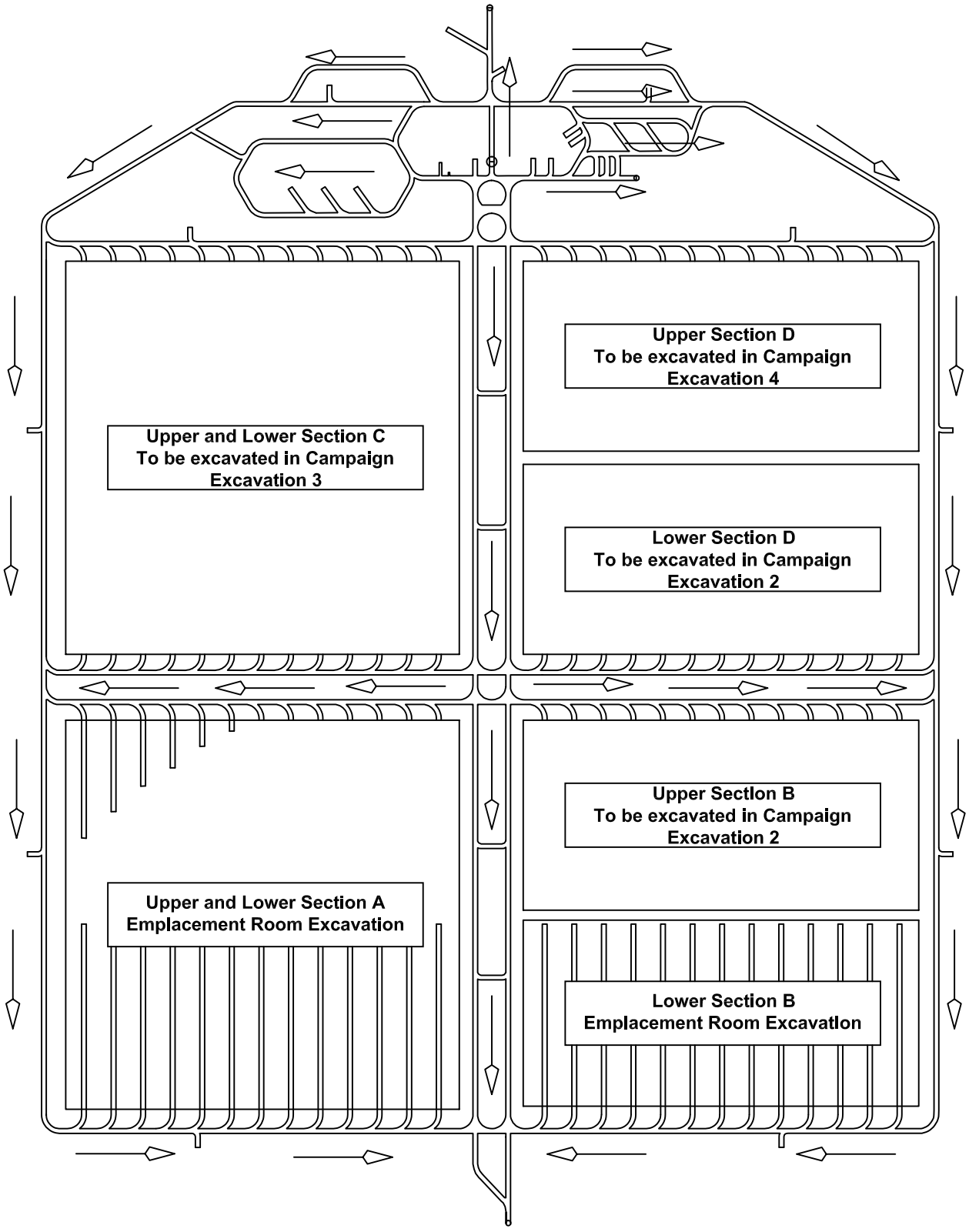
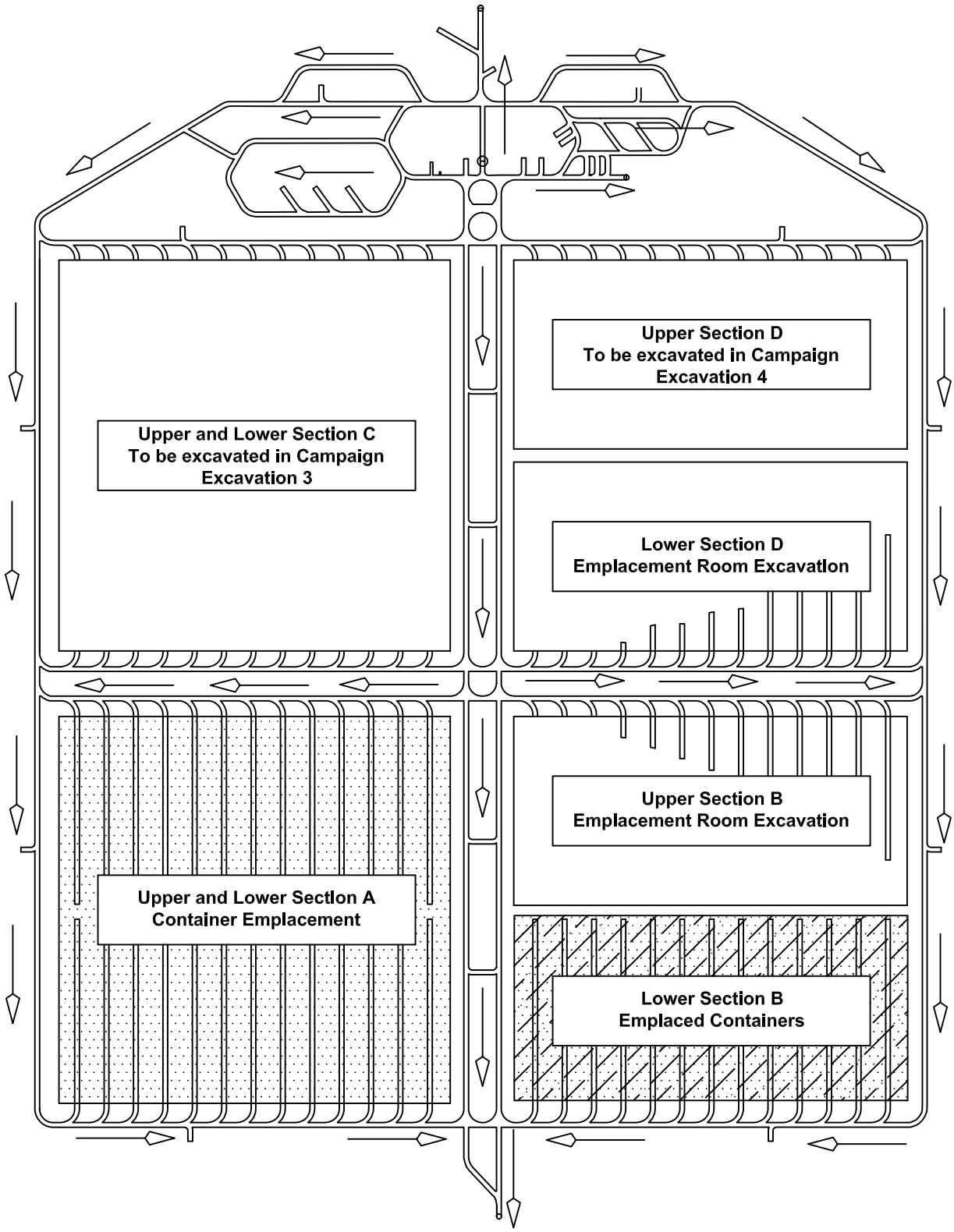
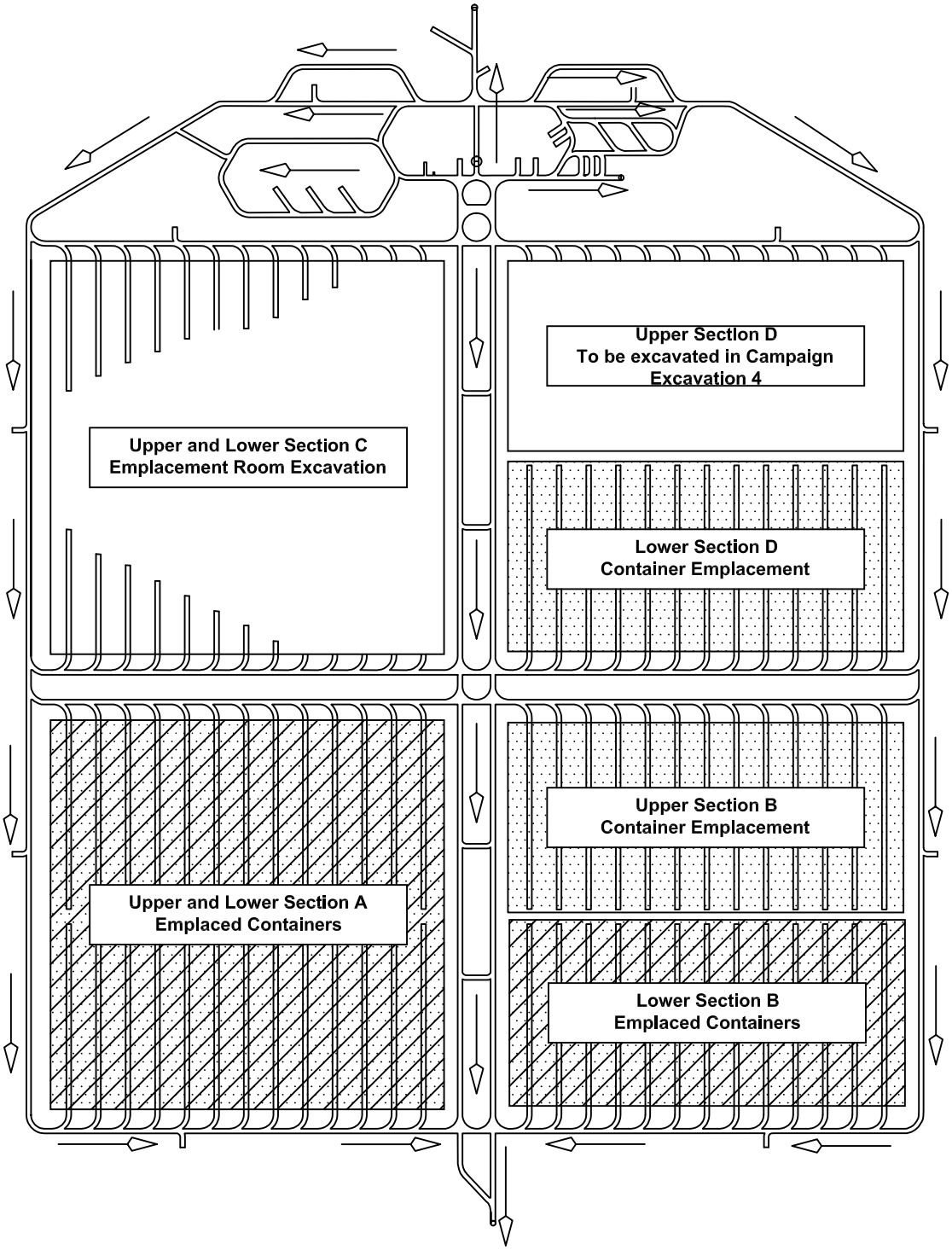


FIGURE 8 - PHASE 1 EXCAVATION AND UFC EMPLACEMENT SEQUENCE



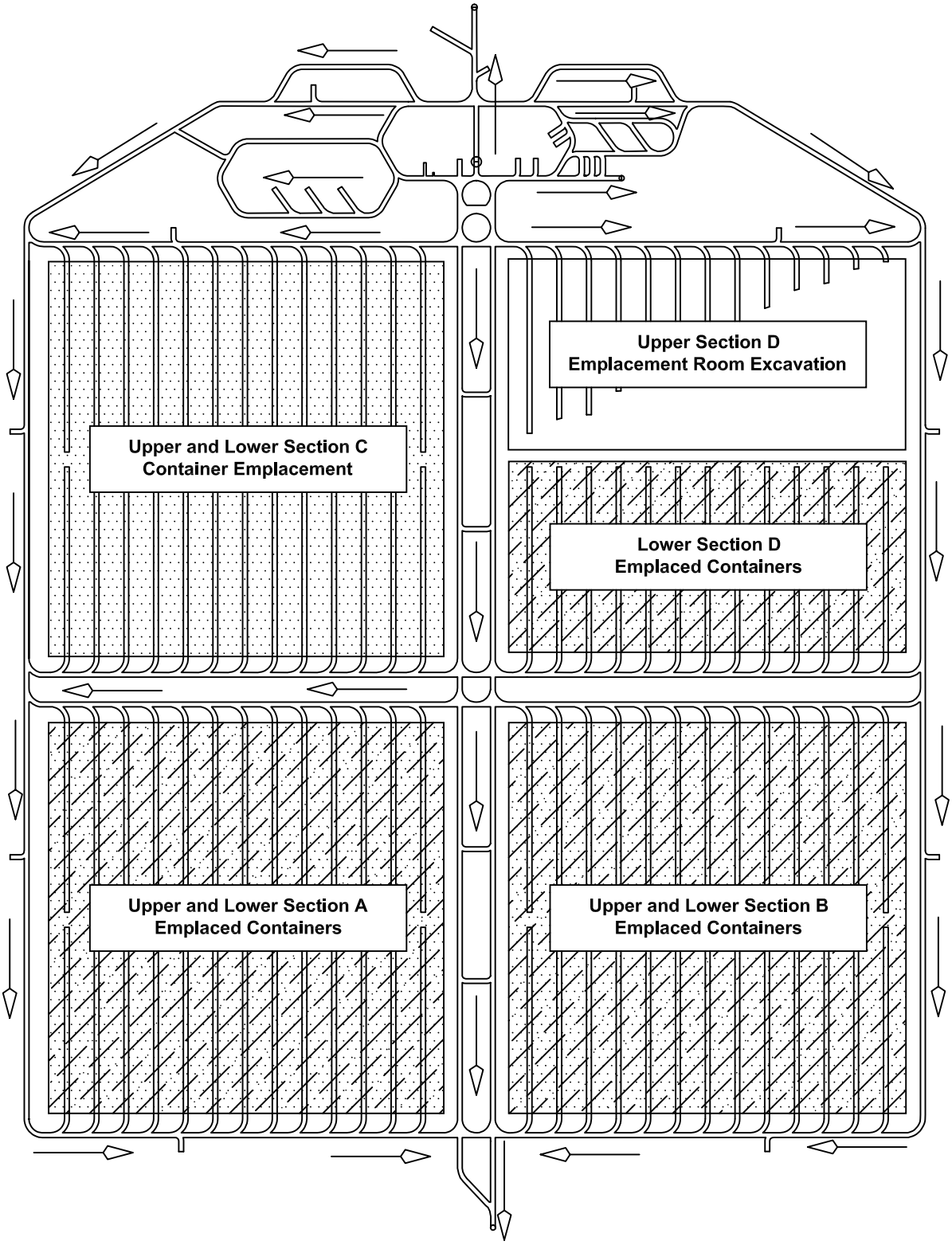
Note: Airflow direction demonstrates non-mixing of excavation and emplacement air.

FIGURE 9 - PHASE 2 EXCAVATION AND UFC EMPLACEMENT SEQUENCE



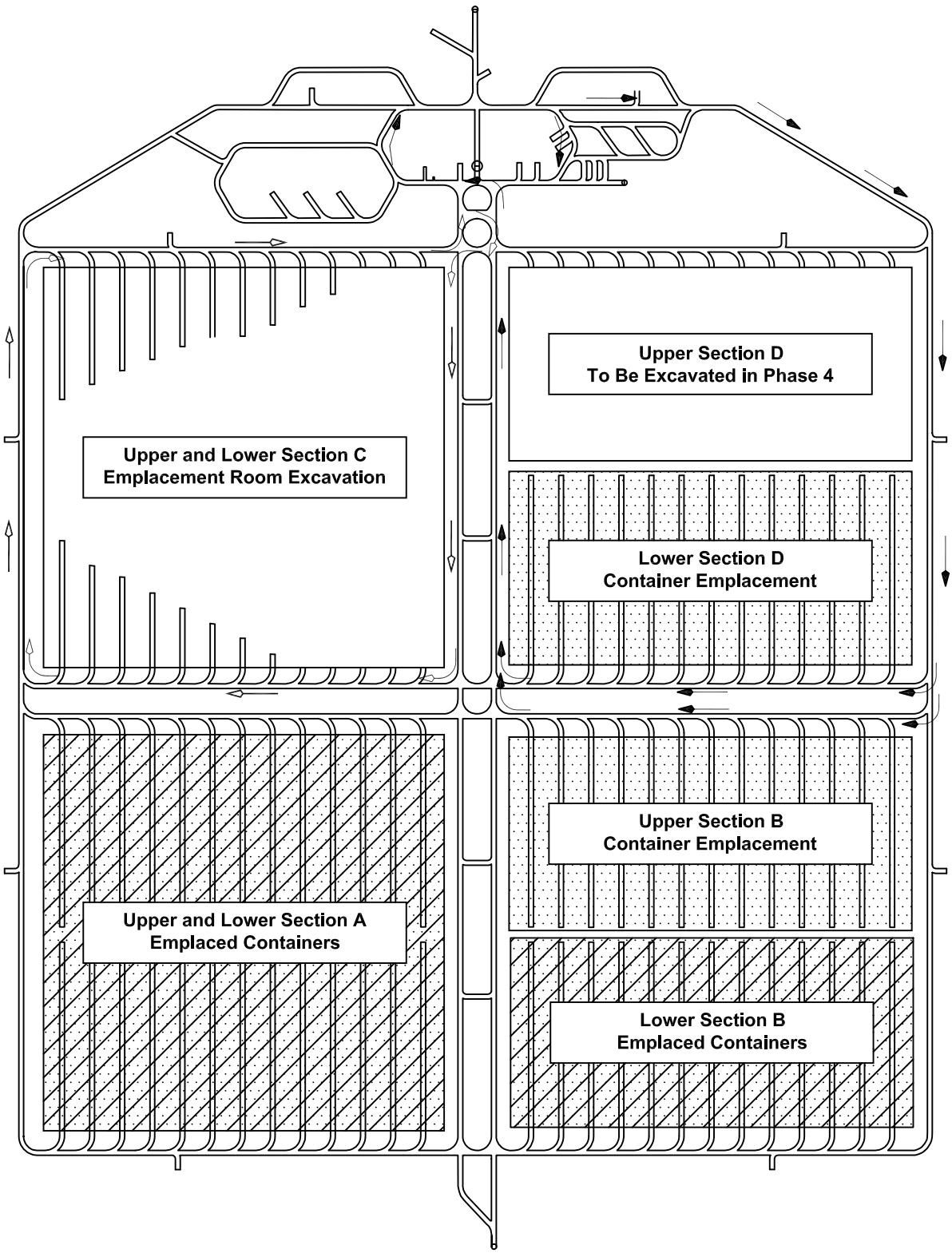
Note: Airflow direction demonstrates non-mixing of excavation and emplacement air.

FIGURE 10 - PHASE 3 EXCAVATION AND UFC EMPLACEMENT SEQUENCE



Note: Airflow direction demonstrates non-mixing of excavation and emplacement air.

FIGURE 11 - PHASE 4 EXCAVATION AND UFC EMPLACEMENT SEQUENCE



LEGEND

Emplacement Traffic

Excavation Traffic

FIGURE 12 TYPICAL MOVEMENT OF TRAFFIC DURING EMPLACEMENT AND EXCAVATION OPERATIONS

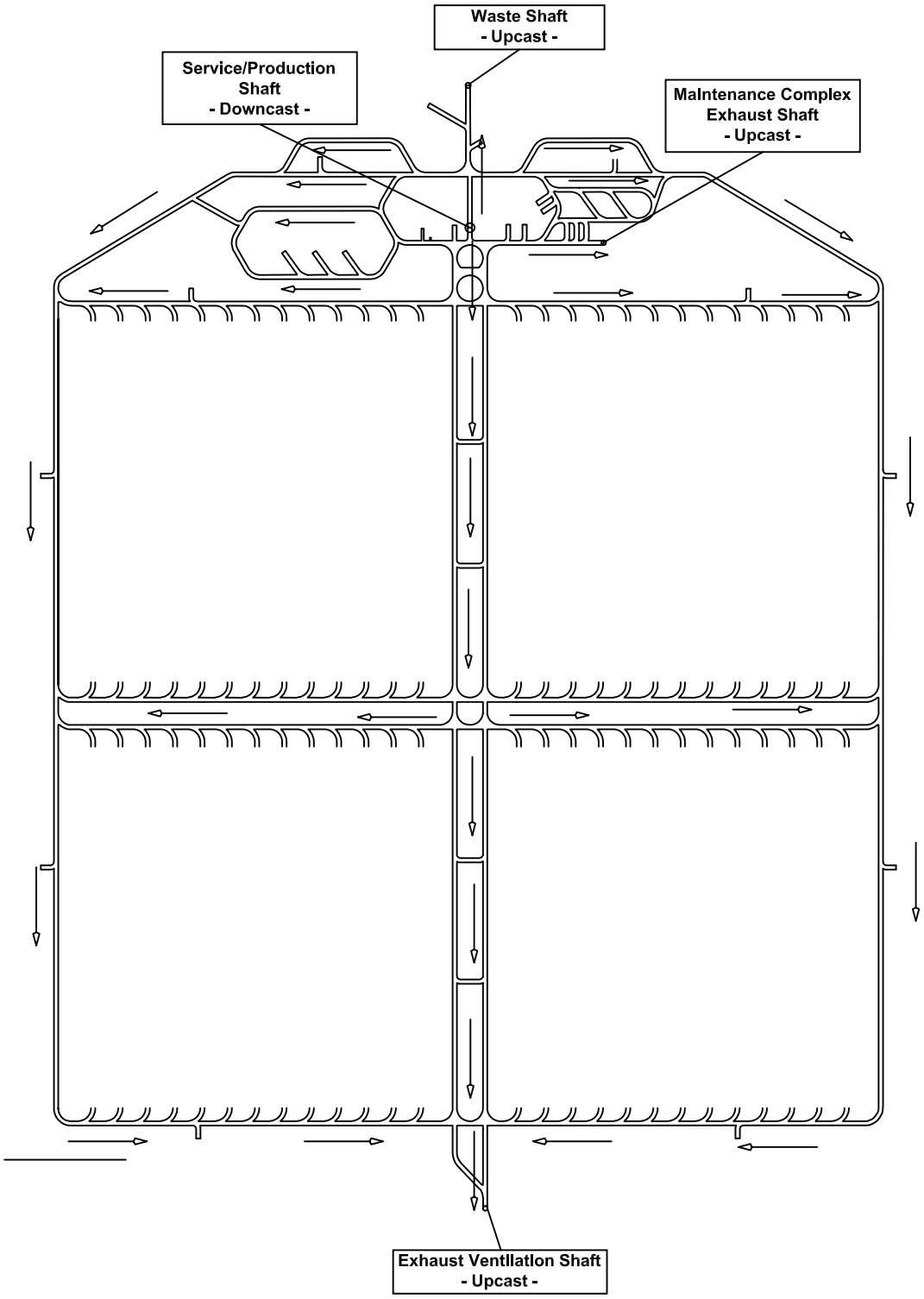


FIGURE 13 - VENTILATION SCHEMATIC FOR THE DEEP GEOLOGIC REPOSITORY

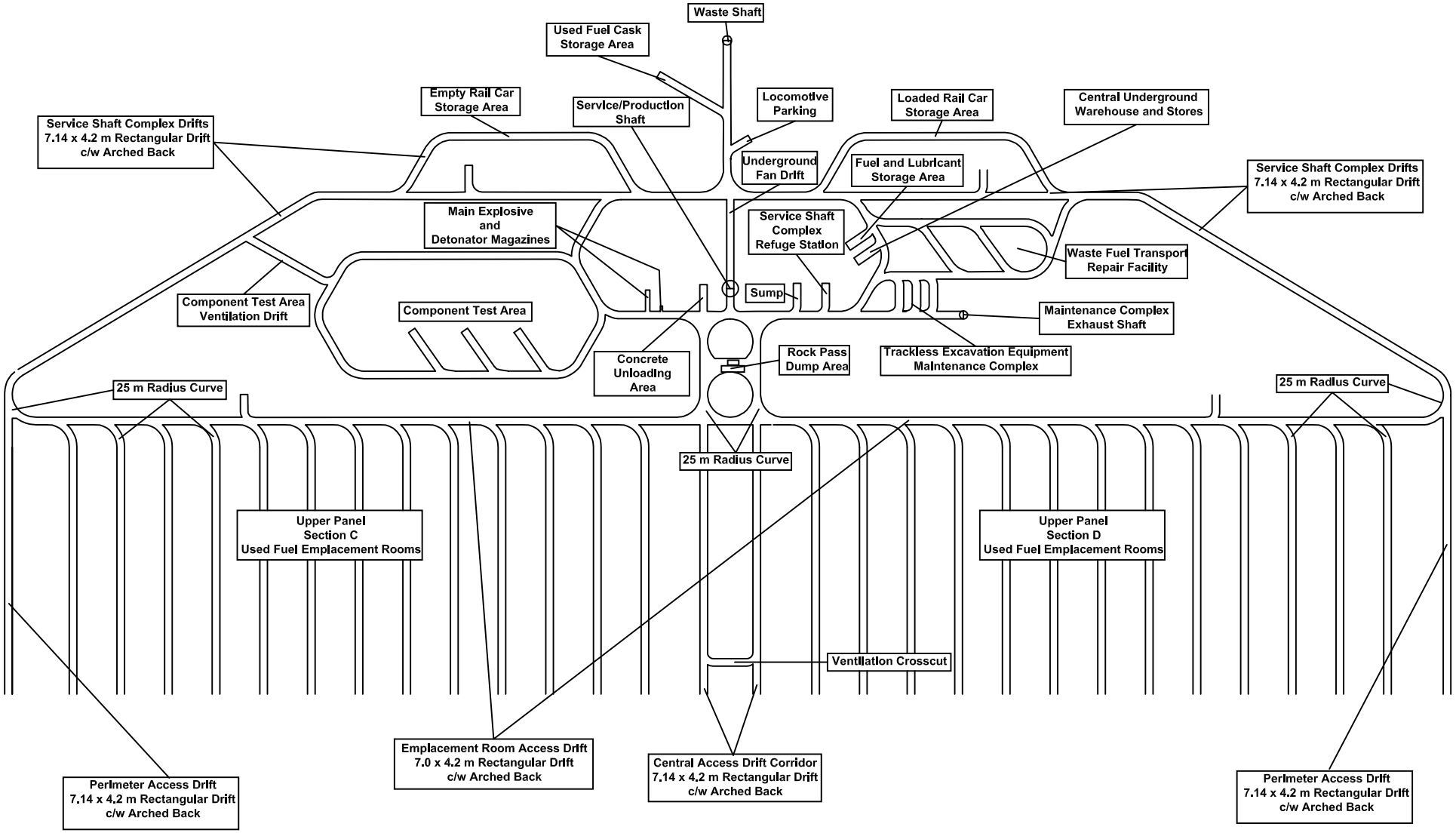


FIGURE 14 - DETAIL OF SERVICE SHAFT AREA

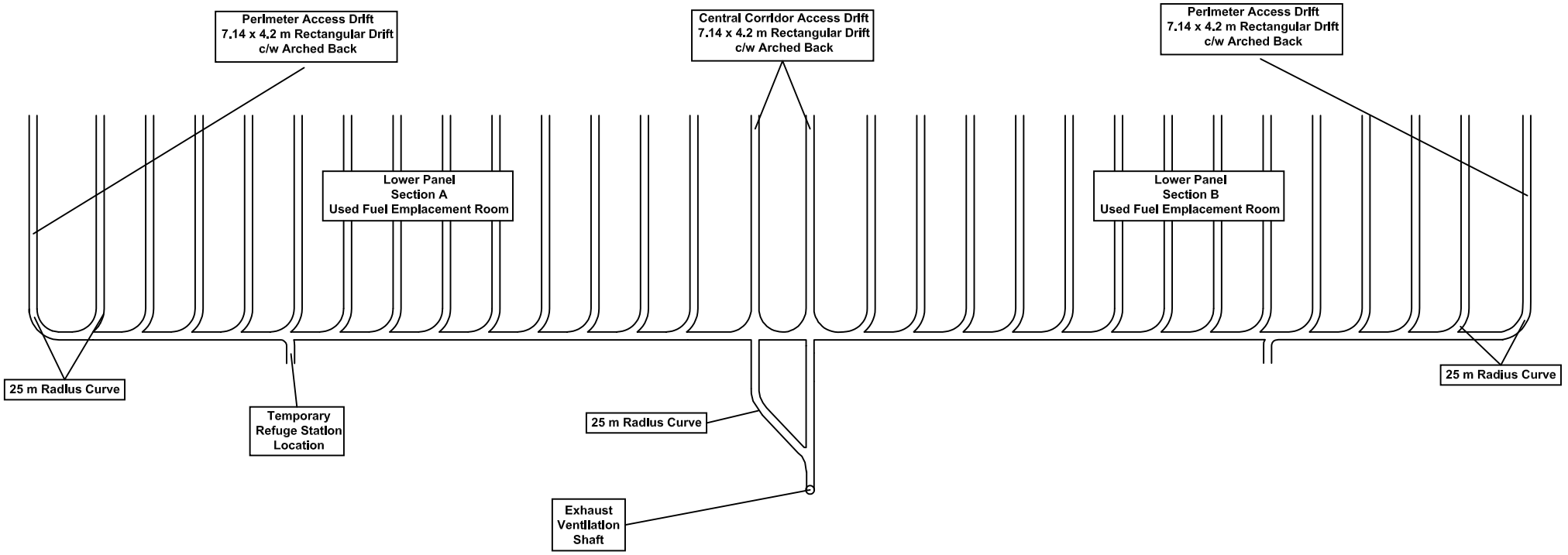
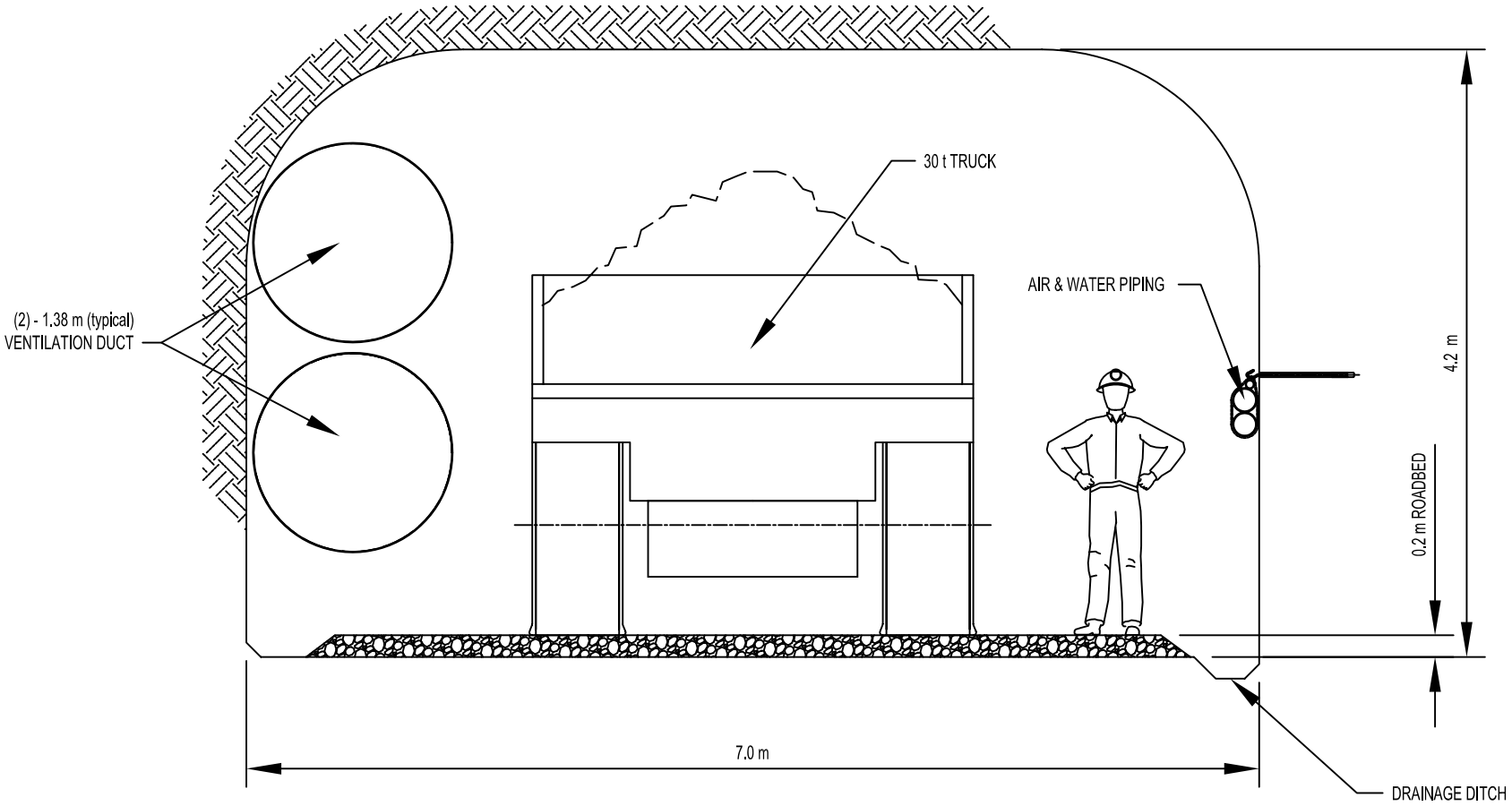


FIGURE 15 DETAIL OF THE UPCAST SHAFT COMPLEX



NOTE:
- LAYOUT MAY BE MIRRORED DEPENDING ON WHETHER AN UPPER OR LOWER EMPLACEMENT PANEL IS BEING DEVELOPED.

FIGURE 16 CROSS SECTION OF ACCESS TUNNELS

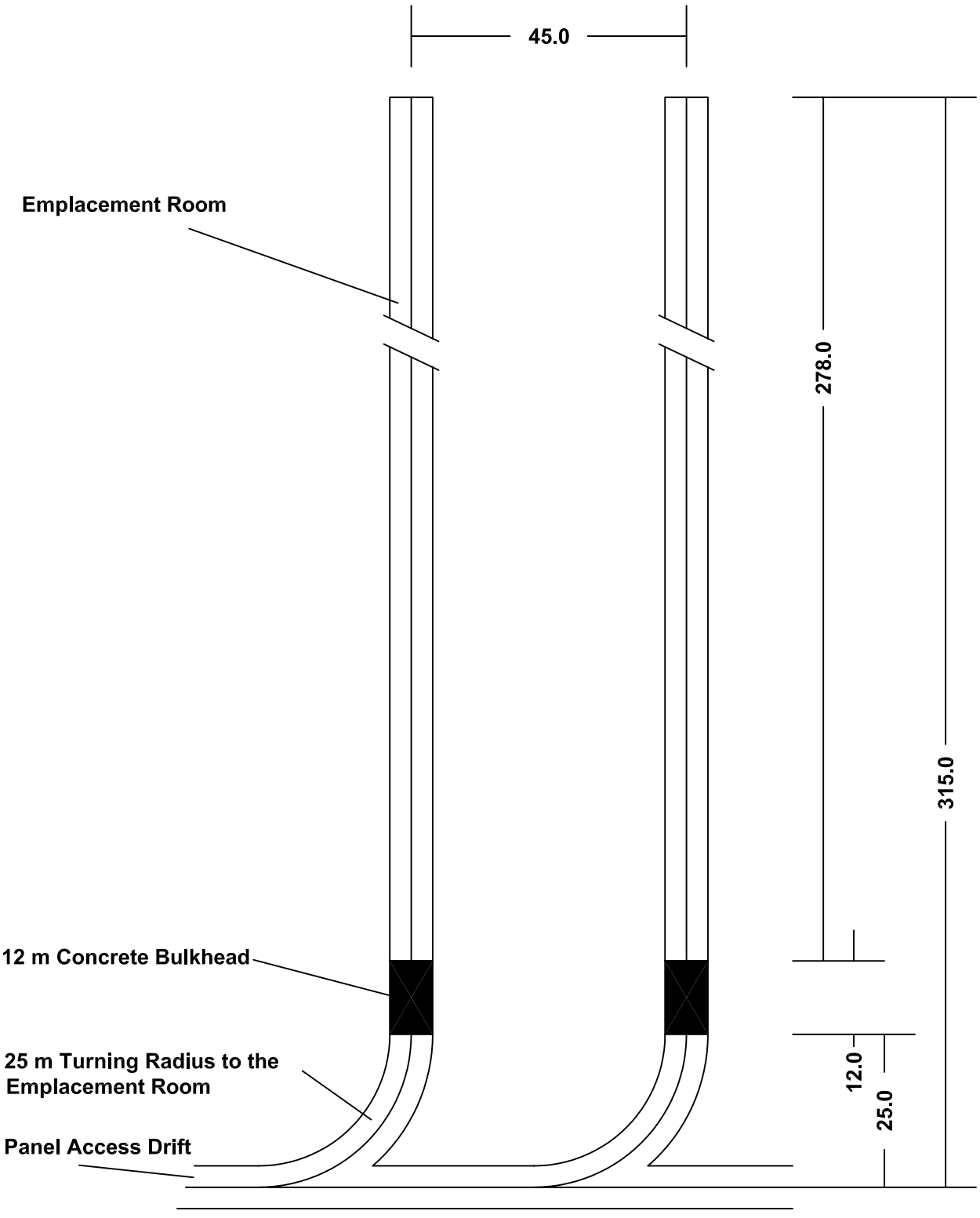
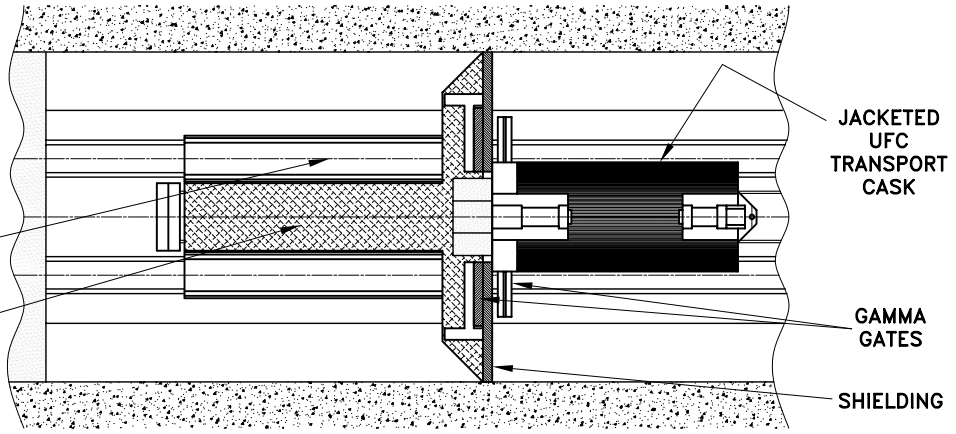
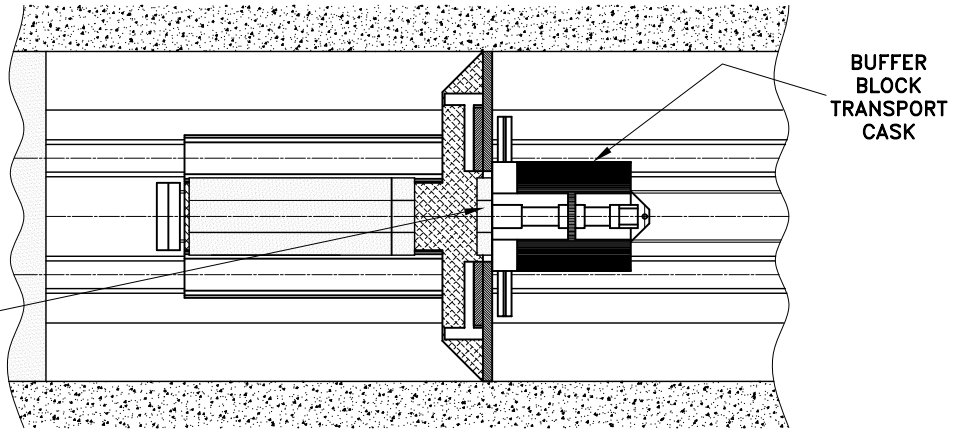


FIGURE 17 LOCATION OF 12m THICK EMPLACEMENT ROOM BULKHEADS

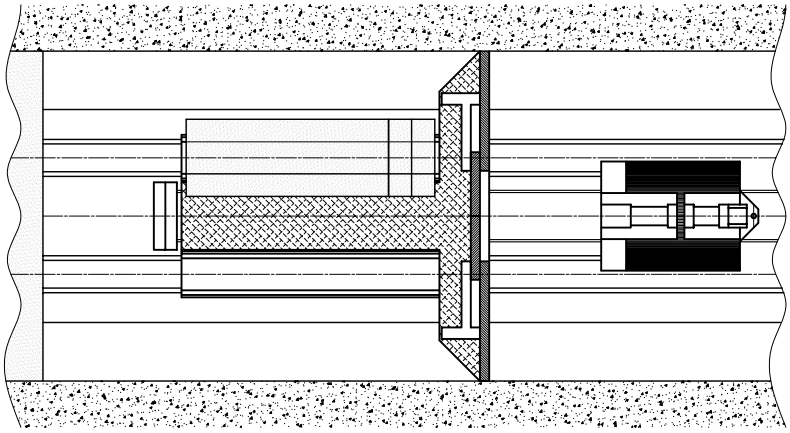
1. ADVANCE LOADED UFC TRANSPORT CASK TO GAMMA GATE AND DOCK. OPEN GAMMA GATES AND INSERT JACKETED UFC ONTO TRANSFER TABLE CLOSE GAMMA GATES AND REMOVE UFC TRANSPORT CASK.



2. ADVANCE LOADED BUFFER BLOCK TRANSPORT CASK TO GAMMA GATE AND DOCK. OPEN GAMMA GATES AND INSERT BLOCKS ONTO TRANSFER TABLE CLOSE GAMMA GATES AND REMOVE BLOCK TRANSPORT CASK.



3. TRANSFER JACKETED UFC AND BUFFER BLOCKS ONTO INSERTION CART



4. INSERT JACKETED UFC AND BUFFER BLOCKS INTO PRE-BUILT EMPLACEMENT STRUCTURE.

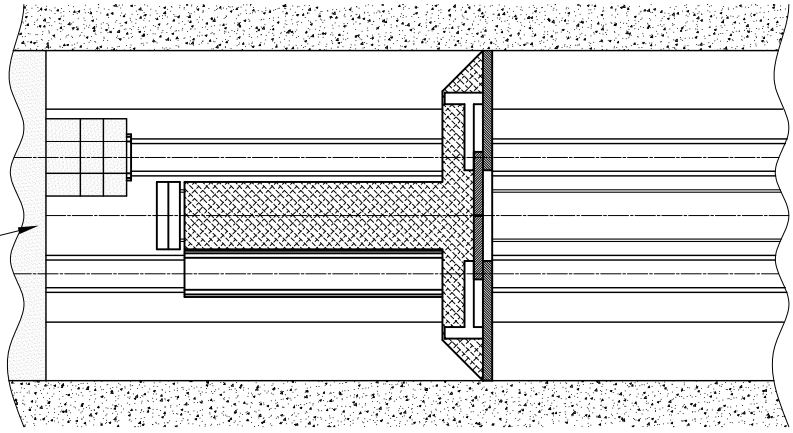
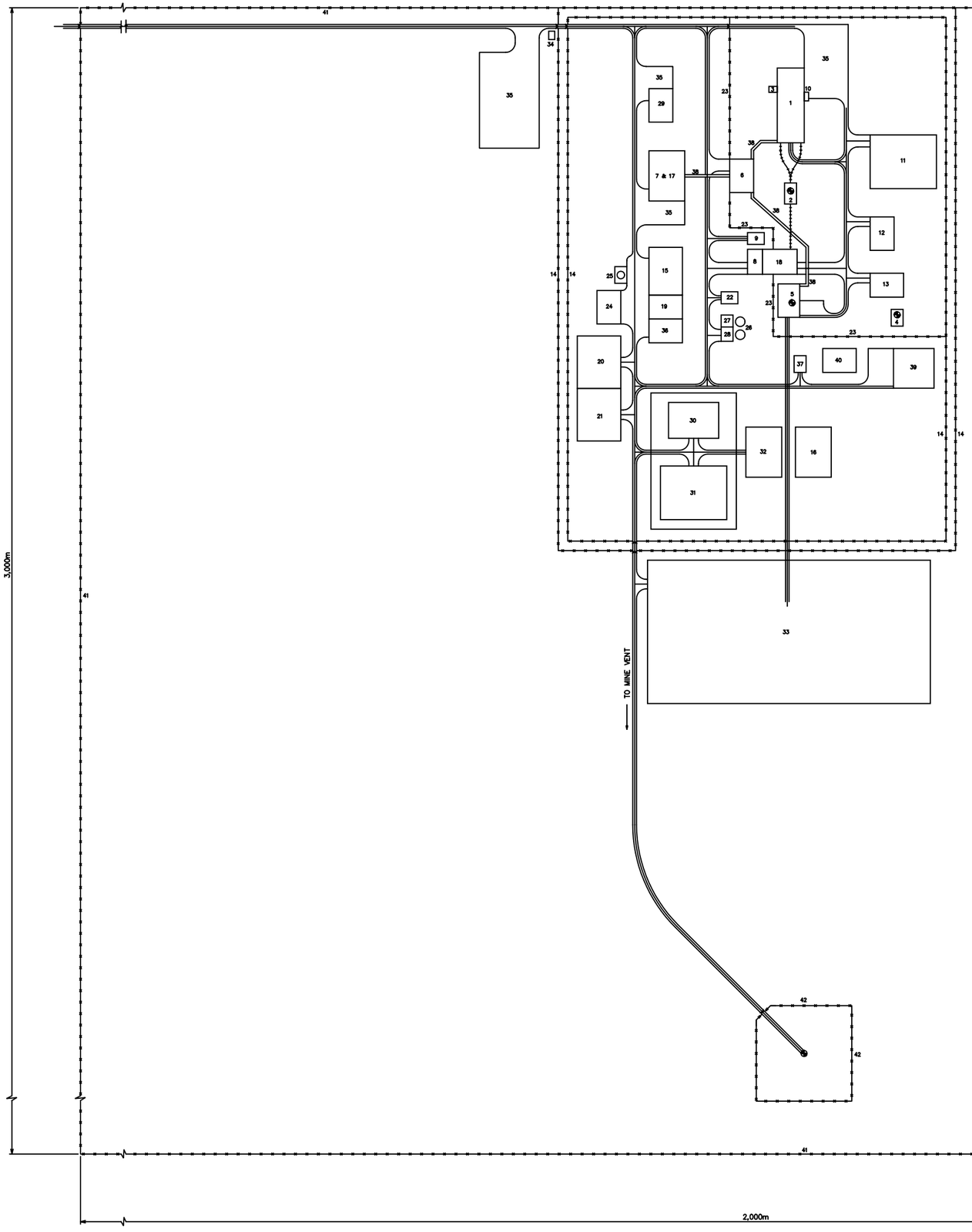


FIGURE 18 SEQUENCE OF EMPLACEMENT ROOM OPERATIONS



LEGEND:

1. USED-FUEL PACKAGING PLANT
2. WASTE-SHAFT HEADFRAME
3. STACK
4. UPCAST VENTILATION SHAFT
5. SERVICE-SHAFT COMPLEX
6. AUXILIARY BUILDING
7. ADMIN. BLDG. INCLUDING FIREHALL
8. SEALING MATERIAL STORAGE BINS
9. DUST COLLECTION BAG HOUSE
10. ACTIVE SOLID WASTE HANDLING FACILITY
11. WASTE MANAGEMENT AREA
12. ACTIVE LIQUID WASTE TREATMENT BLDG.
13. LOW-LEVEL LIQUID WASTE STORAGE AREA
14. MAIN SECURITY FENCE
15. GARAGE
16. STORM RUNOFF HOLDING POND
17. CAFETERIA
18. SEALING MATERIALS COMPACTION PLANT
19. WAREHOUSE
20. SWITCHYARD
21. TRANSFORMER AREA
22. AIR COMPRESSORS
23. SECURITY FENCE (ACTIVE SITE)
24. POWERHOUSE
25. FUEL TANKS
26. WATER STORAGE TANKS
27. WATER TREATMENT PLANT
28. PUMPHOUSE
29. QUALITY CONTROL OFFICES AND LABORATORY
30. CONCRETE BATCHING PLANT AREA
31. ROCK CRUSHING PLANT AREA
32. PROCESS-WATER SETTLING POND
33. WASTE ROCK DISPOSAL AREA
34. GUARD HOUSE
35. PARKING AREA
36. STORAGE YARD
37. SEWAGE TREATMENT PLANT
38. OVERHEAD CORRIDOR
39. HAZARDOUS MATERIALS STORAGE BUILDING
40. SERVICE-SHAFT COMPLEX WATER SETTLING POND
41. PERIMETER FENCE
42. SECURITY FENCE

FIGURE 19
SURFACE FACILITIES DEVELOPMENT
OVERALL SITE PLAN

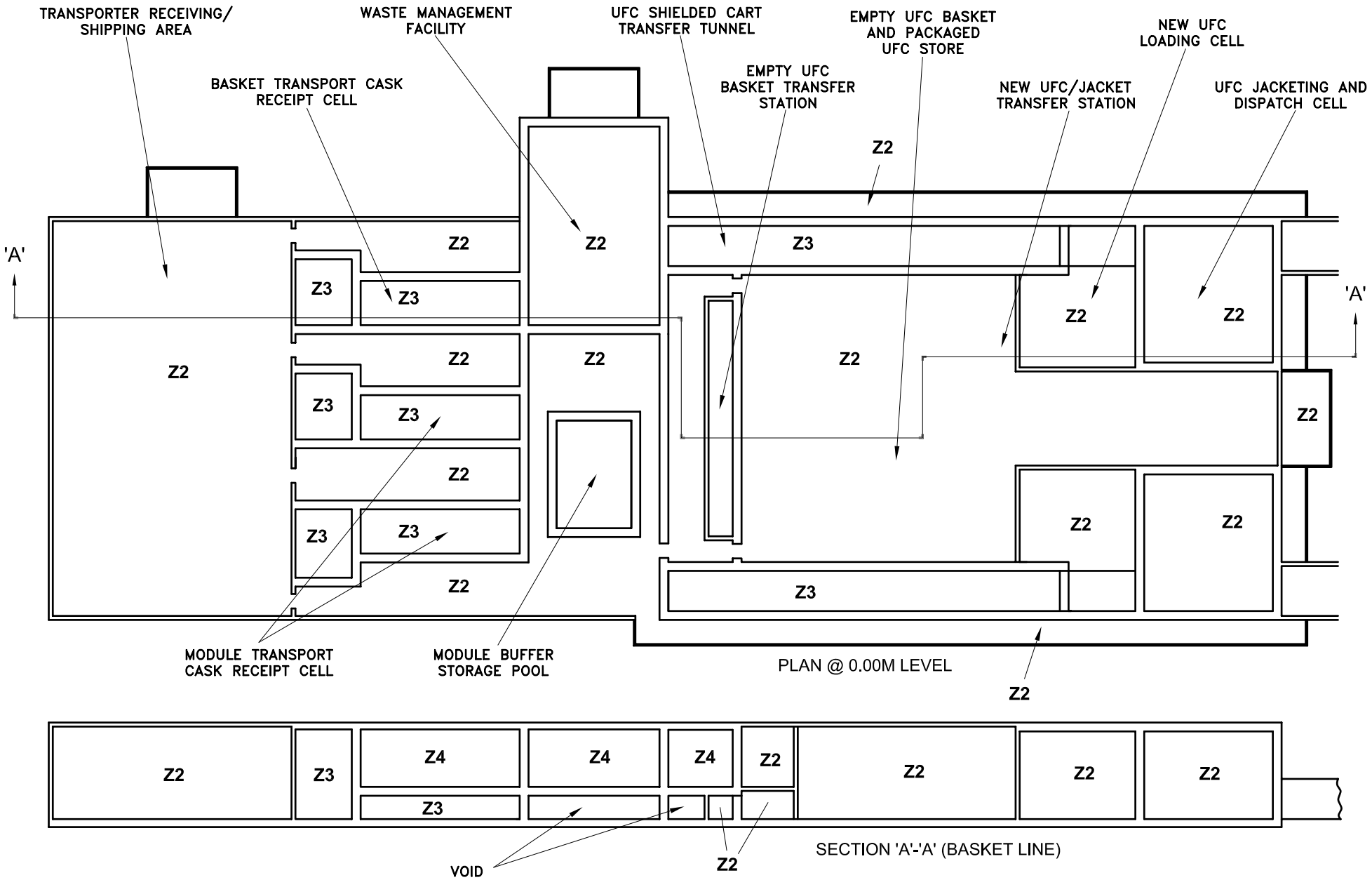


FIGURE 20 SIMPLIFIED PLAN AND ELEVATION OF THE USED FUEL PACKAGING PLANT

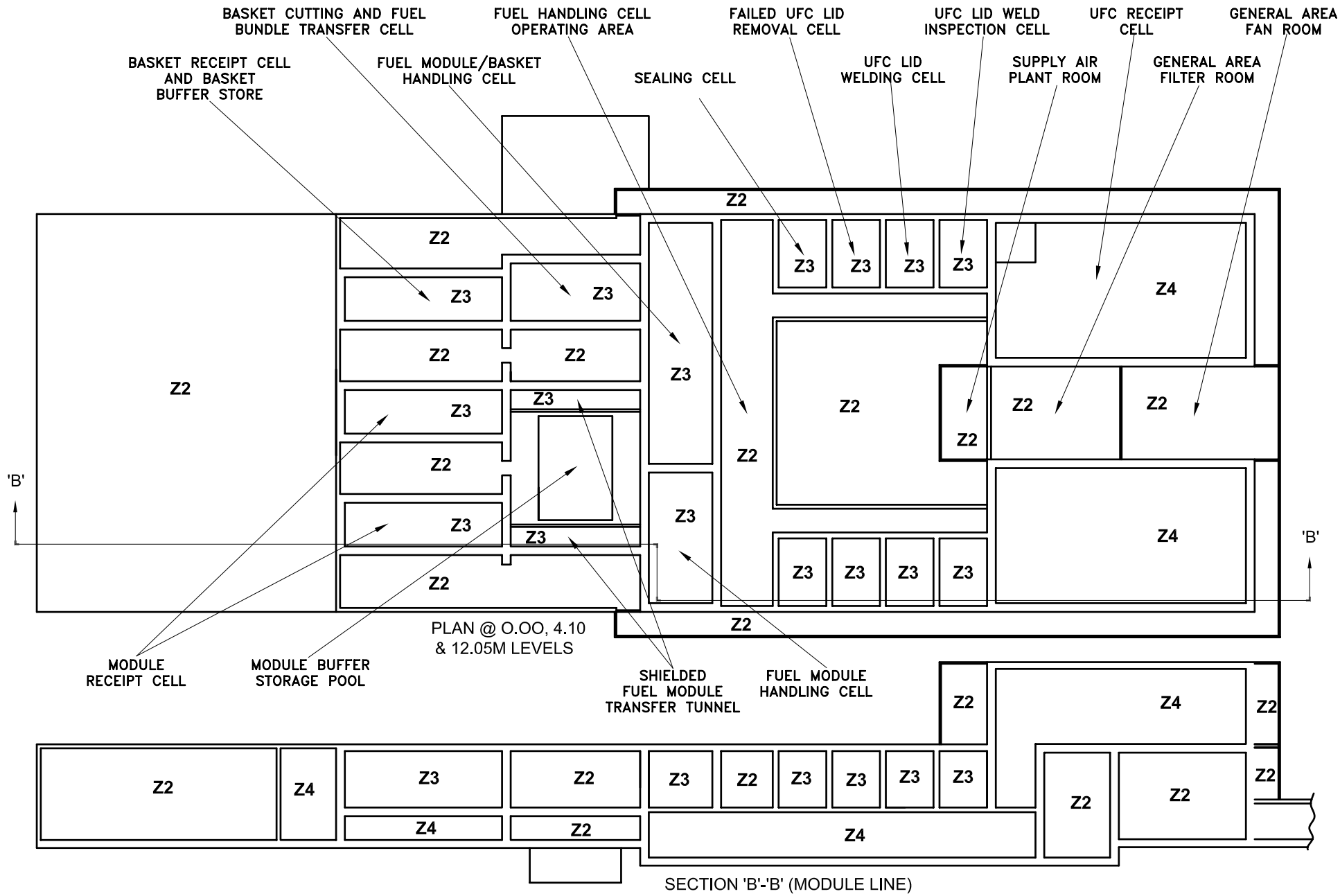


FIGURE 21 SIMPLIFIED PLAN AND ELEVATION OF THE USED FUEL PACKAGING PLANT

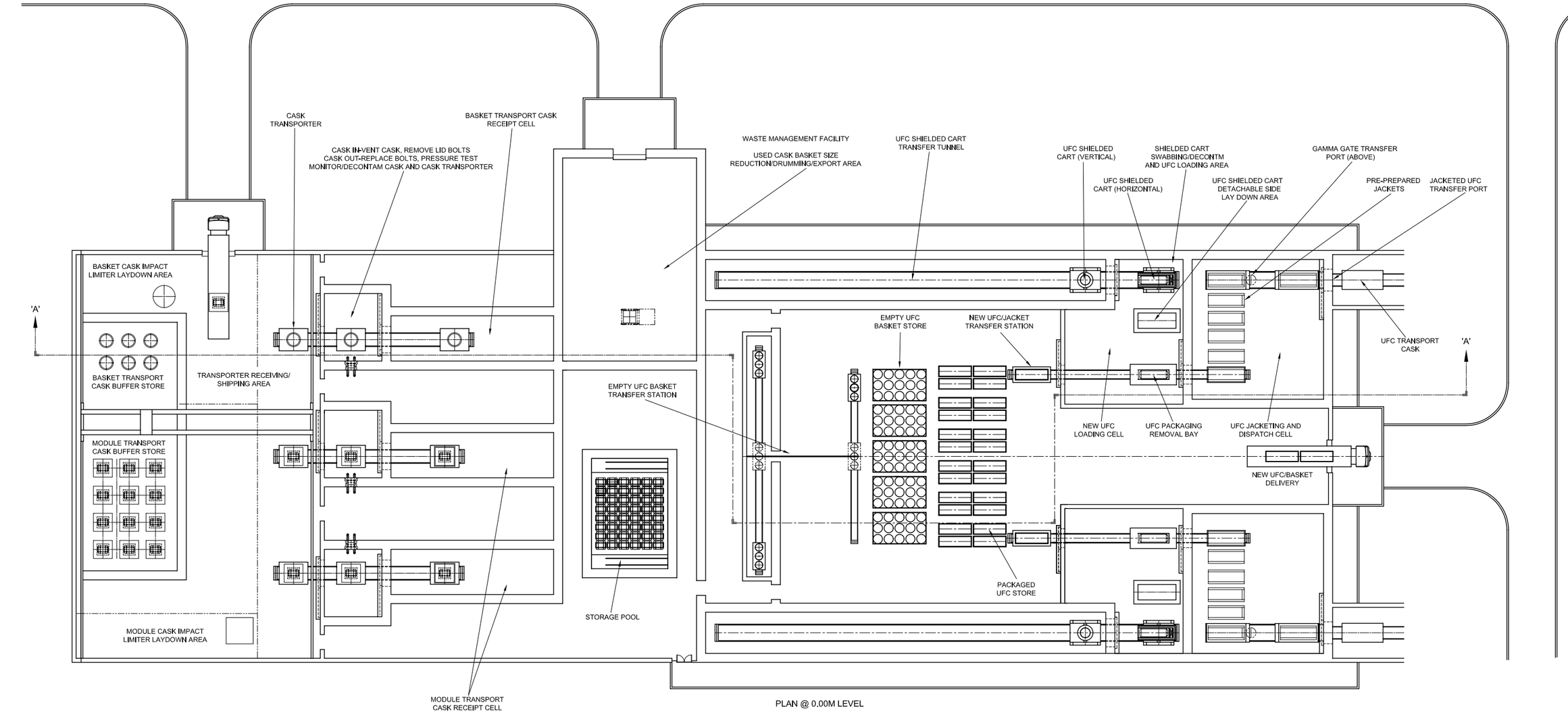


FIGURE 22 USED FUEL PACKAGING PLANT (UFPP) LAYOUT SHEET 1 OF 2

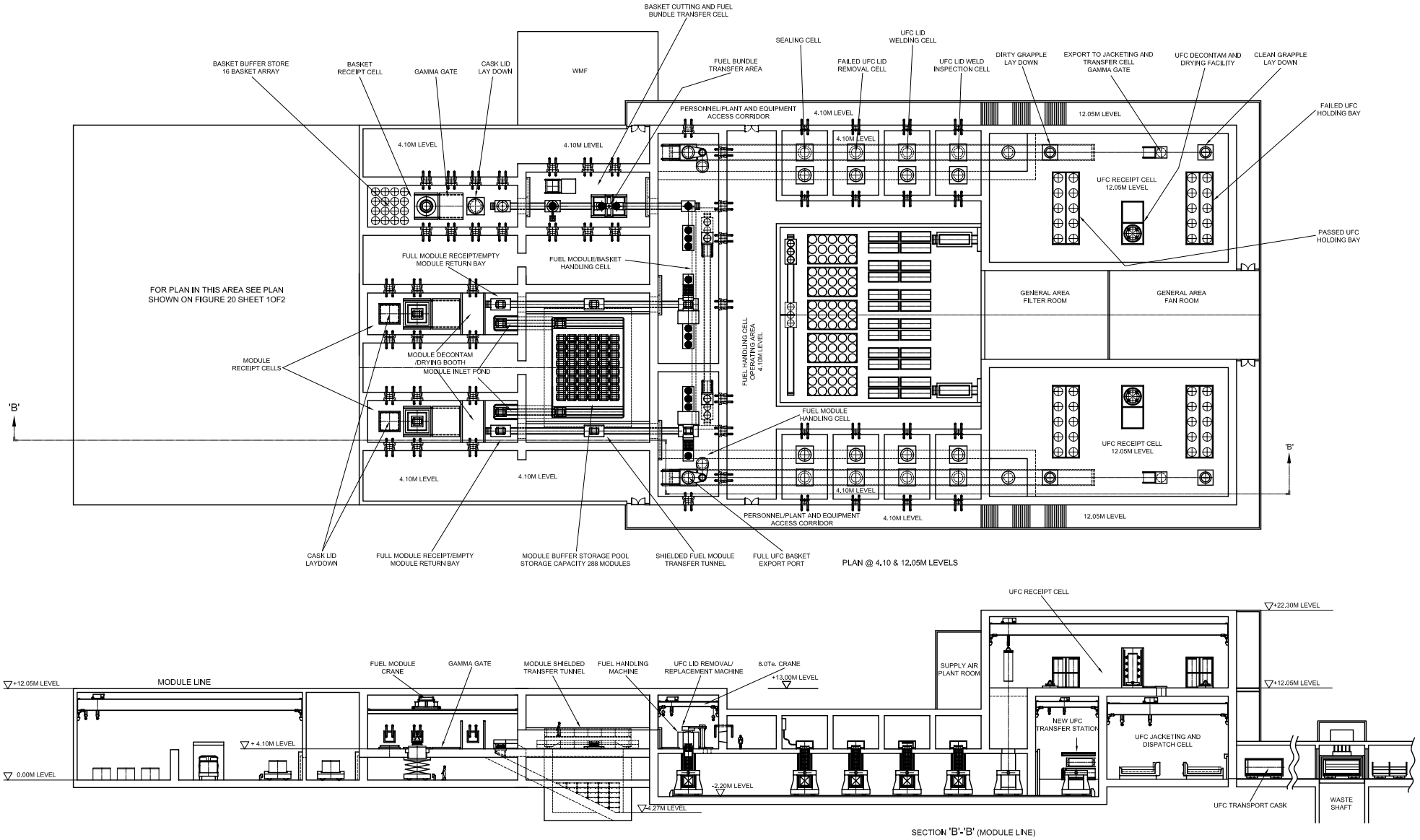


FIGURE 23 USED FUEL PACKAGING PLANT (UFPP) LAYOUT SHEET 2 OF 2

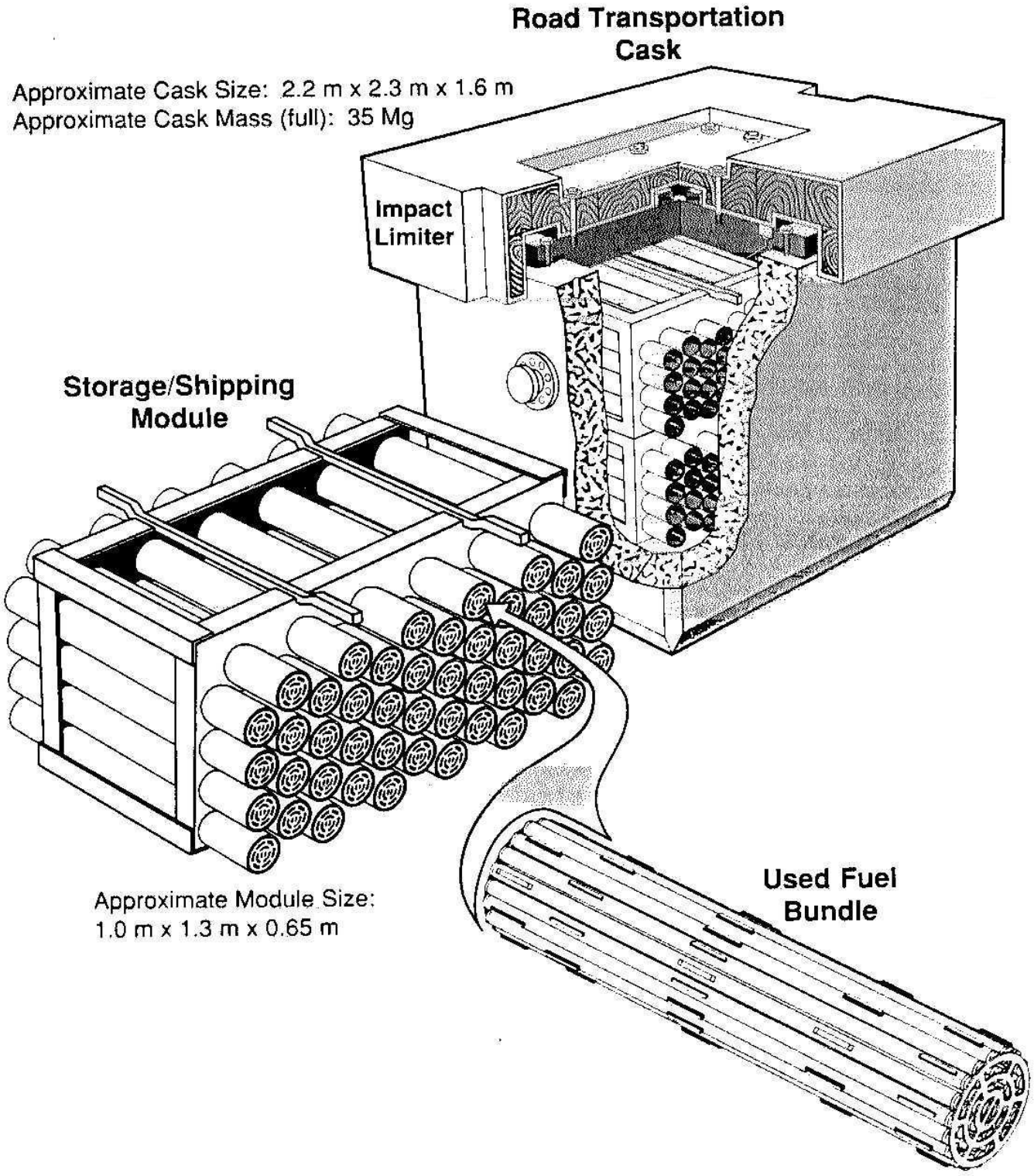
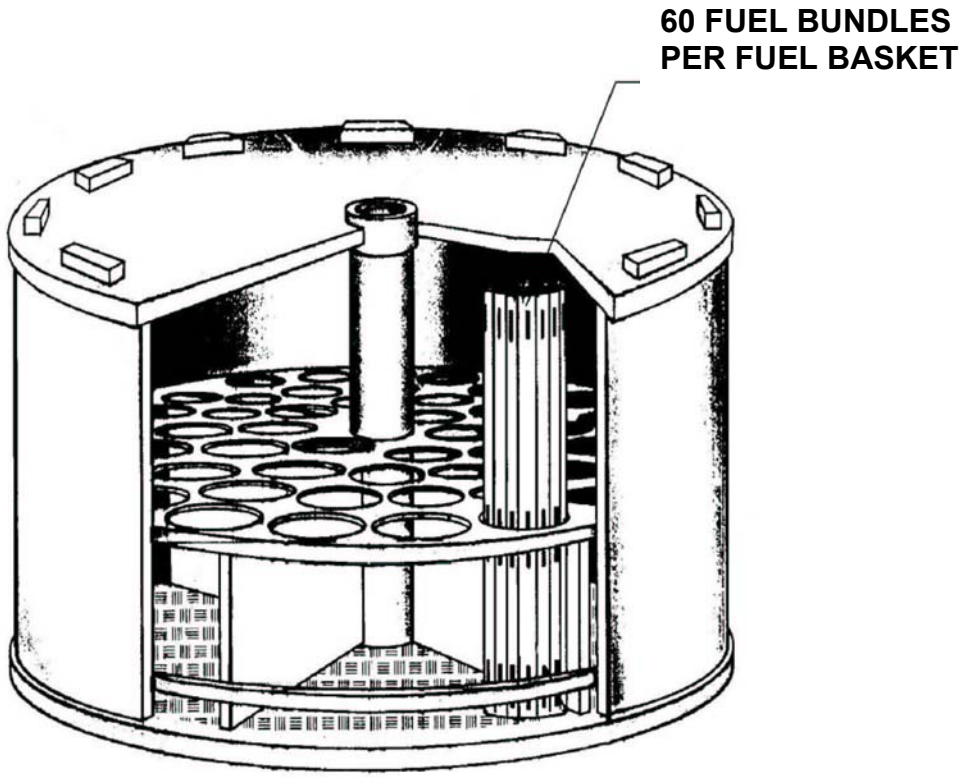


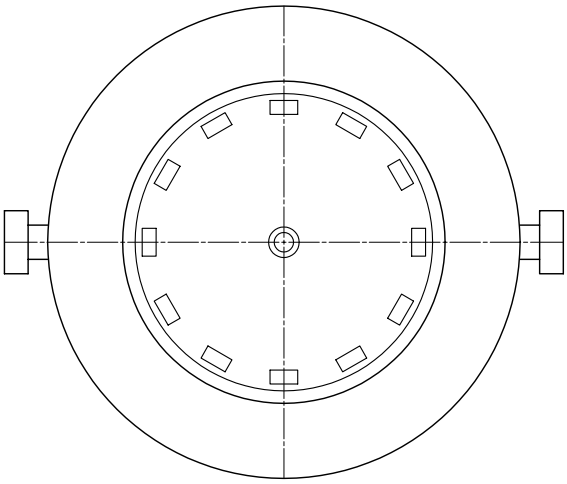
FIGURE 24 IRRADIATED FUEL TRANSPORT CASK (IFTC) SHOWING SHIPPING MODULE AND USED FUEL BUNDLE



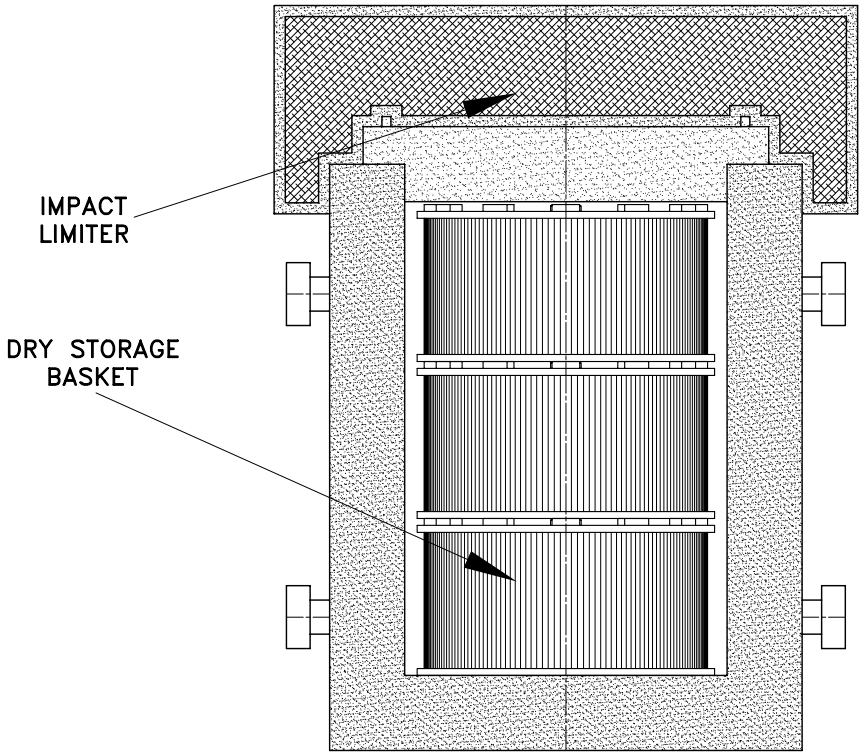
FUEL BASKET DIMENSIONS:-
OUTSIDE DIAMETER = 1070mm
HEIGHT = 560mm

FUEL BASKET WEIGHTS:-
EMPTY = 450Kg
FULLY LOADED = 1942Kg
(60 FUEL BUNDLES)

FIGURE 25 USED FUEL BASKET



PLAN VIEW WITH CASK LID
AND IMPACT LIMITER REMOVED



SECTION ON ℄

FIGURE 26 GENERAL ARRANGEMENT OF PROPOSED DRY STORAGE BASKET TRANSPORT CASK

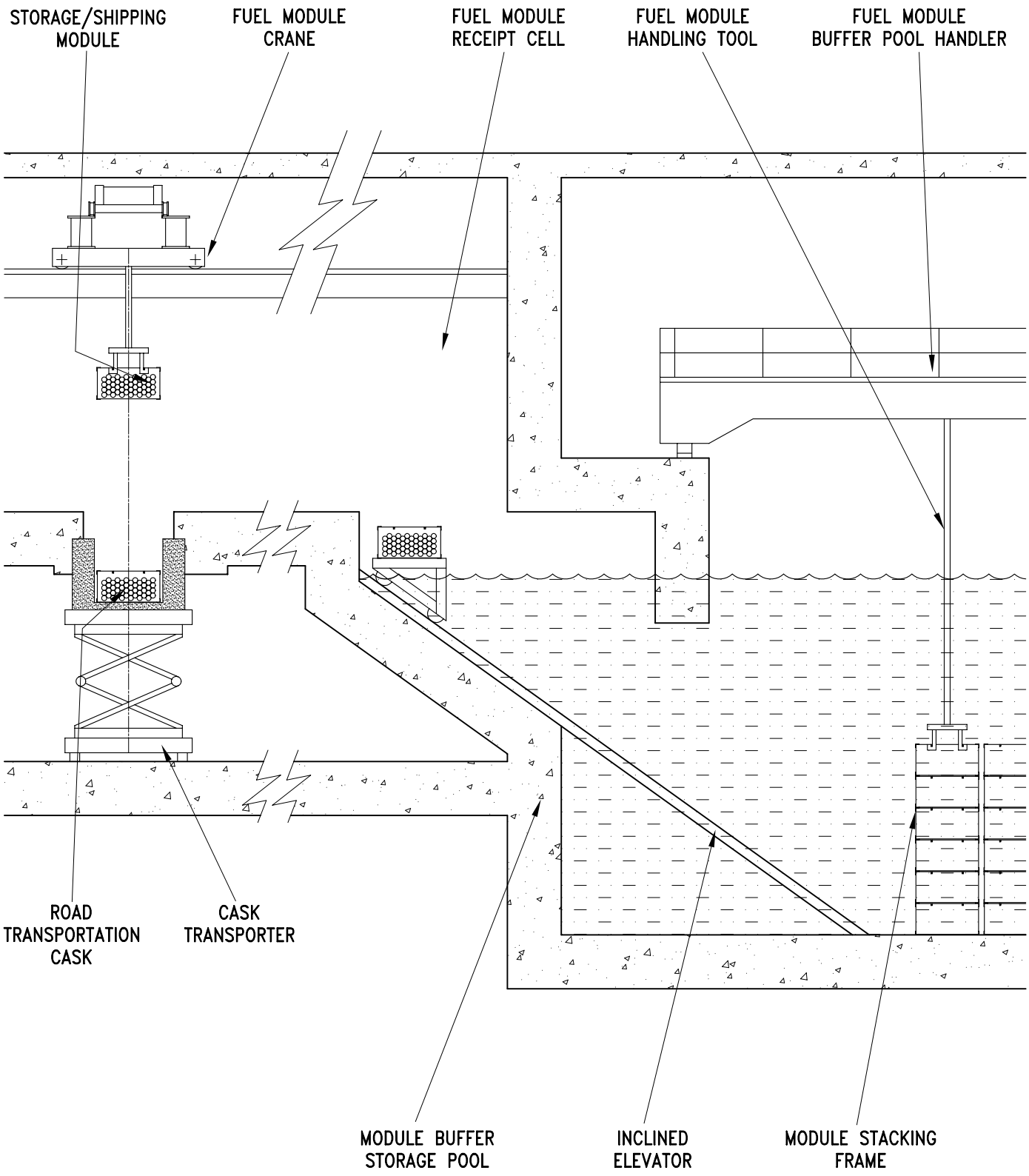
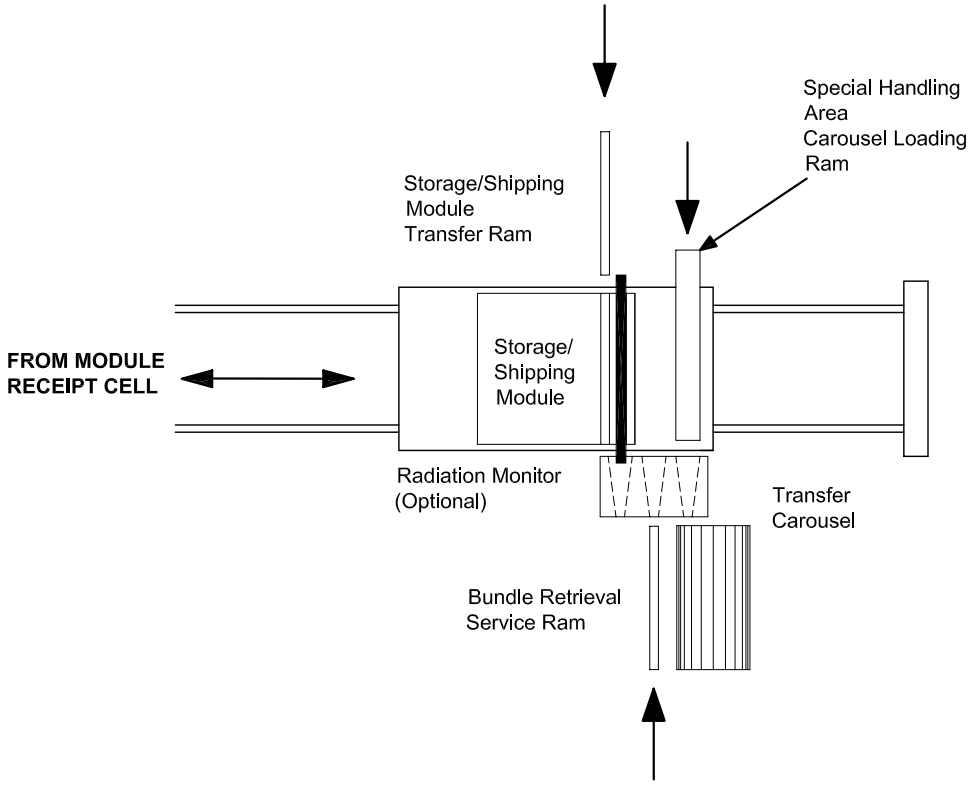


FIGURE 27 FUEL MODULE BUFFER STORAGE POOL



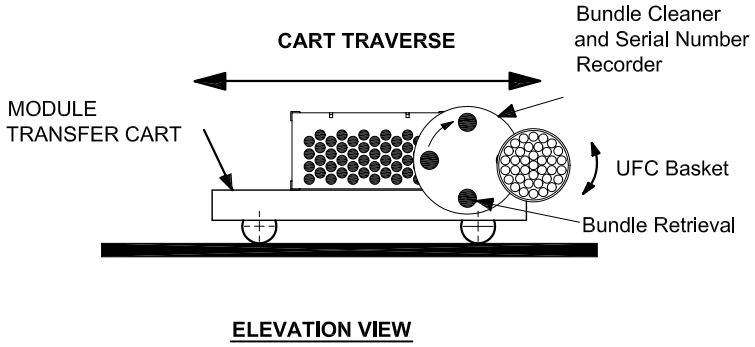
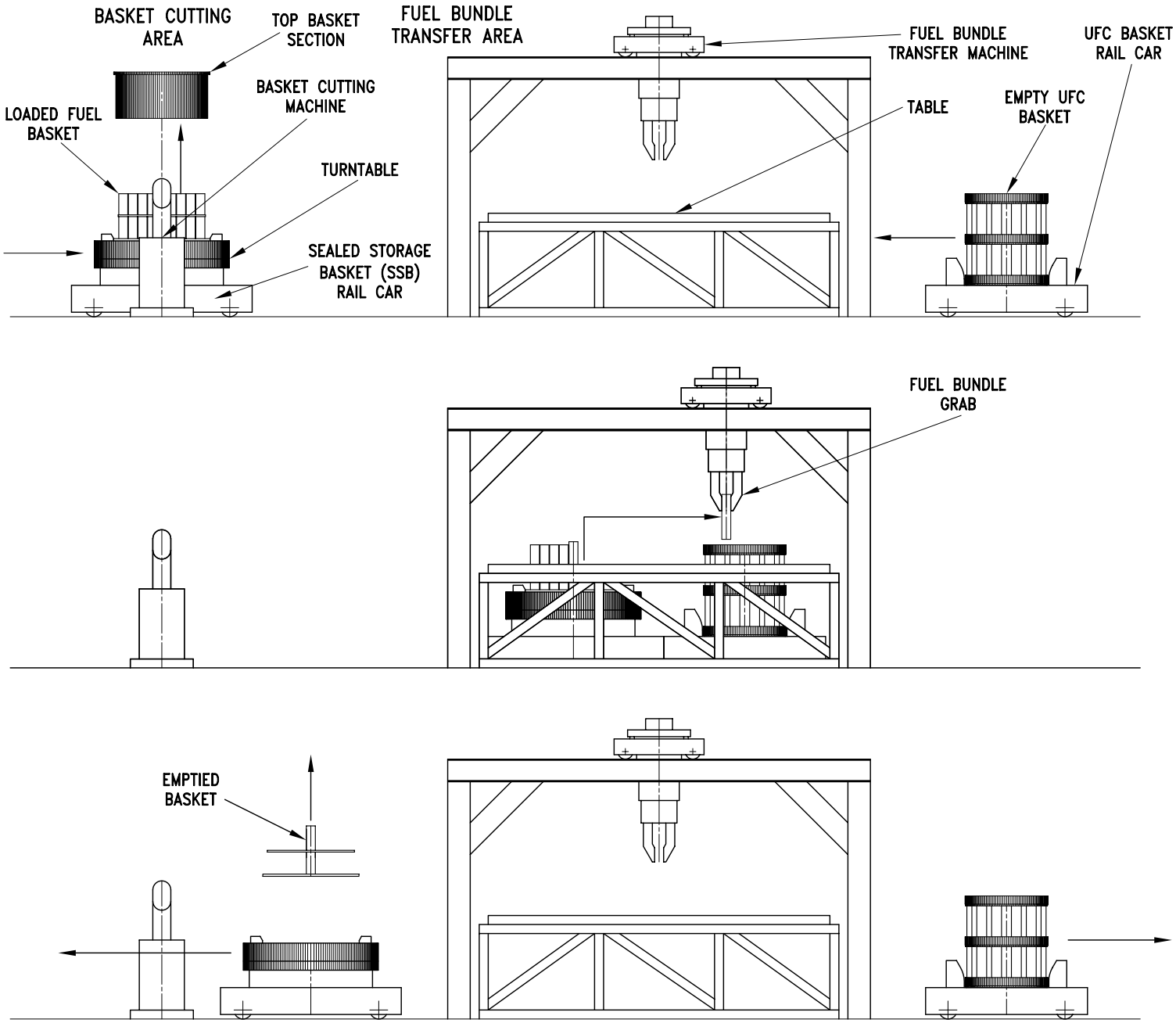


FIGURE 28 FUEL HANDLING CELL FUEL BUNDLE TRANSFER ARRANGEMENT



1. ADVANCE THE UFC BASKET RAIL CAR WITH EMPTY UFC BASKET INTO THE FUEL BUNDLE TRANSFER MACHINE. ADVANCE THE SEALED STORAGE BASKET (SSB) RAIL CAR WITH LOADED BASKET TO THE BASKET CUTTING AREA. CUT THE BASKET IN THE APPROPRIATE PLACES, REMOVE THE TOP BASKET SECTION AND DISCHARGE TO THE WASTE MANAGEMENT FACILITY. ADVANCE THE SSB RAIL CAR INTO THE FUEL BUNDLE TRANSFER MACHINE.

2. WITH THE UFC BASKET IN POSITION RAISE FUEL BUNDLE SUPPORT RODS. TRANSFER FUEL BUNDLES AND FILL UFC BASKET BOTTOM LAYER. LOWER SUPPORT RODS AND TRANSFER TOP LAYER OF FUEL BUNDLES INTO UFC BASKET.

3. REMOVE THE FILLED UFC BASKET RAIL CAR AND SSB RAIL CAR FROM THE FUEL BUNDLE TRANSFER MACHINE.
ADVANCE THE UFC BASKET RAIL CAR TO THE FUEL BASKET HANDLING CELL.
REMOVE THE EMPTIED SEALED STORAGE BASKET AND DISCHARGE TO THE WASTE MANAGEMENT FACILITY.
RETURN THE SSB RAIL CAR TO THE BASKET RECEIPT CELL.

FIGURE 29 SEQUENCE DIAGRAM FOR STORAGE BASKET FUEL BUNDLE TRANSFER

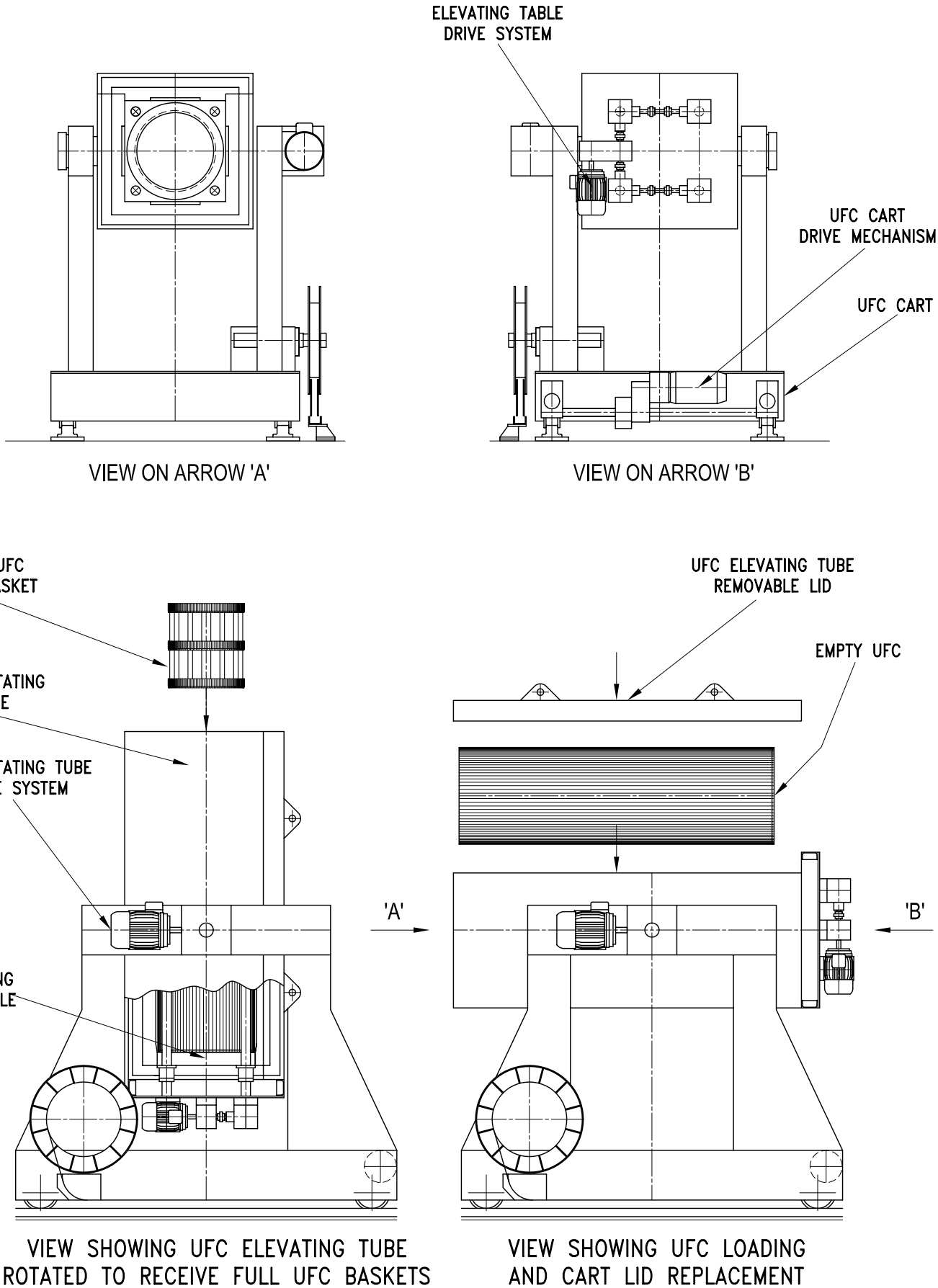
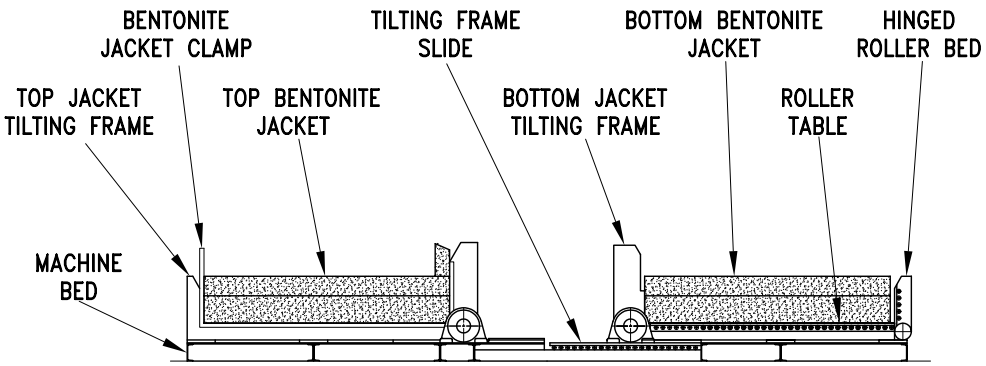
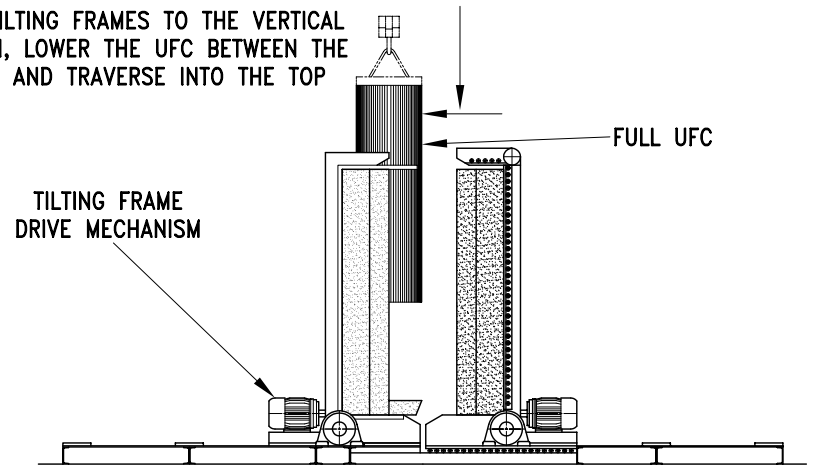


FIGURE 30 GENERAL ARRANGEMENT OF UFC ELEVATING CART

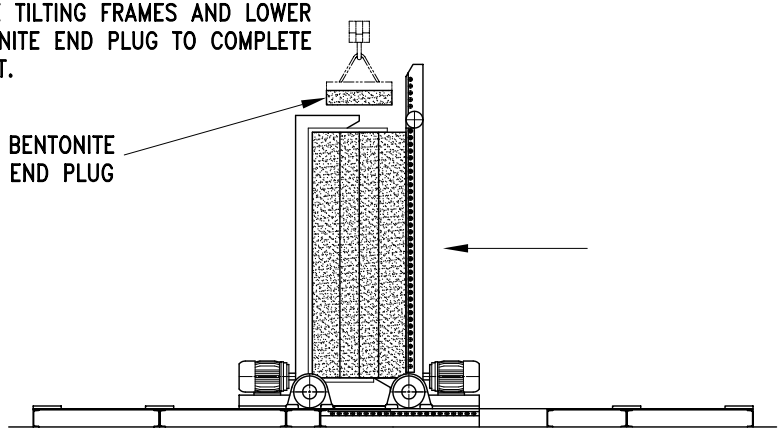
1. INSERT JACKET CLAMP AND APPROPRIATE BENTONITE JACKET INTO THE TILTING FRAMES.



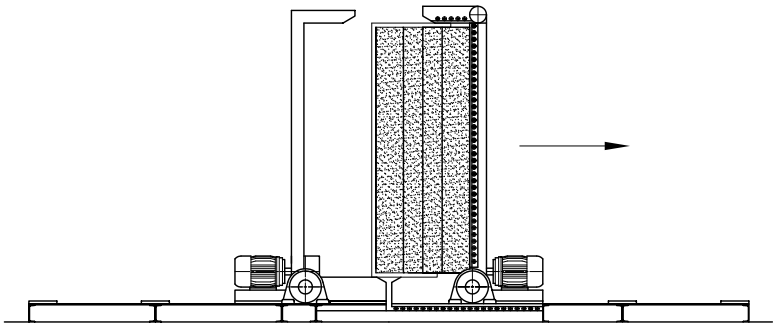
2. RAISE TILTING FRAMES TO THE VERTICAL POSITION, LOWER THE UFC BETWEEN THE JACKETS AND TRAVERSE INTO THE TOP JACKET.



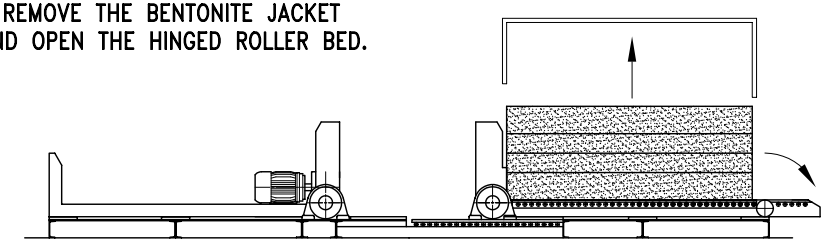
3. CLOSE THE TILTING FRAMES AND LOWER THE BENTONITE END PLUG TO COMPLETE THE JACKET.



4. OPEN THE TILTING FRAMES.



5. LOWER THE TILTING FRAMES TO THE HORIZONTAL POSITION REMOVE THE BENTONITE JACKET CLAMP AND OPEN THE HINGED ROLLER BED.



6. ADVANCE THE JACKETED UFC INTO UFC TRANSPORT CASK. PLACE THE BENTONITE CLAMP INTO THE TOP JACKET TILTING FRAME.

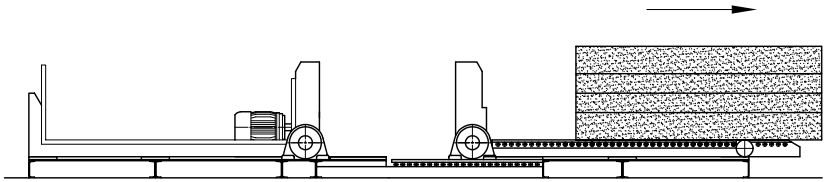


FIGURE 31 GENERAL ARRANGEMENT OF UFC JACKETING MACHINE

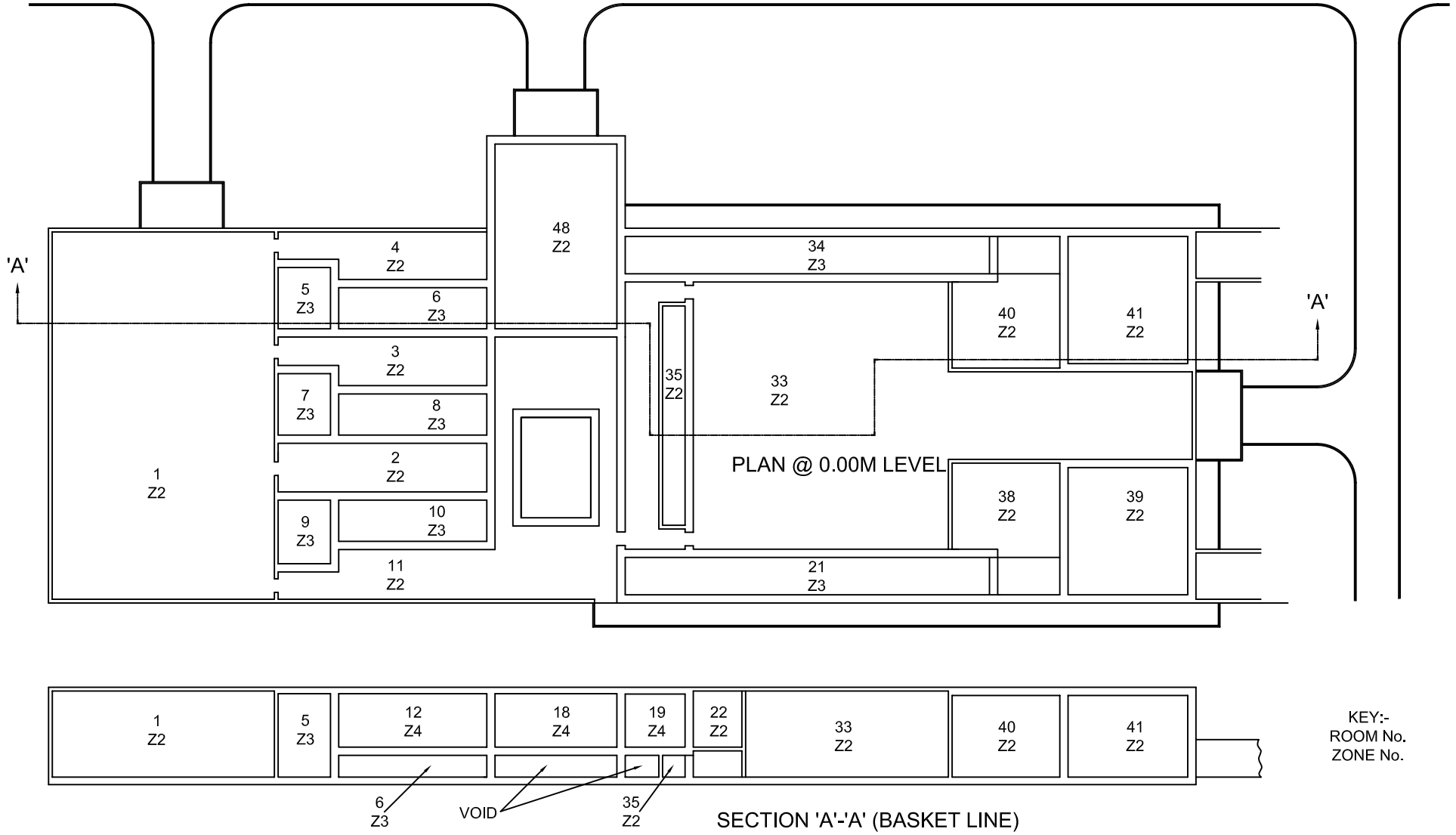


FIGURE 32 UFPP ZONING AND ROOM NUMBERS SHEET 1 OF 2

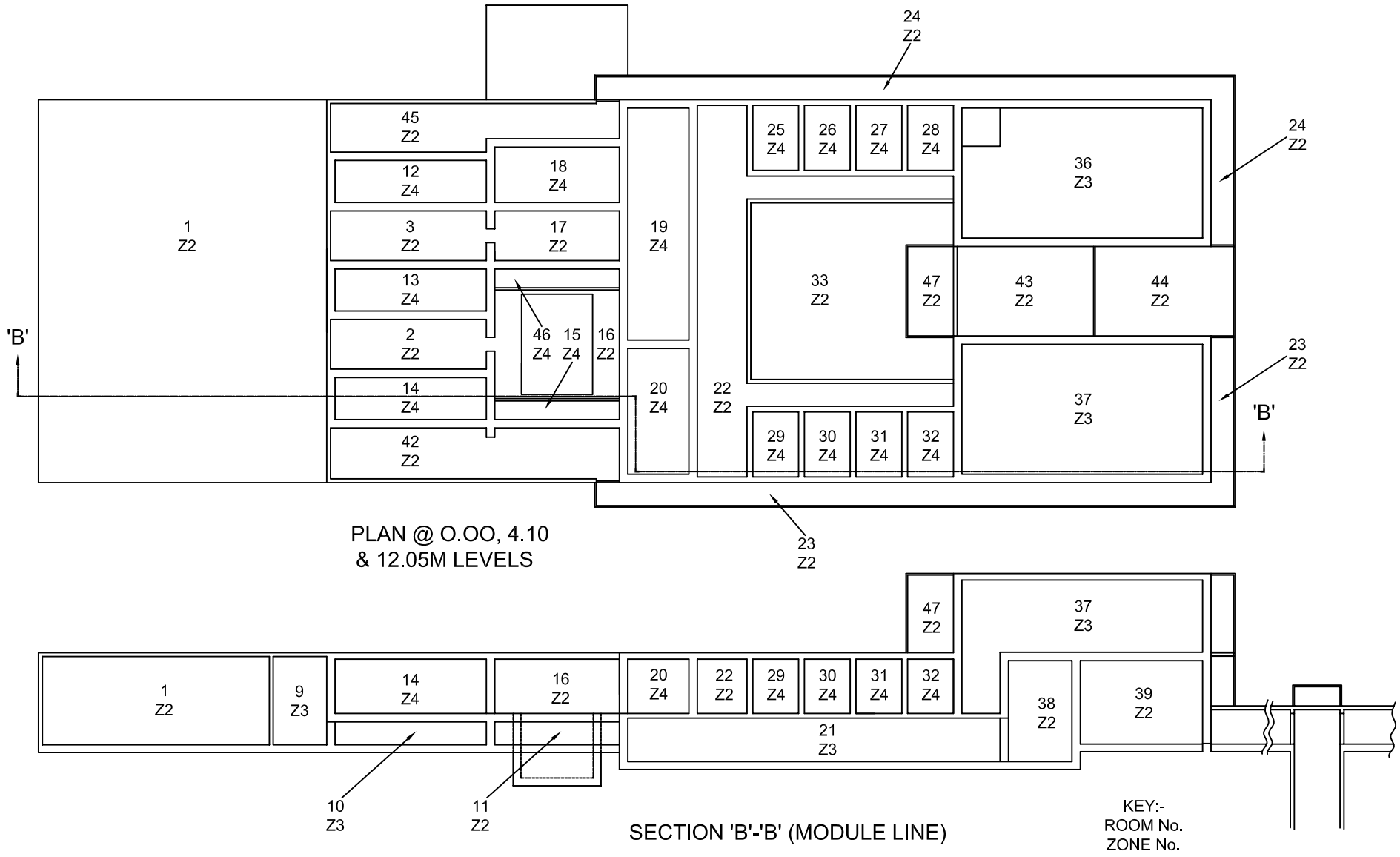
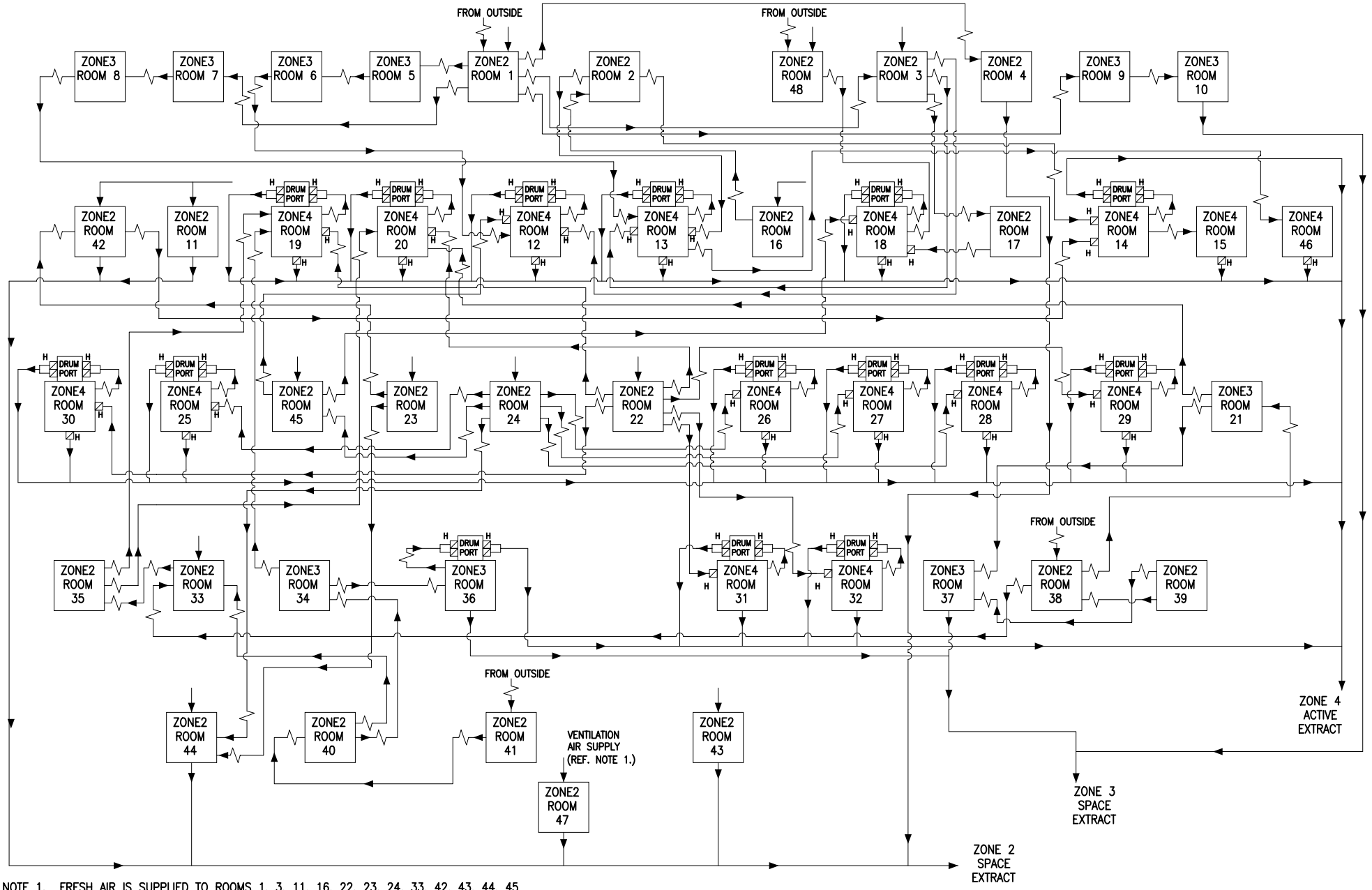


FIGURE 33 UFPP ZONING AND ROOM NUMBERS SHEET 2 OF 2



NOTE 1. FRESH AIR IS SUPPLIED TO ROOMS 1, 3, 11, 16, 22, 23, 24, 33, 42, 43, 44, 45

NOTE 2. H HEPA FILTER

NOTE 3. PROVISION OF DRUM PORT INLET HEPA FILTERS TO BE DETERMINED BY HAZOP.

FIGURE 34 UFPP VENTILATION BLOCK FLOW DIAGRAM

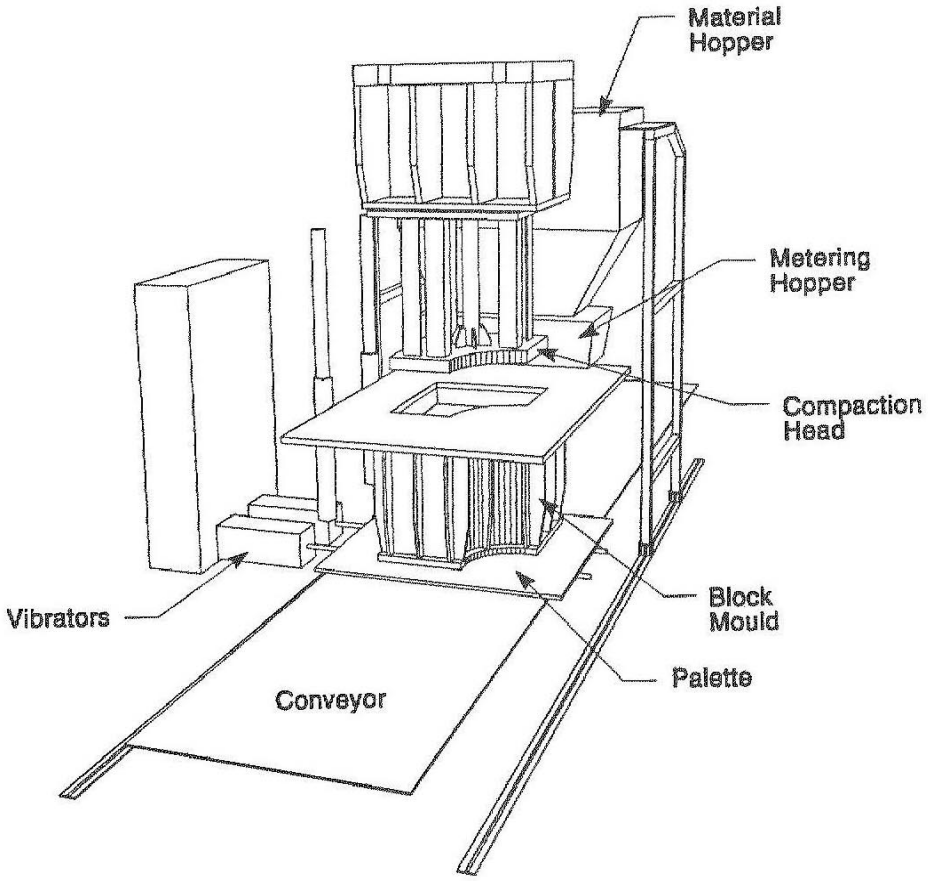
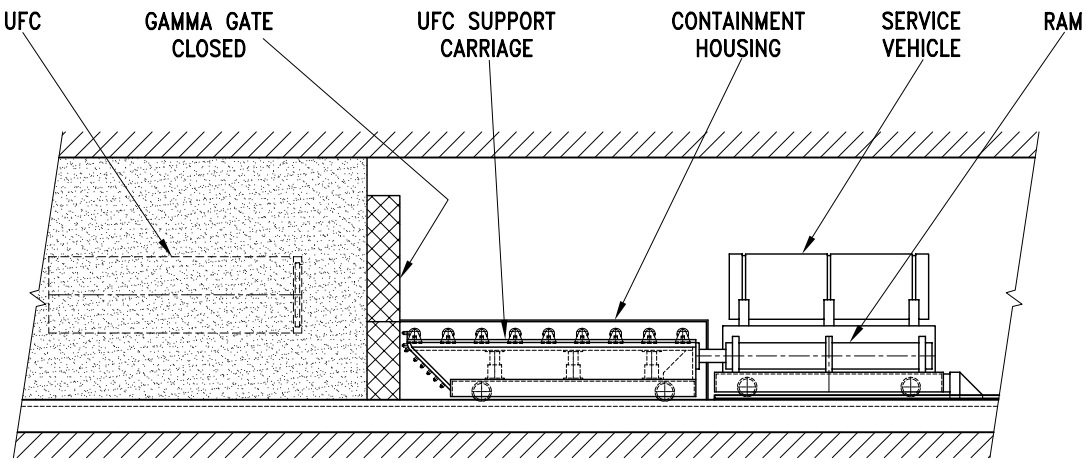
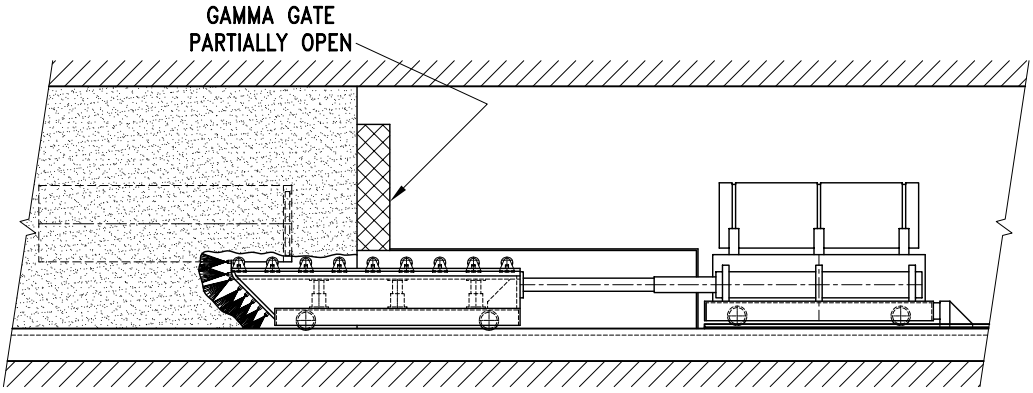


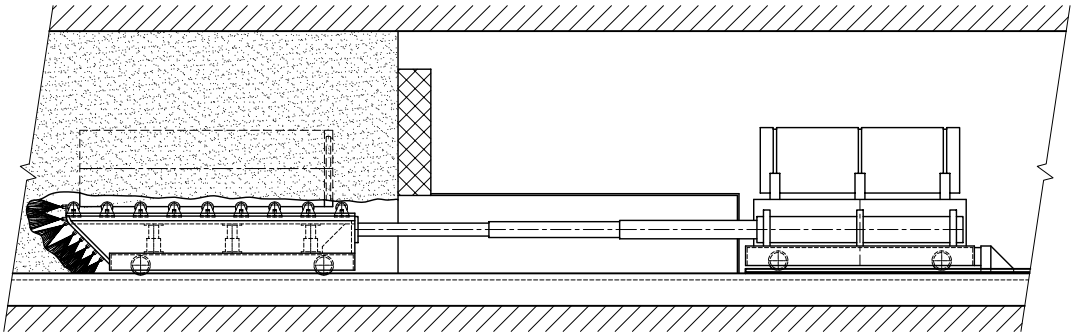
FIGURE 35 BLOCK COMPACTION MACHINE



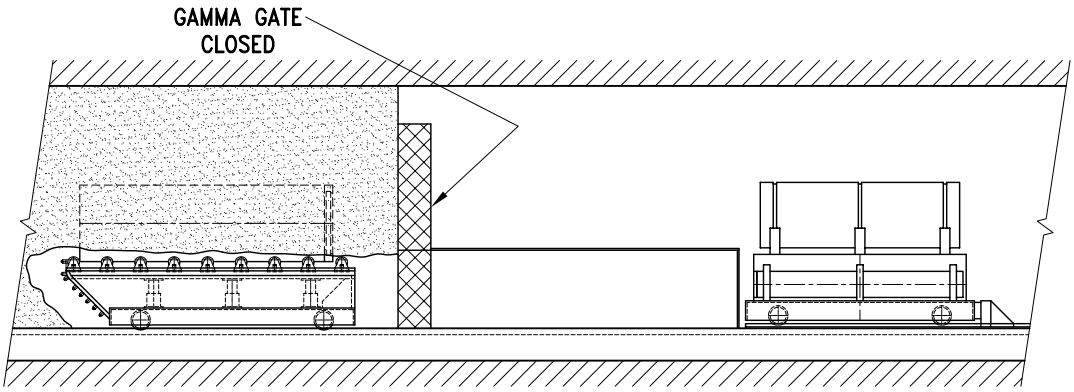
RETRIEVAL EQUIPMENT IN POSITION



UFC SUPPORT CARRIAGE PARTIALLY INSERTED



UFC SUPPORT CARRIAGE FULLY INSERTED



UFC SUPPORT CARRIAGE FULLY INSERTED, WATER OFF, SERVICE VEHICLE AND CONTAINMENT HOUSING PREPARED FOR REMOVAL

FIGURE 36 RECOVERY EQUIPMENT FOR REMOVAL OF LOWER SEALING MATERIALS

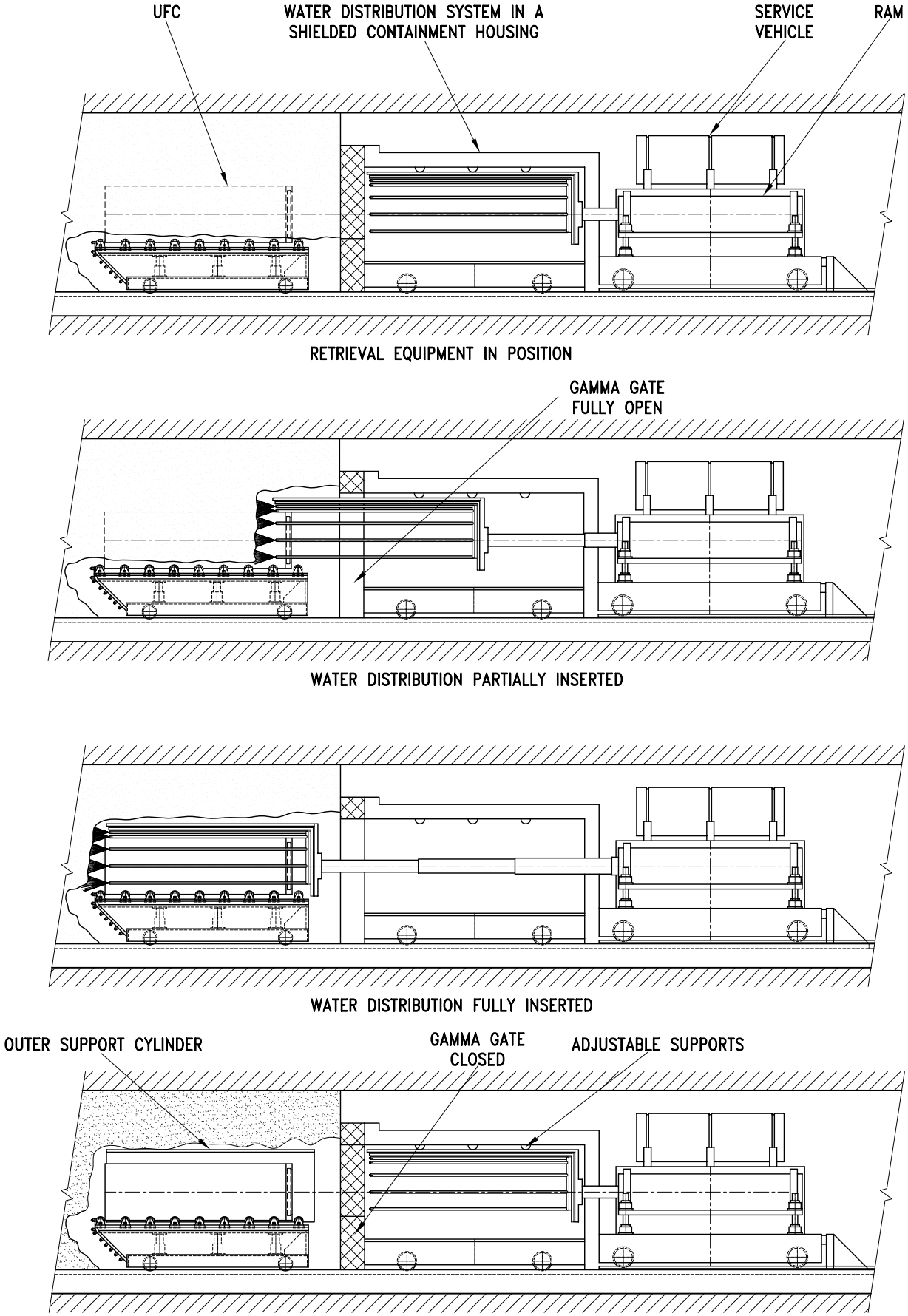
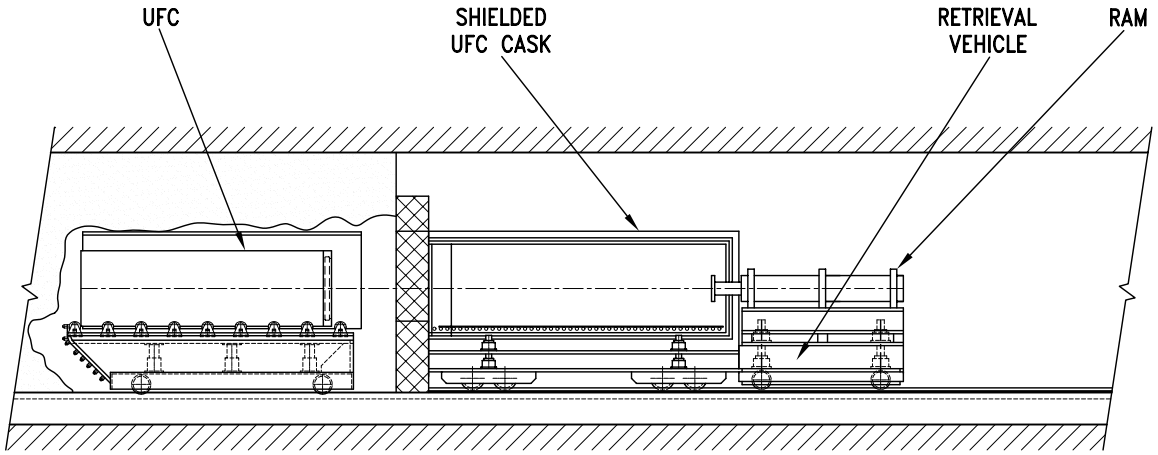
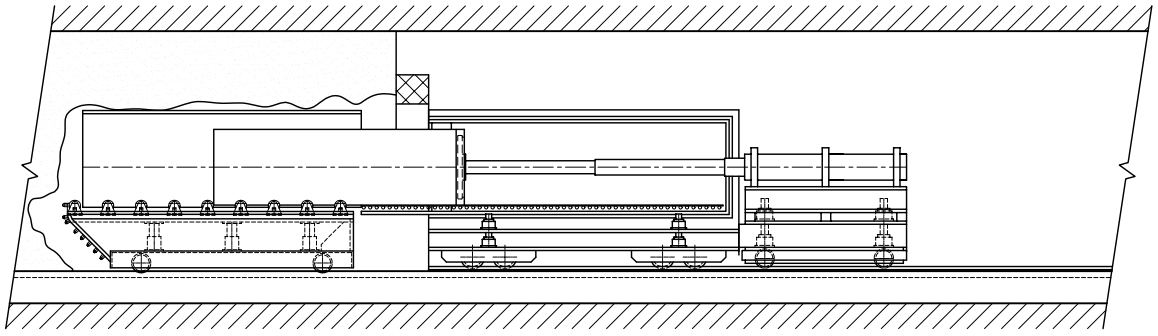


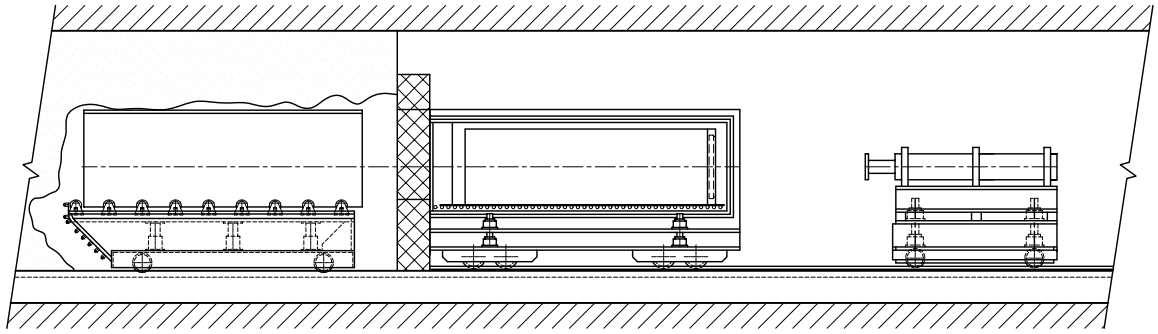
FIGURE 37 RECOVERY EQUIPMENT FOR REMOVAL OF UPPER SEALING MATERIALS



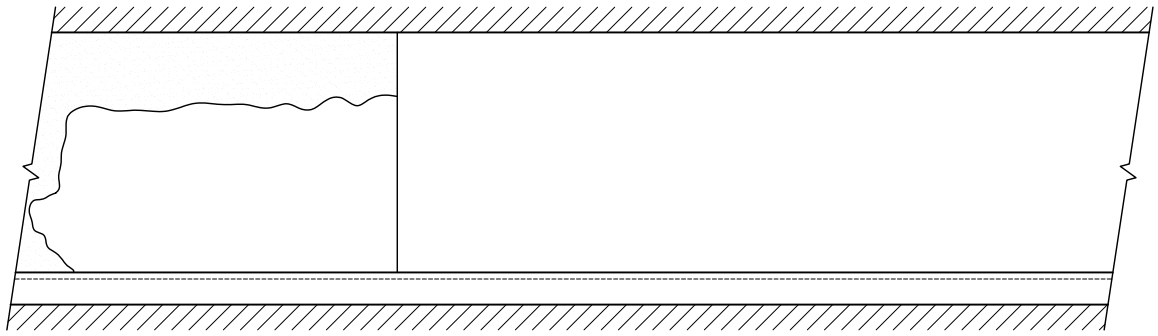
RETRIEVAL EQUIPMENT IN POSITION



UFC PARTLY REMOVED



UFC FULLY REMOVED GAMMA GATES CLOSED AND RETRIEVAL VEHICLE
AND SHIELDED UFC CASK PREPARED FOR REMOVAL



AREA CLEARED OF RETRIEVAL EQUIPMENT AND GAMMA GATES

FIGURE 38 RECOVERY EQUIPMENT FOR REMOVAL OF UFC

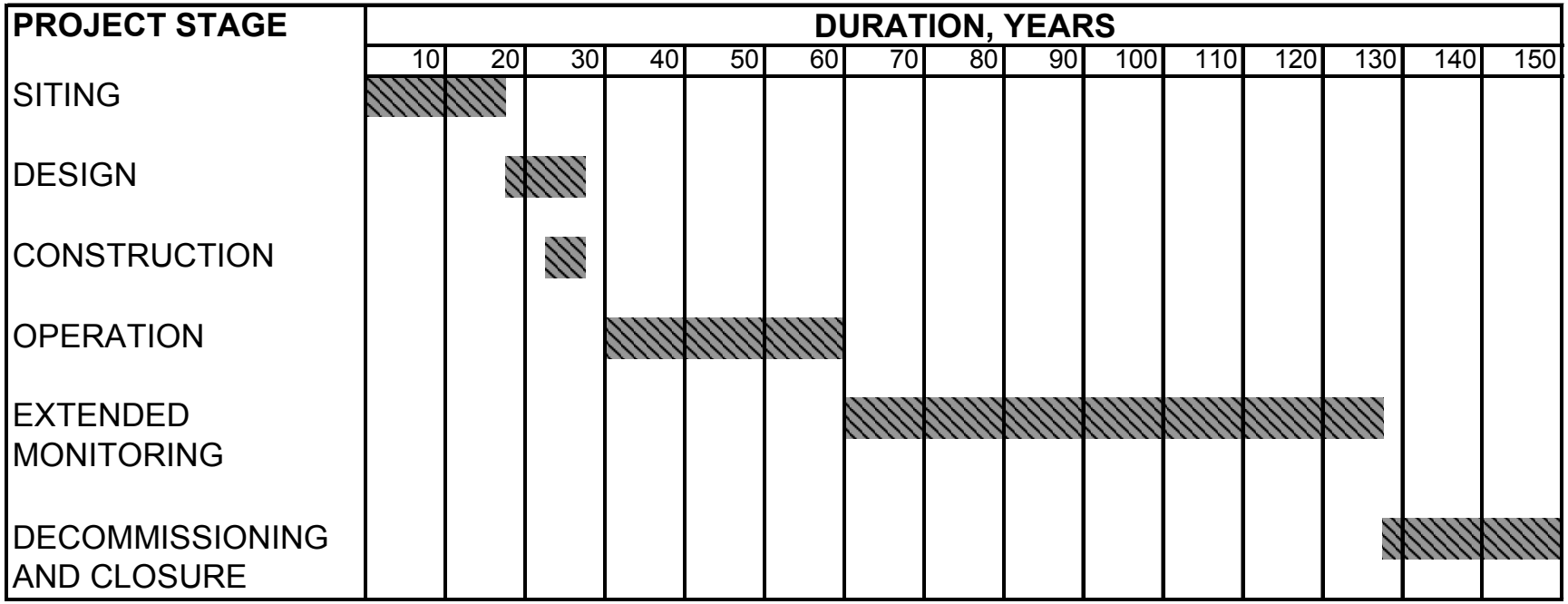


FIGURE 39 – SUMMARY DGR SCHEDULE

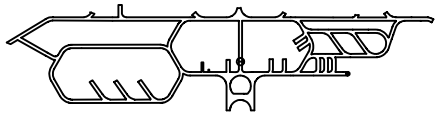


Fig. 1e (i)

Initial Exploration Development

Developing a Test Component Area and determining the proper Repository orientation.

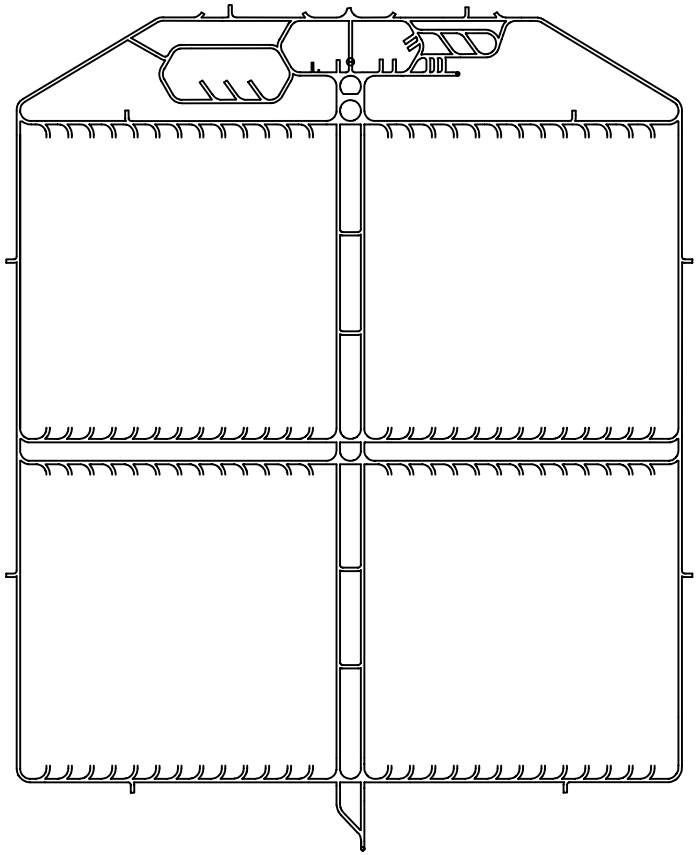


Fig. 1e (ii)

Repository Development

Establishing the perimeter, central and repository panel access drifts, plus the waste fuel transport repair facility and exhaust ventilation shaft.

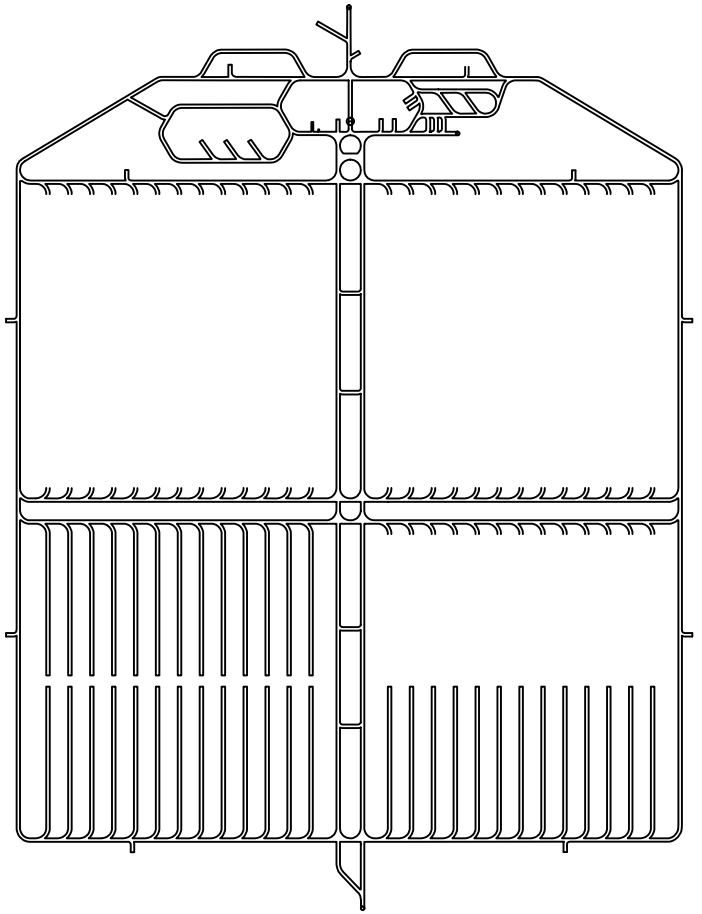


Fig. 1e (iii)

Repository Development - Repository Panel Development

Establish the Waste Shaft, empty and loaded rail car areas and 39 emplacement rooms.

FIGURE 40 DGR DEVELOPMENT STAGES