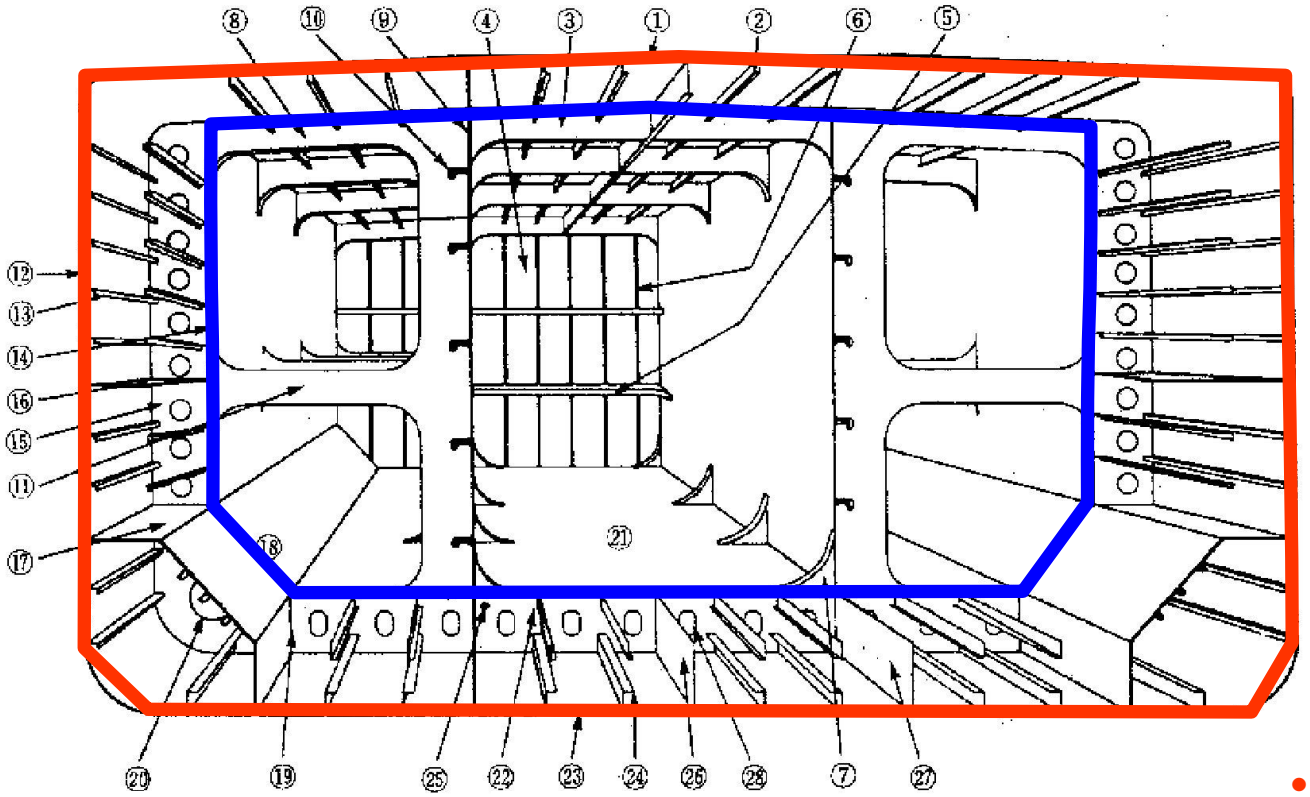
Ship Structural Design
(선체 구조 설계)

2008.6

서울대학교 조선해양공학과
이규열

선체 구조 설계
-300K VLCC 예

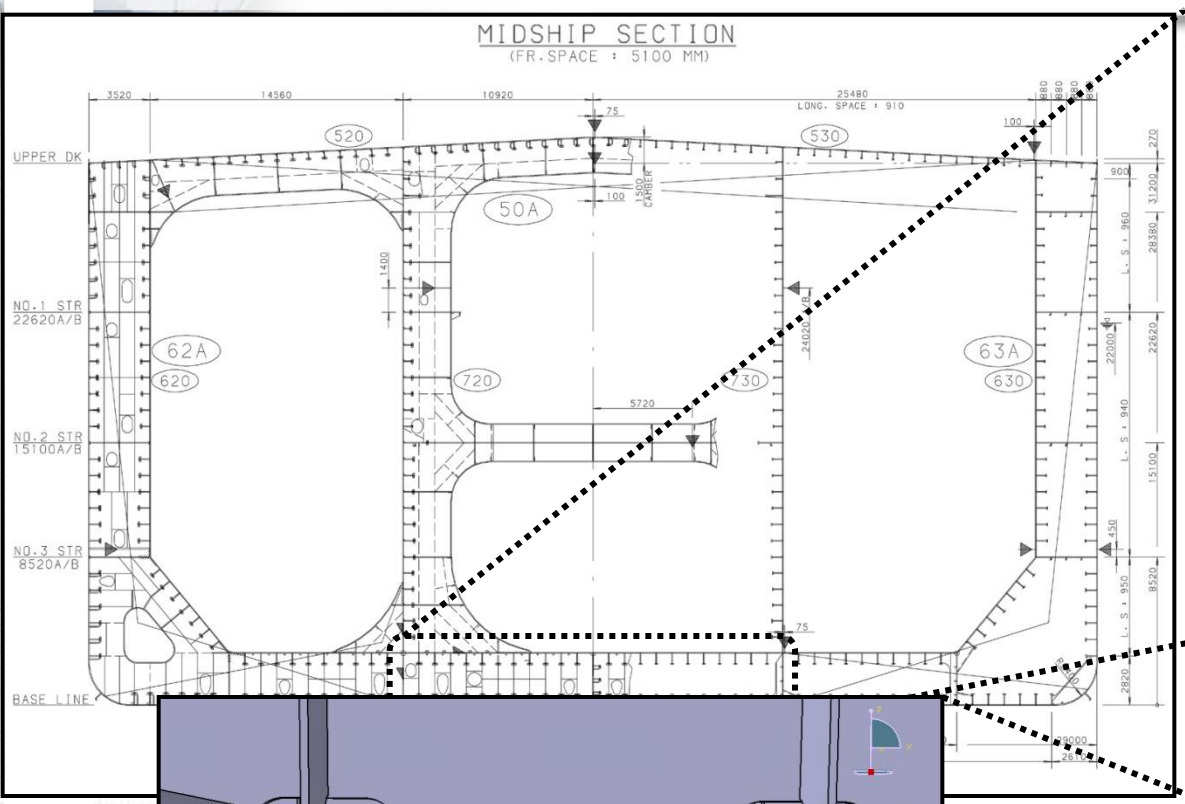
VLCC의 중앙 단면(M/S; Midship Section) 개념도

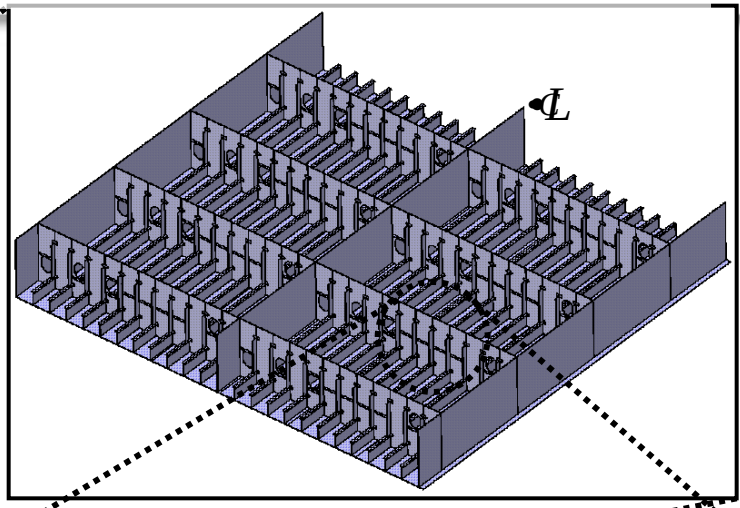


- 1. 갑판
- 2. 갑판 종통재
- 3. 트랜스버스 웨브
- 4. 횡격벽
- 5. 스트링거
- 6. 횡격벽 방요제
- 7. 브라켓
- 8. 트랜스 링
- 9. 화물창내 종격벽
- 10. 종격벽 종통재
- 11. 크로스 타이
- 12. 현측외판
- 13. 현측외판 종통재
- 14. 현측 종격벽
- 15. 윙탱크 늑판
- 16. 수평 거어더
- 17. 호퍼 수평 거어더
- 18. 호퍼 경사판
- 19. 호퍼사이드 거어더
- 20. 호퍼 홀
- 21. 내저판
- 22. 내저판 종통재
- 23. 선저외판
- 24. 선저외판 종통재
- 25. 이중저 늑판
- 26. 센터 거어더
- 27. 사이드 거어더
- 28. 맨홀

- 단일선체
- 이중선체

이중저의 모습


MIDSHIP SECTION
(FR.SPACE : 5100 MM)
UPPER DK
NO.1 STR
22620A/B
NO.2 STR
15100A/B
NO.3 STR
8520A/B
BASE LINE
520
530
50A
62A
620
720
730
63A
630
3520
14560
10920
25480
LONG. SPACE : 910
5720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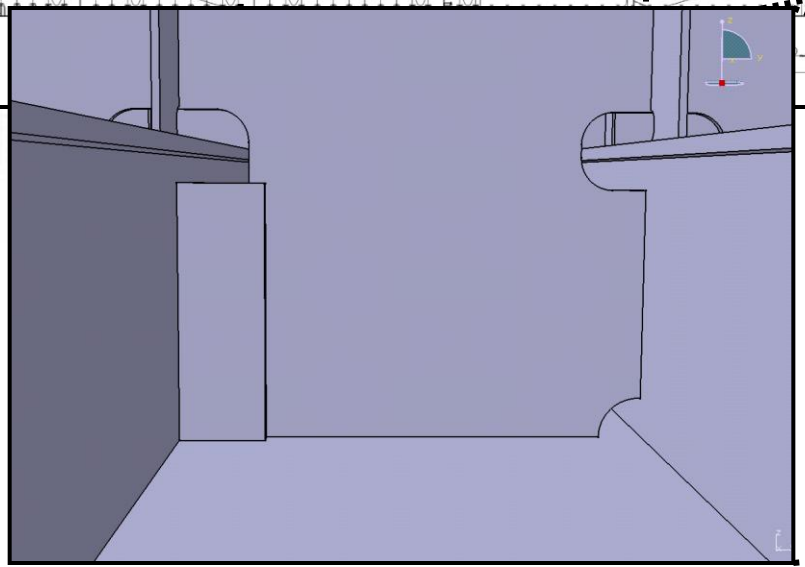
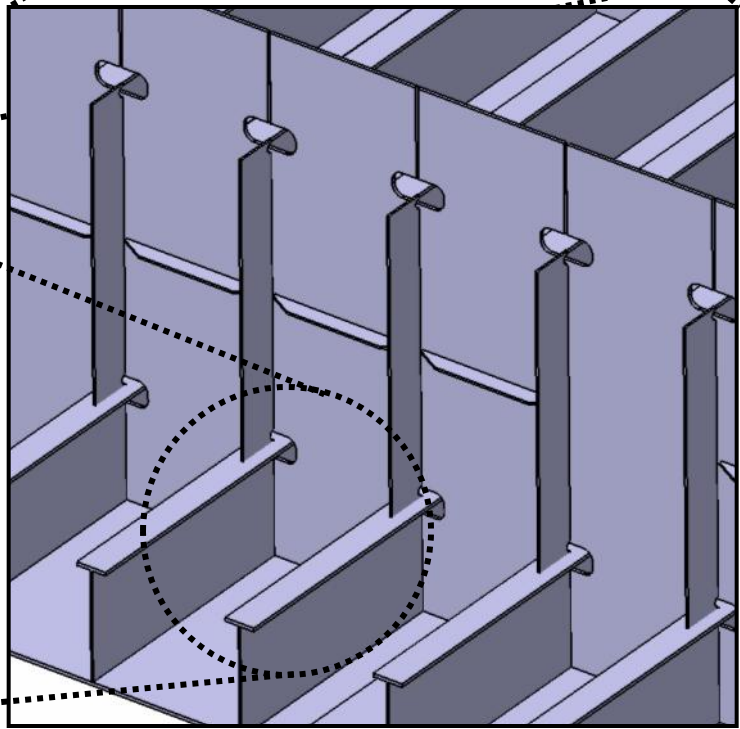
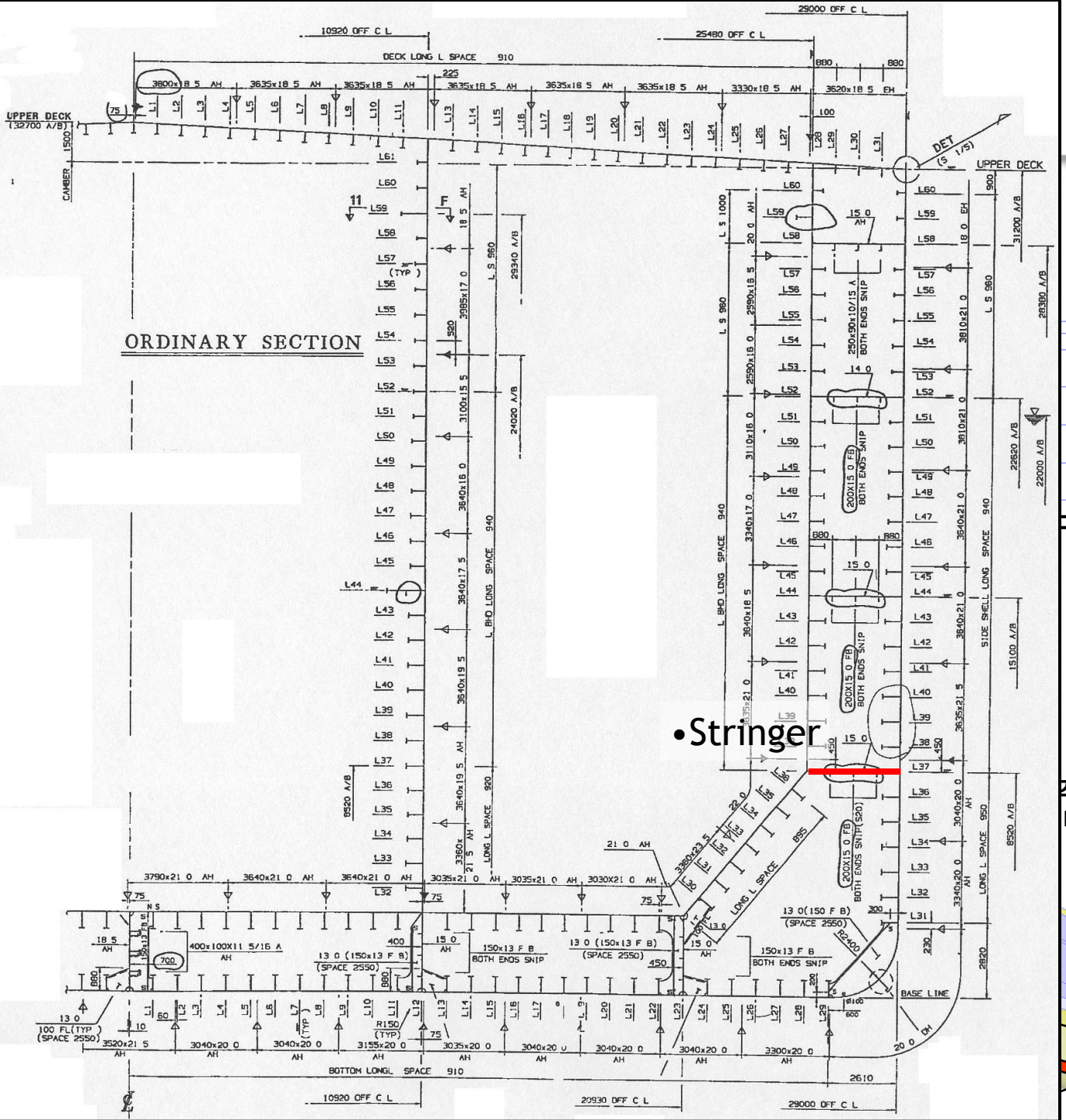
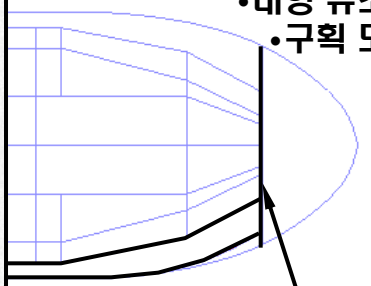




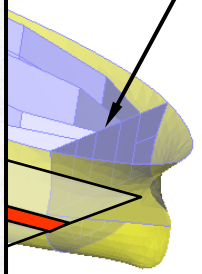


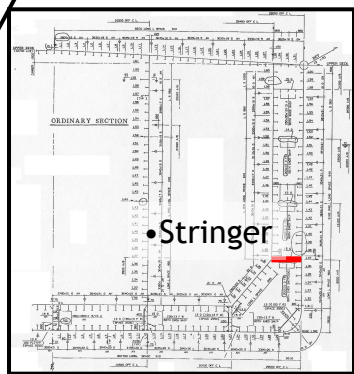
•재화 중량 300,000 톤
•대형 유조선의
•구획 모델



•충돌 횡격벽 판
•(collision bulkhead panel)

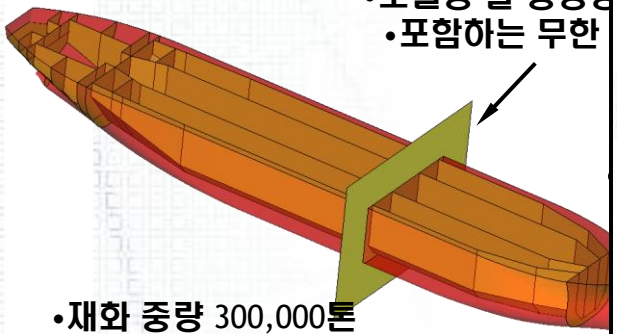
격벽 판
bulkhead panel)





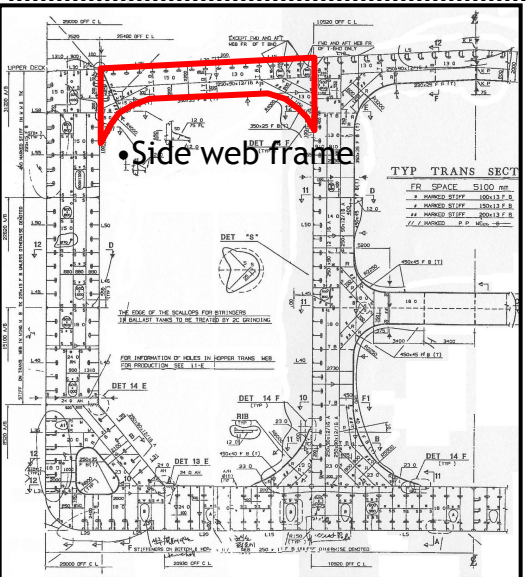
횡방향 구조 부재
- 선행 단계에서 정의된 [illegible]

- **INPUT**
  - 횡방향 판이 설치될 위치
  - 횡방향 판의 형상
  - 횡방향 판의 두께, 재질 등

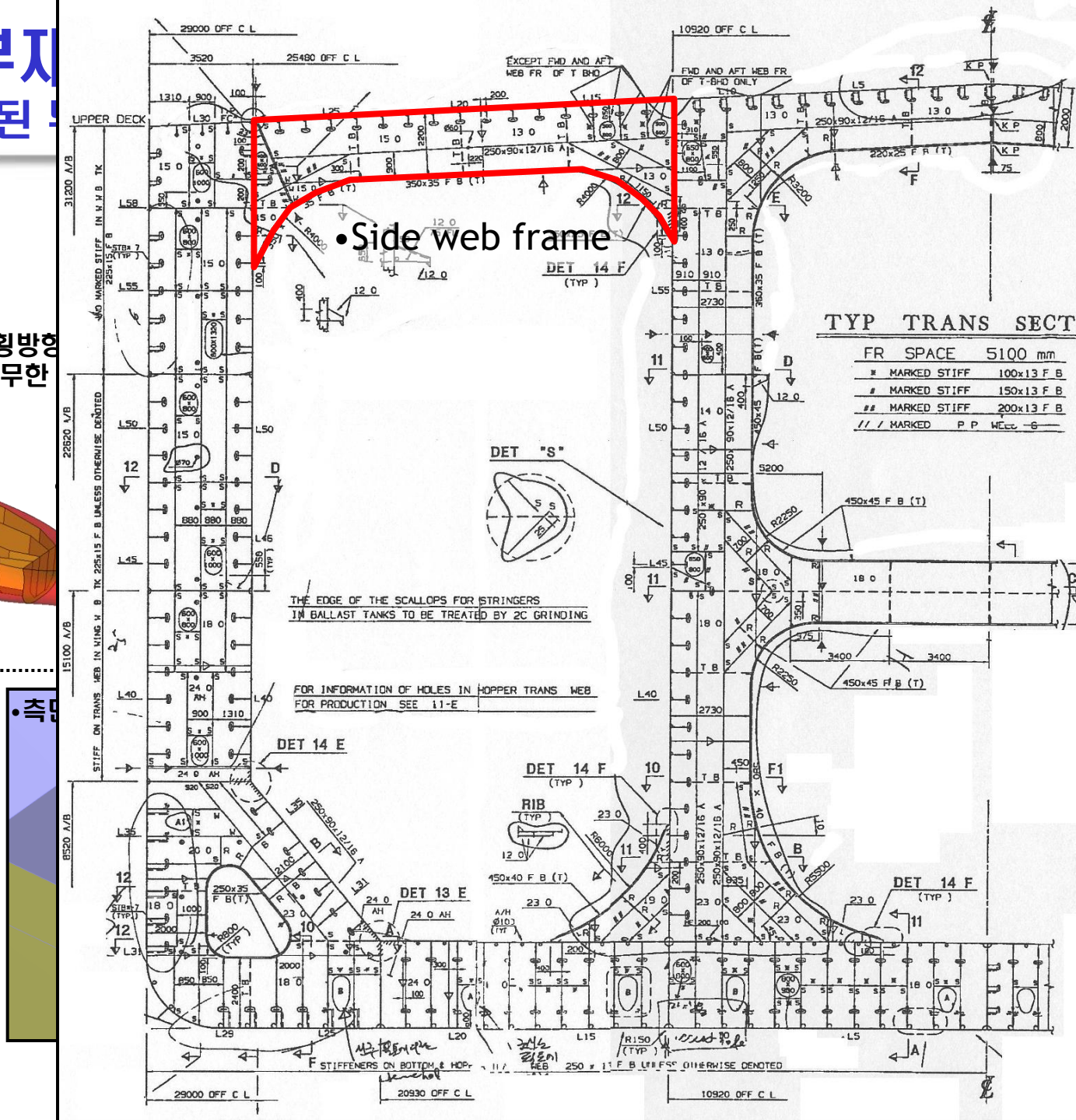


- 모델링 할 횡방향
- 포함하는 무한

- 재화 중량 300,000톤
- 대형 유조선의 구획 모델



- 측면

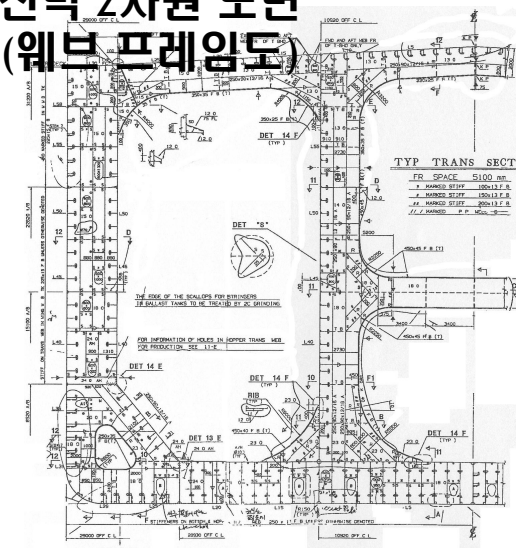


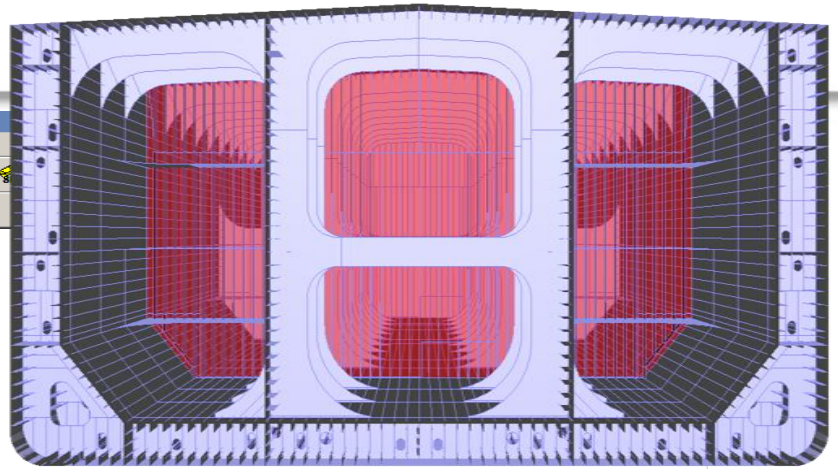
00,000 설계

초기 선체

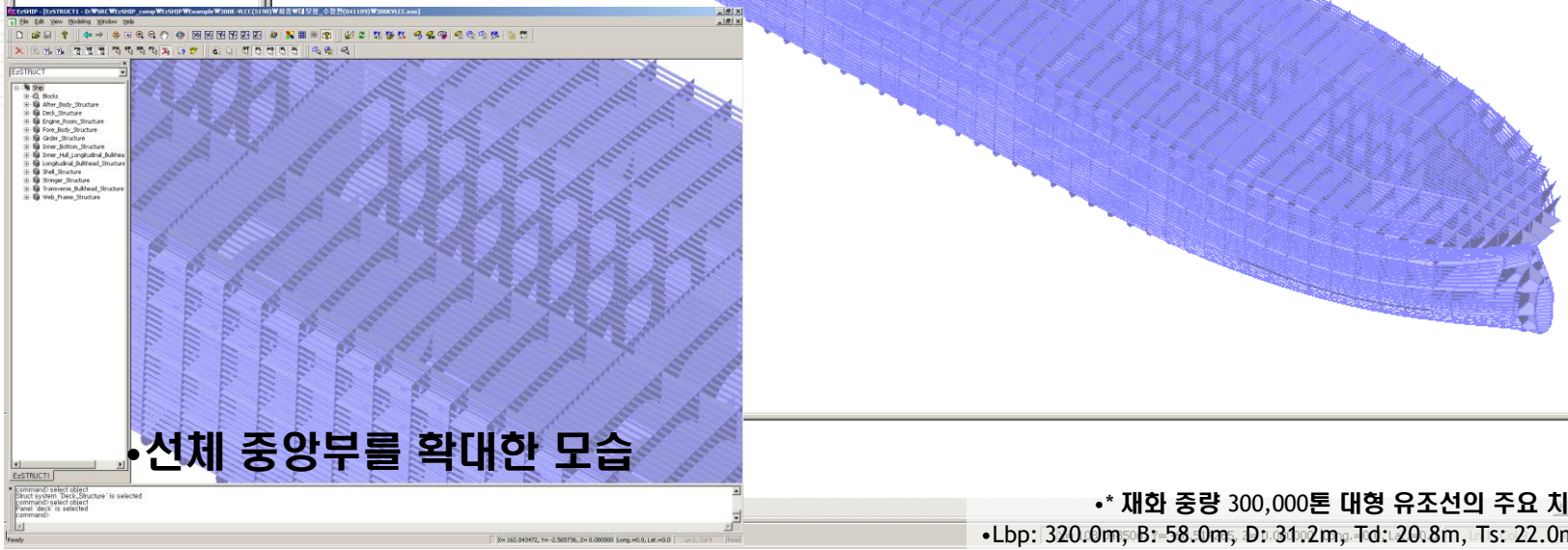
•초기 선체

•선박 2차원 도면
•(웨브 프레임도)





•화물창 내부의 모습

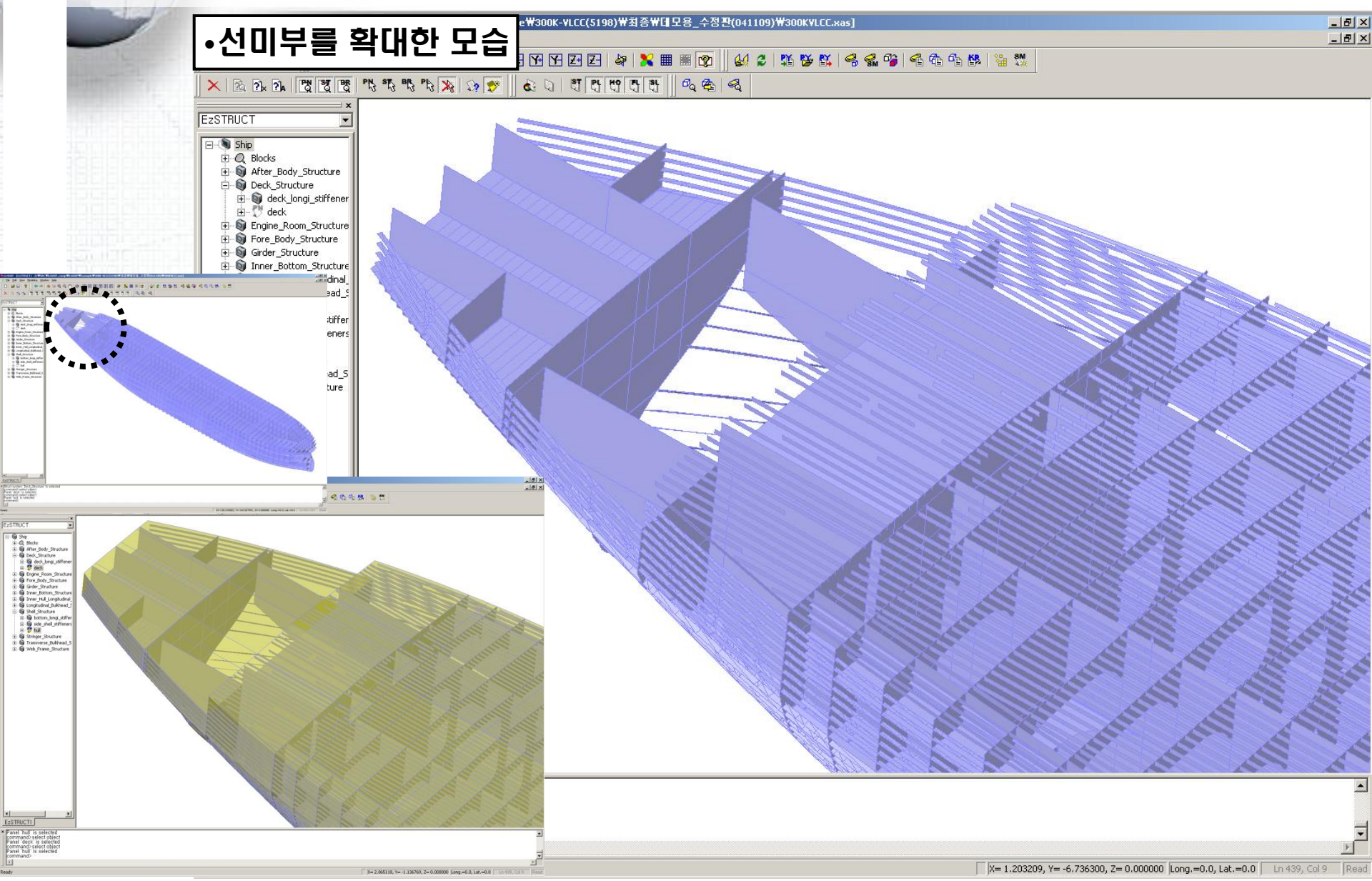


•선체 중앙부를 확대한 모습

•* 재화 중량 300,000톤 대형 유조선의 주요 치수
•Lbp: 320.0m, B: 58.0m, D: 31.2m, Td: 20.8m, Ts: 22.0m, Cb: 0.8086

300,000 DWT VLCC 구조설계

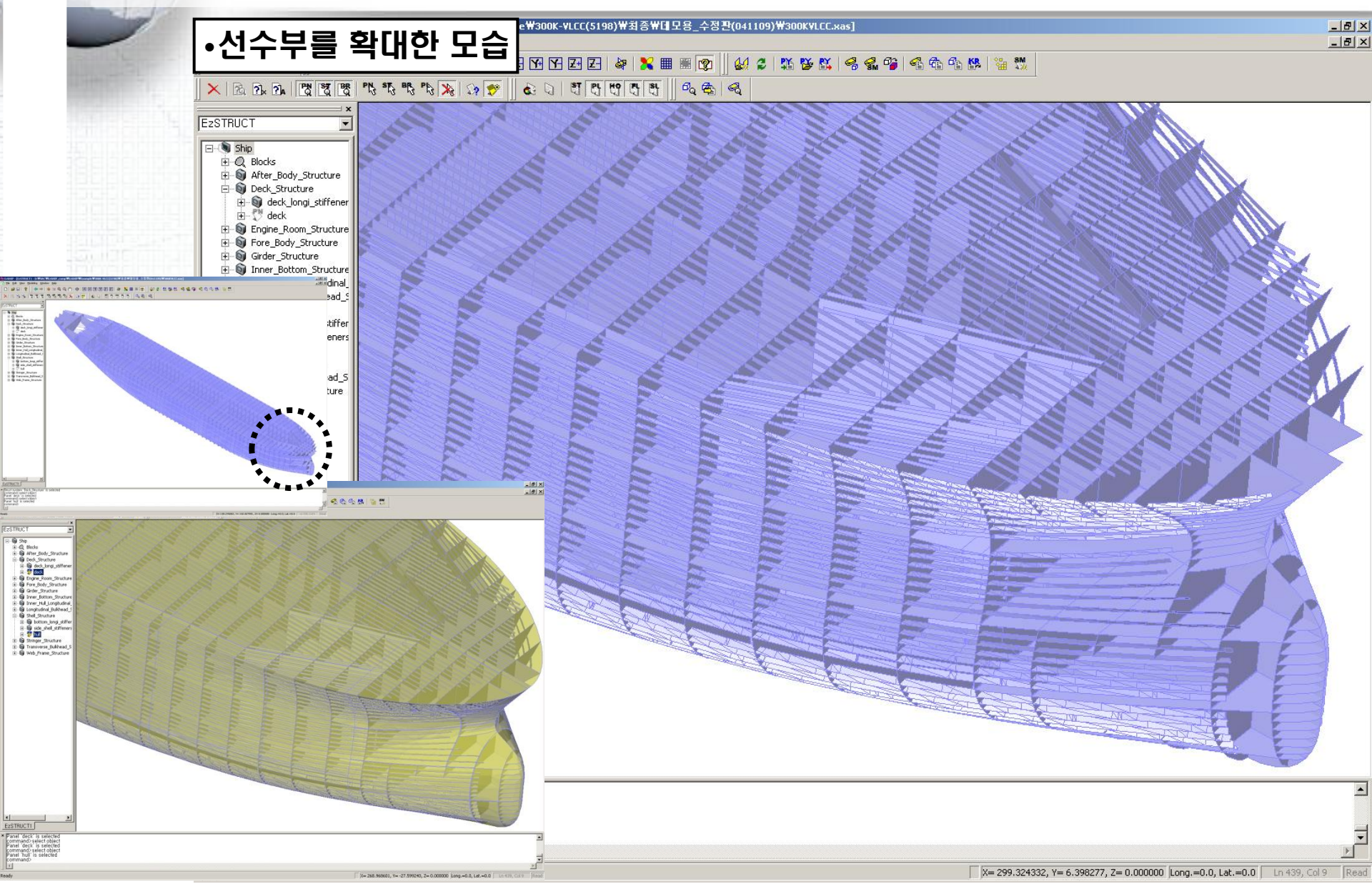
- 초기 선체 구조 모델링



300,000 DWT VLCC 구조설계

- 초기 선체 구조 모델링

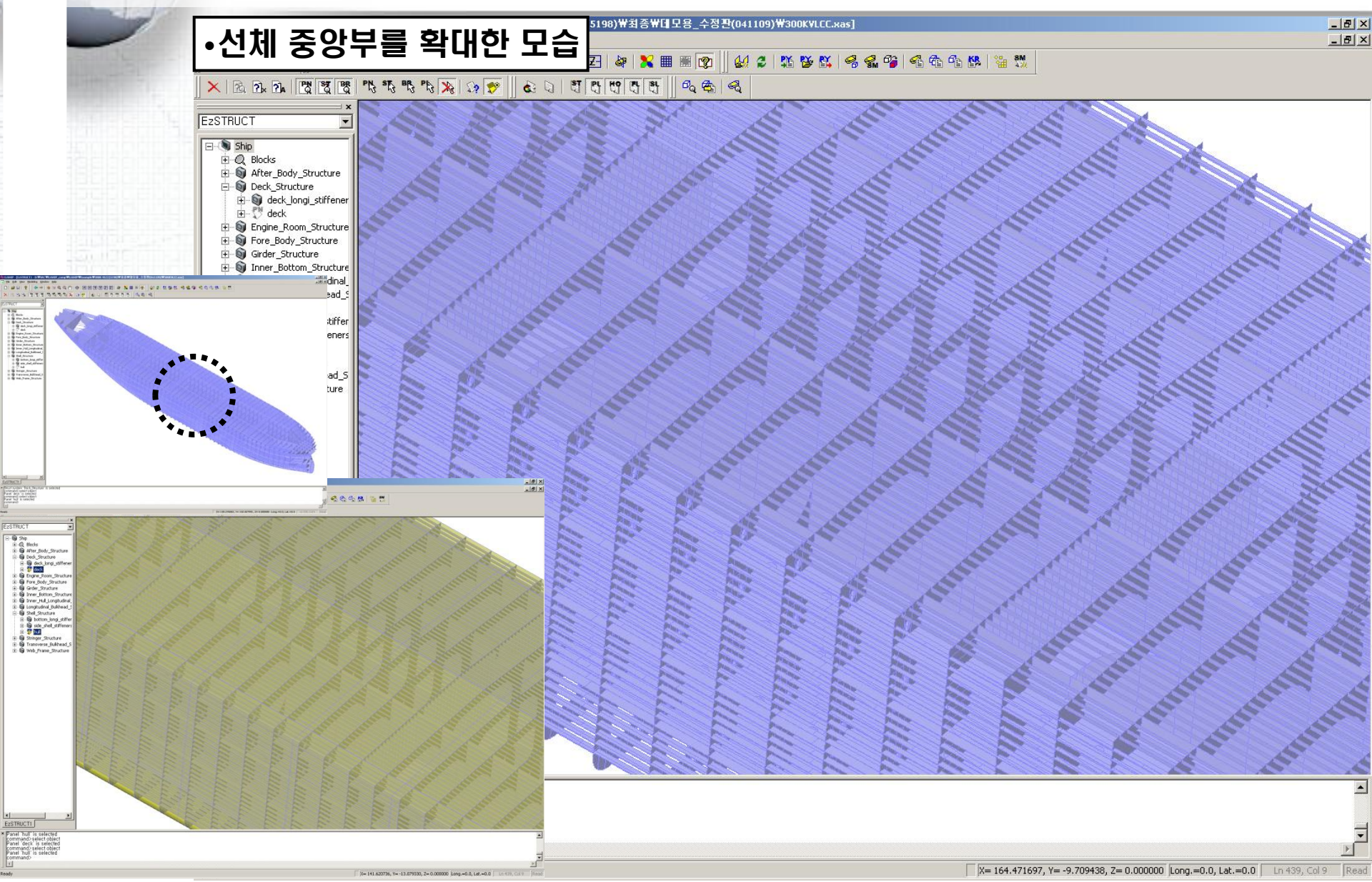
•선수부를 확대한 모습



300,000 DWT VLCC 구조설계

- 초기 선체 구조 모델링

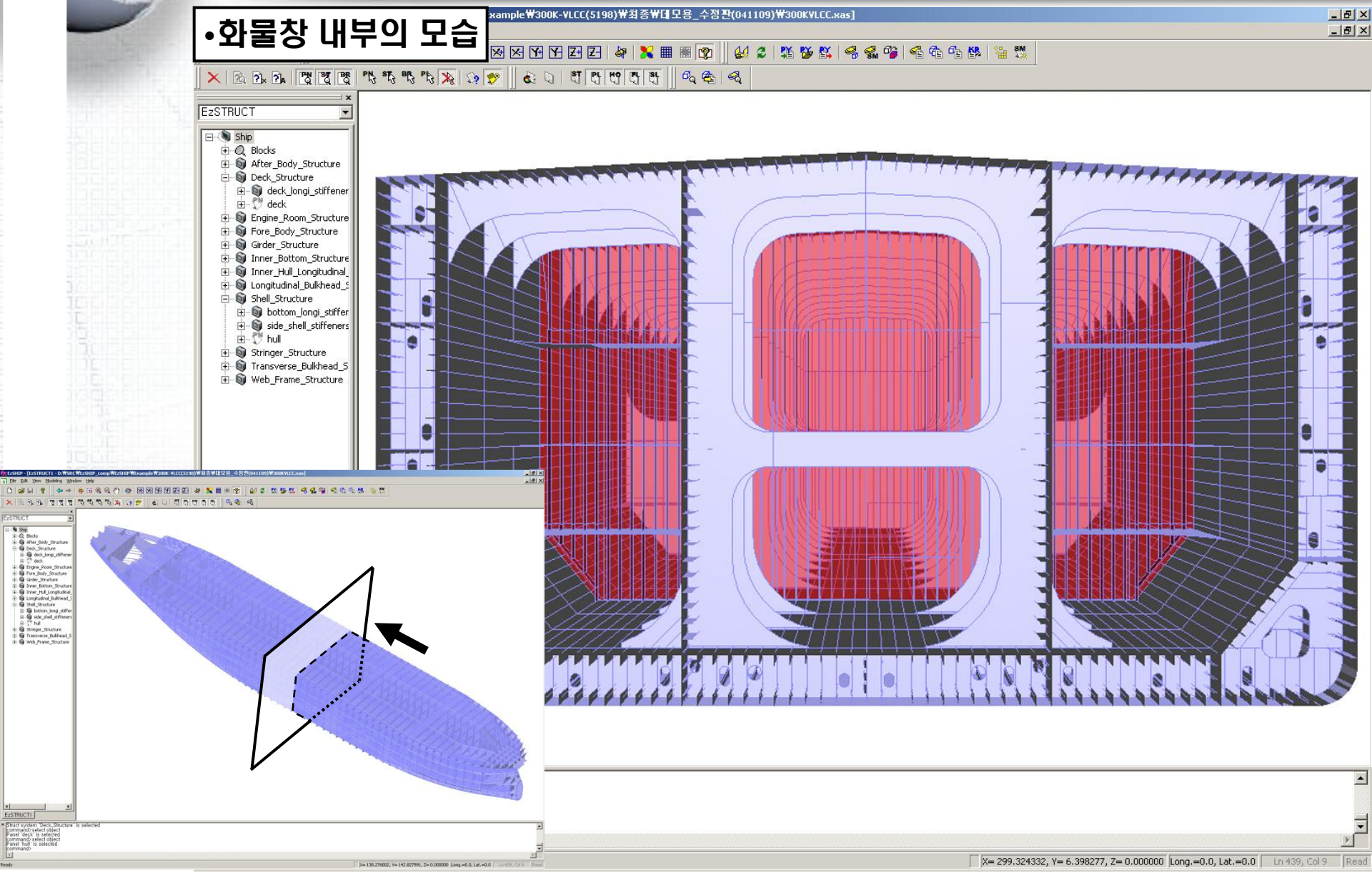
•선체 중앙부를 확대한 모습



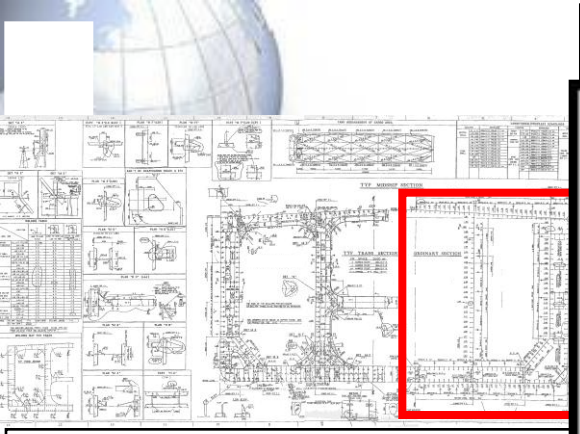
300,000 DWT VLCC 구조설계

- 초기 선체 구조 모델링

•화물창 내부의 모습

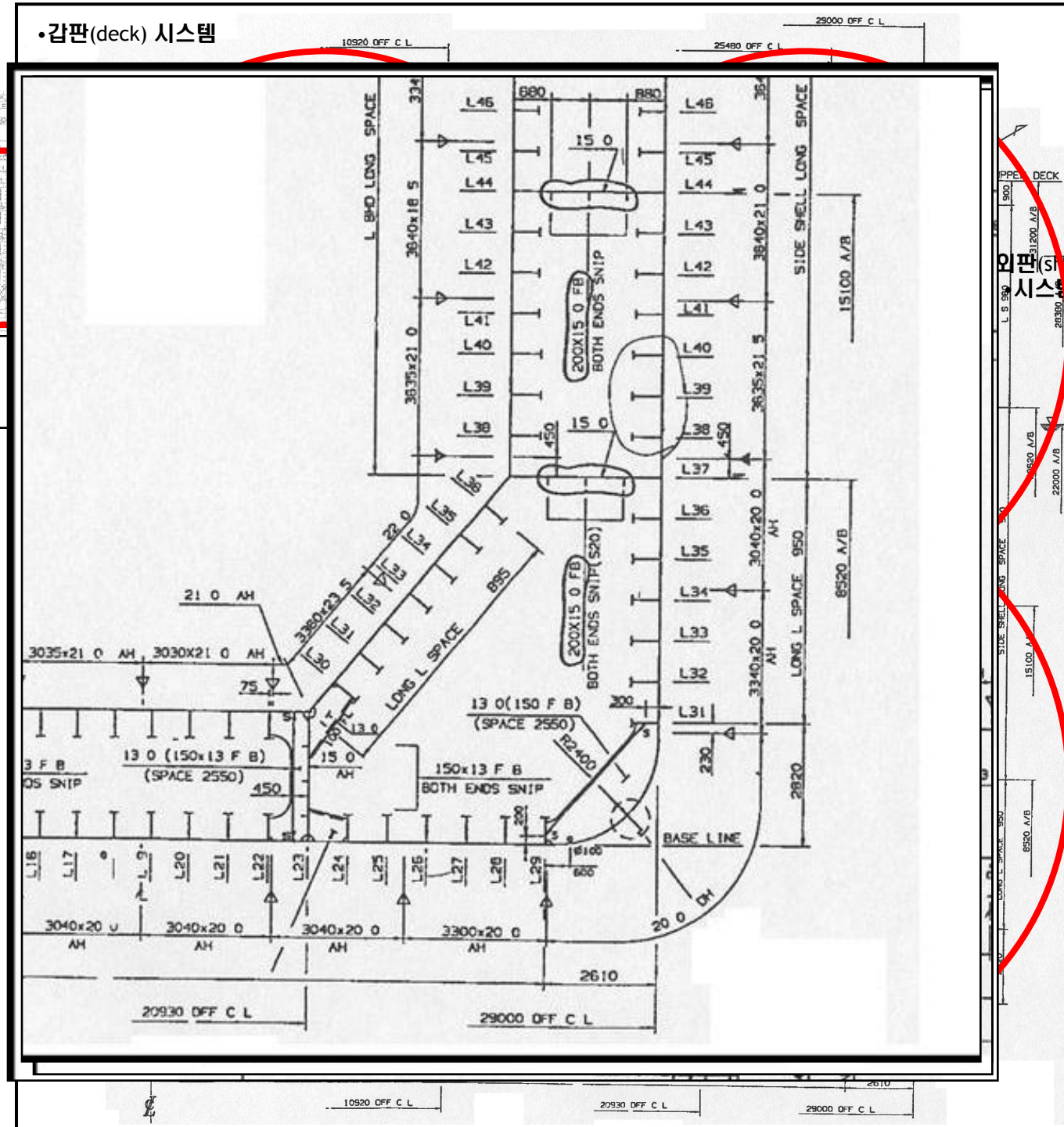


•갑판(deck) 시스템

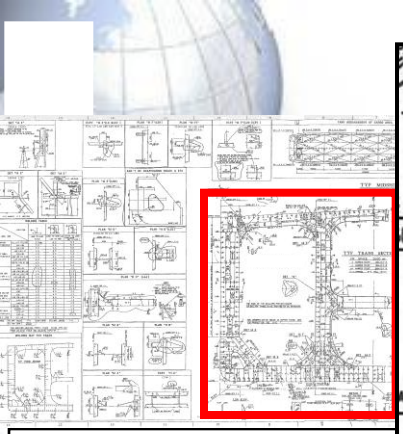


•300,000 DWT VLCC

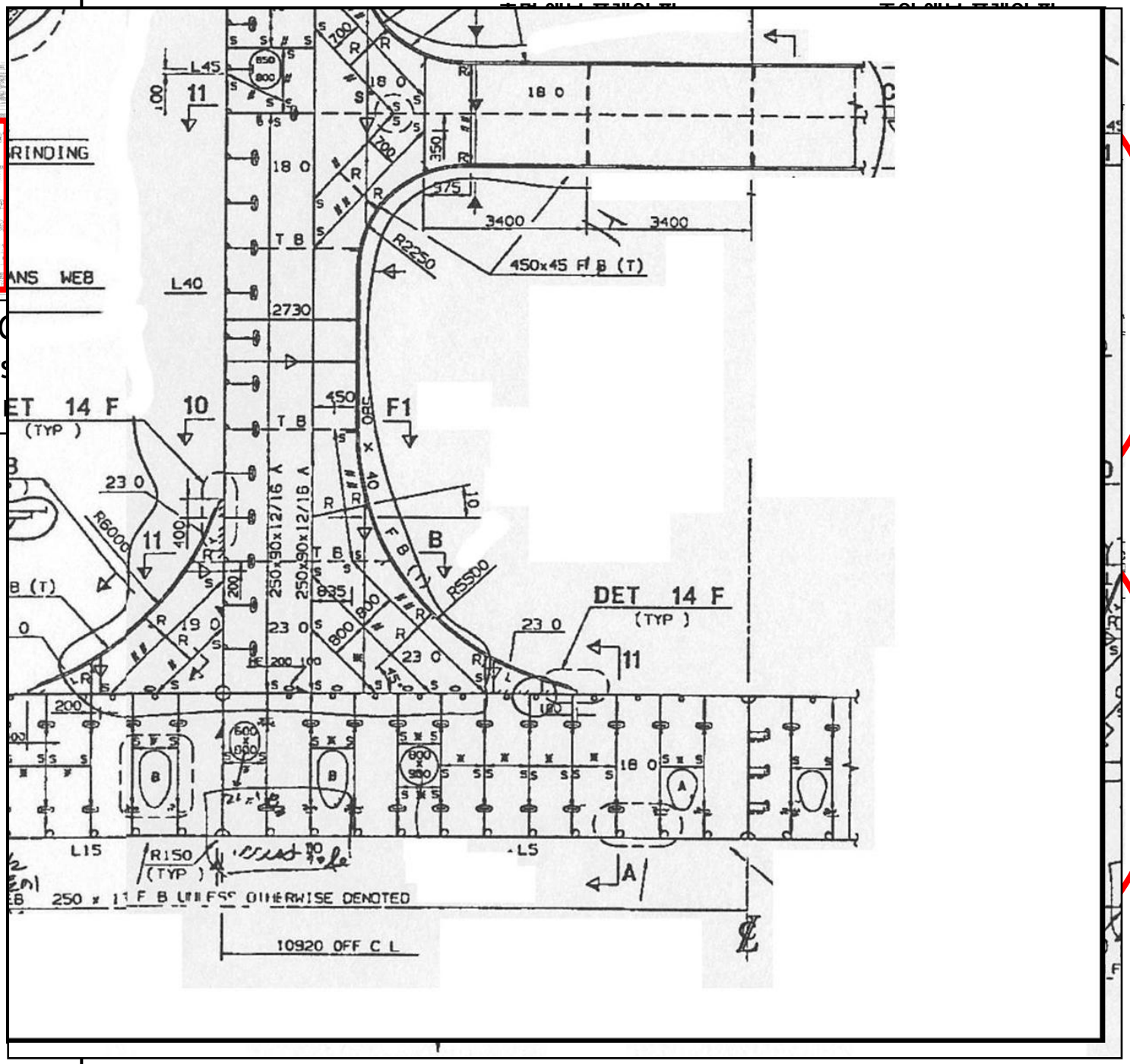
•Midship Section Drawing



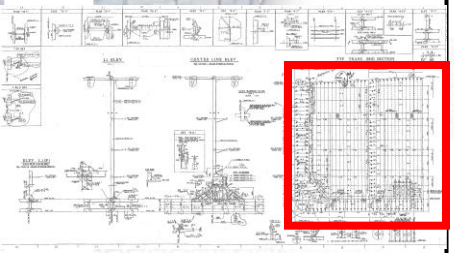
외판(sh
시스

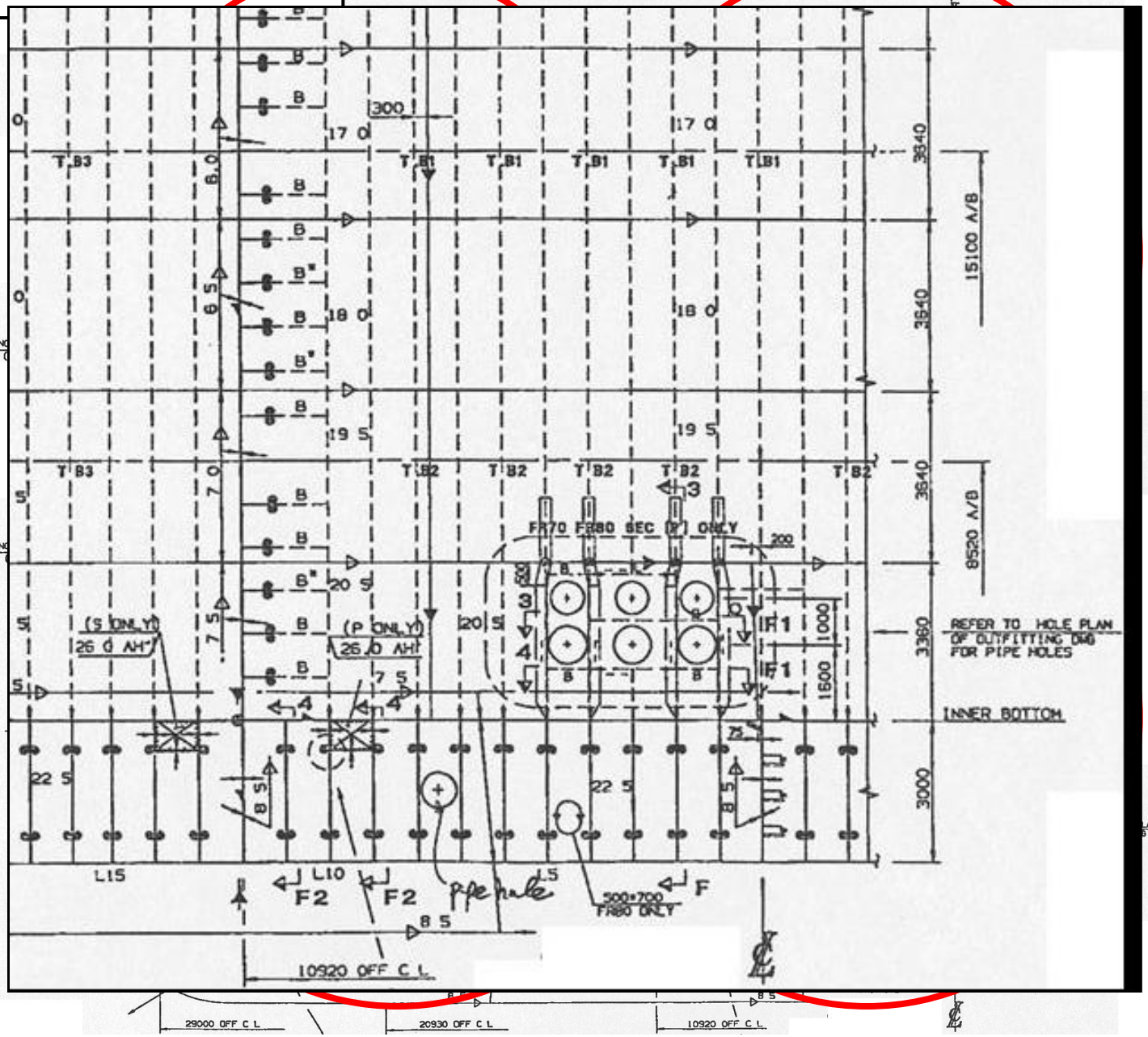


- 300,000 DWT VL
- Typical Transvers
Web Frame Drawi



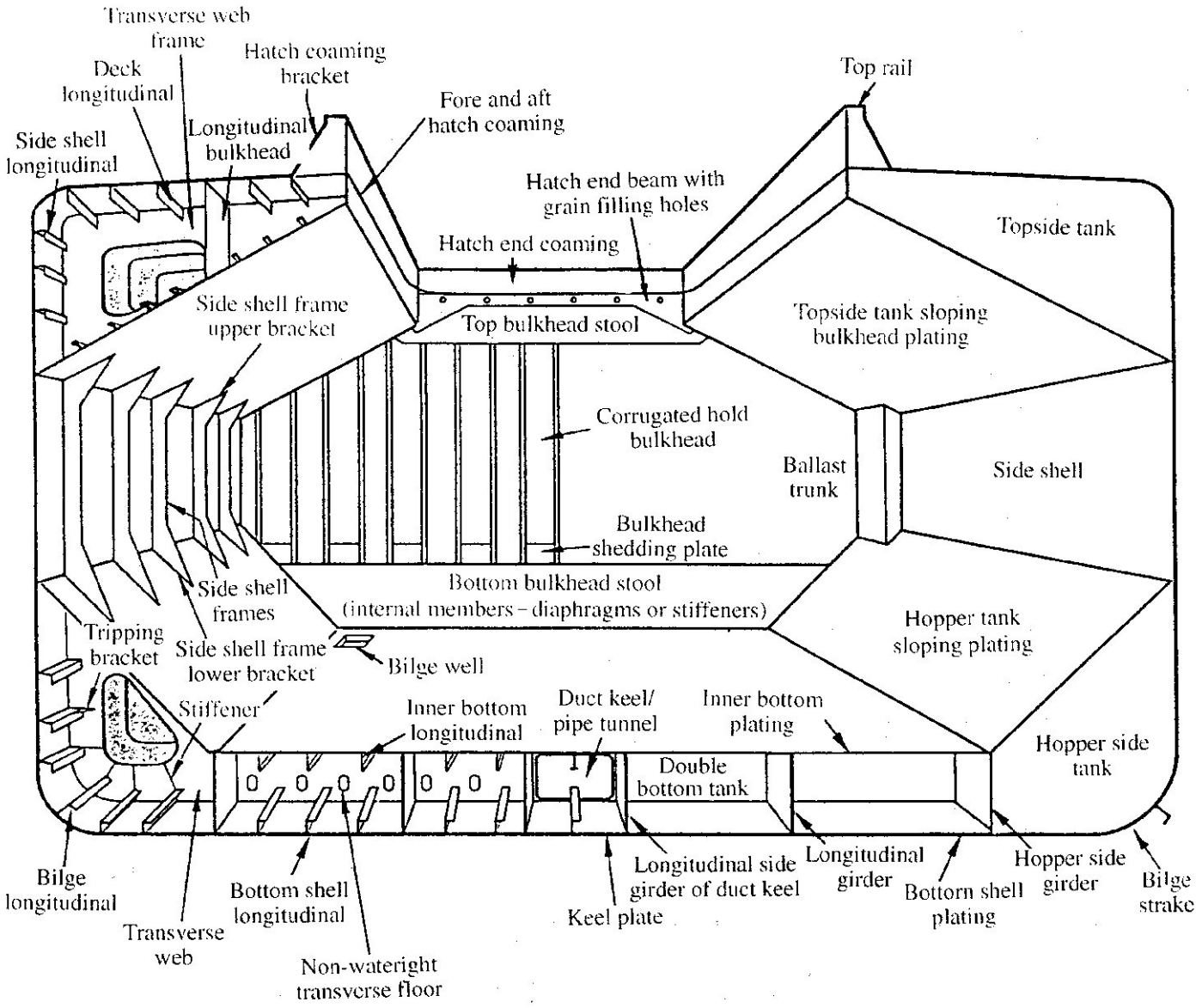
- 300K VLCC-Typical Transverse Bulkhead





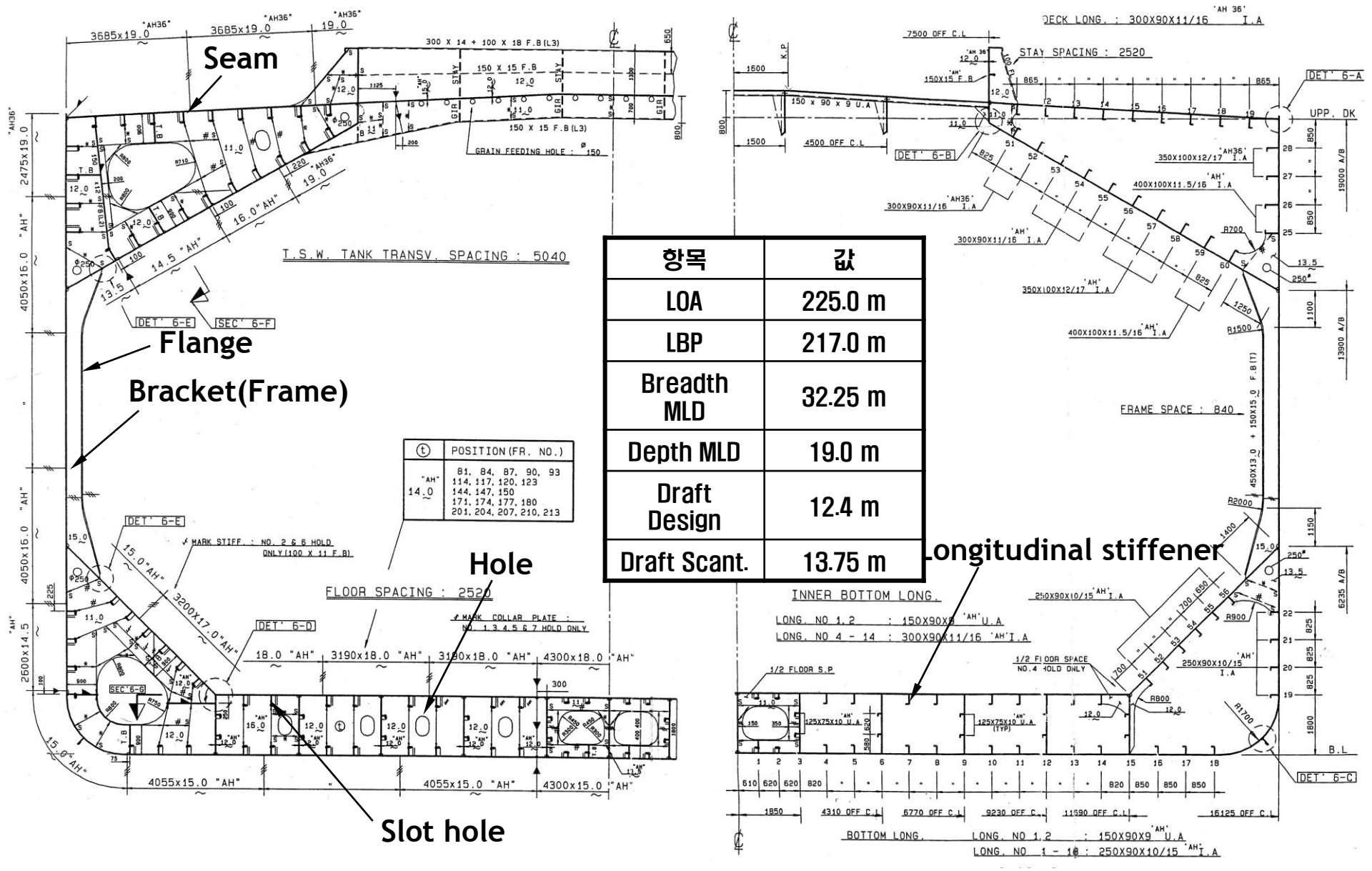
DWT 73,000 ton Bulk Carrier 구조설계 예

살물선의 중앙 단면 개념도



DWT 73,000 ton Bulk Carrier
중앙 횡단면도

구조설계	
	종 방향 구조 부재
	횡 방향 구조 부재
	상세 구조 부재
	선체 구조 모델 완성



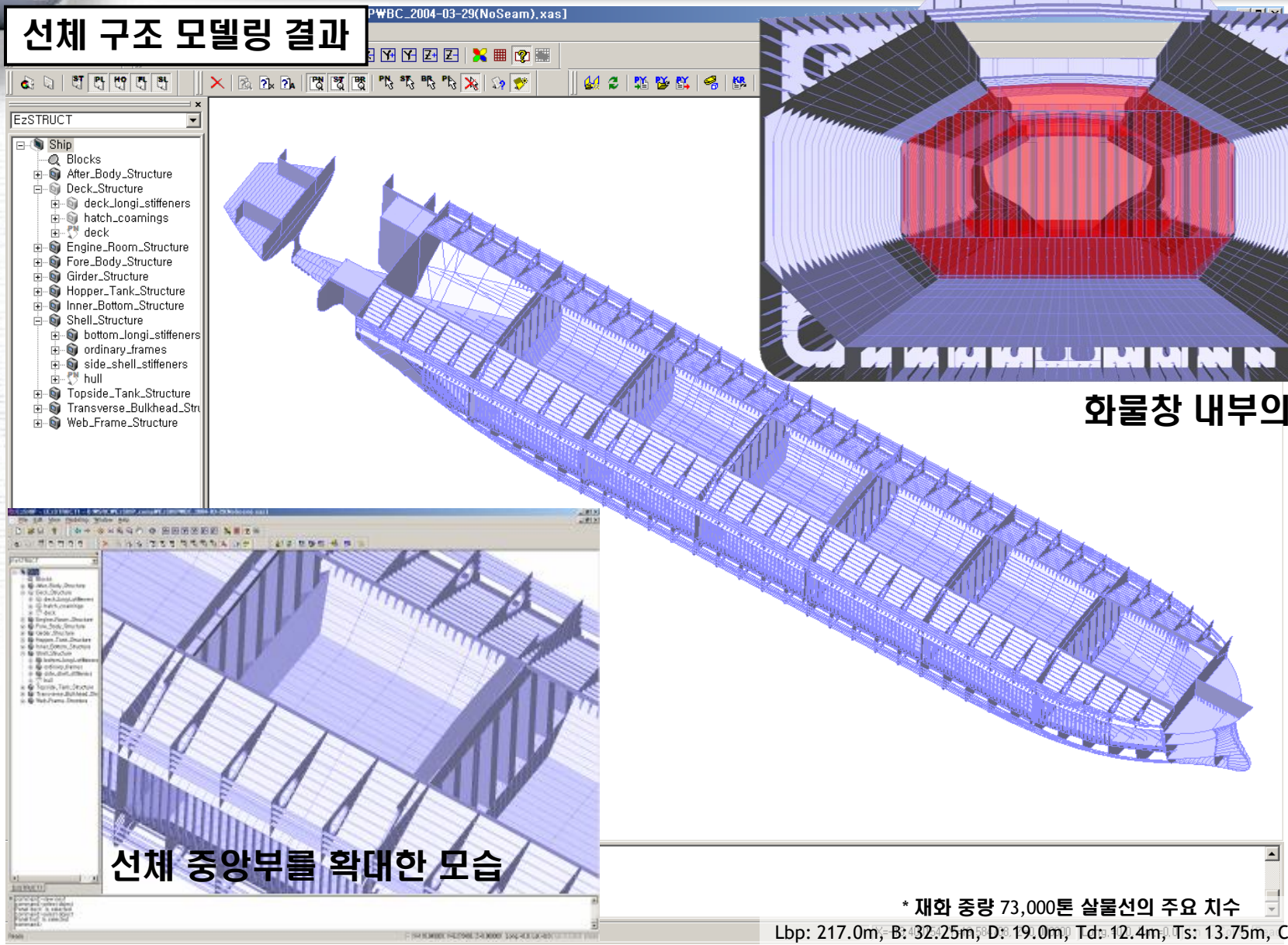
항목	값
LOA	225.0 m
LBP	217.0 m
Breadth MLD	32.25 m
Depth MLD	19.0 m
Draft Design	12.4 m
Draft Scant.	13.75 m

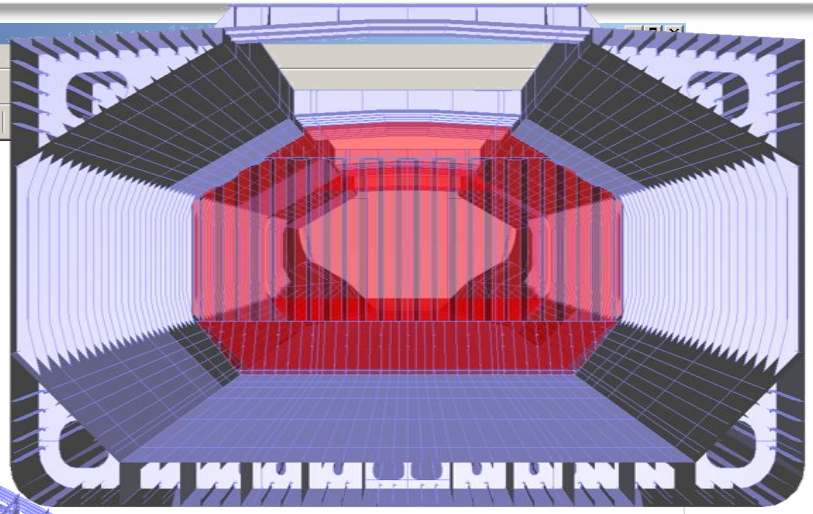
DWT 73,000 ton Bulk Carrier

선체 구조 모델

구조설계	
	종 방향 구조 부재
	횡 방향 구조 부재
	상세 구조 부재
	선체 구조 모델 완성

선체 구조 모델링 결과





화물창 내부의 모습

선체 중앙부를 확대한 모습

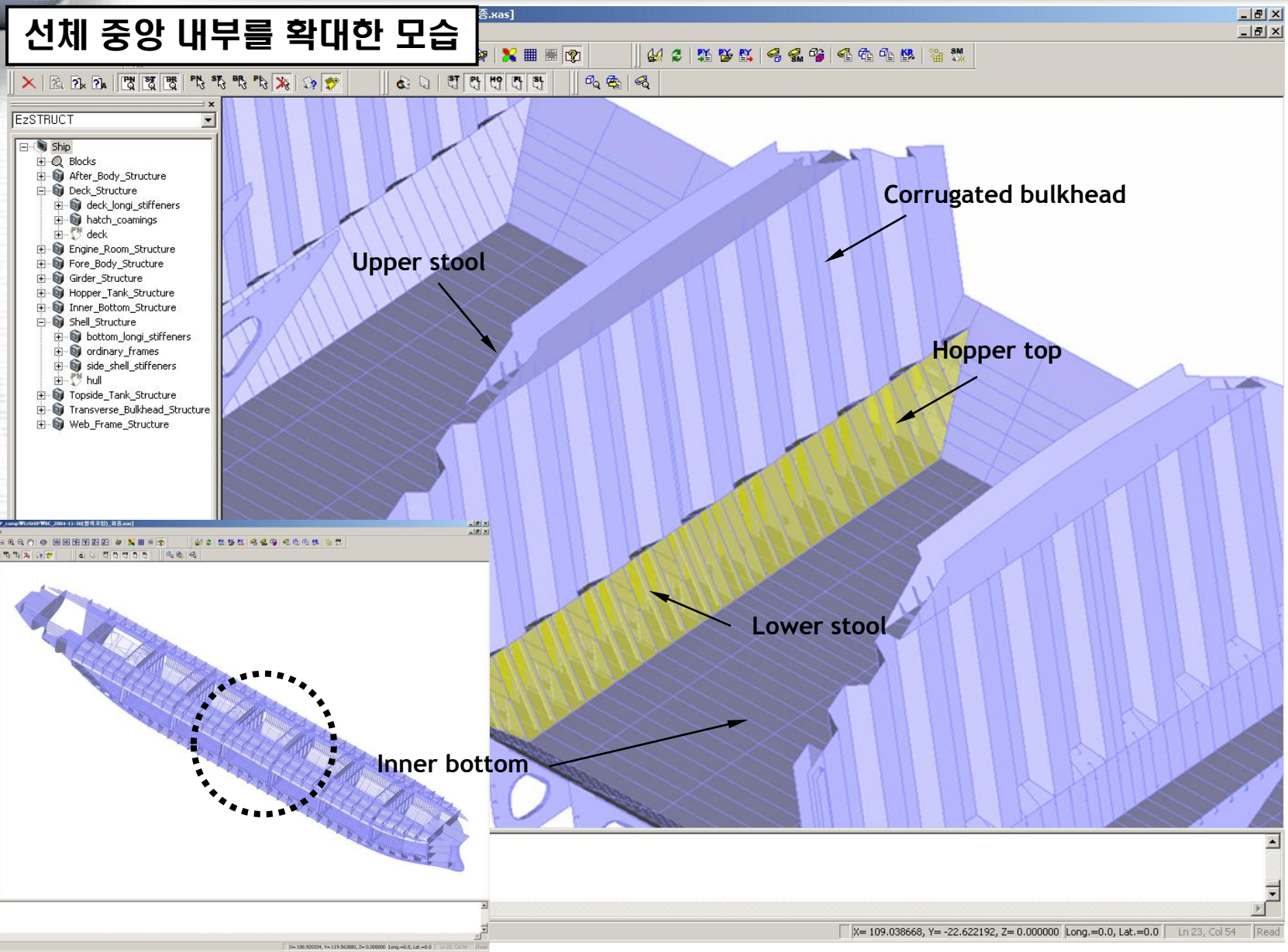
* 재화 중량 73,000톤 살물선의 주요 치수

Lbp: 217.0m, B: 32.25m, D: 19.0m, Td: 12.4m, Ts: 13.75m, Cb: 0.8394

DWT 73,000 ton Bulk Carrier
선체 구조 모델

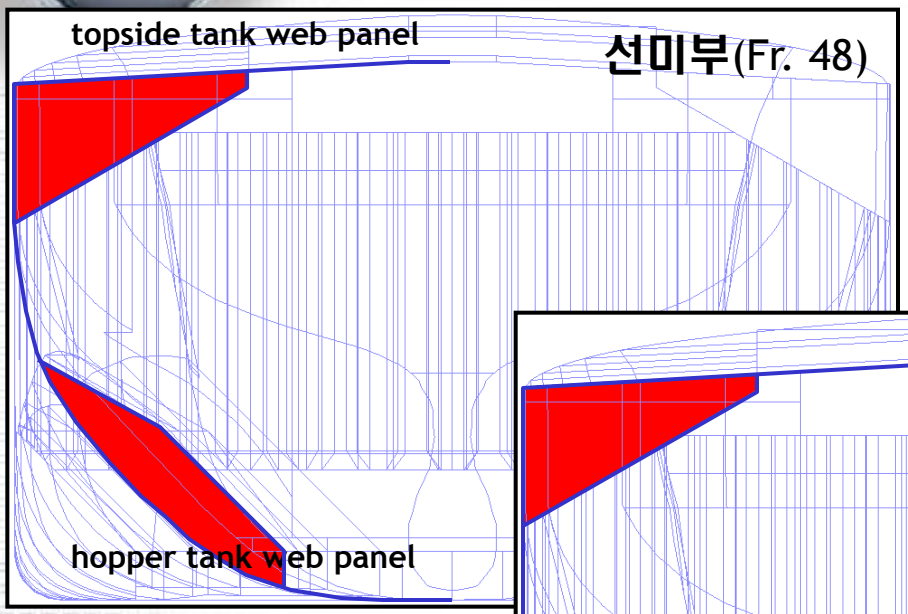
구조설계	
	종 방향 구조 부재
	횡 방향 구조 부재
	상세 구조 부재
	선체 구조 모델 완성

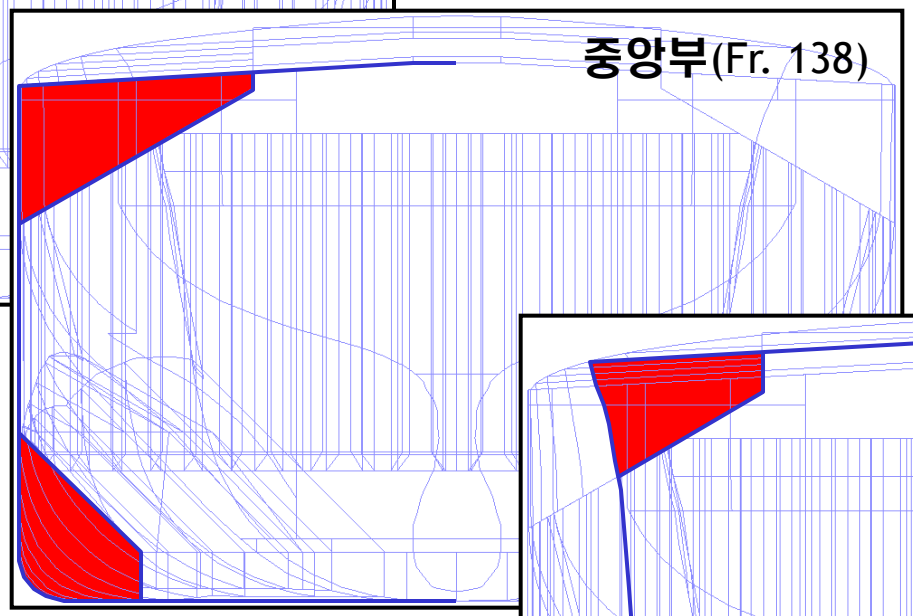
선체 중앙 내부를 확대한 모습

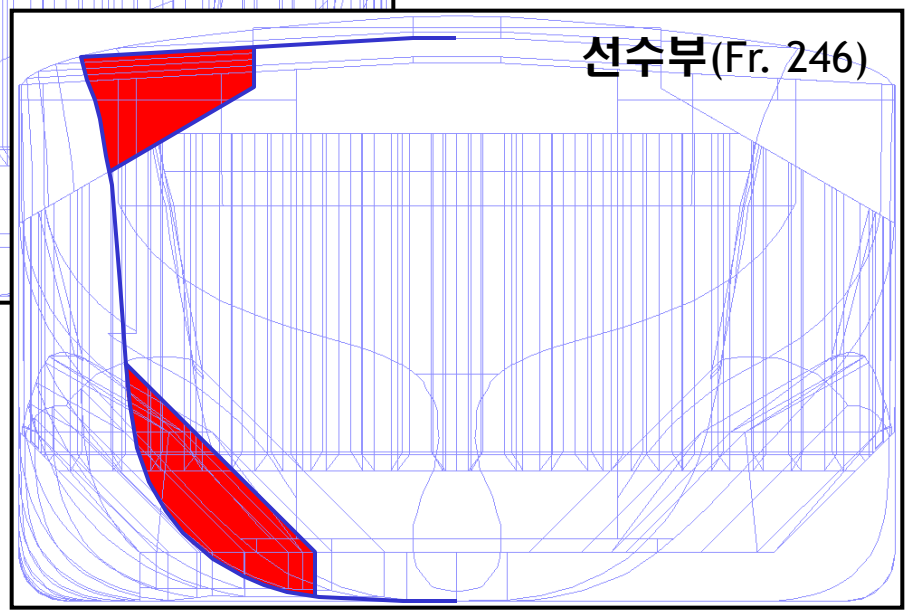


DWT 73,000 ton Bulk Carrier

횡 방향 구조 부재



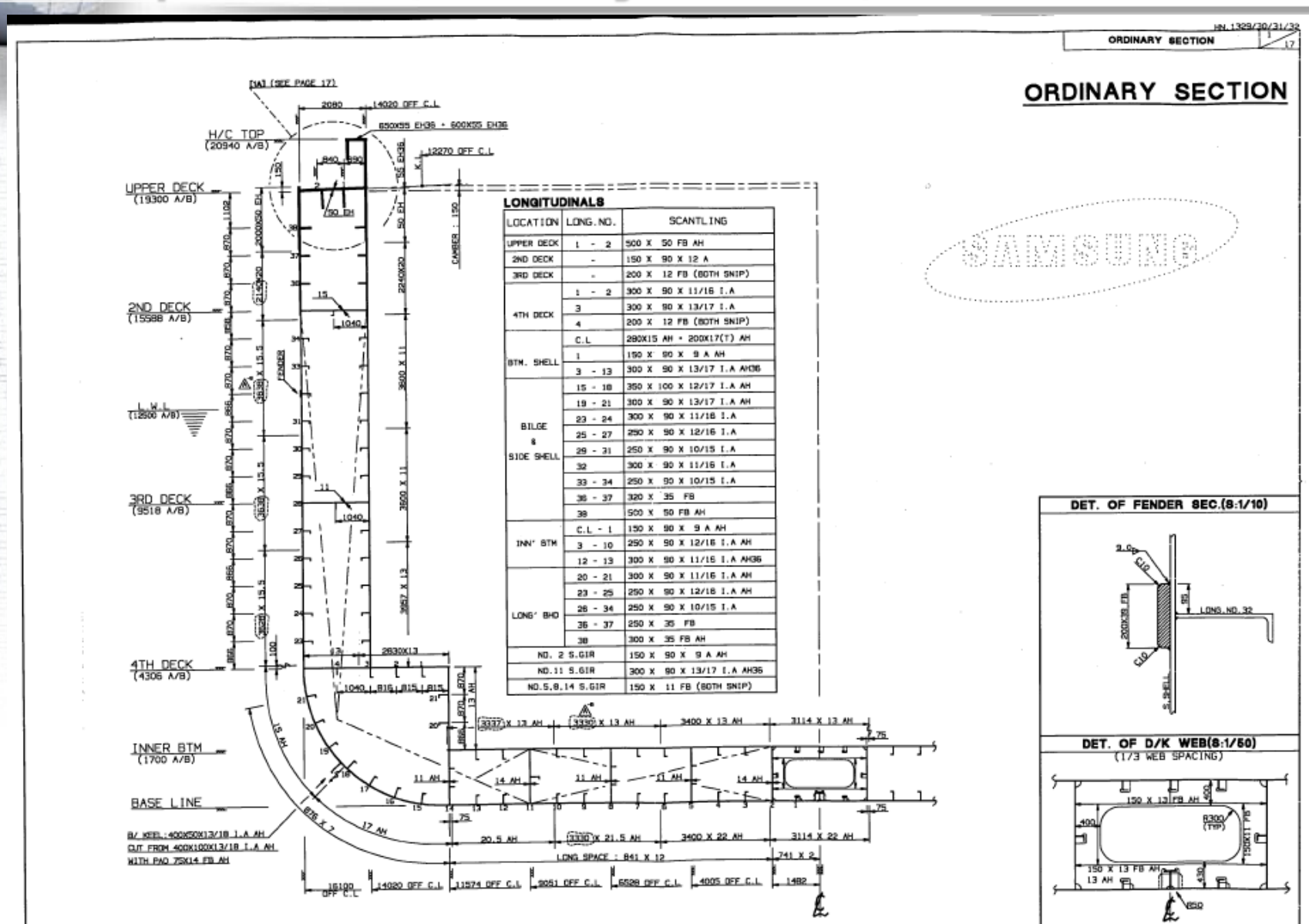




3,700TEU 컨테이너선 구조설계 예

NAOE/SNU
@SDAL
Advanced Ship Design Automation Lab.
http://asdal.snu.ac.kr

3,700 TEU Container ship
– Midship Section(Ordinary Section)



3,700 TEU Container ship – Principal Dimensions / Materials / Classfication

PRINCIPAL DIMENSIONS

LENGTH O.A.	257.24 m (Approx.)
LENGTH B.P	245.24 m
LENGTH SCANTLING	242.733m
BREADTH MOULDED	32.20 m
DEPTH MOULDED	19.30 m
DRAFT SCANTLING	12.50 m
DRAFT DESIGN	10.10 m

MATERIALS

1. NO MARKED STEEL : MILD STEEL GRADE "A" OF MIN YIELD STRESS 235 N/mm2.
2. MARKED "AH","DH","EH" : HIGHER TENSILE STEEL GRADE "A","D","E" OF MIN YIELD STRESS 315 N/mm2.
3. MARKED STEEL "AH36","DH36","EH36" : HIGHER TENSILE STEEL GRADE "A","D","E" OF MIN YIELD STRESS 355 N/mm2.
4. HIGHER TENSILE STEEL SHELL BE OF NORMALIZED STEEL OR EQUIVALENT TMCP STEEL CERTIFICATED BY CLASS.

CLASSIFICATION

Germanischer Lloyd

100 A5 E Container Ship IW, *SOLAS I-2, REG.54*, +MCE, AUT

3,700 TEU Container ship – Notes of Midship Section

NOTES

1. DESIGN STILL WATER BENDING MOMENT IN SEAGOING CONDITION.
   HOGGING CONDITION : 238,000 TON-M (2,335,000 kN-M)
2. MIN. LEG LENGTH OF FILLET WELDING 4.5 EXCEPT AS SHOWN.
3. BOTH SIDES ARE SYMMETRICAL UNLESS OTHERWISE SHOWN.
4. SECTIONS ARE SHOWN IN LOOKING FORWARD AND ELEVATIONS ARE SHOWN TO PORT.
5. THE DETAILS NOT SHOWN IN THIS DRAWING ARE REFERRED TO "STRUCTURAL DETAILS FOR HULL" (DWG. NO. SF091.20)
6. MARK FOR HOLE SIZE

MARK	SIZE	MARK	SIZE
H1	ø450	H4	400x800
H2	ø500	H5	500x800
H3	400x600	H6	600x800

7. MARK FOR STIFF. SIZE

MARK	SIZE	MIN.THK.
✓	100 FB	10
✓	150 FB	10
✓	200 FB	12

8. REFERENCE DRAWING : 1) GENERAL ARRANGEMENT (DWG.NO.:PB101.10)
   2) TRIM & STABILITY BOOKLET (DWG.NO.:PB303.10)
   3) CONSTRUCTION PROFILE & DECK PLANS (DWG.NO.:SB003.10)
   4) SHELL EXPANSION (DWG.NO.:SB007.10)
9. DESIGN LOADS : 1) IN HOLD : 20 FEET CONTAINER -- 25 MT/UNIT
   40 FEET CONTAINER -- 30 MT/UNIT
   2) ON DECK 20 FEET CONTAINER -- 80 MT/STACK
   40 FEET CONTAINER -- 100 MT/STACK

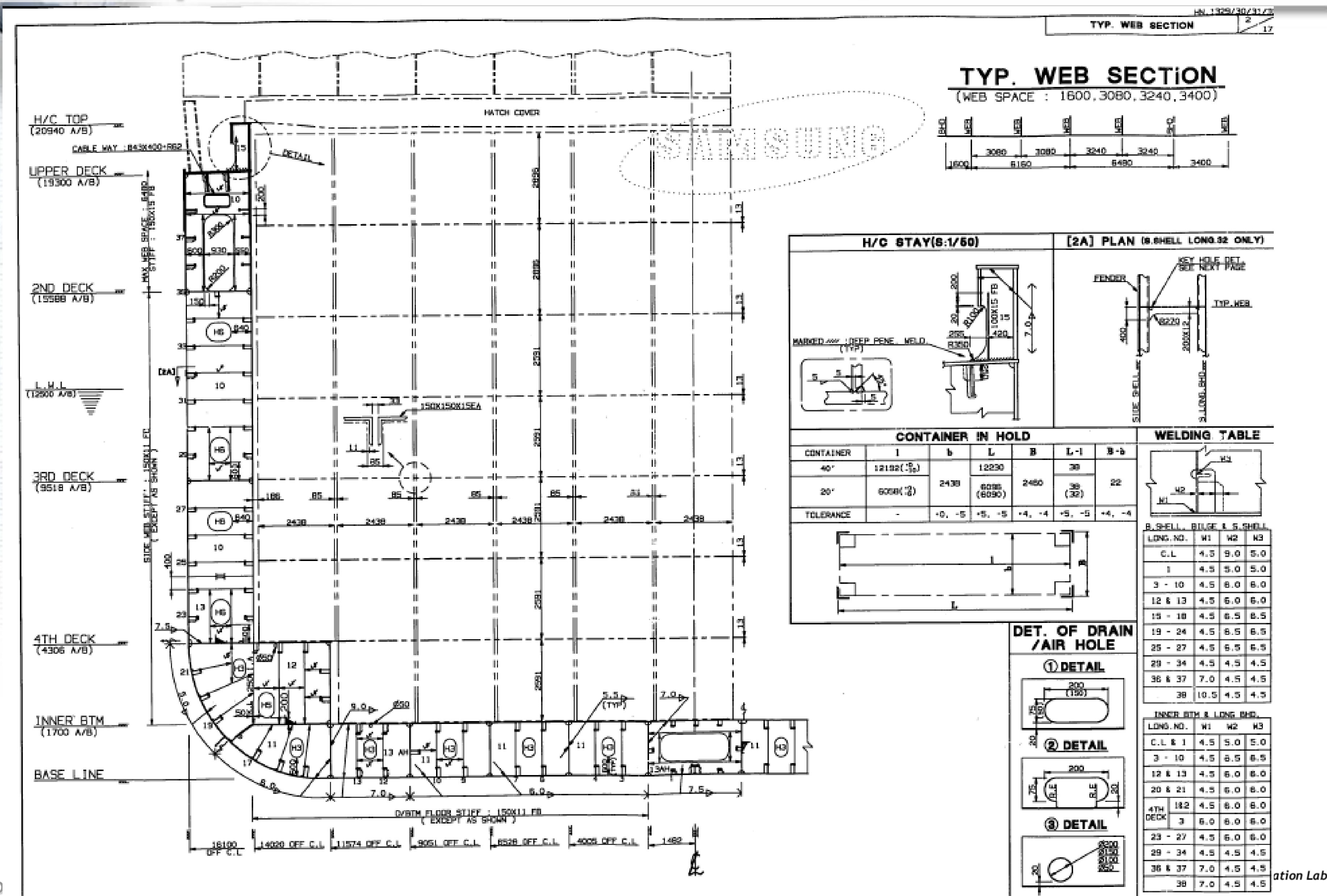
3,700 TEU Container ship
– Plan History of Midship Section

HNO.1329/30/31/32

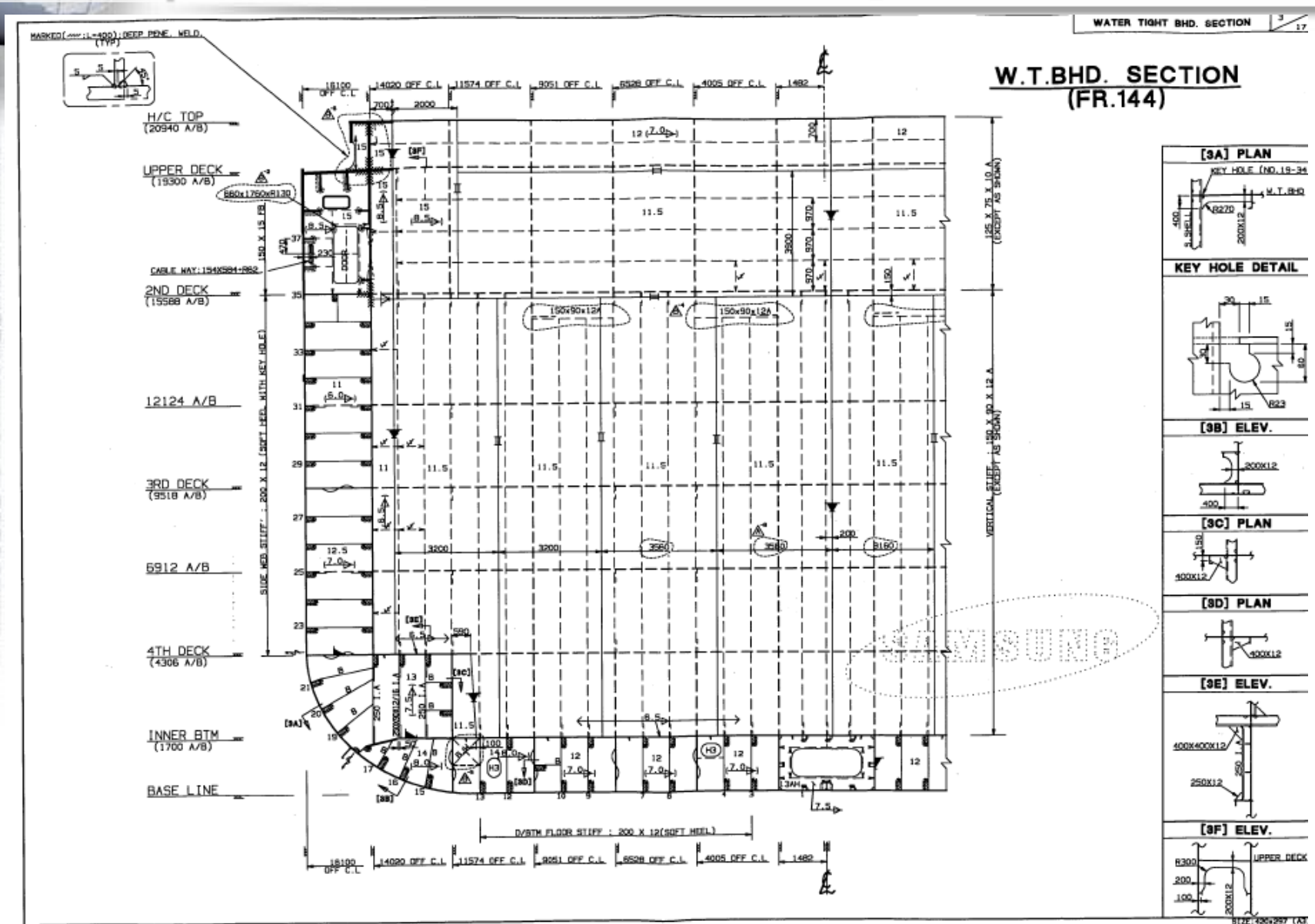
PLAN HISTORY

NO.	DATE	DESCRIPTION		ALT.MARK	CONFIRMED BY
1	1999-11-26	SUBMITTED TO OWNER & CLASS FOR APPROVAL (LTR.NO.:SHI/CGS/1329-1038, (LTR.NO.: SHI/GL/1329-1008)			
2	1999-12-21	APPROVED BY OWNER WITHOUT COMMENTNT. (LTR.NO.: CGS/SHI/1329-3044)			
3	2000-01-10	APPROVAL BY CLASS WITH COMMENT.			
4	2000-01-15	REVISED AS FOLLOWS	REASON	A	H.S.BAN B.S.KANG H.J.AHN
		1. INCREASED THE PLATE SIZE & PLATE THICKNESS.	CLASS		
		2. MODIFIED ADDED THE COLLOR PLATE TYPE.			
		3. MODIFIED VERTICAL WEB OF W.T. BHD.			
		4. REINFORCED THE POSITION OF PIPE HOLE.			
		5. CHANGED THE DEEP WELDING TO FULL PENE. WELDING.			
		6. CHANGED THE WELDING SIZE.			
		7. CHANGED THE DITANCE TO ACCESS HOLE.			
		8. MODIFIED PLATE BREADTH DUE TO STEEL PURCHASE	YARD		
		9. MODIFIED THE ACCESS HOLE.			
5	2000-01-15	SUBMITTED TO OWNER & CLASS FOR APPROVAL (LTR.NO.:SHI/CGS/1329-1040, (LTR.NO.: SHI/GL/1329-1033)			
6	2000-01-26	APPROVED BY OWNER WITHOUT COMMENTNT. (LTR.NO.: CGS/SHI/1329-3078)			
7	2000-04-20	REVISED AS FOLLOWS	REASON	B	H.J.AHN
		1. MODIFIED THE UNDER CRANE STRUCTURE	YARD		
		2. MODIFIED WATER TIGHT OPENING DIMENSION	YARD		
		3. MODIFIED THE W.T BHD VER.WEB			
		4. ADDED THE BUCKLING STIFFENER			
		5. MODIFIED THE BILGE WELL HEIGHT			
		6. MODIFIED THE STIFFENER ARRANGEMENT ON THE W.T & SUMP. BHD			
		7. MODIFIED THE HATCH COAMING OPENING			
		8. MODIFIED THE BENT OPENING ON THE UPPER DECK			
		9. MODIFIED THE BENT & INCLINED OPENING ON THE 2ND DECK			
		10. MODIFIED THE BENT & INCLINED OPENING ON 1212 A/B PLAN			
		11. MODIFIED THE BENT & INCLINED OPENING ON THE 3RD DECK			
		12. MODIFIED THE BENT & INCLINED OPENING ON 6812 A/B PLAN			
		13. MODIFIED THE BENT & INCLINED OPENING ON THE 4TH DECK			

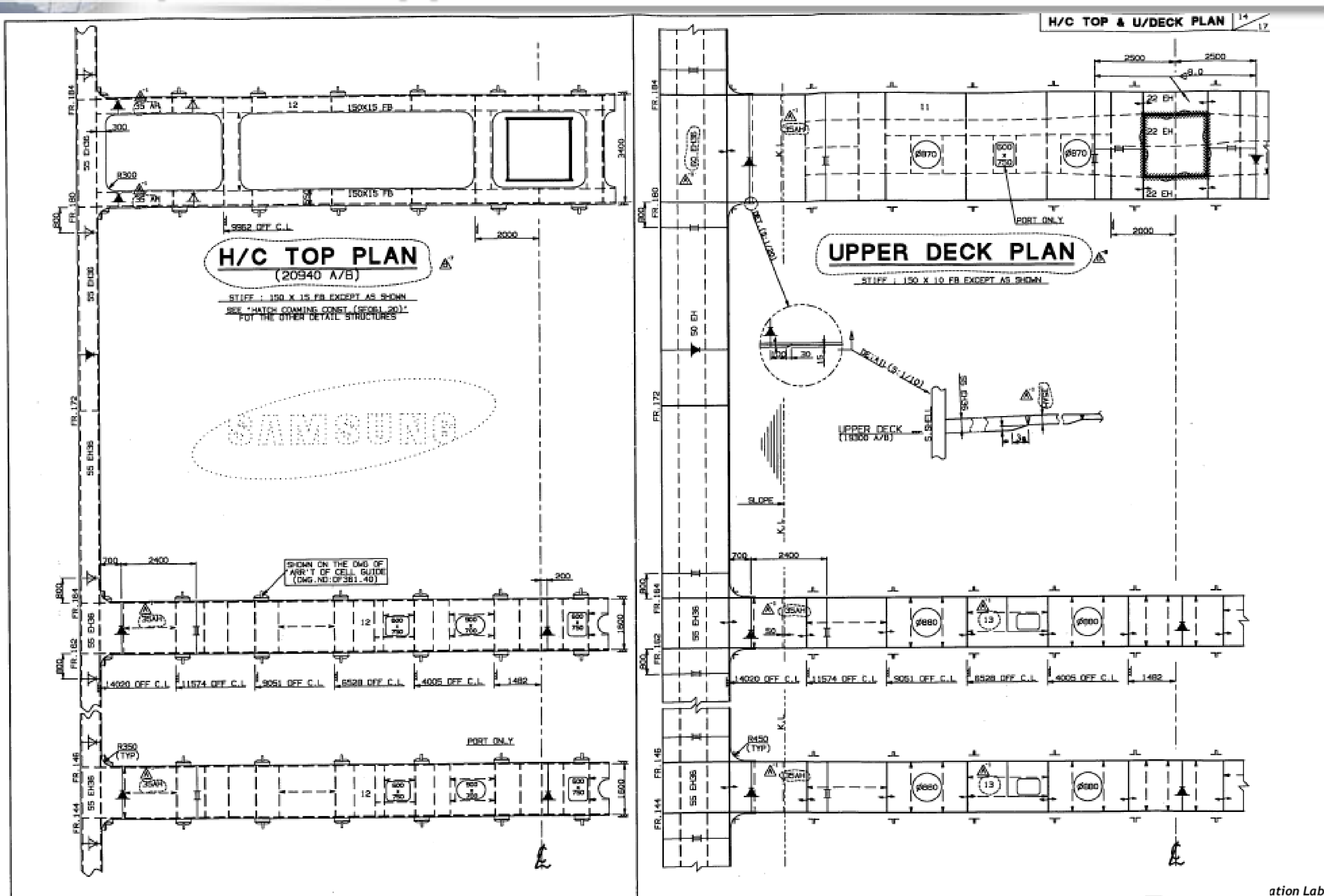
3,700 TEU Container ship
– Midship Section(TYP. Web Section)



3,700 TEU Container ship
– Midship Section(W.T.BHD. Section]



3,700 TEU Container ship
– H/C Top Plan / Upper Deck Plan



5,000TEU 컨테이너선 구조설계 예

NAOE/SNU
@SDAL
Advanced Ship Design Automation Lab.
http://asdal.snu.ac.kr

- 5,000TEU **컨테이너선의 중앙 횡단면도**
  - (Ordinary Frame Section)

LOA	**279.0 m**
LBP	**265.0 m**
Breadth MLD	**40.3 m**
Depth MLD	**24.1 m**
Draft Design	**12.0 m**
Draft Scant.	**14.0 m**

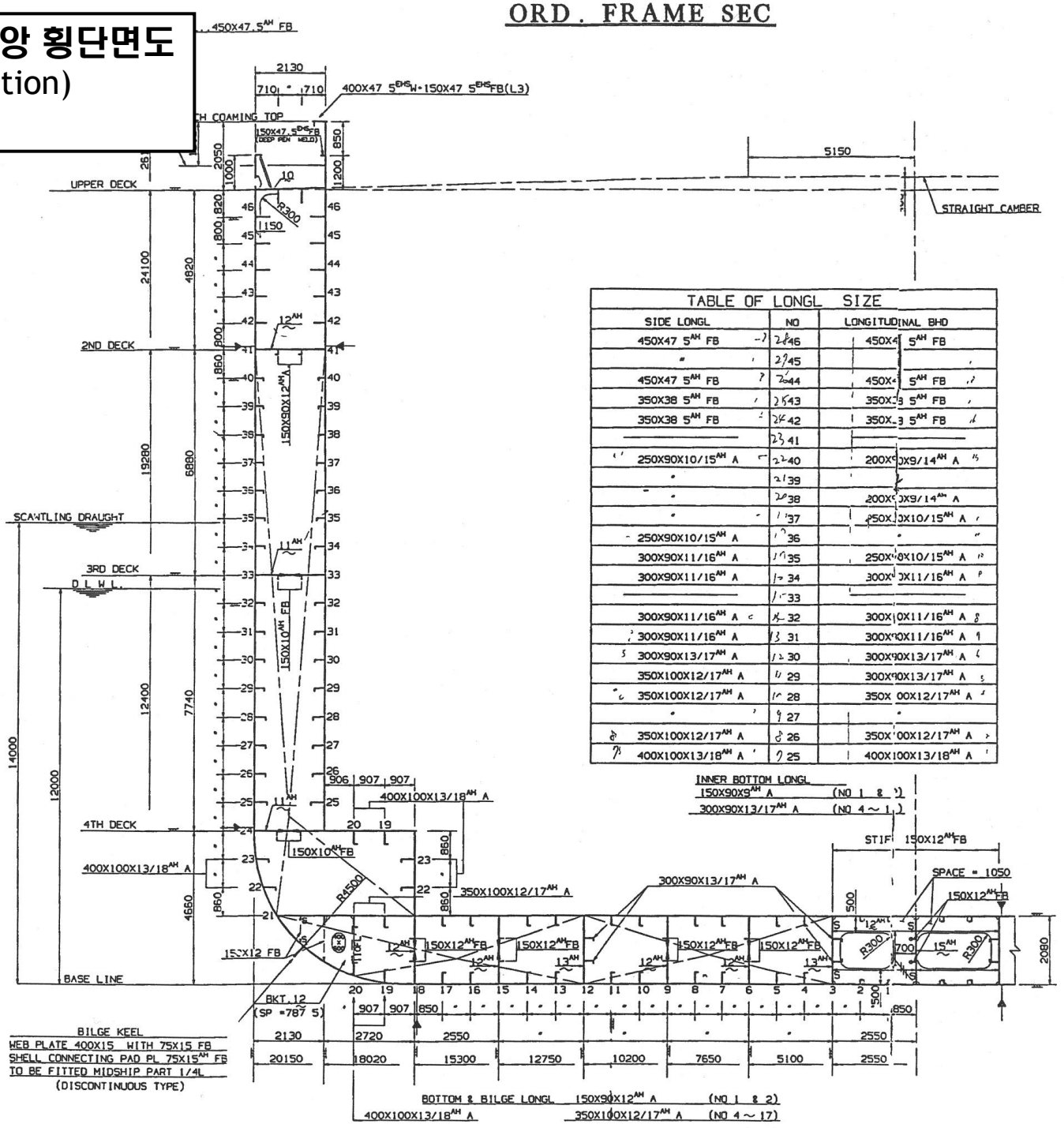
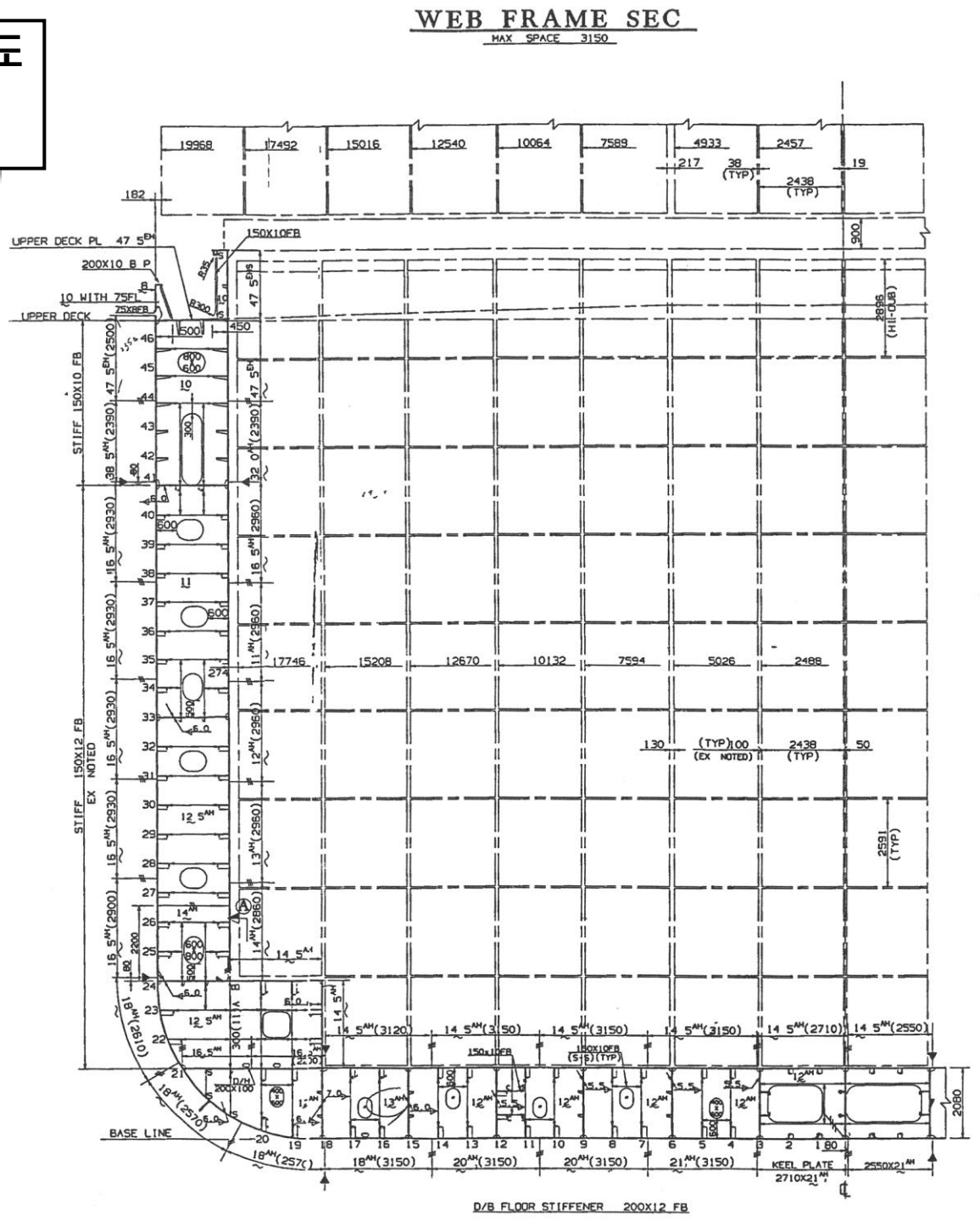


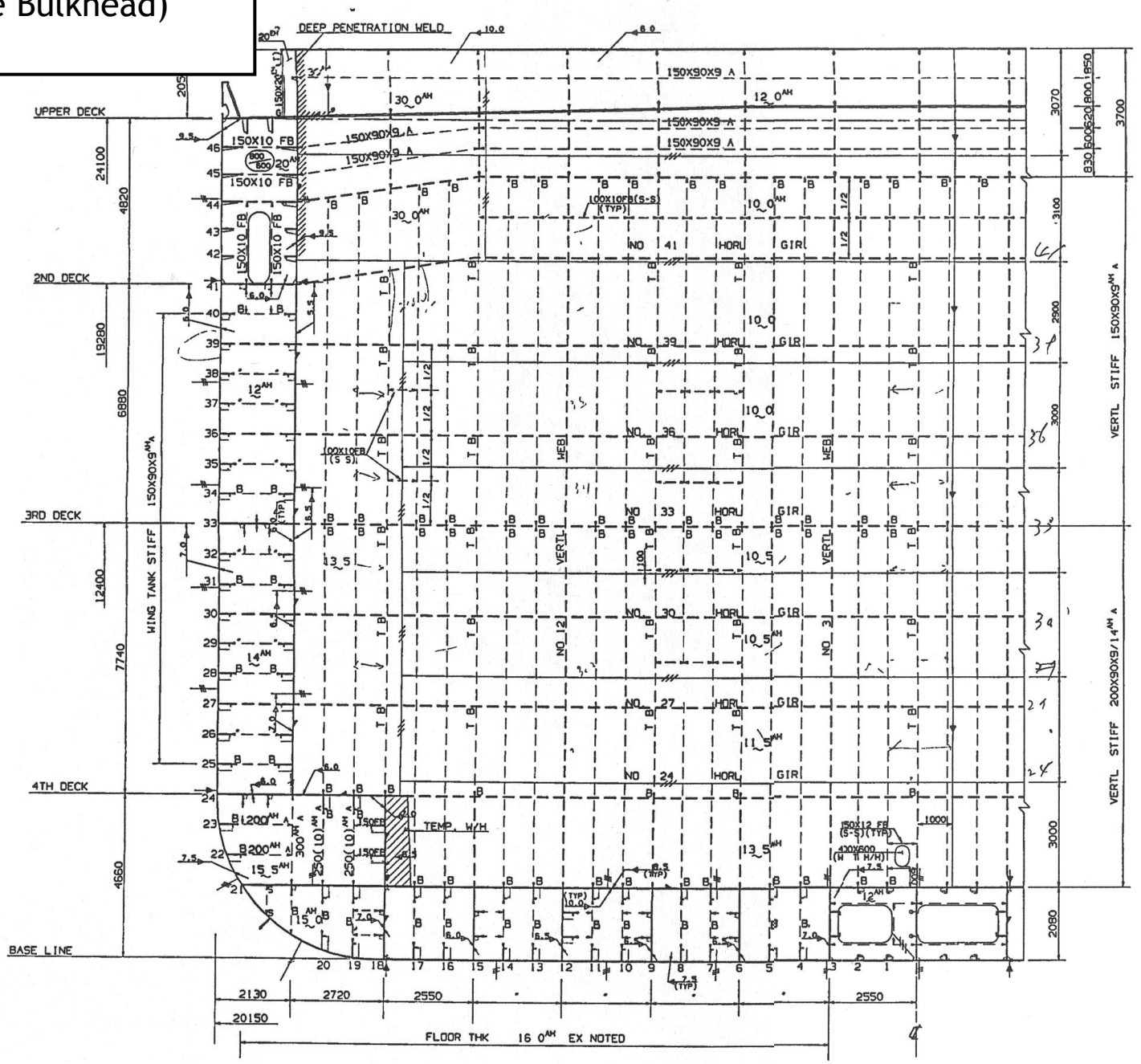
TABLE OF LONGL SIZE

SIDE LONGL	NO	LONGITUDINAL BHD
450X47 5AH FB	46	450X47 5AH FB
	45	
450X47 5AH FB	44	450X47 5AH FB
350X38 5AH FB	43	350X38 5AH FB
350X38 5AH FB	42	350X38 5AH FB
	41	
250X90X10/15AH A	40	200X90X9/14AH A
	39	
	38	200X90X9/14AH A
	37	250X90X10/15AH A
250X90X10/15AH A	36	
300X90X11/16AH A	35	250X90X10/15AH A
300X90X11/16AH A	34	300X90X11/16AH A
	33	
300X90X11/16AH A	32	300X90X11/16AH A
300X90X11/16AH A	31	300X90X11/16AH A
300X90X13/17AH A	30	300X90X13/17AH A
350X100X12/17AH A	29	300X90X13/17AH A
350X100X12/17AH A	28	350X100X12/17AH A
	27	
350X100X12/17AH A	26	350X100X12/17AH A
400X100X13/18AH A	25	400X100X13/18AH A

- 5,000TEU **컨테이너선의 중앙 횡단면도**
  - (Web Frame Section)

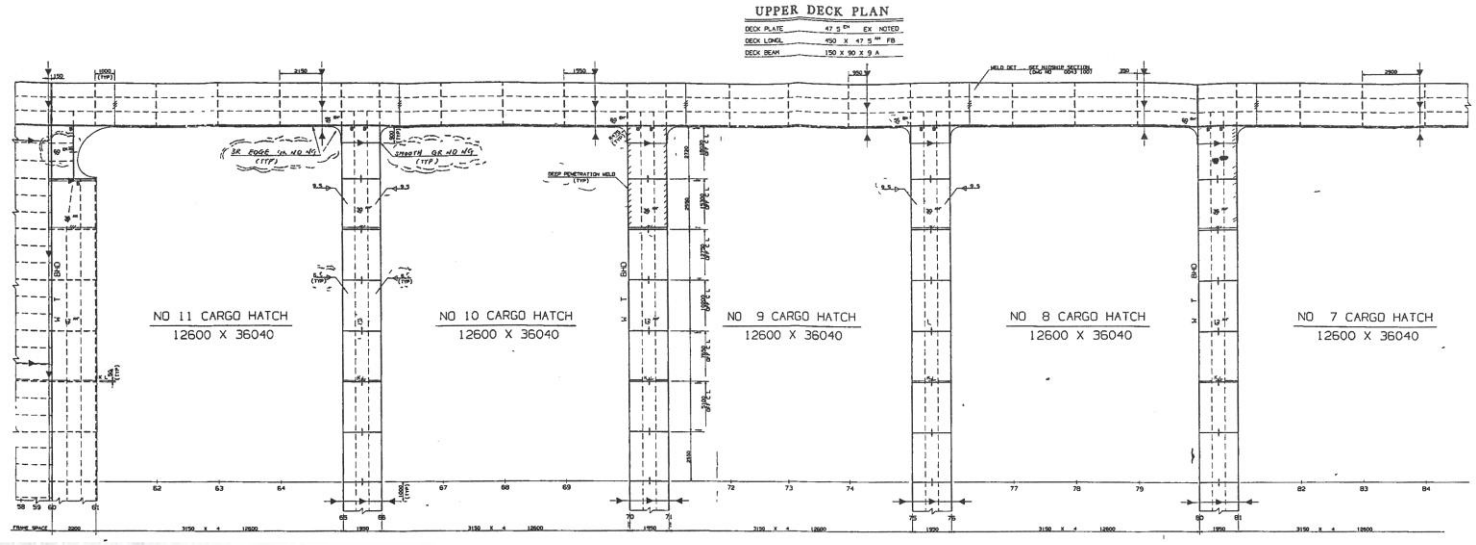


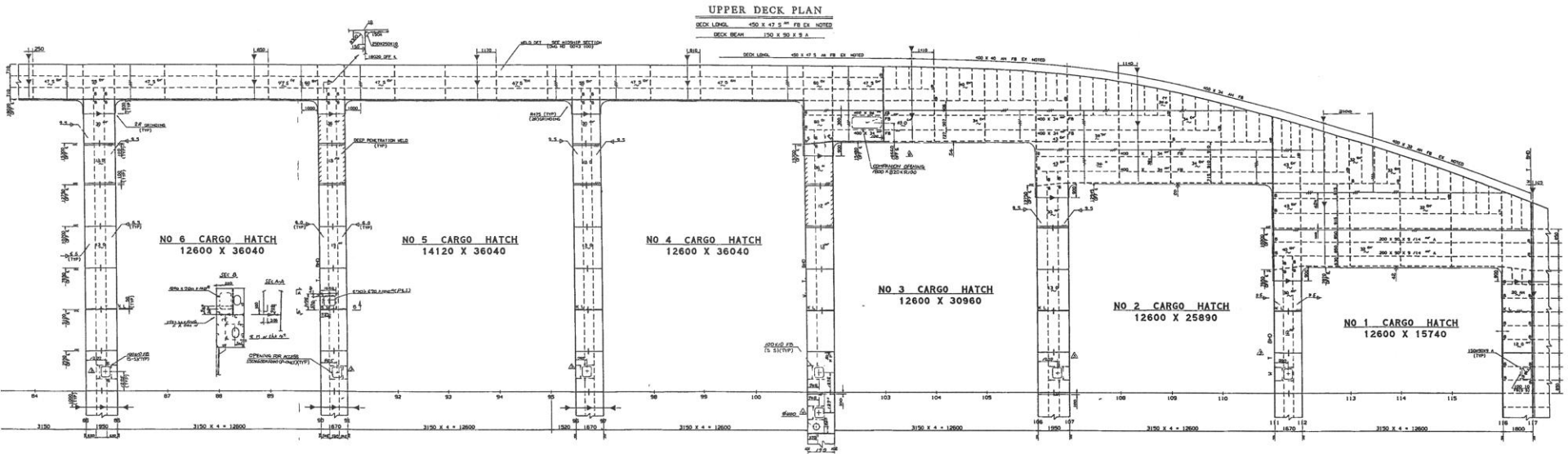
- 5,000TEU **컨테이너선의 중앙 횡단면도**
  - (Typical Transverse Bulkhead)



•5,000TEU **컨테이너선의** Construction Profile(Upper Deck Plan, **평면도**)

•선체 중앙부





•5,000TEU 컨테이너선의 Shell Expansion