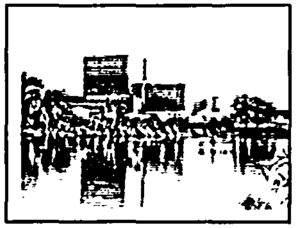
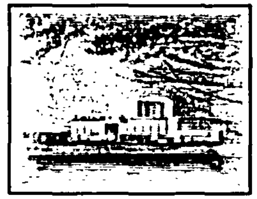
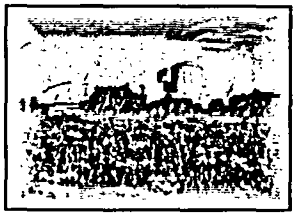
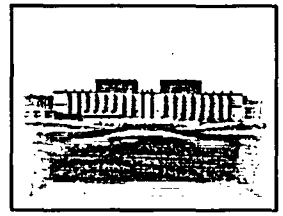


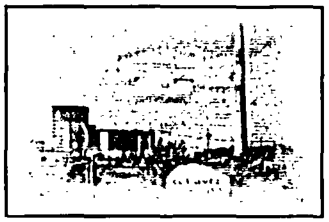


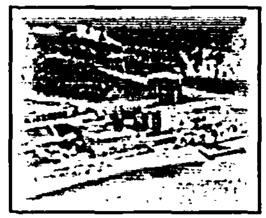


NMC

*Committed to Nuclear Excellence*







# Kewaunee Equipment Hatch License Amendment Request

**November 6, 2003**

# Agenda

- Objectives
- Reason For Change
- Overview of System
- Specific TS Changes
- ISTS Differences
- Justification Overview
- Timeline

# Objectives

- Obtain common understanding of LAR for KNPP
- Determine Potential Roadblocks
- Discuss Timeline for LAR

NMC
Committed to Nuclear Excellence

# Preliminary Information

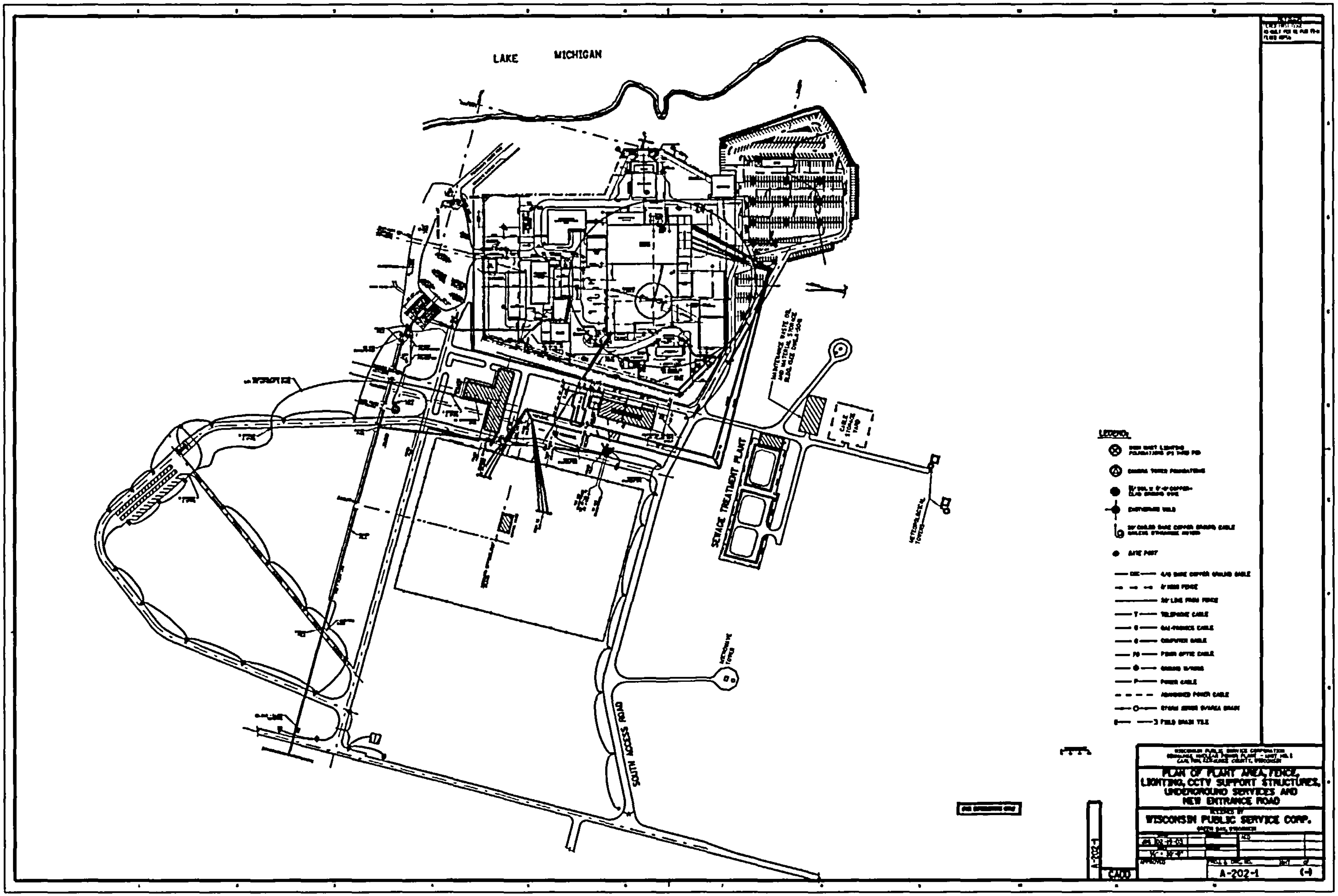
- NO Commitments Made by this Presentation

# Reasons For Change

- Refuel while Equipment Hatch Open
  - Flexibility in Outage Schedule
- Add Requirements for CR Post Accident Recirculation System to Support Analysis

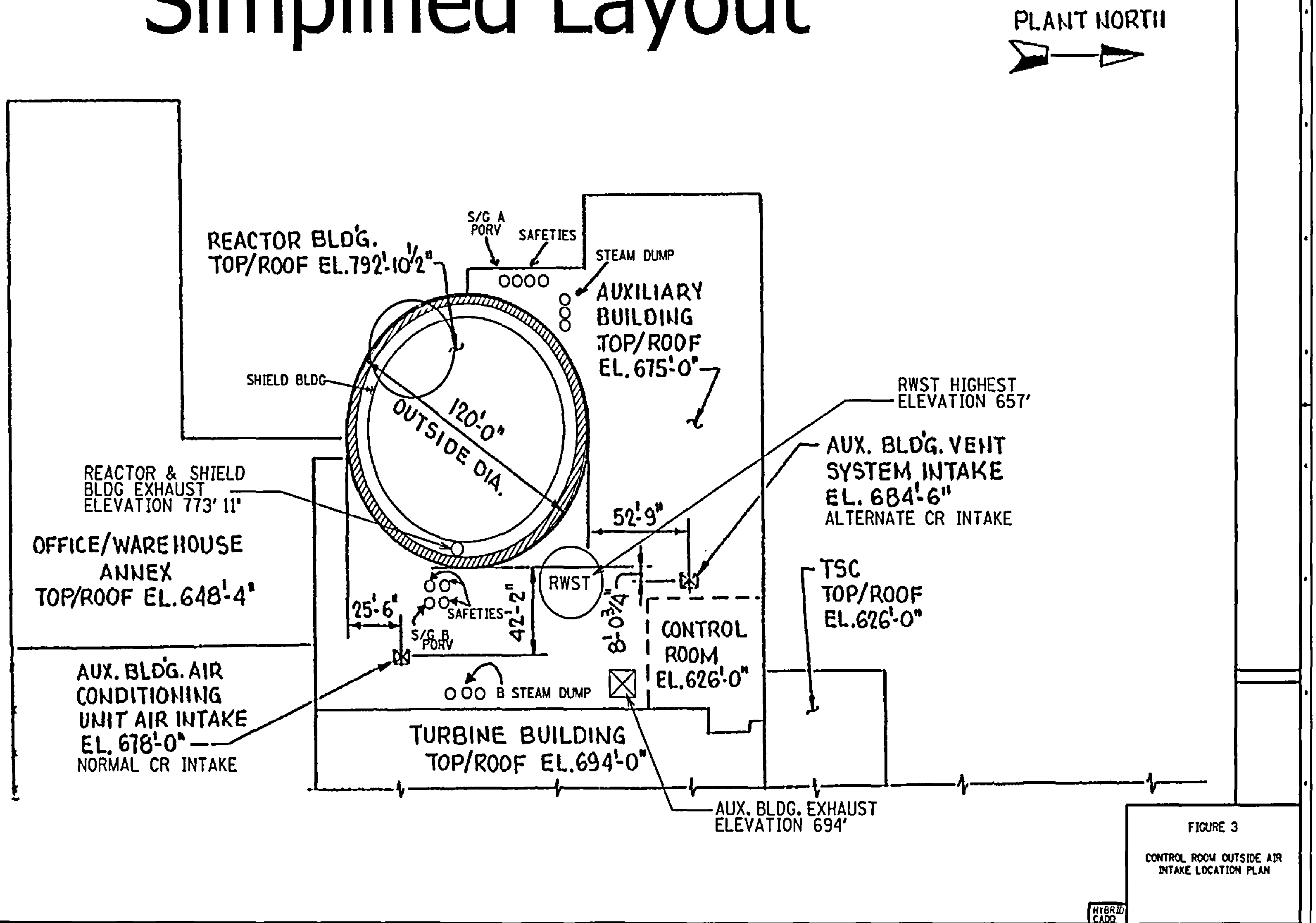
NMC
Committed to Nuclear Excellence

# KNPP Layout

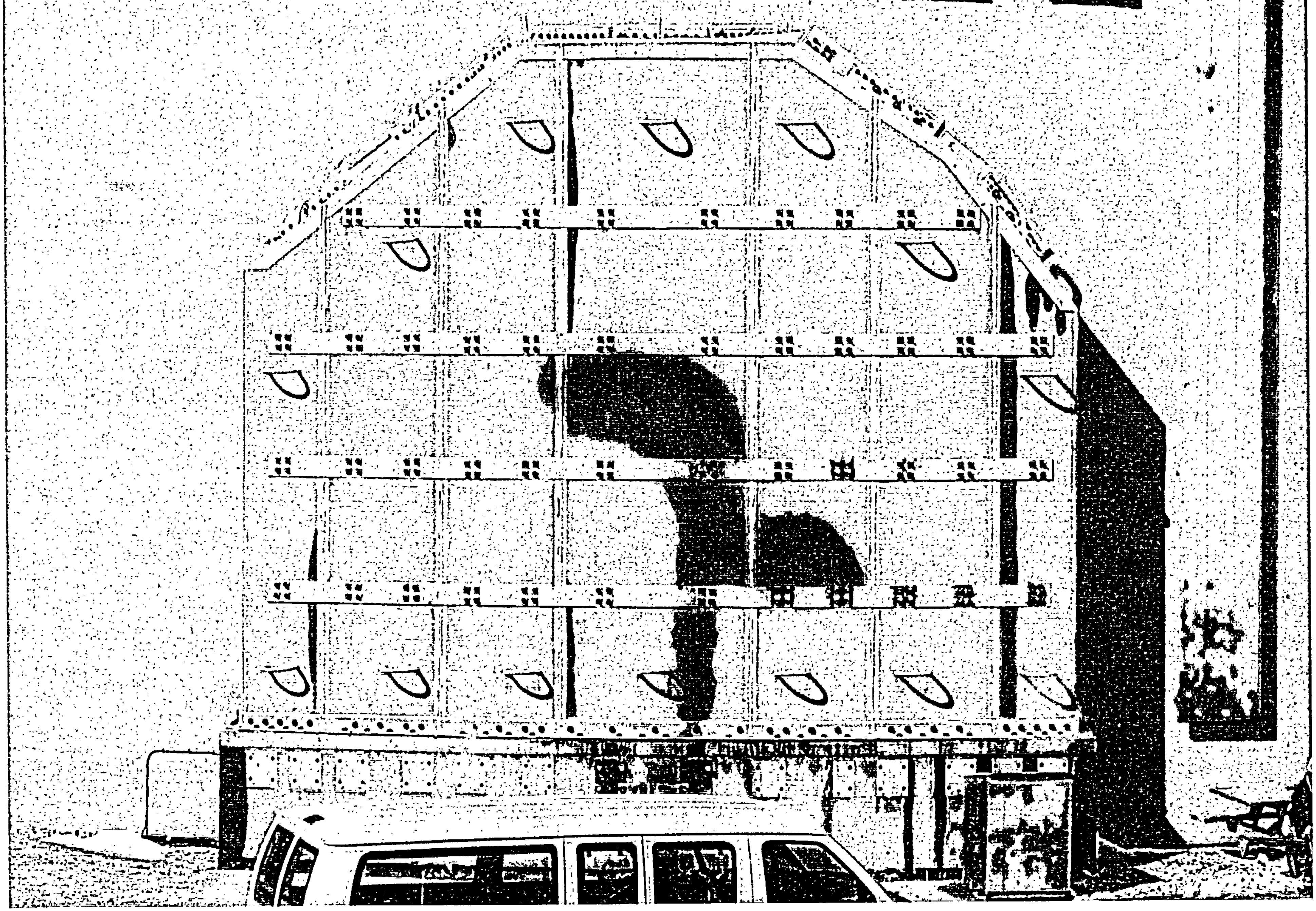


LAKE MICHIGAN
SEWAGE TREATMENT PLANT
SOUTH ACCESS ROAD
LEGEND:
PLAN OF PLANT AREA, FENCE, LIGHTING, CCTV SUPPORT STRUCTURES, UNDERGROUND SERVICES AND NEW ENTRANCE ROAD
WISCONSIN PUBLIC SERVICE CORP.
A-202-1
CADD

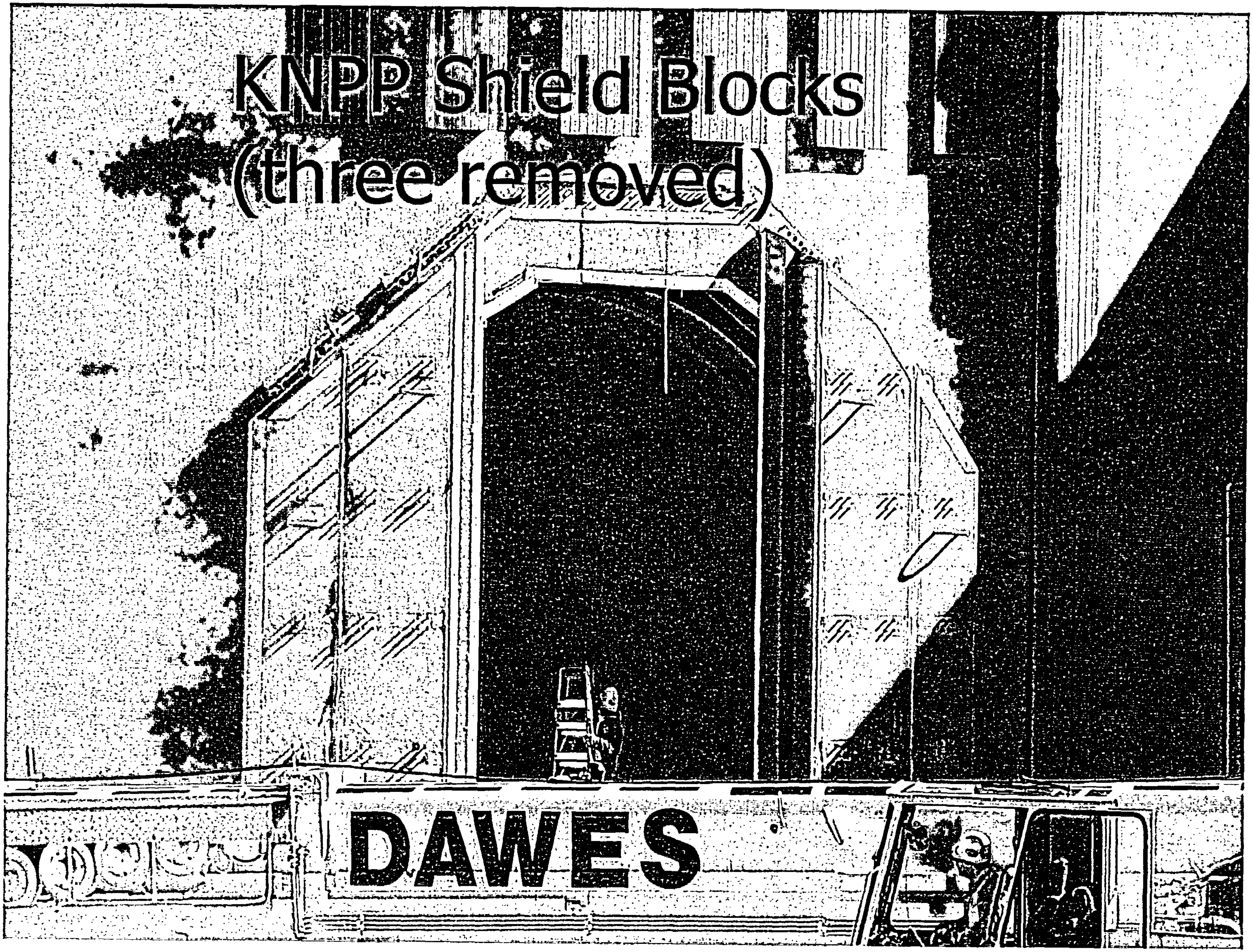
# Simplified Layout



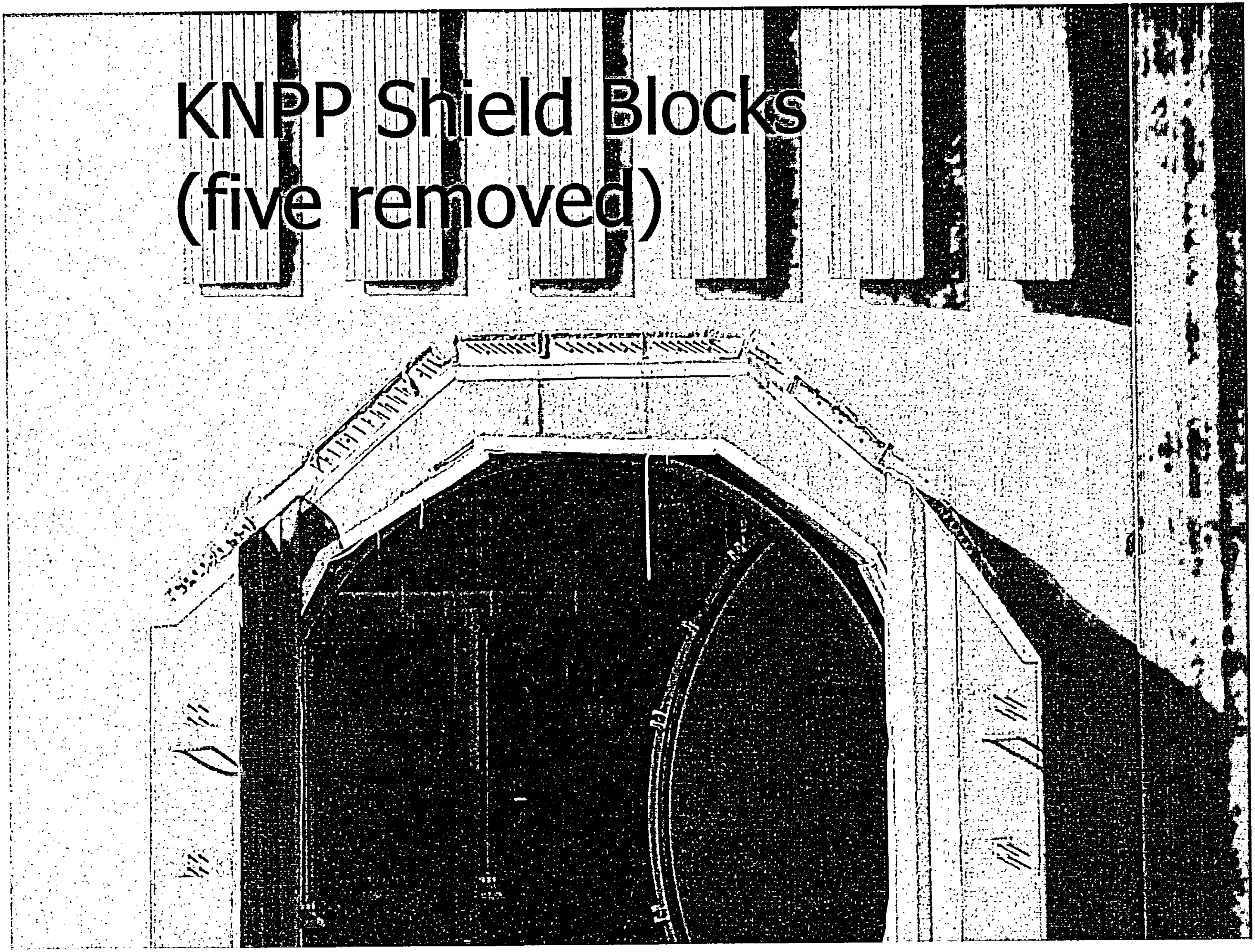
# KNPP Shield Blocks



# KNPP Shield Blocks (three removed)

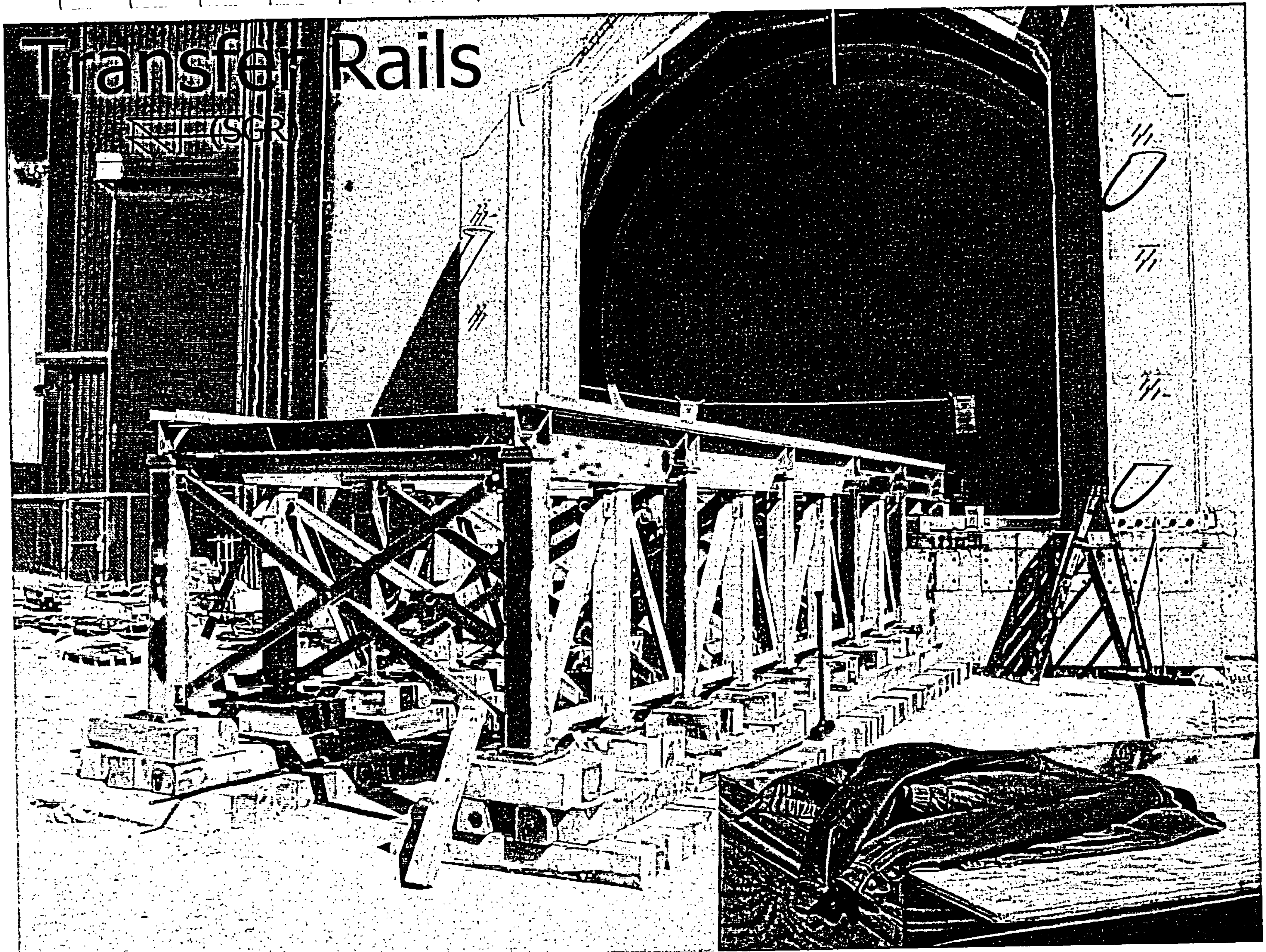


# KNPP Shield Blocks (five removed)

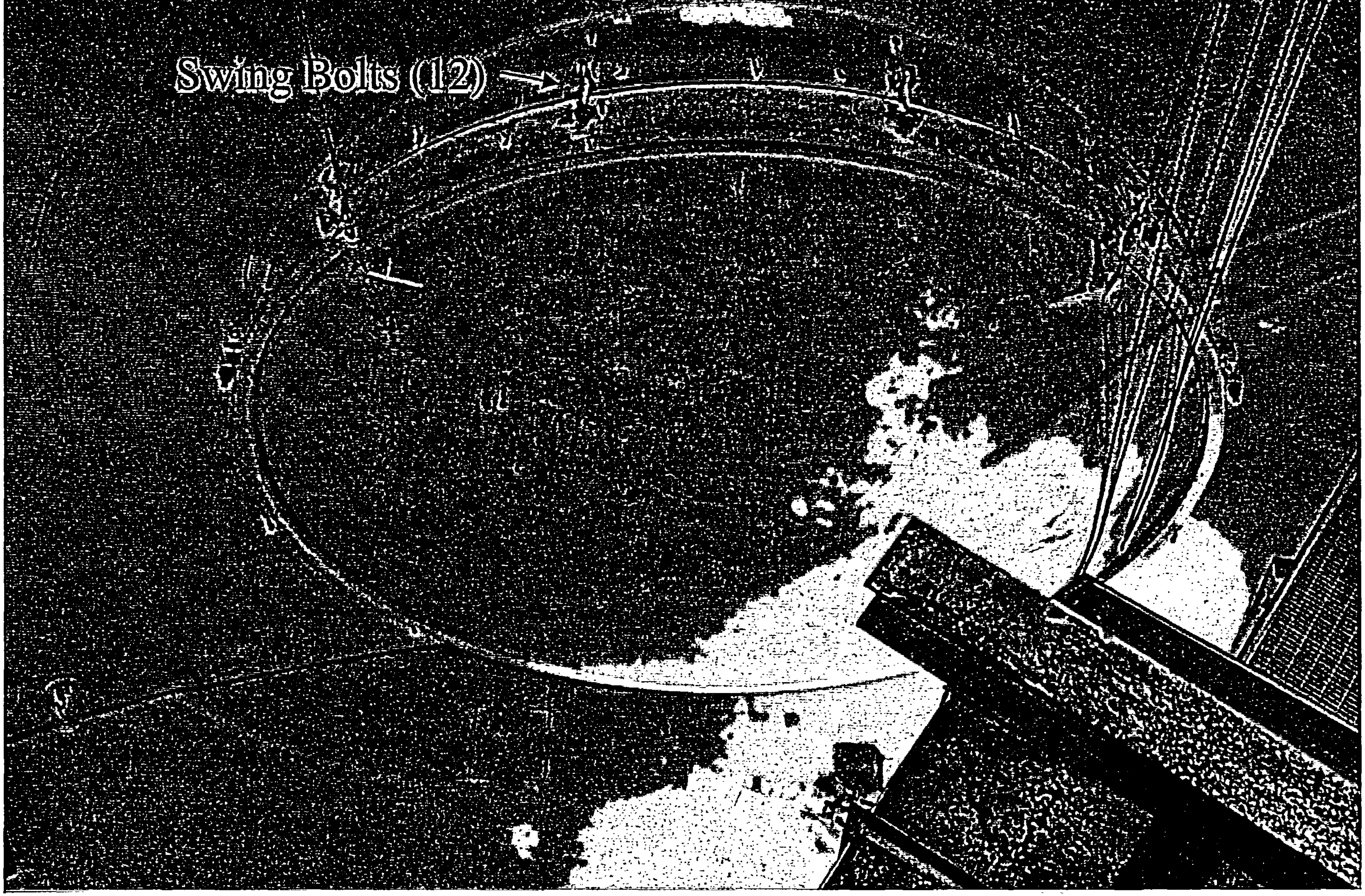


# Transfer Rails

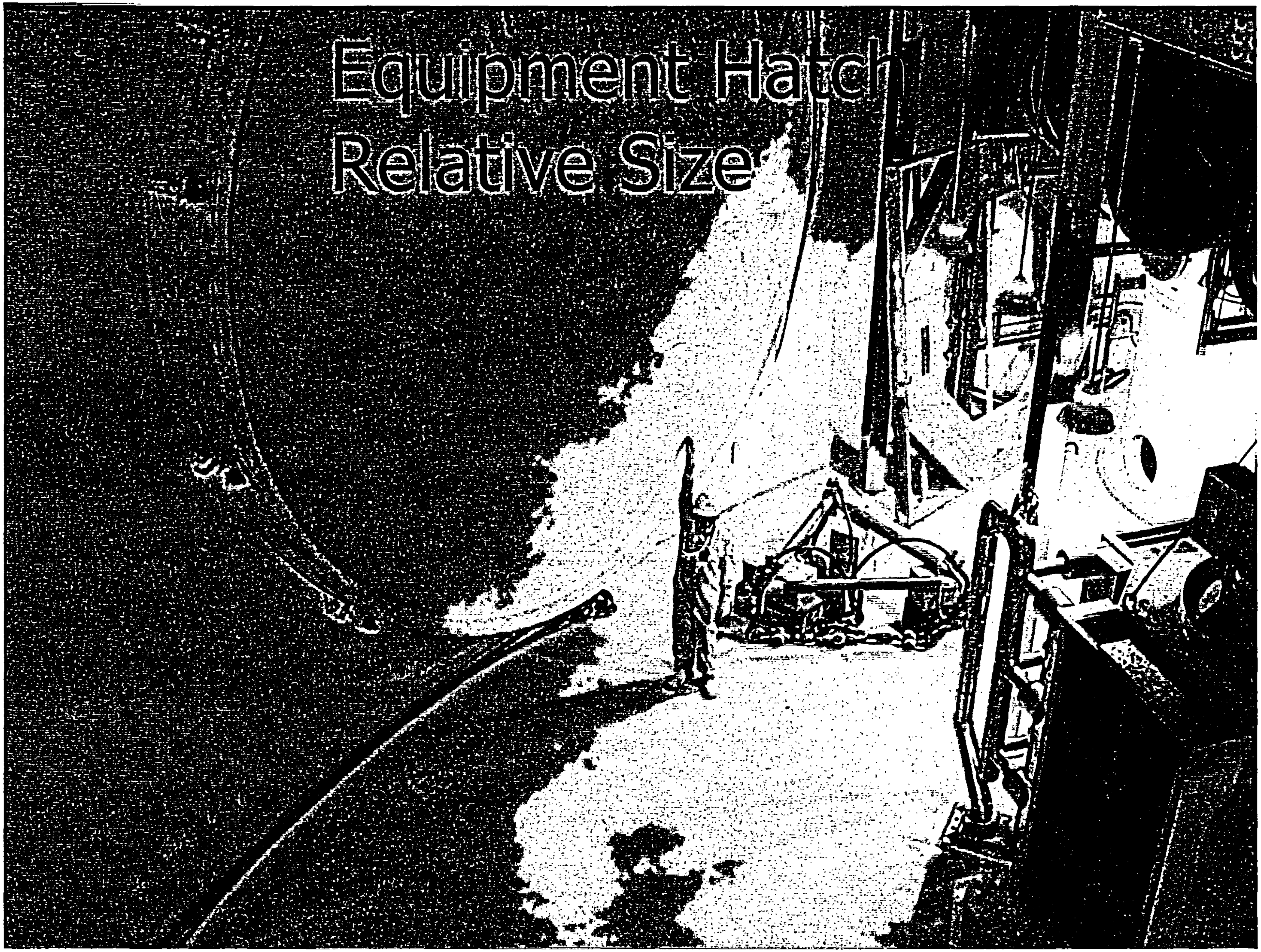
(SGR)

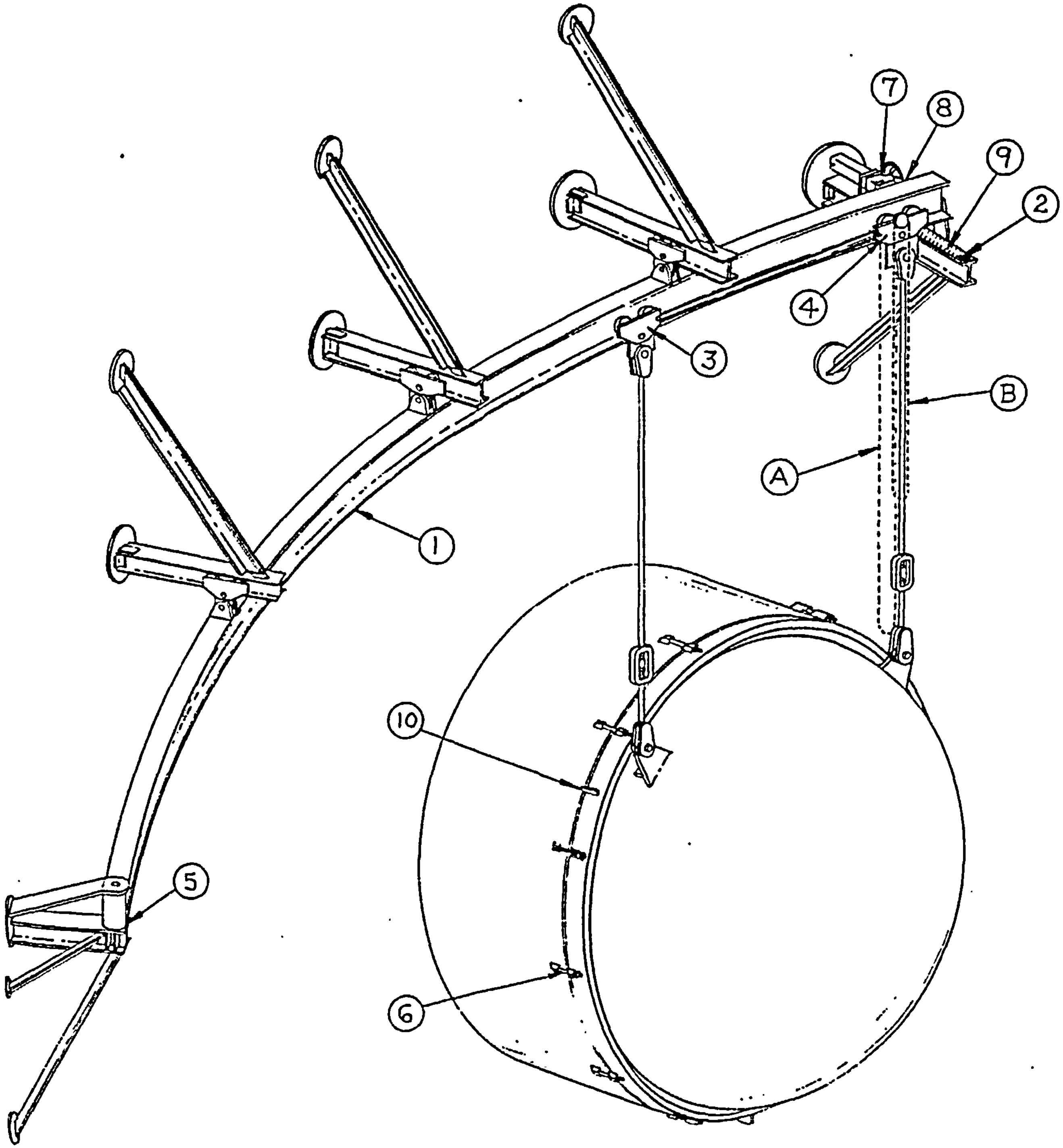


# KNPP Equipment Hatch



# Equipment Hatch Positioner


Equipment Hatch
Relative Size

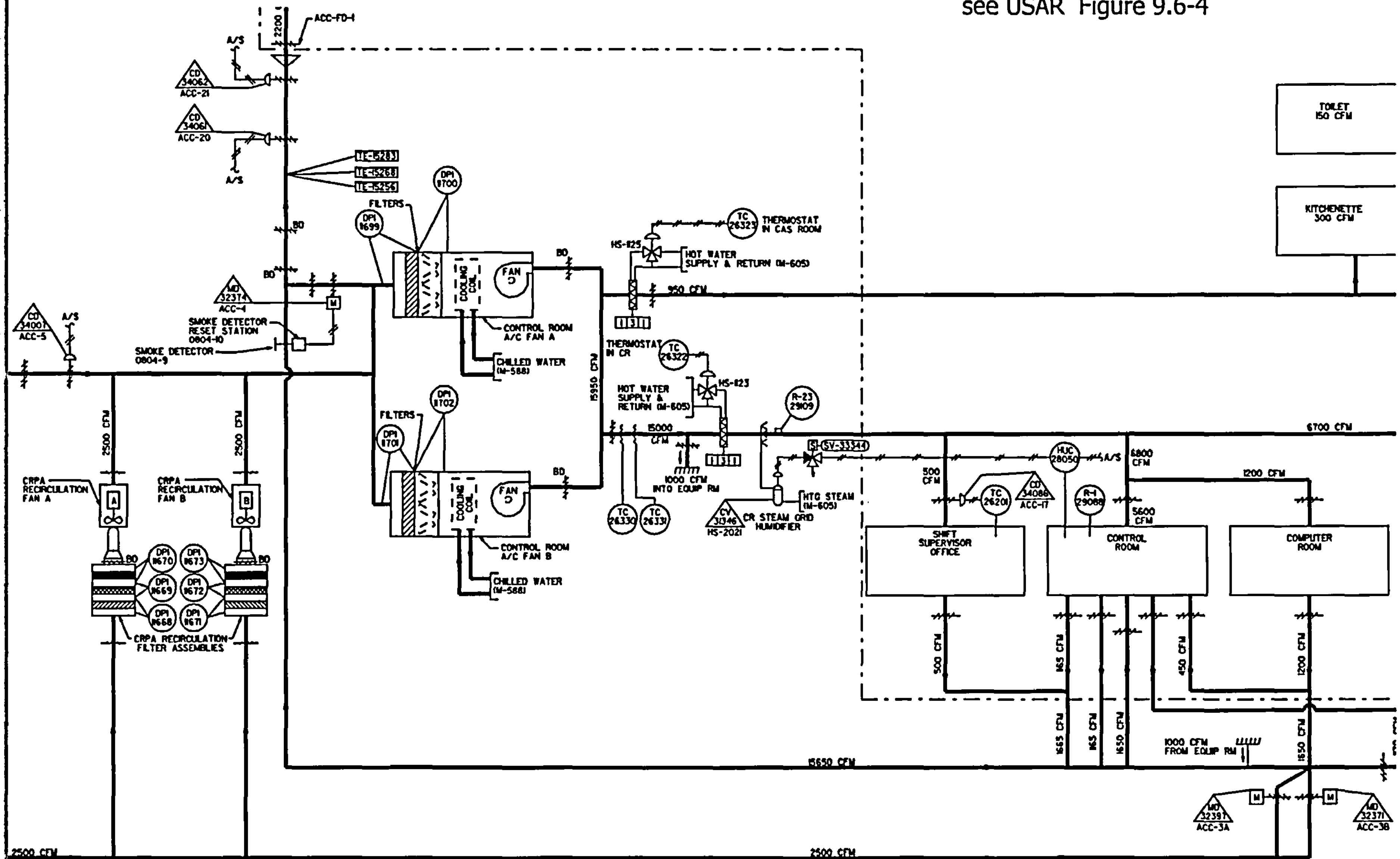



| Item | Description |
|---|---|
| 1 | Beam |
| 2 | Stop |
| 3 & 4 | Trolley |
| 5 | Pivot Point |
| 6 | Swing Bolt |
| 7 | Jactuator |
| 8 & 9 | Sliding Points |
| 10 | Alignment Lug |
| A | Jactuator Chain |
| B | Trolley Chain |

NMC
Committed to Nuclear Excellence

# CR Post Accident Recirc. (simplified)

see USAR Figure 9.6-4



# Technical Specification Changes

- Equipment Hatch Open during Fuel Handling
- Hatch and Airlocks open during head and internals lift
- 24 Hours with Both CRPAR trains OOS
- Verification of capability to close hatch every 7 days

NMC
Committed to Nuclear Excellence

# Differences from ISTS

- Four bolts to hold equipment hatch
- CRPARS Operable in Modes 3 & 4 [5&6]
- End State with CRPARS OOS (Mode 5)
- Toxic Chemical Mode of Operation
- Two CRPARS Trains OOS (non Boundary) enter 3.0.3
- Positive Pressure in Control Room

NMC
Committed to Nuclear Excellence

# Justification Overview

- Based on ISTS
  - 3.9.4 Containment Penetrations
  - 3.7.10 Control Room Emergency Filtration System (CREFS)
  - TSTF 441, Equipment Hatch
- Acceptable Results from Analysis without containment structure credit

| Location | Limit (TEDE) | Analysis Results (TEDE) |
|---|---|---|
| Site Boundary | 6.3 rem | 0.7 rem |
| Low Population Zone | 6.3 rem | 0.11 rem |
| Control Room | 5.0 rem | 1.0 rem |

NMC
Committed to Nuclear Excellence

# GL 2003-01 KNPP Response

- Provide Schedule by 12/5/03 of
  - ASTM E741 Test & Results vs Assumption
  - In-Leakage in Hazardous Chemical Analysis
  - Smoke Assessment
  - TS Changes

NMC
Committed to Nuclear Excellence

# Timeline

- Submittal Date
- Approval - June 30, 2004
- Refueling Outage Fall 2004

NMC
Committed to Nuclear Excellence

## 3.8 REFUELING OPERATIONS

**APPLICABILITY**

Applies to operating limitations during REFUELING OPERATIONS.

**OBJECTIVE**

To ensure that no incident occurs during REFUELING OPERATIONS that would affect public health and safety.

**SPECIFICATION**

a. During REFUELING OPERATIONS:

1. Containment Closure

   a. The equipment hatch ~~shall be closed~~and at least one door in each personnel air lock shall be **closed or** capable of being closed [(1)] ~~in 30 minutes or less. In addition, at least one door in each personnel air lock shall be closed when the reactor vessel head or upper internals are lifted.~~

   b. Each line that penetrates containment and which provides a direct air path from containment atmosphere to the outside atmosphere shall have a closed isolation valve, **or an operable automatic isolation valve, or may be unisolated under administrative controls.**

2. Radiation levels in fuel handling areas, the containment and the spent fuel storage pool, shall be monitored continuously.

3. The reactor will be subcritical for 148 hours prior to movement of its irradiated fuel assemblies. Core subcritical neutron flux shall be continuously monitored by at least two neutron monitors, each with continuous visual indication in the control room and one with audible indication in the containment whenever core geometry is being changed. When core geometry is not being changed at least one neutron flux monitor shall be in service.

4. At least one residual heat removal pump shall be OPERABLE.

5. When there is fuel in the reactor, a minimum boron concentration as specified in the COLR shall be maintained in the Reactor Coolant System during reactor vessel head removal or while loading and unloading fuel from the reactor. The required boron concentration shall be verified by chemical analysis daily.

---

[(1)] Administrative controls ensure that:

- Appropriate personnel are aware that **the equipment hatch or** both personnel air lock doors are open,
- A specified individual(s) is designated and available to close the **equipment hatch and air** lock following a required evacuation of containment, and
- Any obstruction(s) (e.g., cables and hoses) that could prevent closure of an open air lock can be quickly removed.

**BASIS – Refueling Operations (TS 3.8)**

The equipment and general procedures to be utilized during REFUELING OPERATIONS are discussed in the USAR. Detailed instructions, the above specified precautions, and the design of the fuel handling equipment incorporating built-in interlocks and safety features, provide assurance that no incident occurs during the REFUELING OPERATIONS that would result in a hazard to public health and safety.[1] Whenever changes are not being made in core geometry, one flux monitor is sufficient. This permits maintenance of the instrumentation. Continuous monitoring of radiation levels (TS 3.8.a.2) and neutron flux provides immediate indication of an unsafe condition. The residual heat removal pump is used to maintain a uniform boron concentration.

*Containment Closure (TS 3.8.a.1)*

During movement of recently irradiated fuel assemblies (i.e. fuel which has decayed less than 30 days) within containment, a release of fission product radioactivity within containment will be restricted from escaping to the environment when the TS requirements are met. When above COLD SHUTDOWN, this is accomplished by maintaining containment OPERABLE as described in TS 3.6, "Containment." In COLD SHUTDOWN, the potential for containment pressurization as a result of an accident is not likely; therefore, requirements to isolate the containment from the outside atmosphere can be less stringent. The TS requirements are referred to as "containment closure" rather than "containment OPERABILITY." Containment closure means that all potential escape paths are closed or capable of being closed. Since there is no potential for containment pressurization, the Appendix J leakage criteria and tests are not required.

The containment serves to contain fission product radioactivity that may be released from the reactor core following an accident, such that offsite radiation exposures are maintained well within the requirements of 10 CFR 50.67. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following accident conditions.

The containment equipment hatch, which is part of the containment pressure boundary, provides a means for moving large equipment and components into and out of containment. During movement of recently irradiated fuel assemblies within containment, the equipment hatch must be capable of being closed or held in place by at least four swing bolts. Good engineering practice dictates that the bolts required by this TS be approximately equally spaced.

The containment air locks, which are also part of the containment pressure boundary, provide a means for personnel access during operation above COLD SHUTDOWN in accordance with TS 3.6.a, "Containment System Integrity". Each air lock has a door at both ends. The doors are normally interlocked to prevent simultaneous opening when CONTAINMENT INTEGRITY is required. During periods of unit shutdown when containment closure is not required, the door interlock mechanism may be disabled, allowing both doors of an air lock to remain open for extended periods when frequent containment entry is necessary. During movement of recently irradiated fuel assemblies within containment, containment closure is required; therefore, the door interlock

[1] USAR Section 9.5.2

mechanism may remain disabled, but one air lock door must always remain closed or capable of being closed.

The requirements for containment penetration closure provides additional defense–in–depth to further ensure that a release of fission product radioactivity within containment will be restricted to within regulatory limits.

The other containment penetrations that provide direct access from containment atmosphere to outside atmosphere must be isolated on at least one side. Isolation may be achieved by an OPERABLE automatic isolation valve, or by a manual isolation valve, blind flange, or equivalent. Equivalent isolation methods must be approved and may *include use of a material that can provide a temporary, atmospheric pressure, ventilation* barrier for the other containment penetrations during recently irradiated fuel movements.

During REFUELING OPERATIONS or movement of irradiated fuel assemblies within containment, the most severe radiological consequences result from a fuel handling accident involving handling recently irradiated fuel. The fuel handling accident is a postulated event that involves damage to irradiated fuel. Fuel handling accidents, *analyzed include dropping a single irradiated fuel assembly and handling tool or a heavy* object onto other irradiated fuel assemblies (i.e., all rods in one assembly are damaged releasing the gap activity of iodines and noble gases). The requirements of TS 3.8.a.10, refueling cavity water level, in conjunction with a minimum decay time of 100 hours prior to irradiated fuel movement with containment closure capability or a minimum decay time of 30 days without containment closure capability, ensures that the release of fission product radioactivity, subsequent to a fuel handling accident, results in doses that are within the values specified in 10 CFR 50.67 as modified by Regulatory Guide 1.183, Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors" (RG 1.183). The acceptance limits for offsite radiation exposure for a Fuel Handling Accident is listed in RG 1.183 as 6.3 rem TEDE, which is 25% of the 10 CFR 50.67 limits. Containment penetrations satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

This TS limits the consequences of a fuel handling accident involving handling recently irradiated fuel in containment by limiting the potential escape paths for fission product radioactivity released within containment. The TS requires any penetration providing direct access from the containment atmosphere to the outside atmosphere to be closed, have an OPERABLE automatic isolation, or, as in the case of the containment personnel air lock and equipment hatch, capable of being closed.

The TS is modified allowing penetration flow paths with direct access from the containment atmosphere to the outside atmosphere to be unisolated under administrative controls. Administrative controls ensure that 1) appropriate personnel are aware of the open status of the penetration flow path during REFUELING OPERATIONS or movement of irradiated fuel assemblies within containment, and 2) specified individuals are designated and readily available to isolate the flow path in the event of a fuel handling accident.

The containment personnel air lock doors many be open during movement of irradiated fuel in the containment and during REFUELING OPERATIONS provided that one door is capable of being closed in the event of a fuel handling accident. Should a fuel handling accident occur inside containment, one personnel air lock door will be closed following an evacuation of containment.

The containment penetration requirements are applicable during movement of recently irradiated fuel assemblies within containment because this is when there is a potential for the limiting fuel handling accident. When above COLD SHUTDOWN, containment penetration requirements are addressed by TS 3.6. In COLD SHUTDOWN or REFUELING, when movement of irradiated fuel assemblies within containment is not being conducted, the potential for a fuel handling accident does not exist. Additionally, due to radioactive decay, a fuel handling accident involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous 30 days) will result in doses that are well within the guideline values specified in 10 CFR 50.67 even without containment closure capability. Therefore, under these conditions no requirements are placed on containment penetration status.

If the containment equipment hatch, air locks, or any containment penetration that provides direct access from the containment atmosphere to the outside atmosphere is not in the required status, including the Containment Purge and Exhaust Isolation System not capable of automatic actuation when the purge and exhaust valves are open, the unit must be placed in a condition where the isolation function is not needed. This is accomplished by immediately suspending movement of recently irradiated fuel assemblies within containment. Performance of these actions shall not preclude completion of movement of a component to a safe position.

A minimum shutdown margin of greater than or equal to 5% $\Delta k/k$ must be maintained in the core. The boron concentration as specified in the COLR is sufficient to ensure an adequate margin of safety. The specification for REFUELING OPERATIONS shutdown margin is based on a dilution during refueling accident.[2] With an initial shutdown margin of 5% $\Delta k/k$, under the postulated accident conditions, it will take longer than 30 minutes for the reactor to go critical. This is ample time for the operator to recognize the audible high count rate signal, and isolate the reactor makeup water system. Periodic checks of refueling water boron concentration ensure that proper shutdown margin is maintained. Specification 3.8.a.6 allows the control room operator to inform the manipulator operator of any impending unsafe condition detected from the main control board indicators during fuel movement.

Interlocks are utilized during REFUELING OPERATIONS to ensure safe handling. Only one assembly at a time can be handled. The fuel handling hoist is dead weight tested prior to use to assure proper crane operation. It will not be possible to lift or carry heavy objects over the spent fuel pool when fuel is stored therein through interlocks and administrative procedures. Placement of additional spent fuel racks will be controlled by detailed procedures to prevent traverse directly above spent fuel.

The one hundred forty-eight hour decay time following plant shutdown is consistent with the spent fuel pool cooling analysis and also bounds the assumption used in the dose calculation for the fuel handling accident. The requirement for the spent fuel pool sweep system, including charcoal adsorbers, to be operating when spent fuel movement is being made provides added assurance that the off-site doses will be within acceptable limits in the event of a fuel handling accident. The spent fuel pool sweep system is designed to sweep the atmosphere above the refueling pool and release

[2] USAR Section 14.1

## 3.12 CONTROL ROOM POST-ACCIDENT RECIRCULATION SYSTEM

### APPLICABILITY

Applies to the OPERABILITY of the Control Room Post-Accident Recirculation System.

### OBJECTIVE

To specify OPERABILITY requirements for the Control Room Post-Accident Recirculation System.

### SPECIFICATION

a. The reactor shall not be made critical unless the following conditions are satisfied,

1. ~~unless both~~Two trains of the Control Room Post-Accident Recirculation System are OPERABLE, except as provided by TS 3.12.a.2.

2. During power operation or recovery from an inadvertent trip, the following conditions of inoperability may exist during the time interval specified. If OPERABILITY is not restored within the time specified, then within 1 hour action shall be initiated to:

- Achieve HOT STANDBY within the next 6 hours.
- Achieve HOT SHUTDOWN within the following 6 hours.

A. One train of Control Room Post-Accident Recirculation may be out of service for 7 days.

B. Two trains of Control Room Post-Accident Recirculation may be out of service for 24 hours if due to control room boundary failure.

~~Both trains of the Control Room Post-Accident Recirculation System, including filters, shall be OPERABLE or the reactor shall be shut down within 12 hours, except that when one of the two trains of the Control Room Post-Accident Recirculation System is made or found to be inoperable for any reason, reactor operation is permissible only during the succeeding 7 days.~~

b. During REFUELING OPERATIONS or movement of fuel assemblies that have occupied part of a critical reactor within the previous 30 days:

1. Two trains of the Control Room Post-Accident Recirculation System shall be OPERABLE, except as provided by TS 3.12.b.2 and TS 3.12.b.3.

2. One train of Control Room Post-Accident Recirculation System may be out of service provided:

A. The opposite train is in service in the emergency mode or,

B. Movement of fuel assemblies that have occupied part of a critical reactor within the previous 30 days is suspended.

3. **Two trains of Control Room Post-Accident Recirculation System may be out of service provided movement of fuel assemblies that have occupied part of a critical reactor within the previous 30 days is suspended.**

c. During testing the system shall meet the following performance requirements:

1. The results of the in-place cold DOP and halogenated hydrocarbon tests at design flows on HEPA filter and charcoal adsorber banks shall show ≥ 99% DOP removal and ≥ 99% halogenated hydrocarbon removal.

2. The results of the laboratory carbon sample analysis from the Control Room Post-Accident Recirculation System carbon shall show ≥ 95% radioactive methyl iodide removal when tested in accordance with ASTM D3803-89 at conditions of 30°C, and 95% RH.

3. Fans shall operate within ±10% of design flow when tested.

d. **The control room boundary may be opened intermittently under administrative control.**

## BASIS - Control Room Post-Accident Recirculation System (TS 3.12)

The Control Room Post-Accident Recirculation System (CRPARS) is designed to filter the Control Room atmosphere during Control Room isolation conditions. The Control Room Post-Accident Recirculation System is designed to automatically start upon SIS or high radiation signal. The CRPARS consists of two independent, redundant trains that recirculate and filter the control room air. Each train consists of a prefilter, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section, for removal of gaseous activity (principally iodines), and a fan. Ductwork, valves or dampers, and instrumentation also form part of the system.

~~If the system is found to be inoperable, there is no immediate threat to the Control Room and reactor operation may continue for a limited period of time while repairs are being made. If the system cannot be repaired within 7 days, the reactor is placed in HOT STANDBY until the repairs are made.~~ The CRPARS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) for design basis accidents and *fuel handling accidents.*

Two independent and redundant CRPARS trains are required to be OPERABLE to ensure that at least one is available assuming a single failure disables the other train. Total system failure could result in exceeding a dose of 5 rem to the control room operator in the event of a large radioactive release. The CRPARS is considered OPERABLE when the individual components necessary to limit operator exposure are OPERABLE in both trains.

A CRPARS train is OPERABLE when the associated:

a. Fan is OPERABLE,

b. HEPA filters and charcoal adsorbers are not excessively restricting flow, and are capable of performing their filtration functions, and

c. Ductwork, valves, and dampers are OPERABLE, and air circulation can be maintained.

In addition, the control room boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors. Allowing the control room boundary to be opened intermittently under administrative controls modifies the TS. For entry and exit through doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls consist of stationing a dedicated individual at the opening who is in continuous communication with the control room. This individual will have a method to rapidly close the opening when a need for control room isolation is indicated.

When CRITICAL and during REFUELING OPERATION, CRPARS must be OPERABLE to control operator exposure during and following a DBA. In all Modes, the CRPARS is required to cope with a release from the rupture of a gas decay tank (GDT) or the Volume Control Tank (VCT). Although required to cope with a release from the gas decay tank or the Volume Control Tank the requirement does not meet the criteria found in 10 CFR 50.36 for inclusion in Technical Specifications, therefore the requirement for operability of the CRPARS when in all modes due to the presents of radioactive gases in the GDT or VCT is not included in the Technical Specifications. During movement of recently irradiated fuel assemblies, the CRPARS must be OPERABLE to cope with the release from a fuel handling accident [involving handling recently irradiated fuel]. [The CRPARS is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [ ] days), due to radioactive decay.]

When one CRPARS train is inoperable, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE CRPARS train is adequate to perform the control room protection function. However, the overall reliability is reduced because a single failure in the OPERABLE CRPARS train could result in loss of CRPARS function. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and ability of the remaining train to provide the required capability.

If the control room boundary is inoperable when critical, the CRPARS trains cannot perform their intended functions. Actions must be taken to restore an OPERABLE control room boundary within 24 hours. During the period that the control room boundary is inoperable, appropriate compensatory measures (consistent with the intent of GDC 19) should be utilized to protect control room operators from potential hazards such as radioactive contamination, toxic chemicals, smoke, temperature and relative humidity, and physical security. Preplanned measures should be available to address these concerns for intentional and unintentional entry into the condition. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of compensatory measures. The 24 hour Completion time is a typically reasonable time to diagnose, plan and possibly repair, and test most problems with the control room boundary.

When critical, if the inoperable CRPARS train or control room boundary cannot be restored to OPERABLE status within the required Completion Time, the unit must be placed in a MODE that minimizes accident risk. To achieve this status, the unit must be placed in at least HOT SHUTDOWN within 12 hours. The allowed Completion Time is reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

During REFUELING OPERATIONS, if the inoperable CRPARS train cannot be restored to OPERABLE status within the required Completion Time, action must be taken to immediately place the OPERABLE CRPARS train in the emergency mode. This action ensures that the remaining train is OPERABLE, that no failures preventing automatic actuation will occur, and that any active failure would be readily detected. An alternative is to immediately suspend activities that could result in a release of radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk. This does not preclude the movement of fuel to a safe position.

During REFUELING OPERATIONS, with two CRPARS trains inoperable, action must be taken immediately to suspend activities that could result in a release of radioactivity that might enter the control room. This places the unit in a condition that minimizes accident risk. This does not preclude the movement of fuel to a safe position.

If both CRPARS trains are inoperable when critical for reasons other than an inoperable control room boundary, the CRPARS may not be capable of performing the intended

**function and the unit is in a condition outside the accident analyses. Therefore, a plant shutdown as stated in TS 3.12.a.2 must be initiated.**

Accident analysis assumes a charcoal adsorber efficiency of 90%.(1) To ensure the charcoal adsorbers maintain that efficiency throughout the operating cycle, a safety factor of 2 is used. Therefore, if accident analysis assumes a charcoal adsorber efficiency of 90%, this equates to a methyl iodide penetration of 10%. If a safety factor of 2 is assumed, the methyl iodide penetration is reduced to 5%. Thus, the acceptance criteria of 95% efficient will be used for the charcoal adsorbers.

Although committing to ASTM D3803-89, it was recognized that ASTM D3803-89 Standard references Military Standards MIL-F-51068D, Filter, Particulate High Efficiency, Fire Resistant, and MIL-F-51079A, Filter, Medium Fire Resistant, High Efficiency. These specifications have been revised and the latest revisions are, MIL-F-51068F and MIL-F-51079D. These revisions have been canceled and superseded by ASME AG-1, Code on Nuclear Air and Gas Treatment. ASME AG-1 is an acceptable substitution. Consequently, other referenced standards can be substituted if the new standard or methodology is shown to provide equivalent or superior performance to those referenced in ASTM D3803-89.



(1) USAR TABLE 14.3-8, "Major Assumptions for Design Basis LOCA Analysis"

b. Prior to entering INTERMEDIATE SHUTDOWN from COLD SHUTDOWN, if not performed in the previous 92 days, verify each containment isolation manual valve and blind flange that is located inside containment and required to be closed during accident conditions is closed, except for containment isolation valves that are locked sealed or otherwise secured closed or open as allowed by TS 3.6.b.2.

c. Valves and blind flanges in high radiation areas may be verified by use of administrative means.

g. **During REFUELING OPERATIONS with the equipment hatch open, verify the capability to close the equipment hatch every 7 days.**