

Emergency Shut Down System for LNGC

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KOREAN REGISTER

KR

Requirements for ESDS

Emergency shut down system

- ◆ IGC Code 5.6.3
 - ❖ 육상과 선박간의 액 및 가스화물의 이송을 차단하기 위한 원격차단밸브의 설치
 - ❖ 선박에 적어도 2개 장소에서 조작
 - CACC (mandatory)
 - ❖ 화재시 차단될 수 있도록 98°C - 104°C에서 용해될 수 있도록 가용성 엘리트먼트 설치
 - ❖ 모든 liquid piping에 설치될 shutdown valve는
 - 30초 이내에 폐쇄되어야 함.
 - 폐쇄신호 발한 뒤부터

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Requirements for ESDS

- ◆ Valve 의 요건
 - ❖ Fail-closed type (Fail safe)
 - Closed by spring or self weight
 - Opened by hydraulic or pneumatic power
 - ❖ Accumulator
 - 동작용 관장치와 연결되어서는 안됨
 - Stop valve의 설치 금지
 - 2회 이상 차단 가능
 - 양현 동시 사용시에는 한 현의 요구 만족

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Emergency Shut Down System

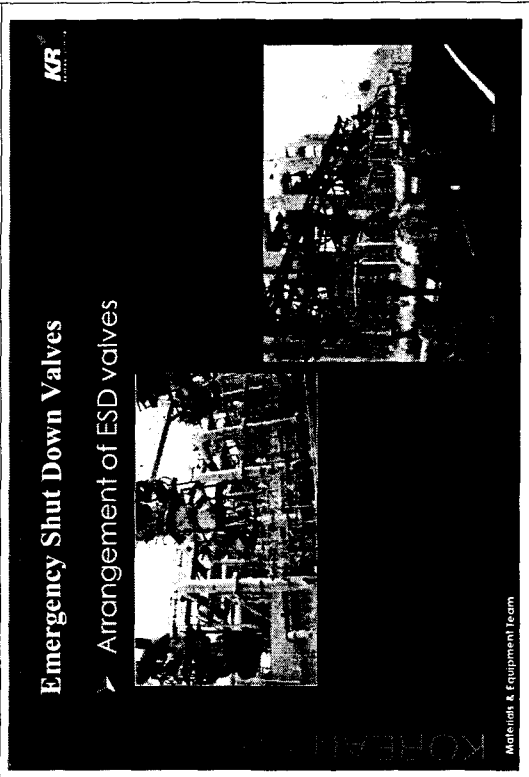
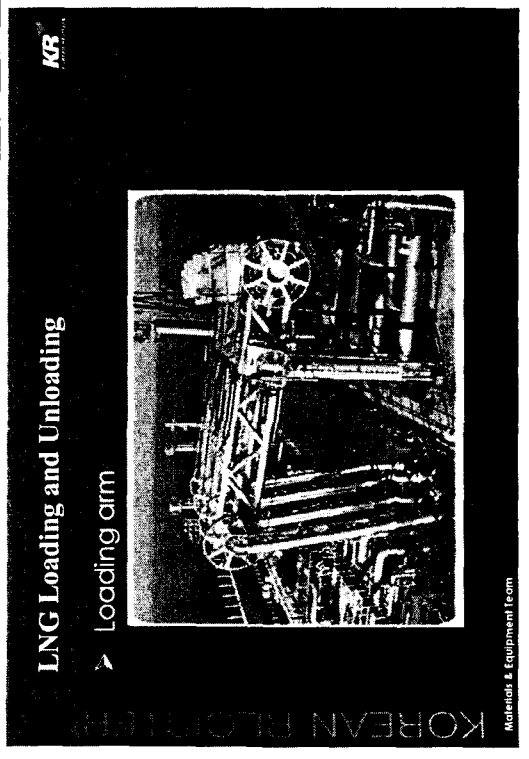
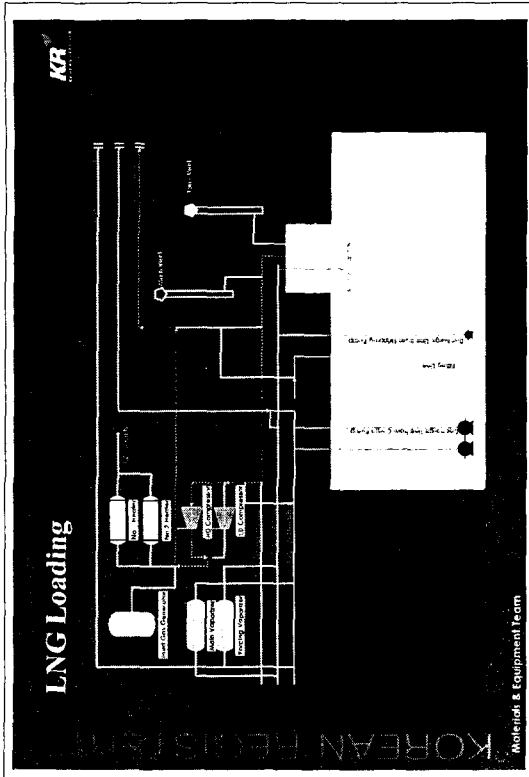
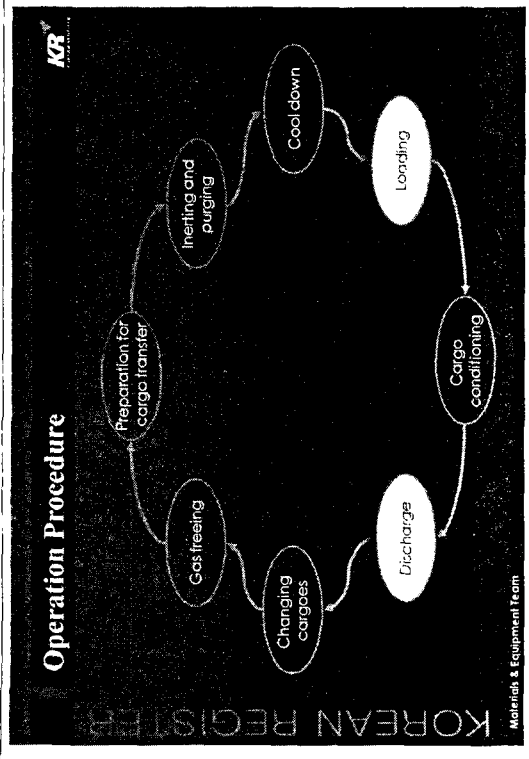
ESDS

- ◆ Main equipment shut down
- ◆ Communication between ship and shore

Emergency Case

- ◆ Fire
- ◆ Abnormal status of cargo system
- ◆ Abnormal status of electric system
- ◆ Manual shut down

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Accumulator Design

Accumulator 용량산정

- ◆ 일반적으로 플래터형 사용
- ◆ Polytopic index를 사용하여 보정

$$V_1 = \frac{V_w}{e \cdot \eta \cdot F}$$

V_1 = Accumulator의 용적

$$F = \frac{Q^{1/n-1}}{A^{1/m}}$$

F = 토출계수

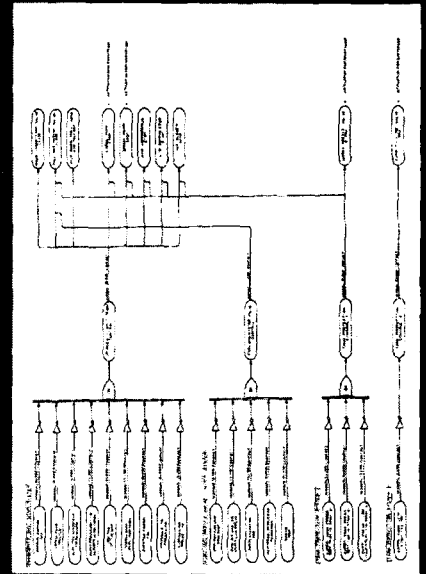
Accumulator Design

- ESD shore connection valve
- ◆ Shore connection valve
 - ❖ Liquid line 400A x 4 set
 - ❖ Vapor line 400A x 1 set
 - ❖ Nitrogen line 80A x 1 set
- ◆ $V_w = (620cc \times 5 \text{ valves} + 77cc \times 1 \text{ valve}) \times 2 \text{ times}$

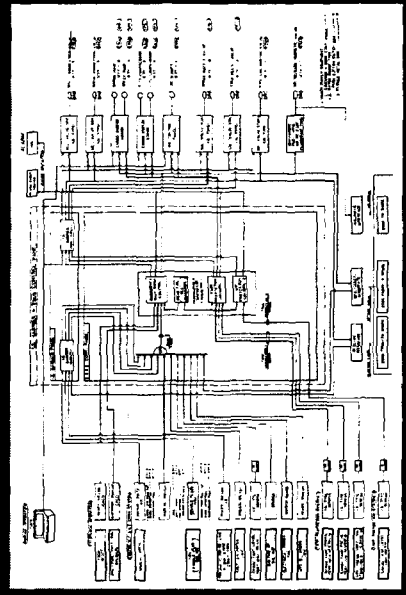
$$F = \frac{Q^{1/n-1}}{A^{1/m}} = \frac{1.31^{1/6-1}}{0^{1/14}} = 0.148$$

$$V_1 = \frac{V_w}{e \cdot \eta \cdot F} = \frac{6.4}{0.88 \times 0.95 \times 0.148} = 52 \text{ ?}$$

ESDC Control Flow

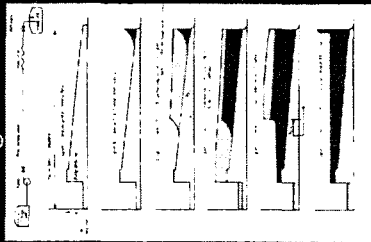


ESDS Block Diagram



Case Study

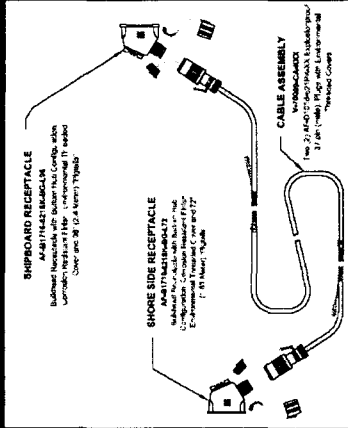
Hammering effect



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ESD System

Electric ESD ship to shore system



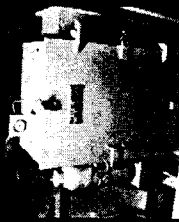
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ESD System

Fusible plug



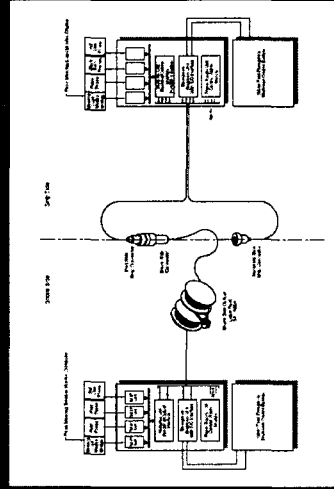
Solenoid Box and Accumulator



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ESD System

Ship shore transmission and ESD link system



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