

노형별 원자로용기 지지구조물 설계 검토

제18회 2021 KEPIC-Week
2021년 10월 26일(화) ~ 2021년도 10월 29일(금)
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한국전력기술(주) 원자로설계개발단

박 홍 선



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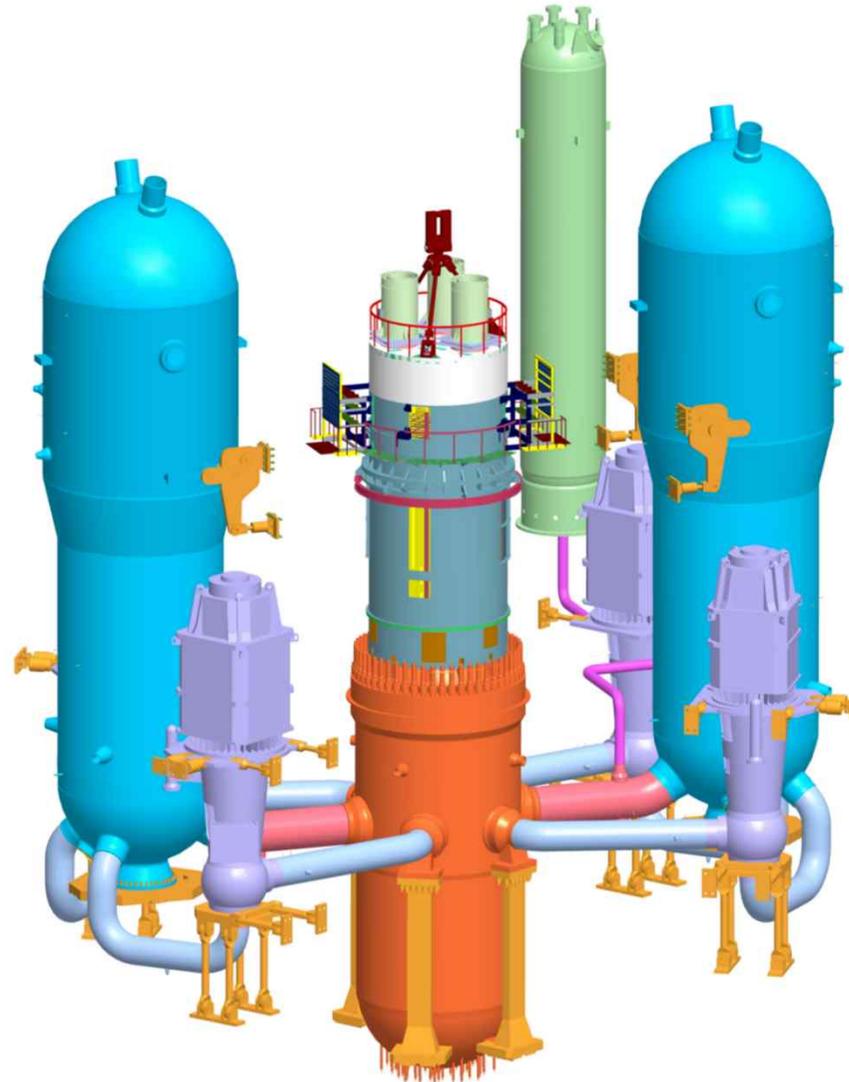
개요

- 원자로용기
 - 원자력발전소 핵중기 공급계통의 중심에 배치
 - 핵연료집합체를 지지하고 높은 설계 압력과 온도에서 운전
 - 핵분열에 의한 방사성물질의 안전하게 유지
 - 전력 생산에 필요한 열을 제한된 통로를 이용하여 효과적이고 지속적으로 공급
- 원자로용기 지지대
 - 원자로용기에 설치되고, 원자로공동의 콘크리트 구조물 위에 고정
 - 운전 중 발생할 수 있는 모든 하중을 지지
 - 원자로용기의 움직임을 제한하는 역할을 수행하는 안전성 구조물
 - 핵중기 공급계통의 설계방식에 따라 다름
- 노형별 원자로용기 지지대의 형태에 따른 특징 비교 · 검토



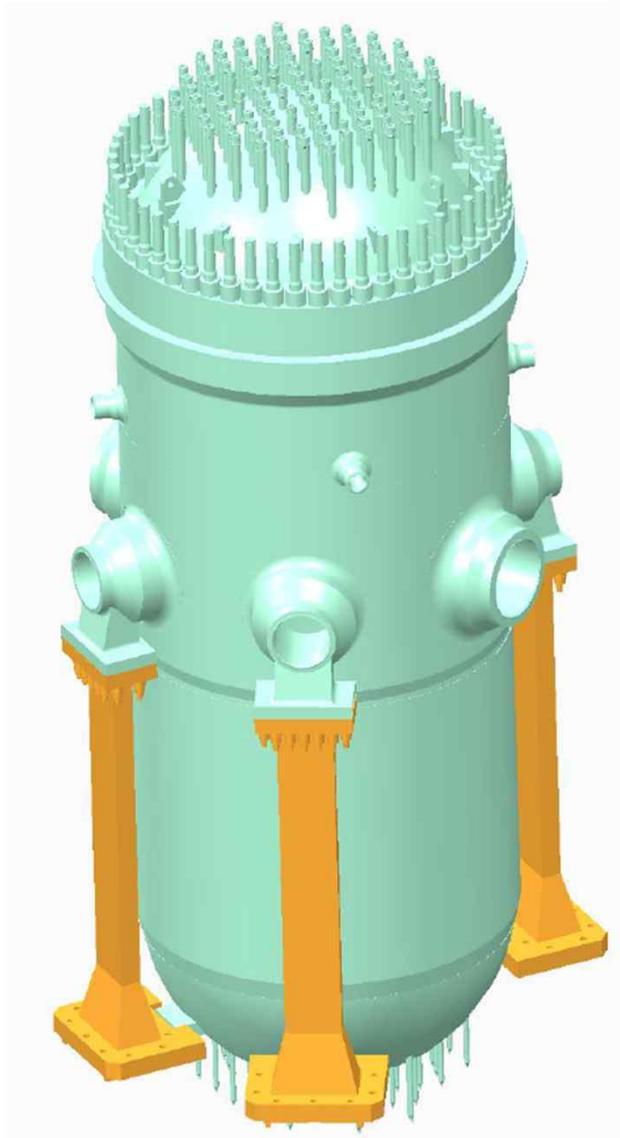
• 지지물 형식(MNF1200) – 1등급 지지물

	판형 및 동체형 지지물	선형 지지물
형태	스커트 또는 새들 2축용력	스트라트, 보압 기둥, 트러스 수직용력
설계절차 및 규정	MNF-3142 MNF-3200	MNF-3143 MNF-3300
해석방법	탄성해석 (MNF-3220, 해석)	탄성해석 (MNF-3320, 선형탄성)
용력이론	최대전단용력이론 Sm (표 MNF-3221.2)	최대용력이론 Sy (표 MNF-3312.1)
피로해석	요건 없음	고사이클 피로설계



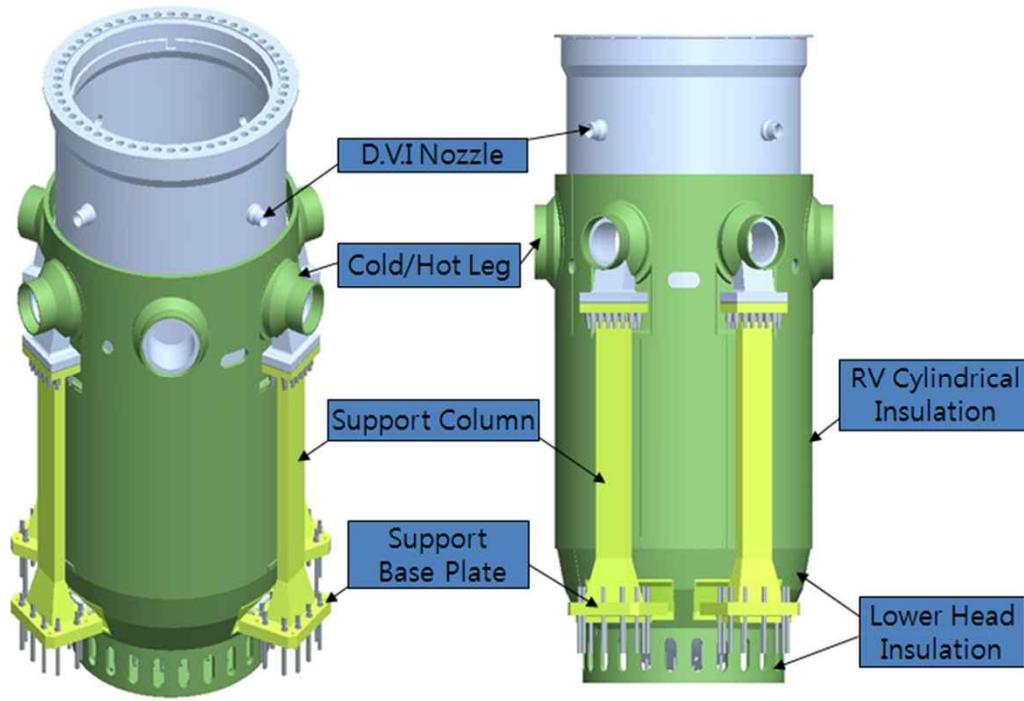
Reactor Coolant System Layout

APR1400 원전 지지대

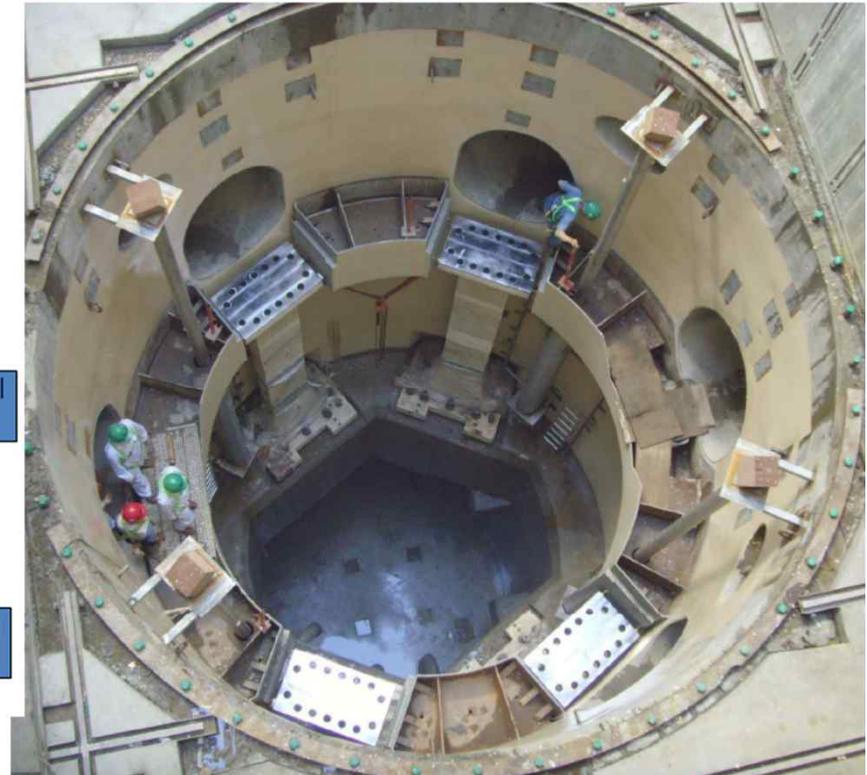


RV Support

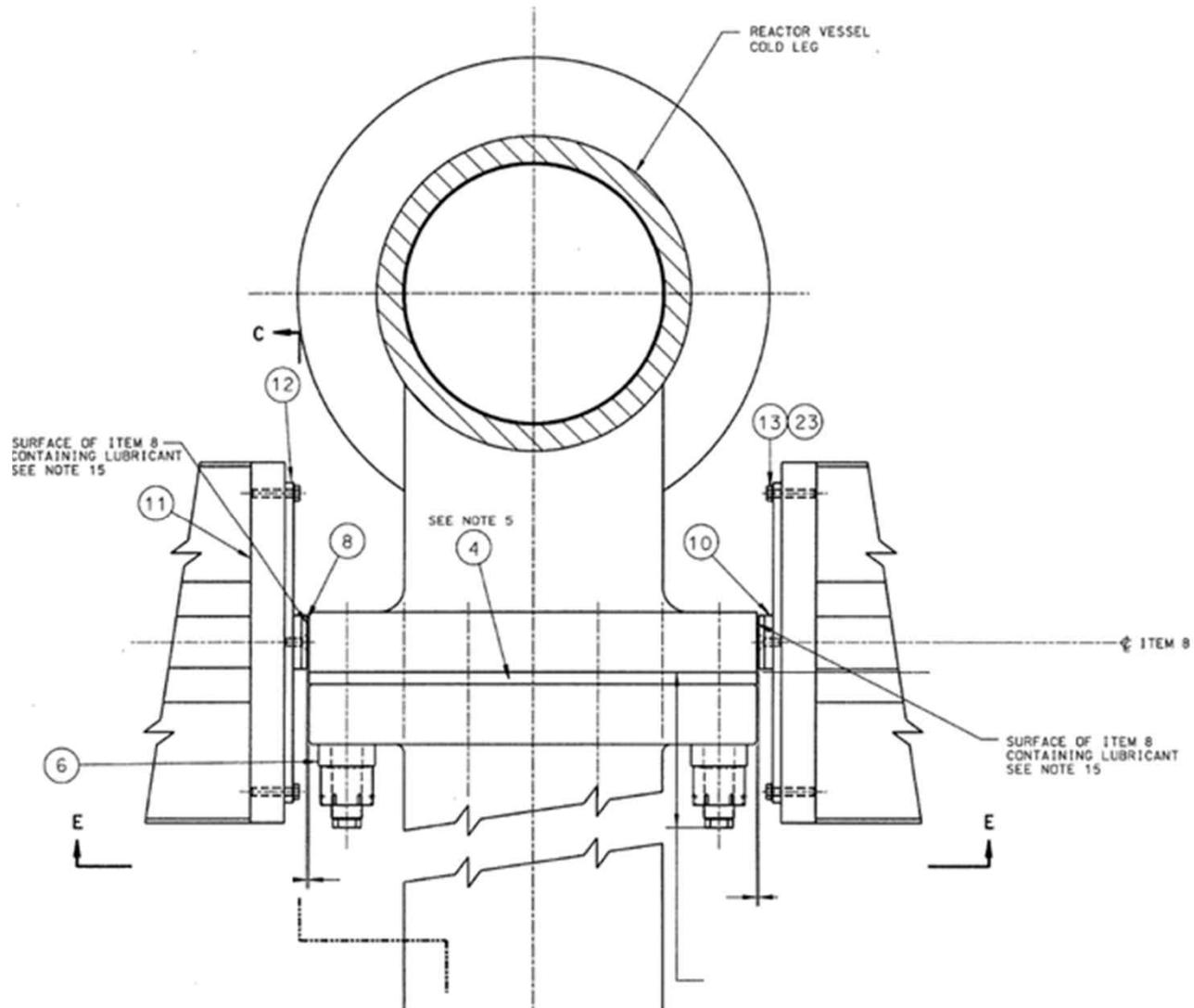
APR1400 원전 지지대



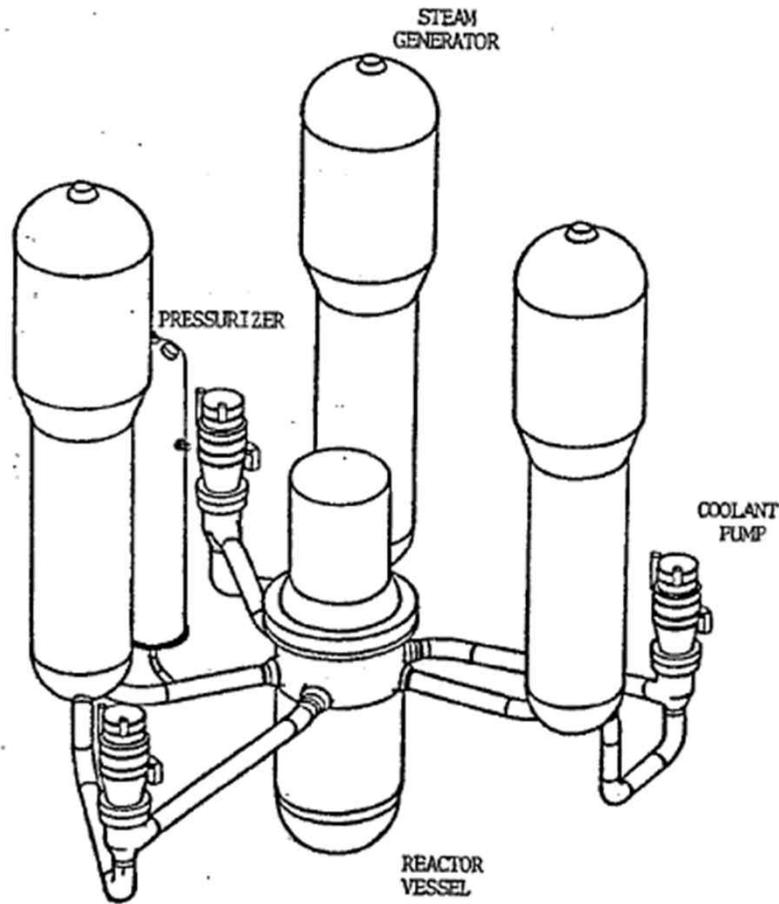
RV Support



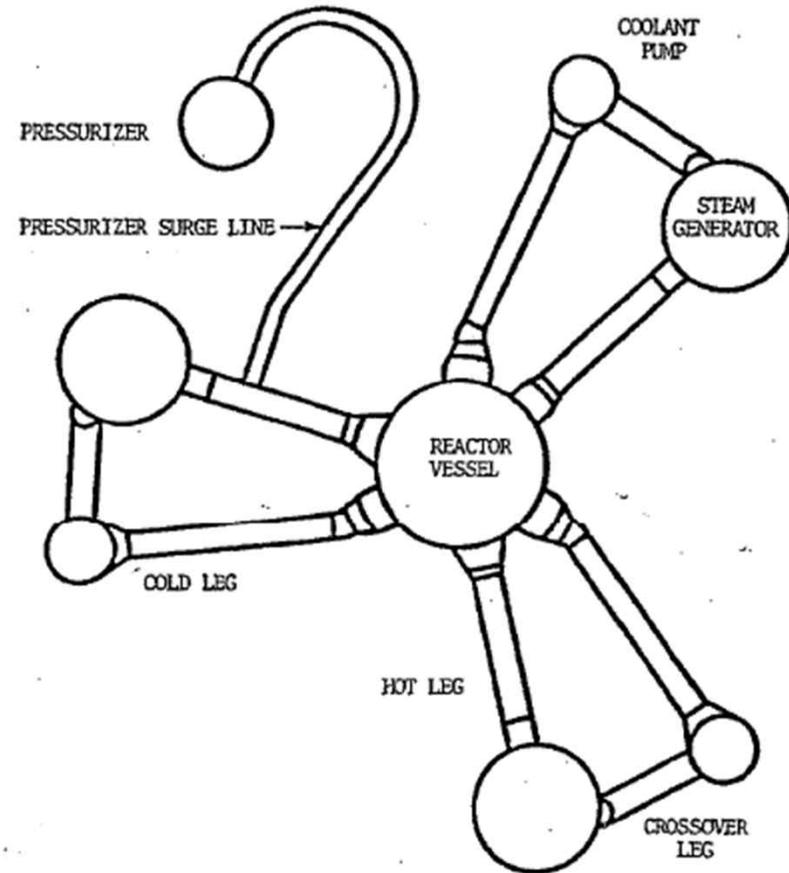
RV Support 설치 현황



RV Cold & Hot Gap

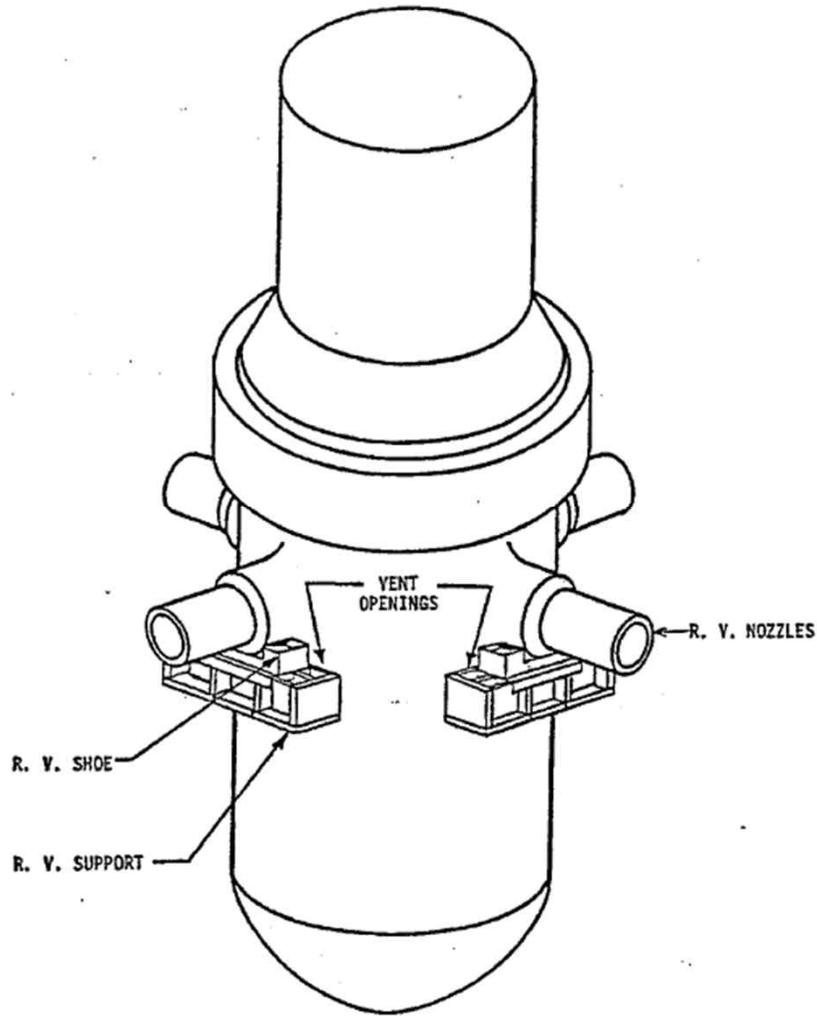


Simplified Diagram of the NSSS

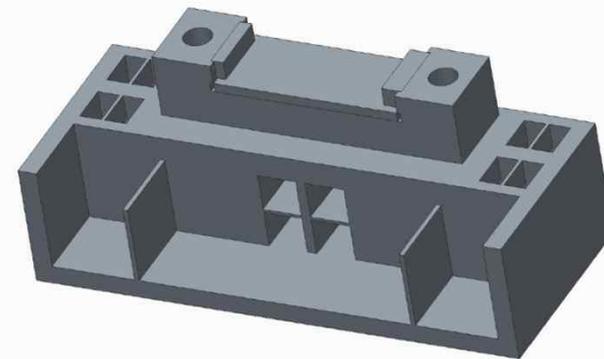
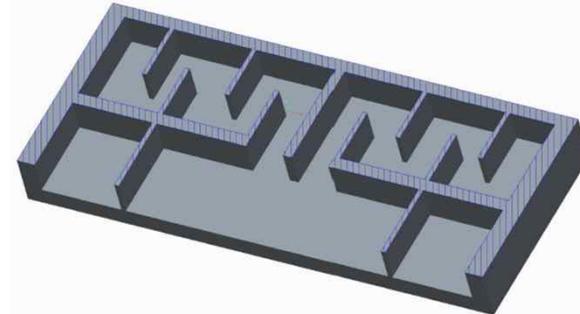
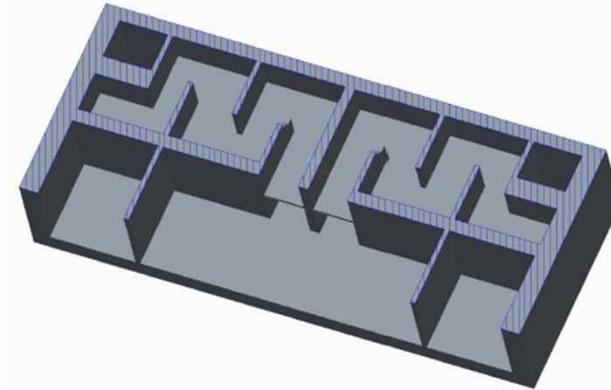


Plan View of the Reactor Coolant Loops

국내 원전 지지대(고리 3,4/한빛 1,2)

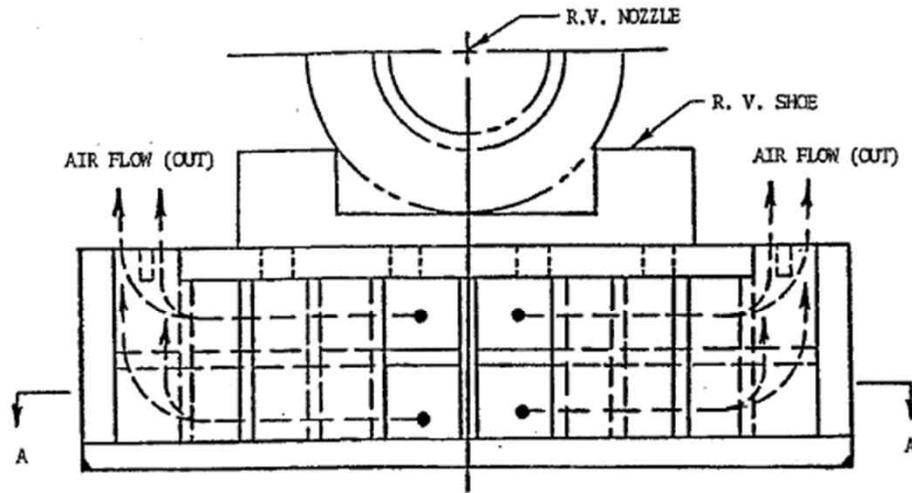


RV Support System



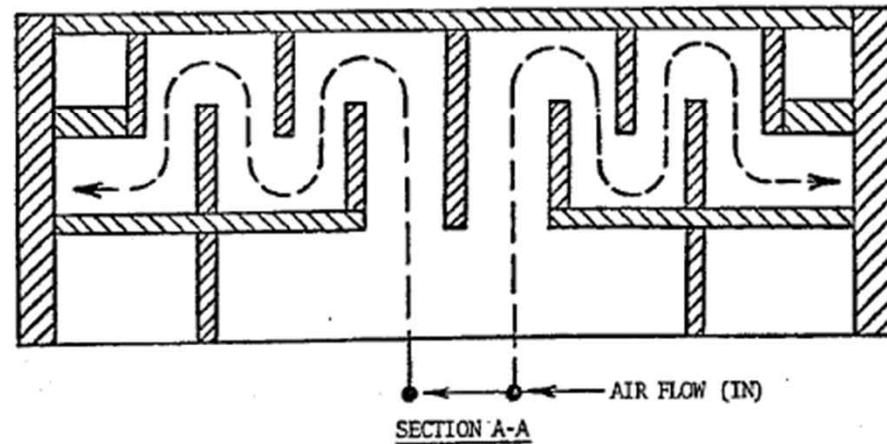
RV 지지대 Pro-Engineering 모델

국내 원전 지지대(고리 3,4/한빛 1,2)



SIDE VIEW

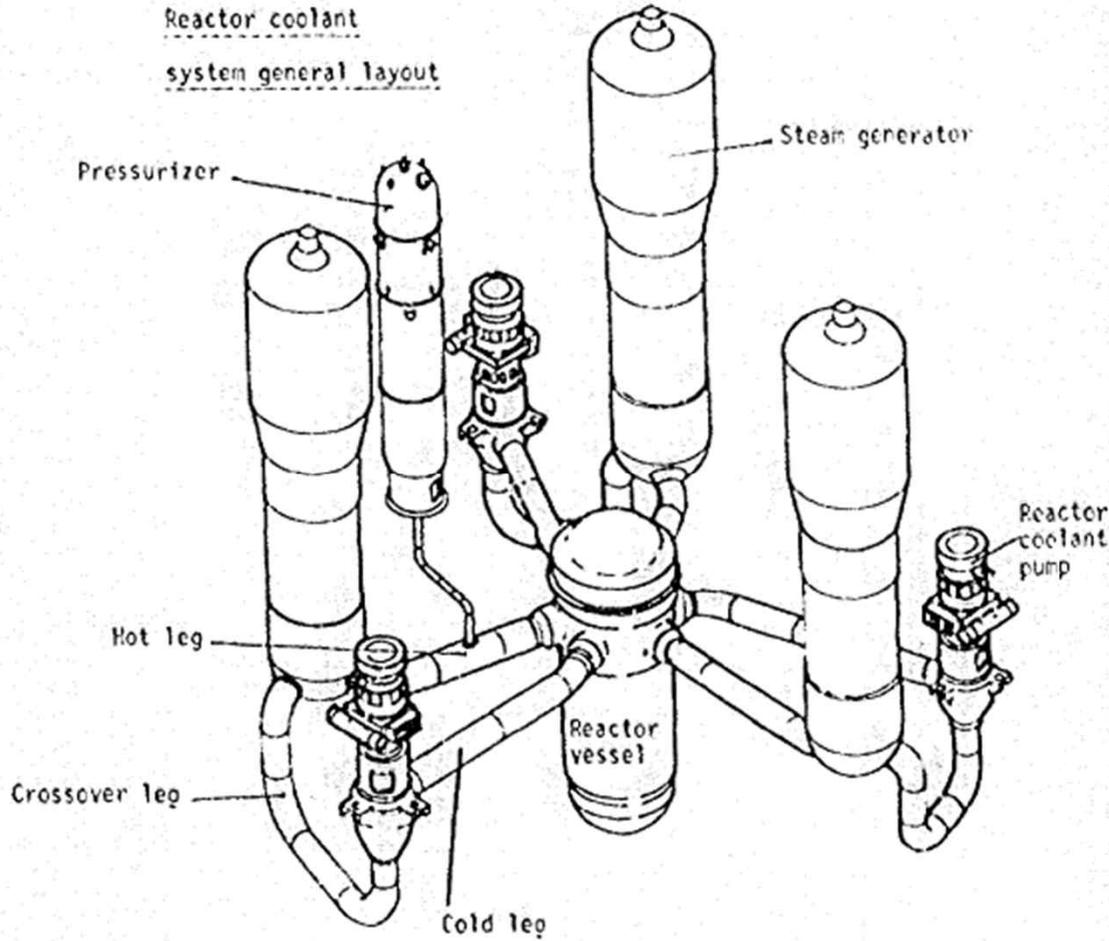
RV Support Air Flow Pattern



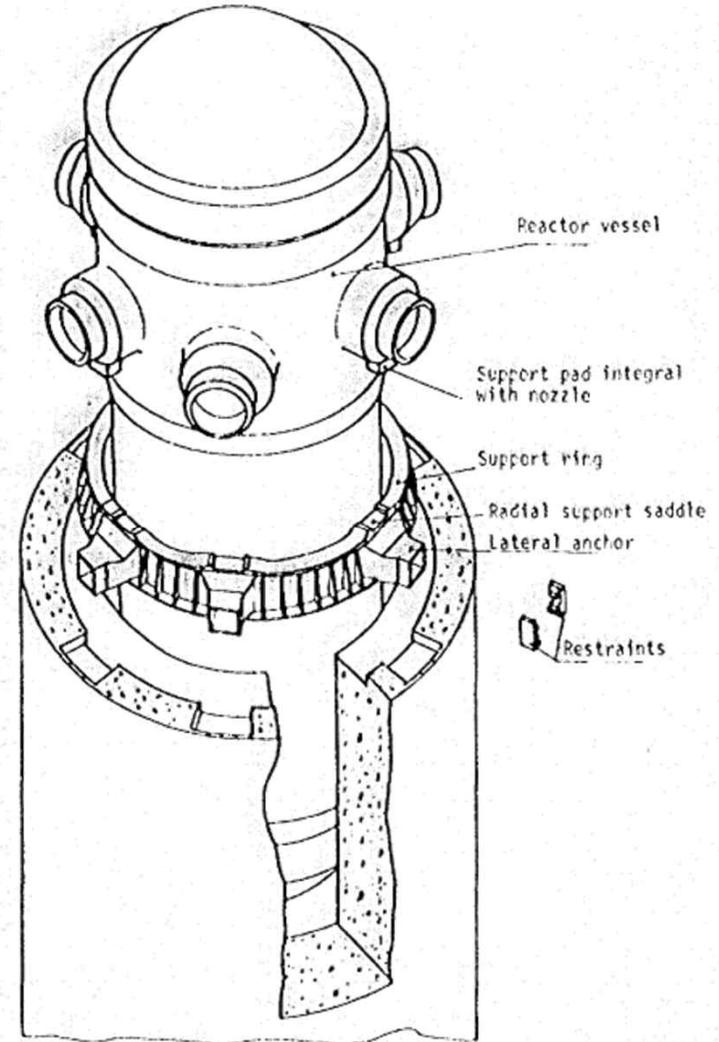
SECTION A-A



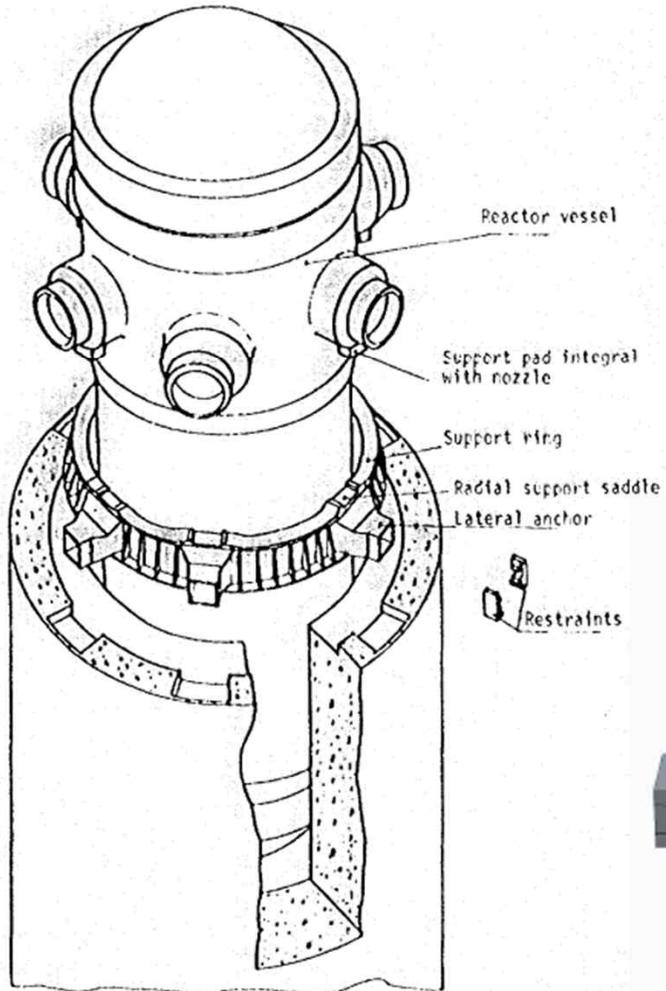
Reactor coolant system general layout



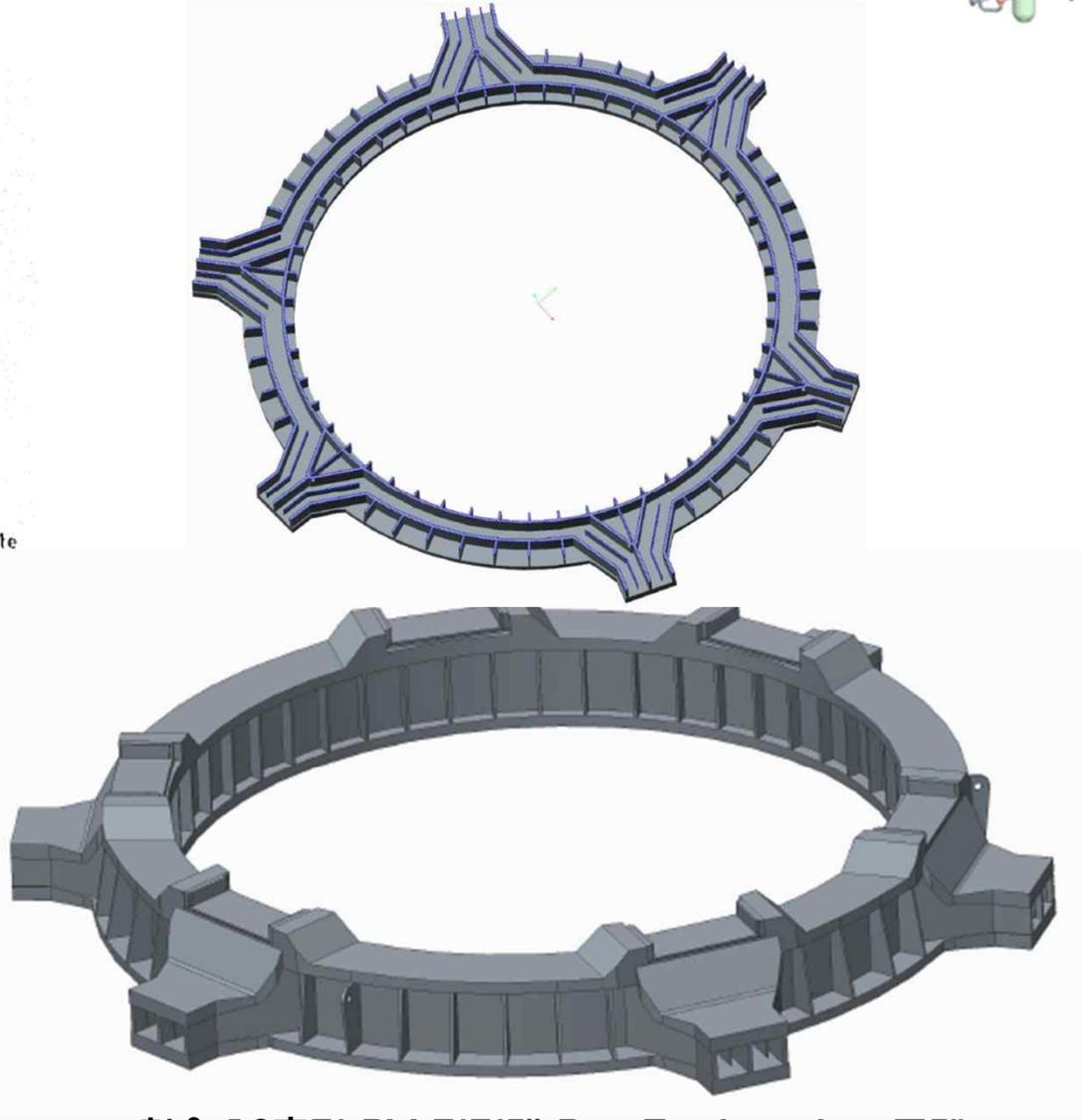
RCS General Layout



국내 원전 지지대(한울 1,2)

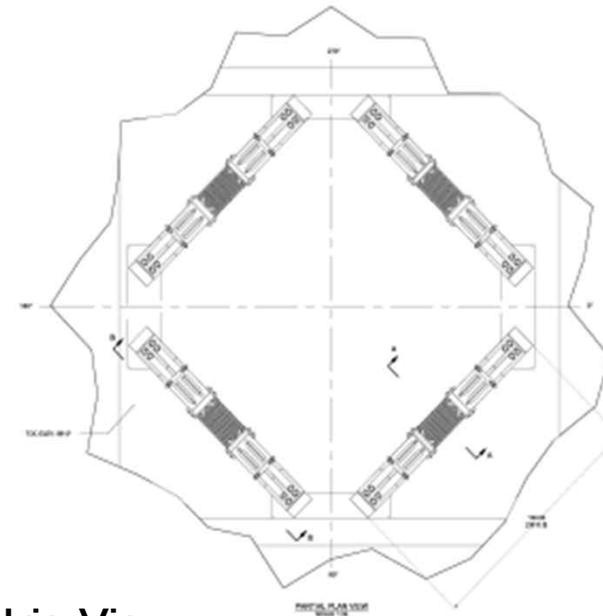
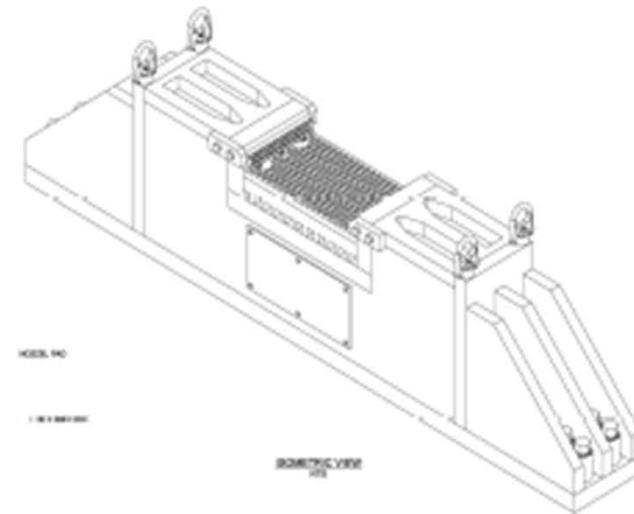
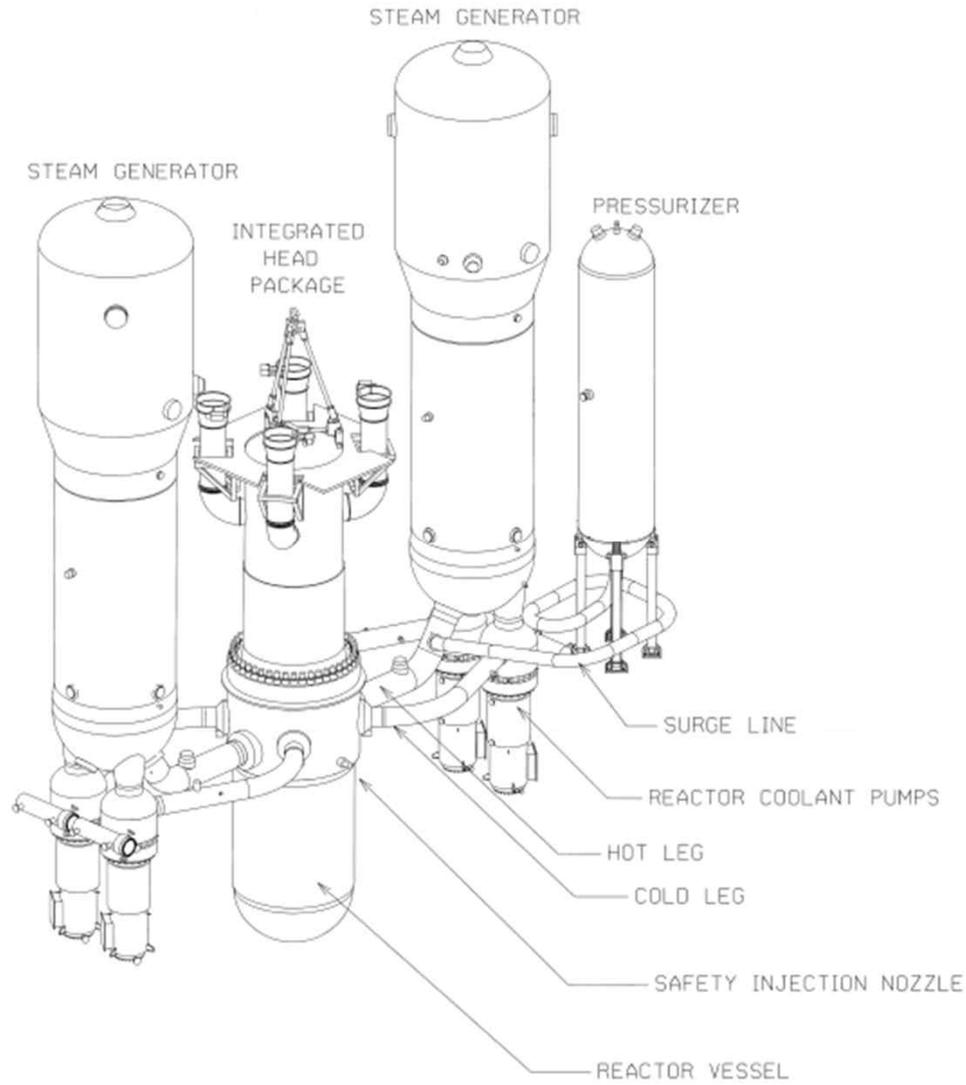


RV supports



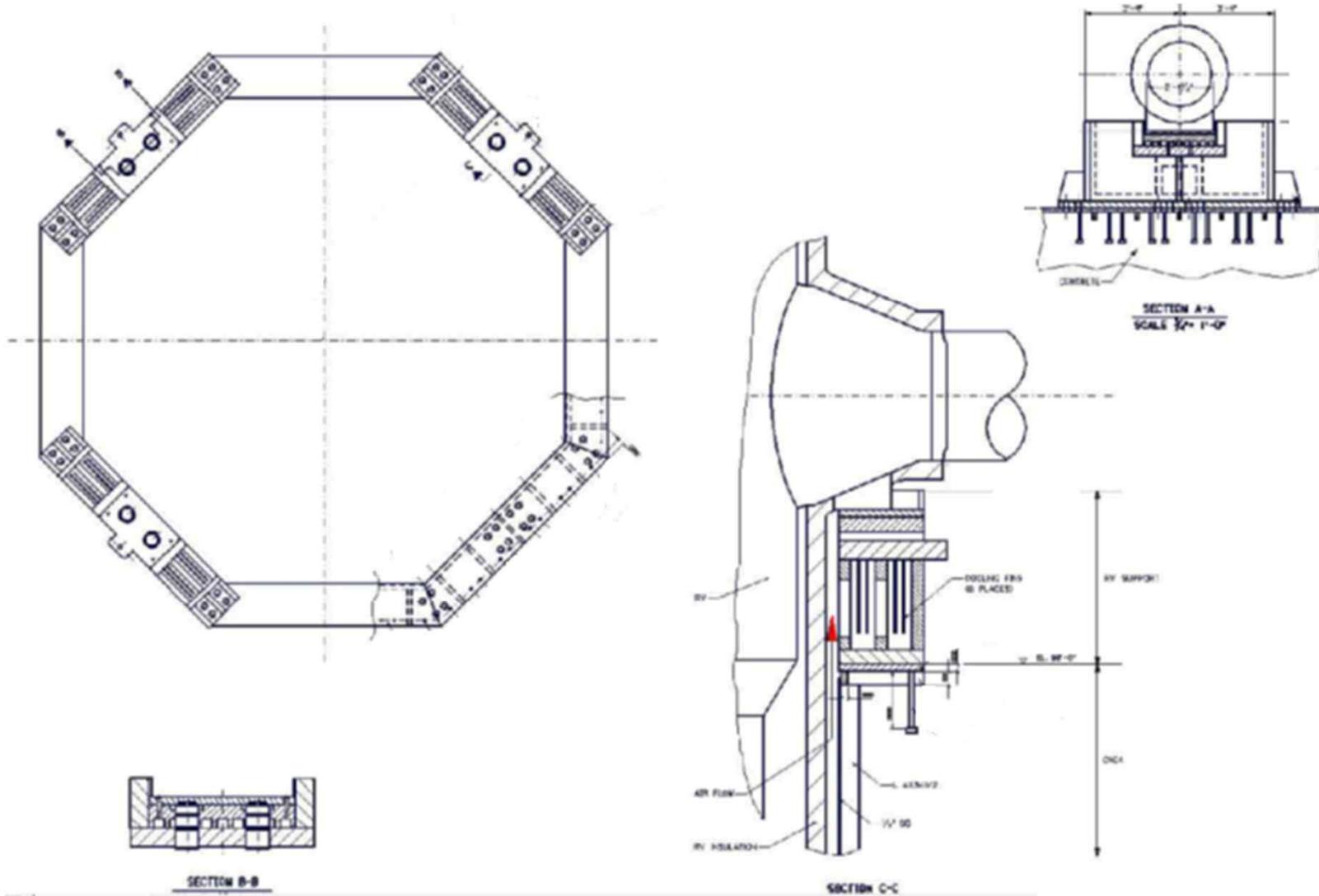
한울 1,2호기 RV 지지대 Pro-Engineering 모델

해외 원전 지지대(AP1000)



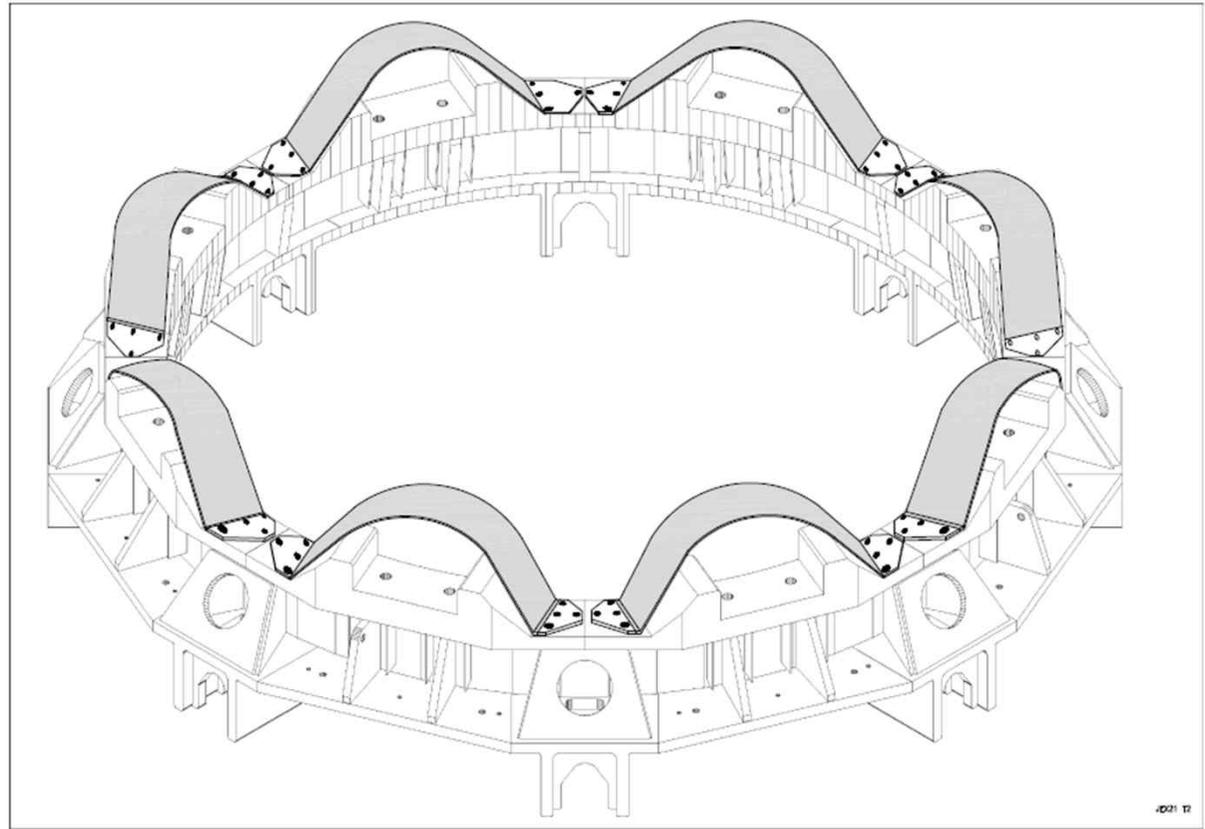
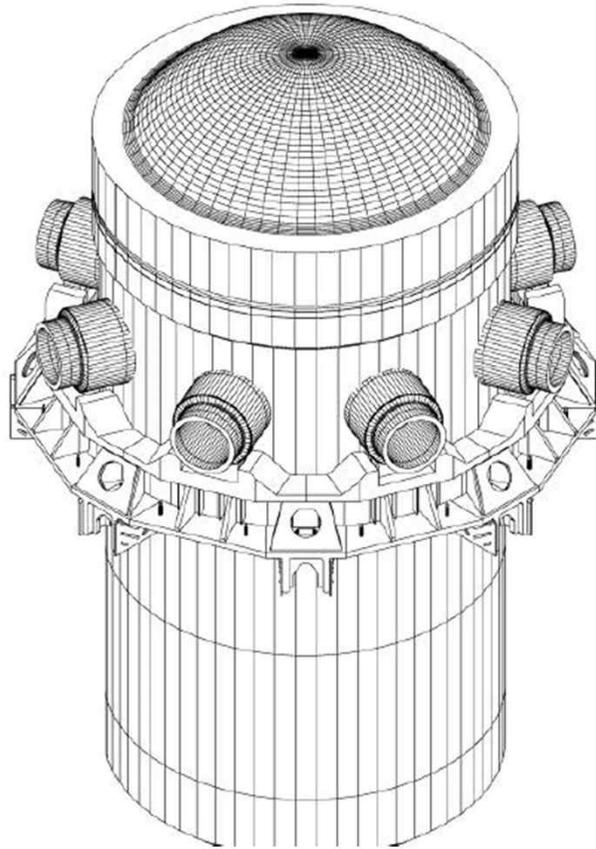
Reactor Coolant Loops-Isometric View

해외 원전 지지대(AP1000)

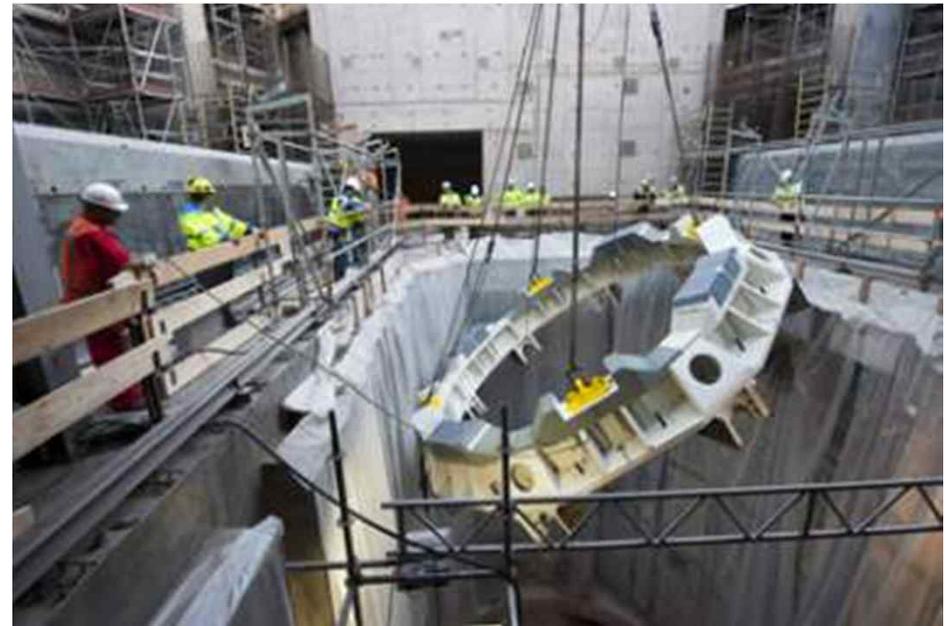


Reactor Vessel Supports

해외 원전 지지대(US-EPR)

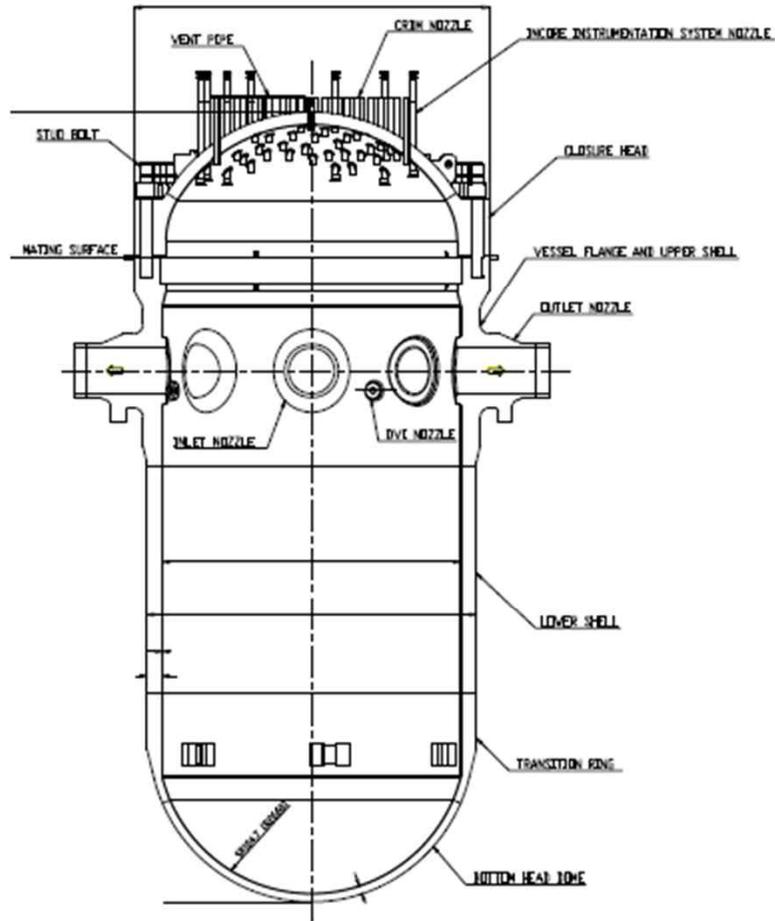


RPV Support

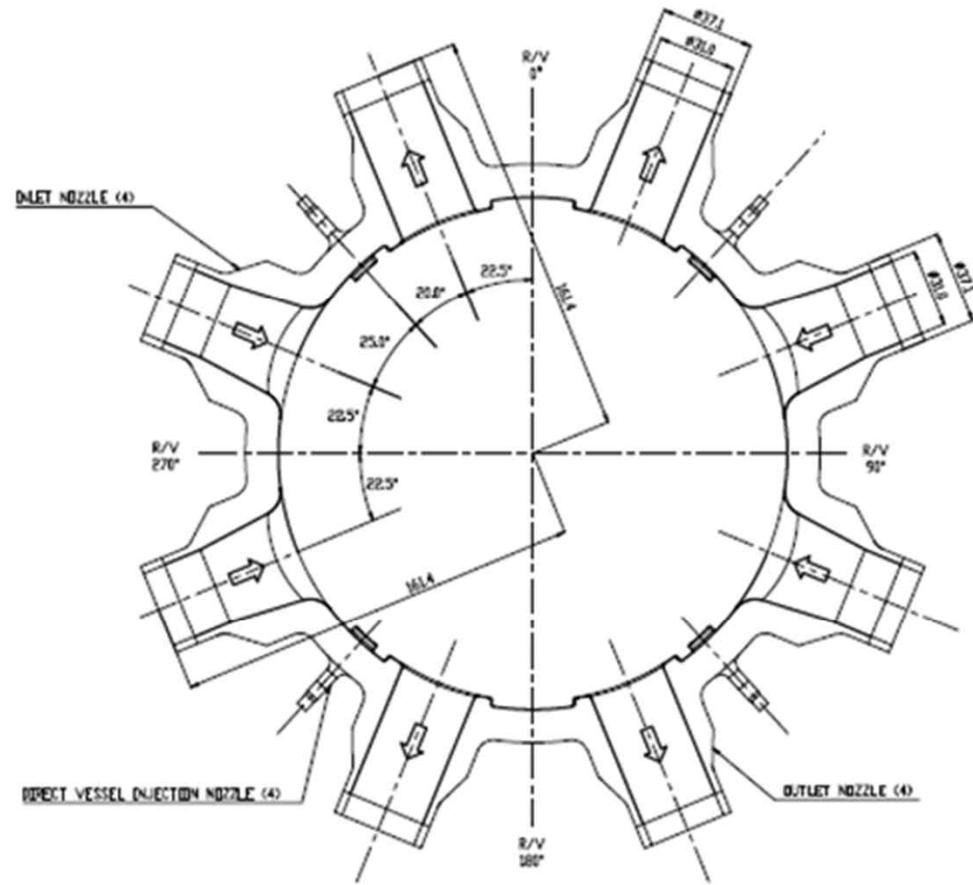


RPV Support 설치

해외 원전 지지대(US-APWR)



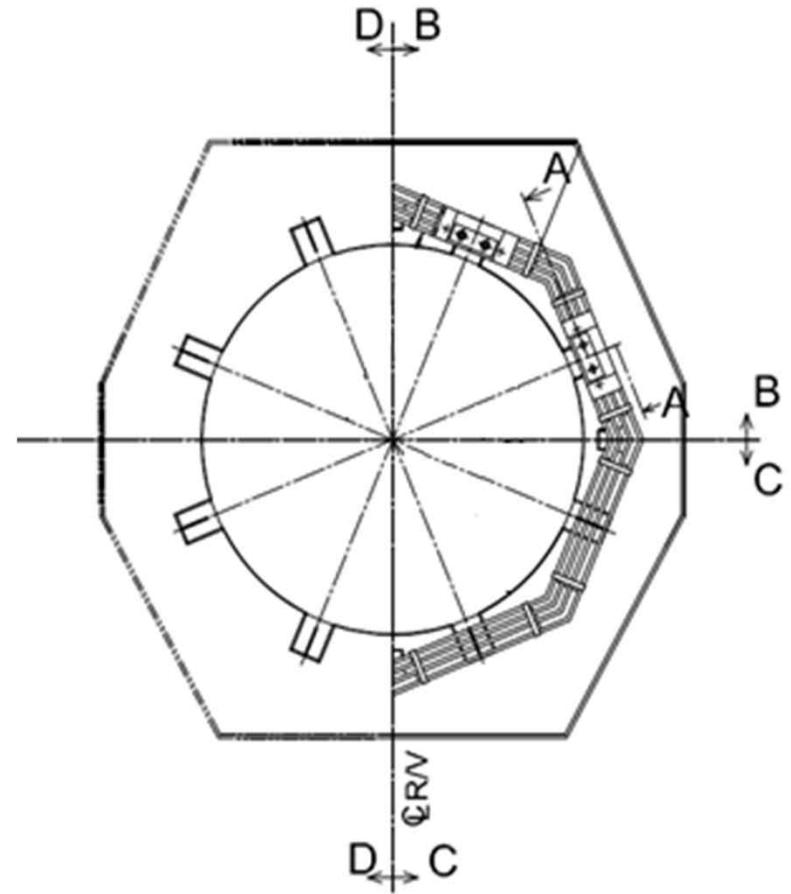
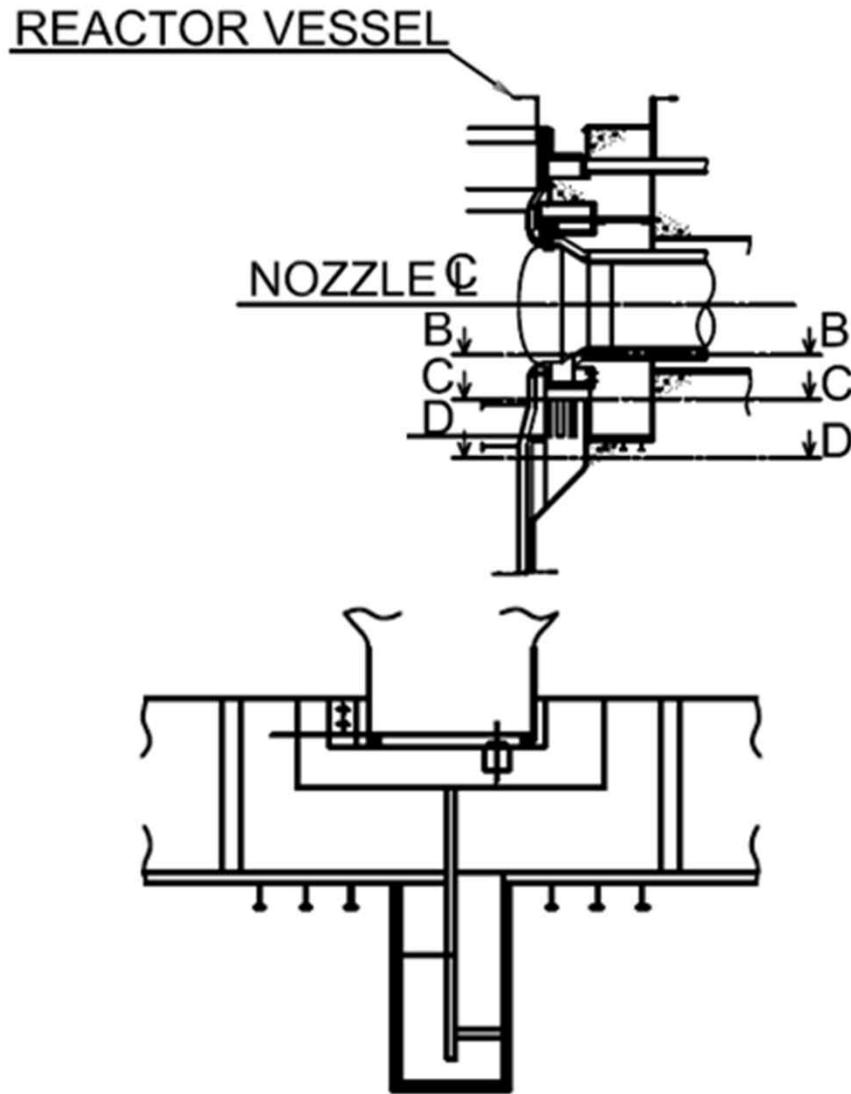
Reactor Vessel Side View



Units: inch

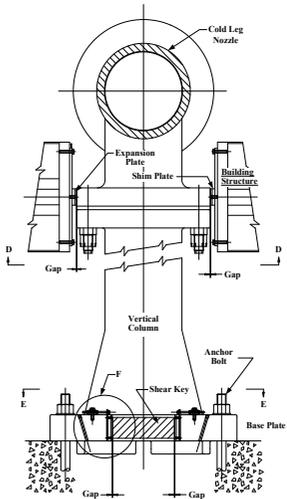
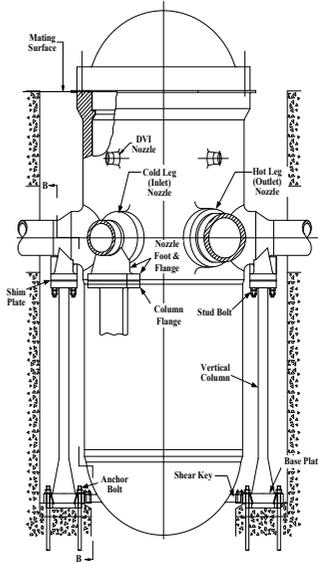
Reactor Vessel Cross-Sectional View

해외 원전 지지대(US-APWR)

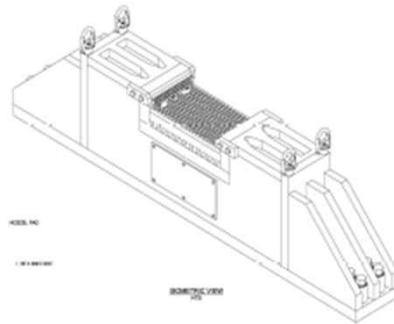
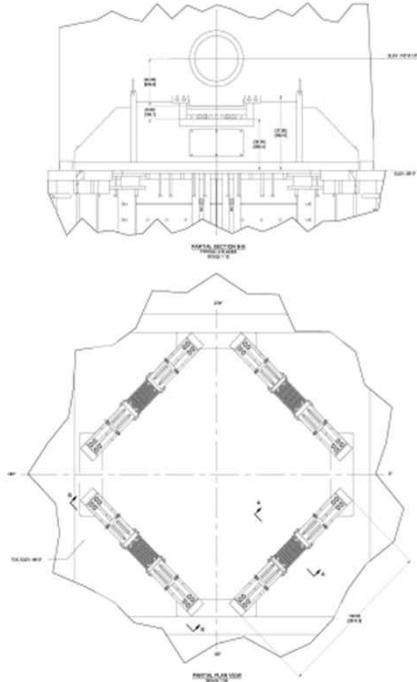


RV Support System

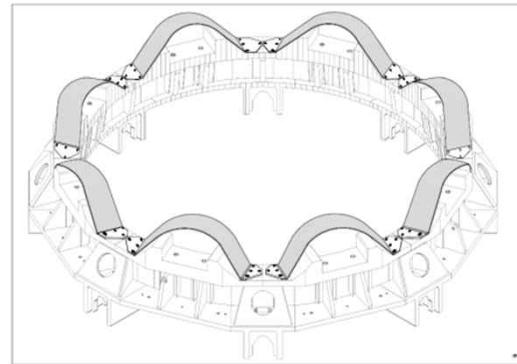
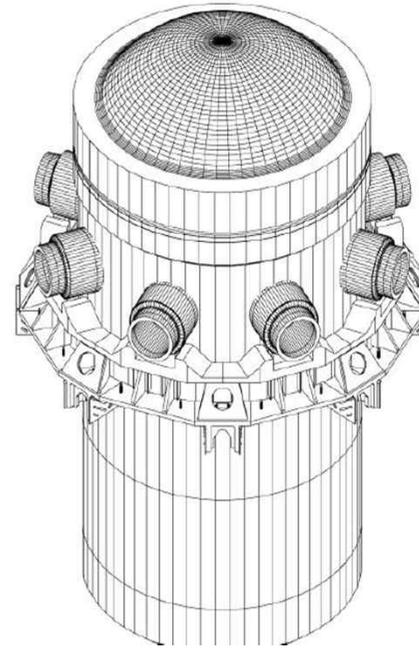
고찰 및 결론



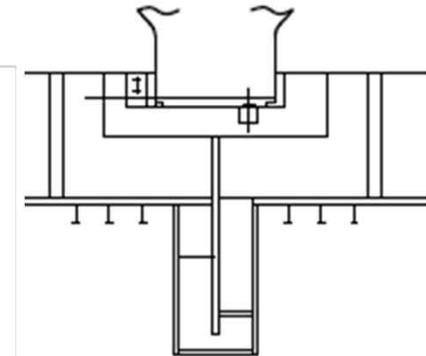
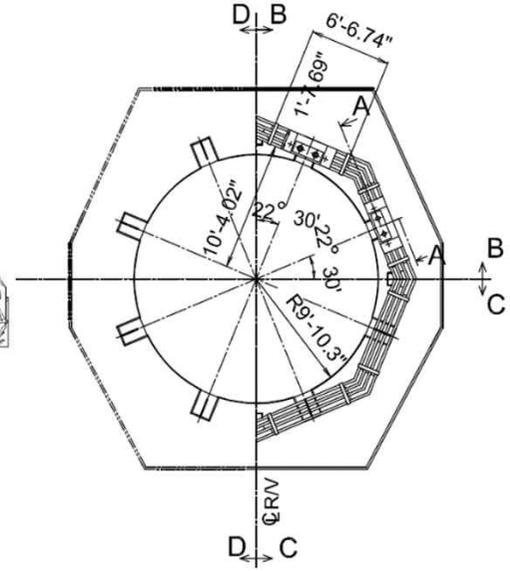
APR1400



AP1000



US-EPR



US-APWR



고찰 및 결론

- 노형별 원자로용기 지지대 특징 파악
- 노형별 원자로용기 지지대의 설계 개념 비교
- 지지대 설계 및 개선의 기초 자료로 활용 예정

Clean Nuclear, Safety First!

熱心히 工夫하며
誠實하게 일하자

