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U.S. Nuclear Regulatory Commission
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Washington, DC 20555-001

Subject: Duke Power Company LLC d.b.a. Duke Energy Carolinas, LLC

McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370

License Amendment Request Revising McGuire Units 1 and 2 Updated Final Safety Analysis Report Commitments to USNRC Regulatory Guide 1.82, Revision 0, "Sumps For Emergency Core Cooling and Containment Spray Systems" and Revising McGuire Units 1 and 2 Technical Specification Surveillance Requirement (SR) 3.5.2.8 and Associated Bases

In accordance with the provisions of Section 50.90 of Title 10 of the Code of Federal Regulations (10CFR), Duke Power Company LLC d.b.a. Duke Energy Carolinas, LLC (Duke) proposes a license amendment request (LAR) for the Facility Operating Licenses (FOL), Updated Final Safety Analysis Report (UFSAR) and Technical Specifications for the McGuire Nuclear Station, Units 1 and 2. The proposed changes will ensure that plant operations will be consistent with the current licensing basis following the installation of the modified Emergency Core Cooling System (ECCS) containment sump strainer assemblies and enclosures at each of the two (2) McGuire Units.

The purpose of this license amendment request is two fold:

(1): Change the licensing bases for the McGuire Nuclear Station (MNS) Units 1 and 2 ECCS containment sump strainers, as stated in the MNS UFSAR, by revising commitments to USNRC Regulatory Guide 1.82, Revision

 A001

0, "Sumps for Emergency Core Cooling and Containment Spray Systems." The proposed changes are needed to:

- request an exception to Regulatory Positions C.1 and C.2 requiring the physical separation of ECCS containment sumps and/or the requirement to provide a structural barrier between ECCS trains within a common sump. It is Duke's position that ECCS redundancy begins at the suction pipes from the containment sump, and the need to provide ECCS train separation within the common sump strainer is not required due to the absence of any credible failure of the sump strainer,
- request an exception to Regulatory Position C.3, C.6, C.9, C.10, C.12, C.13, and C.14 requiring the use of trash racks. The functions of trash racks are met thru alternative means,
- request an exception to Regulatory Position C.7 to reflect the design of the new strainer, and
- request an exception to Regulatory Position C.8 to reflect the design of the new strainer which incorporates the solid deck feature only for the strainer modules located inside the crane wall. For that portion of the strainer located in the pipechase, vortex suppression function is provided by the horizontal grating, and the shielded pipechase location itself provides protection from missiles.

(2): Revise McGuire Technical Specification Surveillance Requirement (SR) 3.5.2.8 by replacing the phrase "each ECCS train containment sump suction inlet" and "suction inlet trash racks and screens" with the phrase "ECCS containment sump strainer assembly and the associated enclosure." The use of the revised terminology reflects the replacement ECCS containment strainer configuration, which does not include trash racks.

Attachment 1 provides the existing UFSAR page for McGuire Units 1 and 2, marked-up to show the proposed changes.

Attachment 2a provides existing Technical Specifications and Bases pages for McGuire Units 1 and 2, marked-up to show the proposed change.

Attachment 2b provides reprinted Technical Specifications and Bases pages for McGuire Units 1 and 2 incorporating the proposed changes.

Attachment 3 provides Duke's evaluation of the LAR which contains a description of the proposed changes, the technical analysis, the determination that this LAR contains No Significant Hazards Considerations, the basis for the categorical exclusion from performing an Environmental Assessment/Impact Statement, precedents and references.

Attachment 4 provides those Figures referenced by this LAR.

Attachment 5 provides a listing of the Regulatory Commitments made in this LAR. There are two (2) Regulatory Commitments contained in this LAR.

Duke requests NRC review and approval of this LAR by April 26, 2007 in order that it may be implemented prior to McGuire Unit 1 commencing Cycle 19 operations. As previously communicated by Duke's February 9, 2007 letter, McGuire Unit 1 will install the ECCS containment sump strainer modification to support resolution of Generic Safety Issue (GSI) 191, "Assessment of Debris Accumulation on PWR Sump Performance," during its Spring 2007 refueling outage. McGuire Unit 2 is installing the ECCS containment sump strainer modification in two phases. Phase 1 was completed during the Fall 2006 refueling outage. Phase 2 of the installation will be completed during the Spring 2008 outage.

Duke has determined that the NRC's standard 30-day grace period will be acceptable for the administrative implementation of revised Technical Specification SR 3.5.2.8.

With the exception of the proposed change to Regulatory Guide 1.82, Revision 0, Regulatory Position C.7, the proposed licensing basis changes will become effective upon receipt of NRC approval. The proposed change to Regulatory Position C.7 will become effective as each of the McGuire Units enters Mode 4 operations subsequent to completing the ECCS containment sump modification commitments associated with USNRC Generic Letter

2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors." Until such time as those modifications are completed, each McGuire Unit will comply with the current licensing basis commitment to Regulatory Guide 1.82, Revision 0, Regulatory Position C.7.

The completion of chemical effects studies and other evaluations is required to confirm that McGuire's ECCS recirculation functions under debris loading conditions will be in full compliance with the Applicable Regulatory Requirements section of NRC Generic Letter 2004-02.

Revisions to the McGuire UFSAR, necessary to reflect approval of this submittal, will be made in accordance with 10CFR50.71(e).

In accordance with Duke internal procedures and the Quality Assurance Topical Report, the proposed amendment has been reviewed and approved by the McGuire Plant Operations Review Committee and the Duke Corporate Nuclear Safety Review Board.

Pursuant to 10CFR50.91, a copy of this LAR has been forwarded to the appropriate North Carolina state official.

Please direct any questions you may have in this matter to K. L. Ashe at (704) 875-4535.

Very truly yours,

G. R. Peterson

xc w/ Attachments:

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Gary R. Peterson affirms that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth herein are true and correct to the best of his knowledge.

Gary R. Peterson

Gary R. Peterson, Vice President, McGuire Nuclear Station

Subscribed and sworn to me: March 8, 2007
Date

Deana A. DeLoach/Deana A. DeLoach, Notary Public

My commission expires: June 18, 2008
Date

bxc w/attachments:

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MNS Master File (MG01DM)
NRIA/ELL (EC050)
NSRB Support Staff (EC05N)

ATTACHMENT 1

Marked-Up McGuire UFSAR

prevented from blocking the sump by encapsulation, transport qualification, or acceptable interaction pursuant to Regulatory Guide 1.82 (NUREG 0897). Encapsulation prevents the mass insulation from leaving the system piping except for the limited area of direct impingement from a pipe breach. Transport qualification demonstrates the fluid velocities necessary to transport the decimated insulation are below those calculated in the area from the insulation's location to the containment sump. Acceptable interaction has demonstrated the limited quantities of decimated blanket insulation which may reach the containment sump result in acceptable pressure drops across the sump screens. Emergency Core Cooling and Containment Spray Pumps thus maintain adequate net positive suction head.

The reflective insulation or mass (encapsulated/blanket) insulation, which is utilized on high energy piping, is expected to be stripped off during a postulated rupture in the vicinity of the rupture. All insulation in the vicinity of postulated pipe breaks is in the lower Containment area and would pose no problems in clogging drains. However, in the event that a break occurred, and reflective insulation, mass (encapsulated/blanket) insulation or parts thereof were thrown into the ice condenser via the lower inlet door, there is a possibility of clogging a bay drain. Under these circumstances, water would run over to the next bay after exceeding a level of 1 inch in the affected bay.

Non-safety related equipment in the Containment is also designed so as not to become a source of sump blockage.

The containment sump structure design is in conformance with Regulatory Guide 1.82 except that Section C is revised as follows:

C.1.1 A configuration utilizing the containment side structure and floor as the intake structure boundary is considered acceptable for those plants in which the post LOCA water level in the containment is sufficiently high, thus making additional sump depressions in the floor non-productive. Redundance is provided by two separate suction pipes protected by a trash rack, screen and guard pipes.

C.1.2 The containment recirculation intake structure and the suction piping should be protected from high energy piping systems to the extent practical to preclude damage by whipping pipes of high-velocity jets of water or steam.

C.1.4 A curb should be provided around the intake structure to prevent the accumulation of heavy debris against the outer screen.

C.1.7 A vertically mounted fine inner screen should be provided. The design coolant velocity at the inner screen should be approximately 45 cm/sec (1.5 ft/sec). The available surface area used in determining the design coolant velocity should be based on one-half of the free surface area of the fine inner screen to conservatively account for partial blockage. Only the vertical screens should be considered in determining available surface area.

Water is available, for recirculation, from the following sources:

1. Refueling water storage tank
2. Reactor Coolant System
3. Safety Injection System - accumulators
4. Ice Condenser - ice melt

After the usable volume of the refueling water storage tank is transferred to containment during the injection phase of operating, at least 350,000 gallons of water are in the lower compartment of the Containment prior to the start of recirculation. After all the ice has melted, there is an additional 250,000 gallons (minimum) available for recirculation. Water is collected in the refueling cavity during the initial

C.1: A configuration utilizing the containment side structure and floor as the intake structure boundary is considered acceptable for those plants in which the post LOCA water level in the containment is sufficiently high, thus making additional sump depressions in the floor non-productive. Redundance is provided by two separate suction pipes protected by guard pipes.

C.2: The containment recirculation intake structure and suction piping are protected from high energy piping systems to the extent practical to preclude damage by whipping pipes or high-velocity jets of water or steam. ECCS/CSS train separation within the common sump strainer is not required due to the absence of any credible loads which could fail the sump strainer.

C.3: The sump is located on the lowest floor elevation in the containment exclusive of the reactor vessel cavity. A substantial strainer is provided to filter debris from recirculated coolant. The crane wall and containment strainer enclosure act as a primary filter to prevent large debris from reaching the sump strainer.

C.6: The location of the sump strainer assembly provides protection from missiles and large debris. The crane wall and containment strainer enclosure act as a primary filter to prevent large debris from reaching the sump strainer.

C.7: A sump strainer with complex geometry, crediting all effective strainer surface area, is provided that precludes loss of NPSH for ECCS and CSS pumps during the period these components are required to operate.

C.8: Vortex suppression is provided to preclude air entrainment in the recirculated coolant.

C.9: Sump strainers are designed to withstand the vibratory motion of seismic events without loss of structural integrity.

C.10: The size of openings in the sump strainer is based on the minimum restrictions found in systems served by the sump. The minimum restriction takes into account the overall operability of the system served. Strainer perforations are less than 1/10 inch in diameter.

C.12: Materials for the sump strainer assembly and associated enclosure are selected to avoid degradation during periods of inactivity and operation and have low sensitivity to adverse effects such as stress assisted corrosion that may be induced by chemically reactive spray during LOCA conditions.

C.13: The sump strainer assembly and associated enclosure include access openings to facilitate inspection.

C.14: Inservice inspection requirements for ECCS containment sump components (strainer assembly and enclosure) include the following:

a. ECCS containment sump components are inspected during every refueling downtime, and

b. The inspection consists of a visual examination of the components for evidence of structural distress or corrosion.

ATTACHMENT 2a

Marked-Up McGuire Technical Specification and Bases Pages

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.5.2.4	Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.2.5	Verify each ECCS automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	18 months
SR 3.5.2.6	Verify each ECCS pump starts automatically on an actual or simulated actuation signal.	18 months
SR 3.5.2.7	Verify, for each ECCS throttle valve listed below, each position stop is in the correct position. Centrifugal Charging Pump Injection Throttle Valve Number: NI480, NI481, NI482, NI483 Safety Injection Pump Throttle Valve Number: NI488, NI489, NI490, NI491	18 months
SR 3.5.2.8	Verify, by visual inspection, that the ECCS containment sump strainer assembly and the associated enclosure ~~each ECCS train containment sump suction inlet is~~ are not restricted by debris and ~~the suction inlet trash racks and screens~~ show no evidence of structural distress or abnormal corrosion.	18 months

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.5 and SR 3.5.2.6

These Surveillances demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SI signal and that each ECCS pump starts on receipt of an actual or simulated SI signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 18 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for unplanned plant transients if the Surveillances were performed with the reactor at power. The 18 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of ESF Actuation System testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.7

The position of throttle valves in the flow path on an SI signal is necessary for proper ECCS performance. These valves have mechanical locks to ensure proper positioning for restricted flow to a ruptured cold leg, ensuring that the other cold legs receive at least the required minimum flow. The 18 month Frequency is based on the same reasons as those stated in SR 3.5.2.5 and SR 3.5.2.6.

SR 3.5.2.8

Periodic inspections of the ECCS containment sump strainer assembly (consisting of modular tophats, grating, plenums and waterboxes) ~~containment sump~~ and the associated enclosure (the stainless steel structure surrounding the strainer assembly located inside the crane wall) ~~suction inlets~~ ensure ~~that it is~~ they are unrestricted and stay~~s~~ in proper operating condition. Inspections will consist of a visual examination of the exterior surfaces of the strainer assembly and interior and exterior surfaces of the strainer enclosure for any evidence of debris, structural distress, or abnormal corrosion. The intent of the surveillance is to ensure the absence of any condition which could adversely affect strainer functionality. Surveillance performance will not require removal of any tophat modules, but the strainer exteriors shall be visually inspected. This inspection will necessarily entail opening the top of the enclosure to allow access for inspection of the strainers, and to verify cleanliness of the enclosure interior space. This surveillance is not a commitment to inspect 100 percent of the surface area of all tophats or enclosure sides, but a sufficiently detailed inspection of the enclosure and exterior strainer surfaces is required to establish a high confidence that no adverse conditions are present. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and on the need to have access to the location. This Frequency has been found to be sufficient to detect abnormal degradation and is confirmed by operating experience.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
2. 10 CFR 50.46.
3. UFSAR, Section 6.2.1.
4. UFSAR, Chapter 15.
5. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).
6. NRC Memorandum to V. Stello, Jr., from R.L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
7. IE Information Notice No. 87-01.

ATTACHMENT 2b

Reprinted McGuire Technical Specification and Bases Pages

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.4	Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.2.5	Verify each ECCS automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	18 months
SR 3.5.2.6	Verify each ECCS pump starts automatically on an actual or simulated actuation signal.	18 months
SR 3.5.2.7	Verify, for each ECCS throttle valve listed below, each position stop is in the correct position. Centrifugal Charging Pump Injection Throttle Valve Number: NI480, NI481, NI482, NI483 Safety Injection Pump Throttle Valve Number: NI488, NI489, NI490, NI491	18 months
SR 3.5.2.8	Verify, by visual inspection, that the ECCS containment sump strainer assembly and the associated enclosure are not restricted by debris and show no evidence of structural distress or abnormal corrosion.	18 months

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.2 ECCS—Operating

BASES

BACKGROUND

The function of the ECCS is to provide core cooling and negative reactivity to ensure that the reactor core is protected after any of the following accidents:

a. Loss of coolant accident (LOCA), coolant leakage greater than the capability of the normal charging system;

b. Rod ejection accident;

c. Loss of secondary coolant accident, including uncontrolled steam or feedwater release; and

d. Steam generator tube rupture (SGTR).

The addition of negative reactivity is designed primarily for the loss of secondary coolant accident where primary cooldown could add enough positive reactivity to achieve criticality and return to significant power.

There are three phases of ECCS operation: injection, cold leg recirculation, and hot leg recirculation. In the injection phase, water is taken from the refueling water storage tank (RWST) and injected into the Reactor Coolant System (RCS) through the cold legs. When sufficient water is removed from the RWST to ensure that enough boron has been added to maintain the reactor subcritical and the containment sumps have enough water to supply the required net positive suction head to the ECCS pumps, suction is switched to the containment sump for cold leg recirculation. When the core decay heat has decreased to a level low enough to be successfully removed without direct RHR pump injection flow, the RHR cold leg injection path is realigned to discharge to the auxiliary containment spray header. After approximately 7 hours, part of the ECCS flow is shifted to the hot leg recirculation phase to provide a backflush which, for a cold leg break, would reduce the boiling in the top of the core and prevent excessive boron concentration.

The ECCS consists of three separate subsystems: centrifugal charging (high head), safety injection (SI) (intermediate head), and residual heat removal (RHR) (low head). Each subsystem consists of two redundant, 100% capacity trains. The ECCS accumulators and the RWST are also part of the ECCS, but are not considered part of an ECCS flow path as described by this LCO.

BACKGROUND (continued)

The ECCS flow paths consist of piping, valves, heat exchangers, and pumps such that water from the RWST can be injected into the RCS following the accidents described in this LCO. The major components of each subsystem are the centrifugal charging pumps, the RHR pumps, heat exchangers, and the SI pumps. Each of the three subsystems consists of two 100% capacity trains that are interconnected and redundant such that either train is capable of supplying 100% of the flow required to mitigate the accident consequences. This interconnecting and redundant subsystem design provides the operators with the ability to utilize components from opposite trains to achieve the required 100% flow to the core.

During the injection phase of LOCA recovery, a suction header supplies water from the RWST to the ECCS pumps. Mostly separate piping supplies each subsystem and each train within the subsystem. The discharge from the centrifugal charging pumps combines, then divides again into four supply lines, each of which feeds the injection line to one RCS cold leg. The discharge from the SI and RHR pumps divides and feeds an injection line to each of the RCS cold legs. Throttle valves in the SI lines are set to balance the flow to the RCS. This balance ensures sufficient flow to the core to meet the analysis assumptions following a LOCA in one of the RCS cold legs. The flow split from the RHR lines cannot be adjusted. Although much of the two ECCS trains are composed of completely separate piping, certain areas are shared between trains. The most important of these are 1) where both trains flow through a single physical pipe, and 2) at the injection connections to the RCS cold legs. Since each train must supply sufficient flow to the RCS to be considered 100% capacity, credit is taken in the safety analyses for flow to three intact cold legs. Any configuration which, when combined with a single active failure, prevents the flow from either ECCS pump in a given train from reaching all four cold legs injection points on that train is unanalyzed and might render both trains of that ECCS subsystem inoperable.

For LOCAs that are too small to depressurize the RCS below the shutoff head of the SI pumps, the centrifugal charging pumps supply water until the RCS pressure decreases below the SI pump shutoff head. During this period, the steam generators are used to provide part of the core cooling function.

During the recirculation phase of LOCA recovery, RHR pump suction is transferred to the containment sump. The RHR pumps then supply the other ECCS pumps. Initially, recirculation is through the same paths as the injection phase. Subsequently, for large LOCAs, the recirculation phase includes injection into both the hot and cold legs.

BACKGROUND (continued)

The high and intermediate head subsystems of the ECCS also functions to supply borated water to the reactor core following increased heat removal events, such as a main steam line break (MSLB). The limiting design conditions occur when the moderator temperature coefficient is highly negative, such as at the end of each cycle.

During low temperature conditions in the RCS, limitations are placed on the maximum number of ECCS pumps that may be OPERABLE. Refer to the Bases for LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System," for the basis of these requirements.

The ECCS subsystems are actuated upon receipt of an SI signal. The actuation of safeguard loads is accomplished in a programmed time sequence. If offsite power is available, the safeguard loads start immediately in the programmed sequence. If offsite power is not available, the Engineered Safety Feature (ESF) buses shed normal operating loads and are connected to the emergency diesel generators (EDGs). Safeguard loads are then actuated in the programmed time sequence. The time delay associated with diesel starting, sequenced loading, and pump starting determines the time required before pumped flow is available to the core following a safety injection actuation.

The active ECCS components, along with the passive accumulators and the RWST covered in LCO 3.5.1, "Accumulators," and LCO 3.5.4, "Refueling Water Storage Tank (RWST)," provide the cooling water necessary to meet GDC 35 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The LCO helps to ensure that the following acceptance criteria for the ECCS, established by 10 CFR 50.46 (Ref. 2), will be met following a small break LOCA and there is a high level of probability that the criteria are met following a large break LOCA:

a. Maximum fuel element cladding temperature is ≤ 2200°F;

b. Maximum cladding oxidation is ≤ 0.17 times the total cladding thickness before oxidation;

c. Maximum hydrogen generation from a zirconium water reaction is ≤ 0.01 times the hypothetical amount generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react;

APPLICABLE SAFETY ANALYSES (continued)

d. Core is maintained in a coolable geometry; and

e. Adequate long term core cooling capability is maintained.

The LCO also limits the potential for a post trip return to power following an MSLB event and ensures that containment pressure and temperature limits are met.

Each ECCS subsystem is taken credit for in a large break LOCA event at full power (Refs. 3 and 4). This event has the greatest potential to challenge the limits on runout flow set by the manufacturer of the ECCS pumps. It also sets the maximum response time for their actuation. Direct flow from the centrifugal charging pumps and SI pumps is credited in a small break LOCA event. The RHR pumps are also credited, for larger small break LOCAs, as the means of supplying suction to these higher head ECCS pumps after the switch to sump recirculation. This event establishes the flow and discharge head at the design point for the centrifugal charging pumps. The MSLB analysis also credits the SI and centrifugal charging pumps. Although some ECCS flow is necessary to mitigate a SGTR event, a single failure disabling one ECCS train is not the limiting single failure for this transient. The SGTR analysis primary to secondary break flow is increased by the availability of both centrifugal charging and SI trains. Therefore, the SGTR analysis is penalized by assuming both ECCS trains are operable as required by the LCO. The OPERABILITY requirements for the ECCS are based on the following LOCA analysis assumptions:

a. A large break LOCA event, with loss of offsite power and a single failure disabling one ECCS train; and

b. A small break LOCA event, with a loss of offsite power and a single failure disabling one ECCS train.

During the blowdown stage of a LOCA, the RCS depressurizes as primary coolant is ejected through the break into the containment. The nuclear reaction is terminated either by moderator voiding during large breaks or control rod insertion for small breaks. Following depressurization, emergency cooling water is injected into the cold legs, flows into the downcomer, fills the lower plenum, and refloods the core.

The effects on containment mass and energy releases are accounted for in appropriate analyses (Ref. 3). The LCO ensures that an ECCS train will deliver sufficient water to match boiloff rates soon enough to minimize the consequences of the core being uncovered following a large LOCA.

APPLICABLE SAFETY ANALYSES (continued)

It also ensures that the centrifugal charging and SI pumps will deliver sufficient water and boron during a small LOCA to maintain core subcriticality. For smaller LOCAs, the centrifugal charging pump delivers sufficient fluid to maintain RCS inventory. For a small break LOCA, the steam generators continue to serve as the heat sink, providing part of the required core cooling.

The ECCS trains satisfy Criterion 3 of 10 CFR 50.36 (Ref. 5).

LCO

In MODES 1, 2, and 3, two independent (and redundant) ECCS trains are required to ensure that sufficient ECCS flow is available, assuming a single failure affecting either train. Additionally, individual components within the ECCS trains may be called upon to mitigate the consequences of other transients and accidents.

In MODES 1, 2, and 3, an ECCS train consists of a centrifugal charging subsystem, an SI subsystem, and an RHR subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an SI signal and automatically transferring suction to the containment sump.

During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWST to the RCS via the ECCS pumps and their respective supply headers to each of the four cold leg injection nozzles. In the long term, this flow path may be switched to take its supply from the containment sump and to supply its flow to the RCS hot and cold legs. The flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains.

APPLICABILITY

In MODES 1, 2, and 3, the ECCS OPERABILITY requirements for the limiting Design Basis Accident, a large break LOCA, are based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The centrifugal charging pump performance is based on a small break LOCA, which establishes the pump performance curve and has less dependence on power. The SI pump performance requirements are based on a small break LOCA. For both of these types of pumps, the large break LOCA analysis depends only on the flow value at containment pressure, not on the shape of the flow versus pressure curve at higher pressures. MODE 2 and MODE 3 requirements are bounded by the MODE 1 analysis.

APPLICABILITY (continued)

This LCO is only applicable in MODE 3 and above. Below MODE 3, the SI signal setpoint is manually bypassed by operator control, and system functional requirements are relaxed as described in LCO 3.5.3, "ECCS—Shutdown."

As indicated in the Note, the flow path may be isolated for 2 hours in MODE 3, under controlled conditions, to perform pressure isolation valve testing per SR 3.4.14.1. The flow path is readily restorable from the control room.

In MODES 5 and 6, plant conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops—MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops—MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation—High Water Level," and LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation—Low Water Level."

ACTIONS

A.1

With one or more trains inoperable and at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available, the inoperable components must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC reliability evaluation (Ref. 6) and is a reasonable time for repair of many ECCS components.

An ECCS train is inoperable if it is not capable of delivering design flow to the RCS. Individual components are inoperable if they are not capable of performing their design function or supporting systems are not available.

The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one component in a train does not render the ECCS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The intent of this Condition is to maintain a combination of equipment such that 100% of the ECCS flow equivalent to a single OPERABLE ECCS train remains available. This allows increased flexibility in plant operations under circumstances when components in opposite trains are inoperable.

ACTIONS (continued)

An event accompanied by a loss of offsite power and the failure of an EDG can disable one ECCS train until power is restored. A reliability analysis (Ref. 6) has shown that the impact of having one full ECCS train inoperable is sufficiently small to justify continued operation for 72 hours.

Reference 7 describes situations in which one component, such as an RHR crossover valve, can disable both ECCS trains. With one or more component(s) inoperable such that 100% of the flow equivalent to a single OPERABLE ECCS train is not available, the facility is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be immediately entered.

B.1 and B.2

If the inoperable trains cannot be returned to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 6 hours and MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1

Verification of proper valve position ensures that the flow path from the ECCS pumps to the RCS is maintained. Misalignment of these valves could render both ECCS trains inoperable. Securing these valves using the power disconnect switches in the correct position ensures that they cannot change position as a result of an active failure or be inadvertently misaligned. These valves are of the type, described in Reference 7, that can disable the function of both ECCS trains and invalidate the accident analyses. A 12 hour Frequency is considered reasonable in view of other administrative controls that will ensure a mispositioned valve is unlikely.

SR 3.5.2.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing,

SURVEILLANCE REQUIREMENTS (continued)

or securing. A valve that receives an actuation signal is allowed to be in a nonaccident position provided the valve will automatically reposition within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position. The 31 day Frequency is appropriate because the valves are operated under administrative control.

This Frequency has been shown to be acceptable through operating experience.

SR 3.5.2.3

ECCS piping is verified to be water-filled by venting to remove gas from accessible locations susceptible to gas accumulation. Alternative means may be used to verify water-filled conditions (e.g., ultrasonic testing or high point sightglass observation). Maintaining the piping from the ECCS pumps to the RCS full of water ensures that the system will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent water hammer, pump cavitation, and pumping of noncondensible gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an SI signal or during shutdown cooling. The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the procedural controls governing system operation.

SR 3.5.2.4

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by Section XI of the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the plant safety analysis. SRs are specified in the Inservice Testing Program, which encompasses Section XI of the ASME Code. Section XI of the ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.5 and SR 3.5.2.6

These Surveillances demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SI signal and that each ECCS pump starts on receipt of an actual or simulated SI signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 18 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for unplanned plant transients if the Surveillances were performed with the reactor at power. The 18 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of ESF Actuation System testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.7

The position of throttle valves in the flow path on an SI signal is necessary for proper ECCS performance. These valves have mechanical locks to ensure proper positioning for restricted flow to a ruptured cold leg, ensuring that the other cold legs receive at least the required minimum flow. The 18 month Frequency is based on the same reasons as those stated in SR 3.5.2.5 and SR 3.5.2.6.

SR 3.5.2.8

Periodic inspections of the ECCS containment sump strainer assembly (consisting of modular tophats, grating, plenums and waterboxes) and the associated enclosure (the stainless steel structure surrounding the strainer assembly located inside the crane wall) ensure they are unrestricted and stay in proper operating condition. Inspections will consist of a visual examination of the exterior surfaces of the strainer assembly and interior and exterior surfaces of the strainer enclosure for any evidence of debris, structural distress, or abnormal corrosion. The intent of the surveillance is to ensure the absence of any condition which could adversely affect strainer functionality. Surveillance performance will not require removal of any tophat modules, but the strainer exteriors shall be visually inspected. This inspection will necessarily entail opening the top of the enclosure to allow access for inspection of the strainers, and to verify cleanliness of the enclosure interior space. This surveillance is not a commitment to inspect 100 percent of the surface area of all tophats or enclosure sides, but a sufficiently detailed inspection of the enclosure and exterior strainer surfaces is required to establish a high confidence that no adverse conditions are present. The 18 month Frequency is based

BASES

SURVEILLANCE REQUIREMENTS (continued)

on the need to perform this Surveillance under the conditions that apply during a plant outage and on the need to have access to the location. This Frequency has been found to be sufficient to detect abnormal degradation and is confirmed by operating experience.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
2. 10 CFR 50.46.
3. UFSAR, Section 6.2.1.
4. UFSAR, Chapter 15.
5. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).
6. NRC Memorandum to V. Stello, Jr., from R.L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
7. IE Information Notice No. 87-01.

ATTACHMENT 3

DESCRIPTION

Pursuant to 10CFR50.90, Duke Energy Carolinas, LLC (Duke) proposes a license amendment request (LAR) for the Facility Operating License (FOL) and Updated Final Safety Analysis Report (UFSAR) for McGuire Nuclear Station, Units 1 and 2.

The proposed license amendment seeks to revise existing commitments to USNRC Regulatory Guide 1.82, Revision 0, "Sumps for Emergency Core Cooling and Containment Spray Systems," as stated in the McGuire Nuclear Station (MNS) Unit 1 and Unit 2 UFSAR.

The proposed changes will ensure that plant operations will be consistent with the current licensing basis following the installation of the modified Emergency Core Cooling System (ECCS) containment sump strainer assemblies and enclosures at each of the two (2) McGuire Units.

Additionally, the License Amendment Request seeks to revise McGuire Technical Specification Surveillance Requirement (SR) 3.5.2.8 by replacing the phrase "each ECCS train containment sump suction inlet" and "suction inlet trash racks and screens" with the phrase "ECCS containment sump strainer assembly and the associated enclosure."

BACKGROUND

Emergency Core Cooling System Description

The function of the ECCS is to provide core cooling and negative reactivity to ensure that the reactor core is protected after any of the following accidents:

a. Loss of coolant accident (LOCA), coolant leakage greater than the capability of the normal charging system;

b. Rod ejection accident;

c. Loss of secondary coolant accident, including uncontrolled steam or feedwater release; and

d. Steam generator tube rupture (SGTR).

The ECCS consists of three separate subsystems: centrifugal charging (high head), safety injection (SI) (intermediate head), and residual heat removal (RHR) (low head). Each subsystem consists of two redundant, 100 percent capacity trains. The ECCS accumulators and the Refueling Water Storage Tank (RWST) are also part of the ECCS.

There are three phases of ECCS operation: injection, cold leg recirculation, and hot leg recirculation. In the injection phase, water is taken from the RWST and injected into the Reactor Coolant System (RCS) through the cold legs. When RWST level reaches the low level set point (and sufficient water is removed from the RWST to ensure that enough boron has been added to maintain the reactor subcritical and the ECCS containment sump has enough water to supply the required net positive suction head to the ECCS pumps and prevent vortexing), suction is switched to the ECCS containment sump for cold leg recirculation. When the core decay heat has decreased to a level low enough to be successfully removed without direct Residual Heat Removal (RHR) pump injection flow (following swap-over to cold leg recirculation), RHR cold leg injection would be realigned to discharge to the auxiliary containment spray header if containment pressure is greater than 3 psig.

During the cold leg recirculation phase of LOCA recovery, RHR pump suction is transferred to the ECCS containment sump. The RHR pumps then supply the other ECCS pumps (piggy-back mode). Initially, recirculation is through the same paths as the injection phase. Subsequently, for large LOCAs, the recirculation phase includes injection into both the hot and cold legs.

The primary purpose of the Containment Spray System (CSS) is to spray cool water into the Containment atmosphere, when appropriate, in the event of a LOCA and thereby assure the Containment pressure does not exceed containment design pressure.

During the recirculation phases, containment cooling is provided by the recirculation of water from the

ECCS containment sump by the Containment Spray (CS) pumps through the CS heat exchangers and back to the containment via the spray nozzles.

The McGuire ECCS containment sump provides a long term source of cooling water to the ECCS and CS System. In general, the 725 foot floor elevation in the Containment Building is considered the ECCS containment sump; i.e., there are no ECCS train-specific separate collection pits provided. The ECCS containment sump collects ice condenser melt, reactor coolant system spill (including ECCS injection water), and containment spray water and provides water for the ECCS recirculation phase. Two suction lines (the ECCS recirculation lines) are provided. Each ECCS recirculation line supplies one train of ECCS and one containment spray pump. The ECCS recirculation lines are located on either side of the 180° azimuth in the Unit 1 and 2 Reactor Buildings. The lower elevation of the containment collects sufficient volume of water following the injection phase of safety injection to allow for the initiation of recirculation. Water collected in lower containment reaches the ECCS containment sump suction lines in the pipechase (outside the crane wall) by flowing through multiple penetrations in the crane wall located near the containment floor level.

Generic Safety Issue 191

Generic Safety Issue 191 (GSI-191), "Assessment of Debris Accumulation on PWR Sump Performance," discusses the possibility that debris could accumulate on the containment sump screen, resulting in a loss of net positive suction head (NPSH) margin to the ECCS and/or CSS pumps. This loss of NPSH margin may impede or prevent the flow of water needed to meet the criteria of 10CFR50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Reactors." §50.46 requires that licensees design their ECCS System to meet specific criteria, one of which is the capability to provide long-term cooling and decay heat removal.

NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," requested that licensees verify compliance with regulatory requirements and ensure that any interim risks associated with post-accident debris blockage were minimized while evaluations of sump issues proceeded.

Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," states that the current 50 percent screen blockage assumption identified in Regulatory Guide (RG) 1.82, Revision 0, "Sumps for Emergency Core Cooling and Containment Spray Systems," should be replaced with a more comprehensive means of assessing debris effects on a plant-specific basis. The 50 percent screen blockage assumption did not require a plant-specific evaluation of the debris-blockage vulnerability and potentially results in non-conservative guidance for screen blockage effects.

As stated in Duke's letters of March 1 and September 1, 2005, McGuire confirmed the ECCS and CSS recirculation functions under debris loading conditions would be in compliance with the regulatory positions listed in the Regulatory Requirements Section of Generic Letter 2004-02. The design of the modified ECCS containment sump structure will accommodate the effects of debris loading as determined by baseline and refined evaluations specific to McGuire. These evaluations use the guidance of NEI 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology," Revision 0, dated December 2004, as amended by the NRC's Safety Evaluation Report.

As previously communicated by McGuire's February 9, 2007 letter, Unit 1 will install the ECCS containment sump strainer modification to support resolution of GSI-191, "Assessment of Debris Accumulation on PWR Sump Performance," during its Spring 2007 refueling outage. McGuire Unit 2 is installing the containment sump strainer modification in two phases. Phase 1 of the installation was completed during the Fall 2006 outage. Phase 2 of the installation will be completed during the Spring 2008 outage.

ECCS Containment Sump Design

Original ECCS Containment Sump Design

McGuire's original ECCS design incorporated the advantages of a remote containment recirculation sump. Locating the ECCS containment sump structure outside the crane wall (in the pipechase) provides protection from impacts and/or direct exposure to break-generated debris from limiting large break LOCAs.

The as-built configuration of the McGuire Unit 1 ECCS containment sump structure (and original Unit 2 ECCS containment sump structure) is illustrated by McGuire UFSAR Figure 6-196 (see Figure 1 of Attachment 4). For each Unit, the ECCS containment sump structure consists of stainless steel framing that provides the structure for attachment of a stainless steel fine mesh inner screen and an outer trash rack grating. A solid top deck is provided.

The train-specific suction pipes exit lower containment through horizontal penetrations incorporating guard pipes. Each open-ended sump suction inlet line originates in the interior of its train-specific strainer enclosure (see Figure 1). The net screen surface area provided by both ECCS trains is approximately 135 square feet, or 67.5 square feet per train.

Modified ECCS Containment Sump Design

The McGuire strainer modification removes the original ECCS containment sump structure described above and replaces it with a complex strainer assembly located inside and outside the crane wall (see Figures 2, 3A and 3B of Attachment 4). The plenums and strainer portions located Inside the Crane Wall (ICW) are housed within a stainless steel enclosure that preserves the original 'remote sump' design.

The ICW stainless steel enclosure is constructed using a structural framework and grating, covered by 14 gage plating. Enclosure side plating is perforated with 3/32 inch nominal diameter holes, and the enclosure top is solid plate.

Outside the crane wall (in the pipechase), the two train-specific ECCS/CSS recirculation lines connect directly to the main waterboxes via 18 inch diameter piping. The two pipechase waterboxes are interconnected to one another via plenums and connected to the ICW strainer assemblies by 18 inch diameter pipes that pass through crane wall penetrations.

The strainer elements are stainless steel tubular modules (tophats) constructed from two concentric, rolled perforated plates. The openings in the strainer perforated plate are 3/32 inch diameter nominal (see Figures 4 and 5 of Attachment 4). Sandwiched between the concentric tubes of each tophat module is a bypass eliminator, fabricated from fine knitted wire. This component is designed to further filter fine entrained debris that has already penetrated the perforated strainer exterior.

Horizontal vortex suppressors are installed above the tophat strainer assemblies located in the pipechase. Vortex suppression for ICW strainer assemblies is provided by the solid top deck of the enclosure.

Each Unit's new ECCS containment sump strainer assembly and enclosure are nuclear safety-related and designed to withstand safe shutdown earthquake loadings and protected from tornado missiles by virtue of being located within the Containment Building which, in turn, is protected by the seismically designed Reactor Building. The structures are passive assemblies (i.e., no moving parts) qualified for the design environmental conditions of the sump. These structures are designed for the containment sub-compartment differential pressures from the limiting case pressurizer surge line pipe break[1].

[1] Duke obtained permission to use Leak-Before-Break (LBB) methodology as relief from the requirements GDC-4 as they apply to the dynamic effects of a LOCA from a break of the Reactor Coolant main loop (references 3 and 4). However, it does not apply to smaller diameter branch piping. The 14 inch pressurizer surge line is the limiting pipe branch in terms of size and energy content of the break. LBB methodology was not used in the GSI-191 determination of debris generated as a result of a LOCA.

The objective of the new strainer design is to provide debris filtration with acceptable head loss at the postulated debris loads and to ensure adequate NPSH to the ECCS/CSS pumps during the post-LOCA recirculation phases. When completed, the installation of the revised ECCS containment sump design is intended to resolve concerns associated with GSI-191. The completion of chemical effects studies and other evaluations is required to confirm that McGuire's ECCS recirculation functions under debris loading conditions will be in full compliance with the Applicable Regulatory Requirements section of NRC Generic Letter 2004-02. The ECCS sump strainer modification enhances the original design by providing a larger surface area for the filtration of debris; for Unit 1, the total strainer area will increase from 135 square feet to approximately 1740 square feet, and for Unit 2, the total strainer area will increase to about 1640 square feet.

PROPOSED CHANGES

Original Licensing Basis

Section 6.5 of the McGuire FSAR, Rev 9, dated December 5, 1975, contains the following statements:

> The containment sump structure design is in conformance with Regulatory Guide 1.82 except that Section C [of Regulatory Guide 1.82, Rev 0] is revised as follows:
>
> C.1 - A configuration utilizing the containment side structure and floor as the intake structure boundary is considered acceptable for those plants in which the post LOCA water level in the containment is sufficiently high, thus making additional sump depressions in the floor non-productive. Redundancy is provided by two separate suction pipes protected by a trash rack, screen and guard pipes.
>
> C.2 - The containment recirculation intake structure and suction piping should be protected from high energy piping systems to the extent

practical to preclude damage by whipping pipes or high-velocity jets of water or steam.

C.4 - A curb should be provided around the intake structure to prevent the accumulation of heavy debris against the outer screen.

C.7 - A vertically mounted fine inner screen should be provided. The design coolant velocity at the inner screen should be approximately 45 cm/sec (1.5 ft/sec). The available surface area used in determining the design coolant velocity should be based on one-half of the free surface area of the fine inner screen to conservatively account for partial blockage. Only the vertical screens should be considered in determining available surface area.

NUREG 0422, "Safety Evaluation Report by the Office of Nuclear Reactor Regulation US Nuclear Regulatory Commission in the Matter of Duke Power Company McGuire Nuclear Station Units 1 and 2," dated March 1, 1978, contains the following statements:

The applicant has provided a malfunction analysis and other information which demonstrates independence of the redundant spray trains and return air fan systems. Each spray train has its own recirculation piping suction inlet from a common sump. The sump is protected by grating and screening to prevent debris from passing into the suction lines. (Reference: Section 6.2.3).

We therefore conclude that the design of the containment heat removal system conforms to all applicable regulations and guides and is acceptable. The basis for our acceptance is conformance to General Design Criterion 38, 39, 40 and 50 and Regulatory Guides 1.26, "Quality Group Classification and Standards for Water-, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," 1.29, "Seismic Design Classification," and 1.82, "Sumps for Emergency Core Cooling and Containment Spray System." (Reference: Section 6.2.3).

NUREG-0422, Supplement 3, dated May 1980, Appendix A, Section A-43, "Containment Emergency Sump Reliability," includes following:

> Currently, regulatory positions regarding sump design are presented in Regulatory Guide 1.82, 'Sumps for Emergency Core Cooling and Containment Spray Systems,' which address debris (insulation). The Regulatory Guide recommends, in addition to providing redundant separated sumps, that two protective screens be provided.
>
> ...As indicated in Section 6.3.3 of Supplement 2 [to NUREG 0422, dated March 1, 1979] the applicant has performed out-of-plant scale model tests of the McGuire Units 1 and 2 containment sump design. The test identified the need for several design modifications that were subsequently incorporated into plant design. The applicant has demonstrated that there is reasonable assurance that the sump design would perform as expected following a LOCA and therefore is acceptable.
>
> ...Accordingly, we have concluded that McGuire Units 1 and 2 can be operated ... without endangering the health and safety of the public.

Current Licensing Basis

The current licensing basis (with approved revisions to be added to the printed copy of UFSAR Rev 13, dated May 11, 2007) regarding design requirements for the ECCS containment sump are described in McGuire's UFSAR Section 6.5. These design requirements are described as follows:

> The containment sump structure design is in conformance with Regulatory Guide 1.82 except that Section C is revised as follows:
>
> C.1.1 A configuration utilizing the containment side structure and floor as the intake structure boundary is considered acceptable for those plants in which the post LOCA water level in the containment is sufficiently high,

thus making additional sump depressions in the floor non-productive. Redundance is provided by two separate suction pipes protected by a trash rack, screen and guard pipes.

C.1.2 The containment recirculation intake structure and the suction piping should be protected from high energy piping systems to the extent practical to preclude damage by whipping pipes of high-velocity jets of water or steam.

C.1.7 (Unit 1): A vertically mounted fine inner screen should be provided. The design coolant velocity at the inner screen should be approximately 45 cm/sec (1.5 ft/sec). The available surface area used in determining the design coolant velocity should be based on one-half of the free surface area of the fine inner screen to conservatively account for partial blockage. Only the vertical screens should be considered in determining available surface area.

(Unit 2): A sump strainer with complex geometry is provided, crediting all available strainer surface area. The design coolant velocity is less than 0.2 ft/sec based on one-half of the free surface area of the strainer available.

C.1.8 (Unit 2) A solid top deck is provided for the strainer portion located inside the crane wall. No solid top deck is required for the pipechase portion of the containment sump strainer; vortex suppression for strainers in this region is provided by grating. (There are no pipe whip or water/steam jet loads in the pipechase, therefore, a solid top deck is not necessary).

Proposed Licensing Basis Changes

This proposed License Amendment Request seeks to modify the licensing bases for the McGuire Nuclear Station (MNS) Unit 1 and Unit 2, ECCS containment sump, as stated in the UFSAR, by revising current commitments to USNRC Regulatory Guide 1.82, Revision 0, "Sumps For Emergency Core Cooling and Containment Spray Systems."

McGuire's proposed changes from Regulatory Guide 1.82, Revision 0 are listed in Table 1:

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.1: A minimum of two sumps should be provided, each with sufficient capacity to serve one of the redundant halves of the ECCS and CSS systems.	A configuration utilizing the containment side structure and floor as the intake structure boundary is considered acceptable for those plants in which the post LOCA water level in the containment is sufficiently high, thus making additional sump depressions in the floor non-productive. Redundance is provided by two separate suction pipes protected by a trash rack, screen and guard pipes.	A configuration utilizing the containment side structure and floor as the intake structure boundary is considered acceptable for those plants in which the post LOCA water level in the containment is sufficiently high, thus making additional sump depressions in the floor non-productive. Redundance is provided by two separate suction pipes protected by guard pipes.

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.2: Redundant sumps should be physically separated from each other and from high-energy piping systems by structural barriers to the extent practical, to preclude damage to the sump intake filters by whipping pipes or high-velocity jets of water or steam.	The containment recirculation intake structure and suction piping should be protected from high energy piping systems to the extent practical to preclude damage by whipping pipes or high-velocity jets of water or steam.	The containment recirculation intake structure and suction piping are protected from high energy piping systems to the extent practical to preclude damage by whipping pipes or high-velocity jets of water or steam. ECCS/CSS train separation within the common sump strainer is not required due to the absence of any credible loads which could fail the sump strainer.

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.3: The sumps should be located on the lowest floor elevation in the containment exclusive of the reactor vessel cavity. At a minimum, the sump intake should be protected by two screens (1) an outer trash rack and (2) a fine inner screen. The sump screens should not be depressed below the floor elevation.	Conforms to Regulatory Position.	The sump is located on the lowest floor elevation in the containment exclusive of the reactor vessel cavity. A substantial strainer is provided to filter debris from recirculated coolant. The crane wall and containment strainer enclosure act as a primary filter to prevent large debris from reaching the sump strainer.
C.4: The floor level in the vicinity of the coolant sump location should slope gradually down away from the sump.	*Conforms to Regulatory Position. *Approved revision to be added to UFSAR Rev 13, dated May 11, 2007.	None.

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.5: All drains from the upper regions of the reactor building should terminate in such a manner that direct streams of water, which may contain entrained debris, will not impinge on the filter assemblies	Conforms to Regulatory Position.	None.
C.6: A vertically mounted outer trash rack should be provided to prevent large debris from reaching the fine inner screen. The strength of the trash rack should be considered in protecting the inner screen from missiles and large debris.	Conforms to Regulatory Position.	The location of the sump strainer assembly provides protection from missiles and large debris. The crane wall and containment strainer enclosure act as a primary filter to prevent large debris from reaching the sump strainer.

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.7: A vertically mounted fine inner screen should be provided. The design coolant velocity at the inner screen should be approximately 6 cm/sec (0.2 ft/sec). The available surface area used in determining design coolant velocity should be based on 1/2 of the free surface area of the fine inner screen to conservatively account for partial blockage. Only the vertical screens should be considered in determining available surface area.	(Unit 1): A vertically mounted fine inner screen should be provided. The design coolant velocity at the inner screen should be approximately 45 cm/sec (1.5 ft/sec). The available surface area used in determining the design coolant velocity should be based on one-half of the free surface area of the fine inner screen to conservatively account for partial blockage. Only the vertical screens should be considered in determining available surface area. *(Unit 2): A sump strainer with complex geometry is provided, crediting all available strainer surface area. The design coolant velocity is less than 0.2 ft/sec based on one-half of the free surface area of the strainer available. *Approved revision to be added to UFSAR Rev 13, dated May 11, 2007.	A sump strainer with complex geometry, crediting all effective strainer surface area, is provided that precludes loss of NPSH for ECCS and CSS pumps during the period these components are required to operate.

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.8: A solid top deck is preferable, and the top deck should be designed to be fully submerged after a LOCA and completion of the safety injection.	(Unit 1): Conforms to Regulatory Position. *(Unit 2) A solid top deck is provided for the strainer portion located inside the crane wall. No solid top deck is required for the pipechase portion of the containment sump strainer; vortex suppression for strainers in this region is provided by grating. (There are no pipe whip or water/steam jet loads in the pipechase, therefore, a solid top deck is not necessary). *Approved revisions to be added to UFSAR Rev 13, dated May 11, 2007.	Vortex suppression is provided to preclude air entrainment in the recirculated coolant.
C.9: The trash rack and screens should be designed to withstand the vibratory motion of seismic events without loss of structural integrity.	Conforms to Regulatory Position.	Sump strainers are designed to withstand the vibratory motion of seismic events without loss of structural integrity.

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.10: The size of openings in the fine screen should be based on the minimum restrictions found in systems served by the sump. The minimum restriction should take into account the overall operability of the system served.	Conforms to Regulatory Position.	The size of openings in the sump strainer is based on the minimum restrictions found in systems served by the sump. The minimum restriction takes into account the overall operability of the system served. Strainer perforations are less than 1/10 inch diameter.
C.11: Pump intake locations in the sump should be carefully considered to prevent degrading effects such as vortexing on the pump performance.	Conforms to Regulatory Position.	None.

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.12: Materials for trash racks and screens should be selected to avoid degradation during periods of inactivity and operation and should have low sensitivity to adverse effects such as stress-assisted corrosion that may be induced by the chemical reactive spray during LOCA conditions.	Conforms to Regulatory Position.	Materials for the sump strainer assembly and associated enclosure are selected to avoid degradation during periods of inactivity and operation and have low sensitivity to adverse effects such as stress assisted corrosion that may be induced by chemically reactive spray during LOCA conditions.
C.13: The trash rack and screen structure should include access openings to facilitate inspection of the structure and pump suction intake.	Conforms to Regulatory Position.	The sump strainer assembly and associated enclosure include access openings to facilitate inspection.

Table 1
Proposed Licensing Basis Changes

Reg Guide 1.82, Rev 0, Regulatory Position	Current McGuire Licensing Basis Position Commitment	Proposed Change
C.14: Inservice inspection requirements for coolant sump components (trash racks, screens, and pump suction inlets) should include the following: a. Coolant sump components should be inspected during every refueling period downtime, and b. The inspection should be a visual examination of the components for evidence of structural distress or corrosion.	Conforms to Regulatory Position.	Inservice inspection requirements for containment sump components (strainer assembly and enclosure) include the following: a. Containment sump components are inspected during every refueling period downtime, and b. The inspection is a visual examination of the components for evidence of structural distress or corrosion.

Proposed Technical Specification and Bases Changes

The proposed license amendment seeks to revise McGuire Technical Specification Surveillance Requirement (SR) 3.5.2.8 to reflect the ECCS containment sump modification. This modification connects the containment sump suction pipe directly to the strainer manifold, thus making it an integral part of the strainer assembly.

McGuire Technical Specification SR 3.5.2.8 currently states:

"Verify, by visual inspection, each ECCS train containment sump suction inlet is not restricted by debris and the suction inlet trash racks and screens show no evidence of structural distress or abnormal corrosion."

It is proposed that the McGuire Technical Specification SR 3.5.2.8 be revised to state:

"Verify, by visual inspection, that the ECCS containment sump strainer assembly and the associated enclosure are not restricted by debris and show no evidence of structural distress or abnormal corrosion."

The Bases document for McGuire Technical Specification SR 3.5.2.8 currently states:

"Periodic inspections of the containment sump suction inlet ensure that it is unrestricted and stays in proper operating condition. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and on the need to have access to the location. This Frequency has been found to be sufficient to detect abnormal degradation and is confirmed by operating experience."

It is proposed that the McGuire Technical Specification Bases document for SR 3.5.2.8 be revised to state:

"Periodic inspections of the ECCS containment sump strainer assembly (consisting of modular tophats, grating, plenums and waterboxes) and the associated enclosure (the stainless steel structure surrounding the strainer assembly located inside the crane wall) ensure they are unrestricted and stay in proper operating condition. Inspections will consist of a visual examination of the exterior surfaces of the strainer assembly and interior and exterior surfaces of the strainer enclosure for any evidence of debris, structural distress, or abnormal corrosion. The intent of the surveillance is to ensure the absence of any condition which could adversely affect strainer functionality. Surveillance performance will not require removal of any tophat modules, but the strainer exteriors shall be visually inspected. This inspection will necessarily entail opening the top of the enclosure to allow access for inspection of the strainers, and to verify cleanliness of the enclosure interior space. This surveillance is not a commitment to inspect 100 percent of the surface area of all tophats or enclosure sides, but a sufficiently detailed inspection of the enclosure and exterior strainer surfaces is required to establish a high confidence that no adverse conditions are present. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and on the need to have access to the location. This Frequency has been found to be sufficient to detect abnormal degradation and is confirmed by operating experience."

TECHNICAL ANALYSIS and DISCUSSION

Consideration of Missiles

McGuire UFSAR Section 3.5 addresses McGuire's licensing basis with respect to missile protection. The spectrum of missiles to be considered for the new ECCS containment sump strainer can be divided into two groups depending on whether they are internally or externally generated with respect to the reactor building.

a. Externally generated missiles include the following, and are excluded from potential interaction with the ECCS containment sump strainer based on the physical protection afforded by Category 1 structures such as the Reactor Building shell:

- Turbine-generator missiles
- Tornado generated missiles
- Site proximity missiles (such as aircraft)
- Diesel generator missiles

b. Internally generated missiles are those resulting from an event or accident inside containment. With respect to the ECCS and its safety function, the criterion to be satisfied is as described in UFSAR Section 3.5.4.1, i.e. "...missiles that might be generated in coincidence with a loss of reactor coolant shall not cause loss of function of the Engineered Safety Features or loss of Containment Integrity."

The ECCS containment sump strainer design does not introduce components that could become missiles during a LOCA. The spectrum of credible internally generated missiles is described and evaluated in McGuire UFSAR Section 3.5.4.1. The basic approach is to assure design adequacy against generation of missiles, rather than allow missile formation and try to contain their effects.

The discussion in UFSAR Section 3.5.4.1 concludes that catastrophic failure of the reactor vessel, steam generators, pressurizer, reactor coolant pump casings and piping leading to generation of missiles is not postulated, including sections of piping as free missiles. The reactor coolant pump flywheel is excluded as a potential source of missiles under accident conditions as described in UFSAR Section 3.5.2.1. Failure of the pressurizer heaters would result in them striking the concrete mat as described in UFSAR Section 3.5.2.5.3. This area is not in close proximity to the new ECCS containment sump strainer. Failure of valves as a source of missiles, including stem ejection, body or bonnet failure, and mechanical joints, is precluded in UFSAR Section 3.5.2.4. The remaining missiles which are evaluated for their effects are the control rod drive shafts and/or housings, and instrumentation attached to the reactor coolant system.

The effects of ejected control rod drive shafts and/or housings are limited to areas not in close proximity to the ECCS containment sump strainer and their effects are contained by the CRDM missile shield which acts as a structural barrier as described in UFSAR Section 3.5.2.3.

Instrumentation attached to the reactor coolant system, specifically temperature and pressure element assemblies, are discussed in UFSAR Section 3.5.2.5. As missiles, these are low mass and damage to the ECCS containment sump structure is precluded by a combination of distance, trajectory, obstructions and low kinetic energy.

Consideration of Pipe Whips and Jet Impingement

Postulated high energy pipe breaks which could potentially interact with the modified ECCS containment sump strainer were evaluated in accordance with McGuire's current licensing basis as follows:

a. High Energy Pipe Rupture Composite drawings were reviewed to identify any postulated breaks in close proximity to the ECCS containment sump strainer assembly and associated enclosure.

b. Postulated breaks were evaluated to determine if the ECCS containment sump strainer assembly and associated enclosure were within the target zone of pipe whip or jet impingement.

Per the above method, one interaction per Unit was identified based upon the new locations of strainer assemblies to be installed during Unit 2, Phase 2 and Unit 1 modification implementation. This new interaction requires mitigation by appropriate design features in accordance with existing methodologies described in UFSAR Chapter 3.6, "Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping."

To address this jet impingement vulnerability, McGuire will install pipe rupture restraints on the RHR System prior to Unit 1 Beginning of Cycle (BOC) 19, Mode 4 operations and Unit 2 BOC 19 Mode 4 operations (reference Attachment 5).

Consideration of Single Failure

Regulatory Guide 1.82, Rev. 0, includes criteria for the physical separation of ECCS containment sumps assuming the potential for damage exists due to structural interaction (missiles, pipe whip) or other consequences (jet impingement) following an initiating event requiring subsequent use of the sump. Regulatory Guide 1.82, Revision 3 [referenced due to inclusion of clarifying statement not contained in Revision 0], contains the following statement on page 1.82-6: "Consistent with the plant licensing basis single-failure criterion, redundant ECC sumps and sump outlets should be separated to the extent practical to reduce the possibility *that a single event* could render both sumps inoperable."

McGuire's licensing bases for single failures, as reflected in Chapters 3.0 and 6.0 of the McGuire UFSAR, assumes that during the short-term period (i.e., within the first 24 hours following the initiating incident), the single failure is limited to the failure of an active component to complete its function as required. Should a single failure occur during the long-term period rather than the short-term, the engineered safety features are designed to tolerate an active failure or a passive failure without loss of its protective function.

SECY-77-439, "Single Failure Criterion," Introduction, states the following:

> However, in applying the Criterion, it is not assumed that any conceivable failure could occur. For example, reactor vessels or certain types of structural elements within systems, when combined with other unlikely events, are not assumed to fail because the probabilities of the resulting scenarios of events are deemed to be sufficiently small that they need not be considered. In general only those systems or components which are judged to have a credible chance of failure are assumed to fail when the Single Failure Criterion is applied.

SECY-77-439, Section 3.B states the following:

> During the long-term ECCS recirculation cooling mode the most limiting active failure, or single passive failure equal to the leakage that would occur from a valve or pump seal failure, is assumed. The basis for not including other passive failures during the long term is based on engineering judgment that such failures (pipe or valve breaks) have an acceptably low likelihood of occurrence during the long-term

phase of a loss-of-coolant accident. Analysis of ECCS performance in WASH-1400 indicate that passive failures of valves and piping are relatively small contributors to ECCS unavailability during both the injection and recirculation modes of operation.

The planned modification to the ECCS containment sump does not include any changes to any ECCS control or protection system, valve operators, pumps, or controlling instrumentation. The increased surface area of the ECCS containment sump strainer would be expected to reduce head loss and assure adequacy of suction flow to the ECCS and CSS Pumps. The actuation and alignment of the ECCS in response to a LOCA are unaffected. Swapover to sump recirculation, including any required manual operator actions, will take place as before the modification. Thus, it is reasonable to conclude active failure response is not adversely affected by the proposed changes.

As previously discussed, evaluations of missiles, pipe whip and jet impingement have been performed and one vulnerability per Unit was identified. Resolution of these vulnerabilities will be achieved thru commitments to install additional pipe rupture restraints.

The consideration of passive failures is more relevant since the new strainer is a passive device. Passive failures are usually limited to piping systems, pump seals, flanges, gaskets and similar components. Structural loads beyond their design bases are not required to be postulated for nuclear safety-related structures, systems or components (SSCs), and thus failures of these components are not credible.

Regulatory Guide 1.82, Rev. 0 establishes a position that redundant containment sumps should be provided. The inferred intent of this position is to reduce the possibility that a single event could render both ECCS containment sumps inoperable. It is Duke's position that a single, shared (non-redundant) strainer meets the intent of this requirement if it can be shown that it is not susceptible to failure in a manner which would result in the loss of both trains of ECCS/CSS. Active components whose credible failures could render the ECCS inoperable have redundance built into their design. Passive components, on the other hand, do not require such redundance because they are designed such that neither a consequential failure nor single passive failure is credible. Thus, the intent of Regulatory Guide 1.82 is met.

In summary, given that the strainers are seismically qualified, fully passive components, there are no credible failures which could adversely affect the ECCS containment sump strainer structures. Therefore, the need to maintain two physically separated ECCS containment sumps or ECCS/CSS train separation within the same sump is unnecessary.

Selection of Common ECCS Sump Strainer

As previously discussed, the modification to address GSI-191 will incorporate a common strainer that is shared by the suctions of both ECCS/CSS trains. The rationale for the rejection of train-specific strainers is presented herein.

Sizing Constraints for Strainer Installation

There are two considerations which preclude the ability to provide each train of ECCS with its own dedicated strainer having sufficient surface area to resolve GSI-191:

a. Fibrous Debris Challenge

The primary large break LOCA debris reaching the strainers is projected to be fibrous insulation. With this debris challenge, a compact, surface-intensive strainer design is not best suited to the goal of minimizing head loss. Instead, a less compact design that optimizes both surface area and interstitial volume (i.e., one that allows space to accommodate the anticipated debris load) was selected.

b. Available Space

There are two primary restrictions on available space. First, because McGuire is an ice condenser plant with small containment buildings, space is limited. Second, Duke chose to resolve GSI-191 concerns with a design that ensures full submergence of the strainer during all postulated scenarios. The limiting submergence case for ECCS containment sump operation at McGuire is a small break LOCA. Under that minimum inventory restriction, strainer design is limited to an approximate height of less than 3 feet above nominal floor grade.

Performance Benefits of Common ECCS Sump Strainer

For the limiting case (maximum) debris transport scenario, the volume of debris that reaches the sump strainer is primarily a function of pool turbulence (generated by break flow, ice melt drains and spray return flow from upper containment drains). This pool turbulence determines how much debris is suspended in the pool, and thus how much will transport to the sump strainer and accumulate. ECCS flow rate does not have a significant impact on accumulated debris load. Thus, a loss of one ECCS train, which would cut the total sump flow demand in half, does not have a corresponding reduction in debris accumulation.

Consider an ECCS sump strainer design that has two fully separate trains and non-communicating strainers. Since debris accumulation is primarily a function of pool turbulence, then if a single ECCS train were lost, all suspended debris would accumulate on the strainer for the remaining operating train. The resulting debris bed would essentially be twice as thick as compared to dual-train operation, with correspondingly much higher head losses.

As an alternative, consider an ECCS sump strainer design that has redundant suction pipes and valves, but common, interconnected strainer surfaces. Under the same failure scenario described above, the suspended debris would still accumulate over the entire available strainer. Debris bed thickness would be no worse than under dual-train operation, and given that total flow through the debris bed would be reduced by the loss of a single train, head loss for the remaining operating train would actually be less.

Thus, barring passive failure of the common strainer, intercommunication between the redundant suction lines of the ECCS trains has a benefit.

Functional Review of Trash Racks and Alternatives

A typical sump strainer design incorporates trash racks to provide two functions: physical protection for the fine screen strainer, and interception of large debris such that fine screen area remains available for filtration. Standards for ECCS sump strainers and trash racks are stated by Regulatory Guide 1.82, Rev. 0 as follows:

> Pump intakes should be protected by screens and trash racks (coarse outer screens) of sufficient strength to resist impact loads that could be imposed by missiles that may be generated by the initial LOCA or by trash.

The original McGuire sump design complied with the generic guidance by providing a fine inner screen (comprised of 0.063 inch diameter wire strands), protected by a heavy, coarse outer trash rack (comprised of galvanized grating, 1 inch thick with nominally 1 inch by 4 inch openings). The strainer framework of the original design attached the trash rack on the frame exterior and attached the fine inner screen on the inside of the same frame, such that the flow surface areas of the trash rack and fine inner screen were approximately equal.

For the modified ECCS sump strainer design, Duke has determined trash racks to be unnecessary based on the following considerations:

a. Missile and impact protection for the revised ECCS sump strainer design is provided by the location of the strainer elements (in the pipechase or shielded by the ICW enclosure). Additional physical protection provided by a trash rack is not necessary. Resistance to debris impact is also provided by the rolled 14 gage perforated plate that forms the strainer elements. These modules are designed to withstand 10 psid, and are more robust than the perimeter-mounted wire mesh panels that comprised the original strainer.

b. Along with providing physical protection from impacts, the crane wall and ICW enclosure also preserve the original 'remote sump' design. For the limiting case break inside the crane wall, flow reaches the sump strainer through two means; one credited, and one uncredited. For the credited flowpath, water reaches the strainer after first passing through the crane wall penetrations (see Figure 6 of Attachment 4). Thus, entrained debris is allowed to settle and be filtered by passage through crane wall penetrations prior to reaching the strainer. For the uncredited flowpath, water reaches the strainer by passing through the new enclosure. The enclosure surrounding the ICW strainer portion has perforated sides with 3/32 inch diameter holes. The reason this path is not credited is due to the potential for blockage by the projected large debris load. Either flowpath will effectively prevent large debris from reaching the strainer assemblies.

c. Any debris that might transport through the crane wall, or any large debris generated by a break in the pipechase must travel to the strainer inlet area (vicinity of azimuth 180°). The pipechase floor slopes gradually away from the modified sump strainer inlet, which provides some resistance to large debris that may travel on the floor surface.

d. A concern raised by the NRC's June 29, 2005 Crystal River 3 Pilot Plant Audit Report was the risk that the trash rack might transition to a primary filter due to excessive collection of debris. With a strainer surface that is much greater than the trash rack surface, collection of debris on the trash rack could create a choke point, causing a higher head loss than would result by allowing the debris to distribute on the larger surface area provided by the perforated strainer plate. Deletion of the trash rack resolves this concern.

e. McGuire's modified ECCS sump strainer design, developed in accordance with NEI 04-07 guidance, is sized to accommodate all transported debris, without any additional reduction or interception that might be provided by a trash rack.

Backflush Discussion

A possible downside to the incorporation of a common strainer is the loss of effectiveness of a backflushing strategy. This is judged to be insignificant, given that an effective backflush cannot be accomplished with the existing systems.

As shown by Figure 7 of Attachment 4, pump discharge check valves and limited recirculation flow paths present significant obstacles to a backflushing strategy. To achieve even minor backflush flow would require operation of several active components for which no redundancy is available, and therefore, no such plan is credited or proceduralized.

By replacing the existing train-dedicated strainer surfaces with a single, shared suction strainer, the low effectiveness of a possible and uncredited backflush strategy would be further diminished since the return flow through the secured RHR train suction would not be expected to actually reverse the direction of flow through any strainer surfaces.

Comparison/Rejection of ECCS Containment Sump Design Alternatives

Passive vs Active Design

Duke's selection of a passive ECCS containment sump strainer design included the following considerations:

- A continuously 'swept' strainer surface, while effective at avoiding high head losses, might contribute to greater debris penetration and cumulative downstream blockage effects.

- Additional on-going burdens to provide maintenance and surveillance testing to demonstrate active component operability.
- Limited margin in emergency power capacity.
- Limited industry operating experience with active sump strainers.

Perforated Divider Plate Consideration

The factors that led to rejecting train-specific strainers, and the merits of a common strainer, were previously presented. An additional design option of segregating the common strainer into two train-specific halves was also considered. Specifically, this design alternative was the use of perforated divider plates to provide both separation and intercommunication between strainer portions. Two recognized drawbacks, one comparatively minor and one major, influenced the rejection of this design option.

The minor drawback to a perforated divider plate was the additional head loss created by plate resistance in the event that flow through one train (combination ECCS/CSS flow total) was reduced or eliminated, and the remaining 'high flow' train attempted to equalize suction across the divider plate.

The major drawback was a more significant possible consequence of this same 'suction imbalance' scenario. Even with bypass eliminators incorporated into the strainer design, a small amount of fibrous debris is predicted to penetrate/bypass the strainer. If a single ECCS train failure occurred, this fiber load could collect on the interior divider plate, and in conjunction with particulate loads, form an interior thin bed. The resulting high resistance blockage could effectively result in the loss of half of the strainer surface area.

Addition of New Active Components

In order to credit active components that provide inter-train communication (i.e., valves with actuators), a minimum of two components would be required, with parallel flow paths. There are numerous downsides to such an innovative approach; among them:

- Space constraints for the addition of active components.
- Underwater operation concerns.
- Additional operator burden to respond to an ECCS train loss by tying together a partitioned strainer.
- Margin impact on emergency power capacity.
- Inability to design and/or procure components within expected GSI-191 resolution window.

Justification of Proposed Licensing Basis Changes

Regulatory Position C.1: A minimum of two sumps should be provided, each with sufficient capacity to serve one of the redundant halves of the ECCS and CSS systems.

Proposed Change: A configuration utilizing the containment side structure and floor as the intake structure boundary is considered acceptable for those plants in which the post LOCA water level in the containment is sufficiently high, thus making additional sump depressions in the floor non-productive. Redundance is provided by two separate suction pipes protected by guard pipes.

Justification for Change: The current exception to Regulatory Position C.1 is revised to reflect the new ECCS containment sump strainer design. Redundancy of passive strainer components located in shielded areas (i.e., not subject to failure), is not required to meet the GDC criterion of sustained core cooling capability. There are no credible passive failures.

Regulatory Position C.2: Redundant sumps should be physically separated from each other and from high-energy piping systems by structural barriers to the extent practical, to preclude damage to the sump intake filters by whipping pipes or high-velocity jets of water or steam.

Proposed Change: The containment recirculation intake structure and suction piping are protected from high energy piping systems to the extent practical to preclude damage by whipping pipes or high-velocity jets of water or steam. ECCS/CSS train separation within the common sump strainer is not required due to the absence of any credible loads which could fail the sump strainer.

Justification for Change: The current exception to Regulatory Position C.2 is revised to clearly state Duke's position that ECCS redundancy begins at the sump suction pipes, and the need to provide ECCS/CSS train separation within the common sump strainer is not required due to the absence of any credible loads which could fail the ECCS containment sump strainer.

Regulatory Position C.3: The sumps should be located on the lowest floor elevation in the containment exclusive of the reactor vessel cavity. At a minimum, the sump intake should be protected by two screens (1) an outer trash rack and (2) a fine inner screen. The sump screens should not be depressed below the floor elevation.

Proposed Change: The sump is located on the lowest floor elevation in the containment exclusive of the reactor vessel cavity. A substantial strainer is provided to filter debris from recirculated coolant. The crane wall and containment strainer enclosure act as a primary filter to prevent large debris from reaching the sump strainer.

Justification for Change: A new exception to Regulatory Position C.3 is requested in order to reflect the new sump strainer design. The intended functions of the trash rack are provided by alternate means.

Regulatory Position C.6: A vertically mounted outer trash rack should be provided to prevent large debris from reaching the fine inner screen. The strength of the trash rack should be considered in protecting the inner screen from missiles and large debris.

Proposed Change: The location of the sump strainer assembly provides protection from missiles and large debris. The crane wall and containment strainer enclosure act as a primary filter to prevent large debris from reaching the sump strainer.

Justification for Change: A new exception to Regulatory Position C.6 is requested to reflect the new ECCS containment sump strainer design. The intended functions of the trash rack are provided by alternate means.

Regulatory Position C.7: A vertically mounted fine inner screen should be provided. The design coolant velocity at the inner screen should be approximately 6 cm/sec (0.2 ft/sec). The available surface area used in determining design coolant velocity should be based on one-half of the free surface area of the fine inner screen to conservatively account for partial blockage. Only the vertical screens should be considered in determining available surface area.

Proposed Change: A sump strainer with complex geometry, crediting all effective strainer surface area, is provided that precludes loss of NPSH for ECCS and CSS pumps during the period these components are required to operate.

Justification for Change: The current exception to Regulatory Position C.7 is revised to reflect the new ECCS containment sump strainer design. This modified ECCS containment sump assembly, consisting of a complex geometry, and crediting all effective strainer surface area, was designed using the methodology contained in NEI 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology," Rev 0, and the associated NRC Safety Evaluation Report. The completion of chemical effects studies and other evaluations is required to confirm that McGuire's ECCS recirculation functions under debris loading conditions will be in full compliance with the Applicable Regulatory Requirements section of NRC Generic Letter 2004-02.

Regulatory Position C.8: A solid top deck is preferable, and the top deck should be designed to be fully submerged after a LOCA and completion of the safety injection.

Proposed Change: Vortex suppression is provided to preclude air entrainment in the recirculated coolant.

Justification for Change: A new exception to Regulatory Position C.8 is requested so as to reflect the new sump strainer design. The preference for a submerged solid top deck is intended to provide an additional protective barrier against missiles and protection against air or debris entrainment via vortex. Rather than incorporating a completely encompassing solid top-deck, the McGuire design incorporates the solid deck feature only for the strainer modules located inside the crane wall via the enclosure. The enclosure preserves the 'remote sump' design, and provides a vortex suppression function. For that portion of the strainer located in the pipechase, vortex suppression function is provided by the horizontal grating, and the shielded pipechase location itself provides protection from missiles. The efficacy of the horizontal grating in the pipechase serving as a vortex suppressor was demonstrated through qualification testing.

Regulatory Position C.9: The trash rack and screens should be designed to withstand the vibratory motion of seismic events without loss of structural integrity.

Proposed Change: Sump strainers are designed to withstand the vibratory motion of seismic events without loss of structural integrity.

Justification for Change: A new exception to Regulatory Position C.9 is requested to reflect the new ECCS containment sump strainer design. The intended functions of the trash rack are provided by alternate means.

Regulatory Position C.10: The size of openings in the fine screen should be based on the minimum restrictions found in systems served by the sump. The minimum restriction should take into account the overall operability of the system served.

Proposed Change: The size of openings in the sump strainer is based on the minimum restrictions found in systems served by the sump. The minimum restriction takes into account the overall operability of the system served. Strainer perforations are less than 1/10 inch diameter.

Justification for Change: A new exception to Regulatory Position C.10 is requested so as to reflect the new ECCS containment sump strainer design which does not include a screen. The filtration of fine debris is provided by the tophat modules.

Regulatory Position C.12: Materials for trash racks and screens should be selected to avoid degradation during periods of inactivity and operation and should have low sensitivity to adverse effects such as stress-assisted corrosion that may be induced by the chemical reactive spray during LOCA conditions.

Proposed Change: Materials for the sump strainer assembly and associated enclosure are selected to avoid degradation during periods of inactivity and operation and have low sensitivity to adverse effects such as stress assisted corrosion that may be induced by chemically reactive spray during LOCA conditions.

Justification for Change: A new exception to Regulatory Position C.12 is requested to reflect the new ECCS containment sump strainer design. The intended functions of the trash rack are provided by alternate means.

Regulatory Position C.13: The trash rack and screen structure should include access openings to facilitate inspection of the structure and pump suction intake.

Proposed Change: The sump strainer assembly and associated enclosure include access openings to facilitate inspection.

Justification for Change: A new exception to Regulatory Position C.13 is requested to reflect the new ECCS containment sump strainer design. The intended functions of the trash rack are provided by alternate means.

Regulatory Position C.14: Inservice inspection requirements for coolant sump components (trash racks, screens, and pump suction inlets) should include the following:

a. Coolant sump components should be inspected during every refueling period downtime, and

b. The inspection should be a visual examination of the components for evidence of structural distress or corrosion.

Proposed Change: Inservice inspection requirements for ECCS containment sump components (strainer assembly and enclosure) include the following:

a. ECCS containment sump components are inspected during every refueling period downtime, and

b. The inspection consists of a visual examination of the components for evidence of structural distress or corrosion.

Justification for Change: A new exception to Regulatory Position C.14 is requested to reflect the new ECCS containment sump strainer design. The intended functions of the trash rack are provided by alternate means.

Proposed Revision to the McGuire Technical Specifications and Associated Bases

The proposed license amendment seeks to revise McGuire Technical Specification Surveillance Requirement (SR) 3.5.2.8 to reflect the ECCS containment sump modification. This modification encloses the containment sump suction inlet, thus making it an integral part of the strainer assembly. The use of the phrase "ECCS containment sump strainer assembly and the associated enclosure" reflects the replacement ECCS containment strainer configuration, which does not include trash racks.

Inspections will consist of a visual examination of exterior surfaces of the strainer and the interior and exterior surfaces of the strainer enclosure. This will ensure the absence of debris, structural distress or abnormal corrosion. The intent of the surveillance is to ensure the absence of any condition which could adversely affect strainer functionality. In actual practice, this surveillance is not a commitment to inspect 100 percent of surface area of all tophats or enclosure sides, but a sufficiently detailed inspection of the enclosure and exterior strainer surfaces is required to establish a high confidence that no adverse conditions are present. Surveillance performance will not require removal of any tophat modules, but the strainer exteriors shall be visually inspected. This inspection will necessarily entail opening the top of the ICW enclosure to allow access for inspection of ICW strainers, and to verify cleanliness of the enclosure interior space. Limiting the inspection to these areas will minimize the dose to individuals performing the inspection and preclude the possible introduction of debris into the interior portions of the tophats, waterboxes and plenums.

REGULATORY SAFETY ANALYSIS

No Significant Hazards Consideration

Duke Energy Carolinas, LLC (Duke) has concluded that operation of McGuire Nuclear Station Units 1 & 2, in accordance with the proposed changes to the licensing basis, Technical Specification and associated Bases, do not involve any significant hazards. Duke's conclusion is based on its evaluation, in accordance with 10CFR50.91(a)(1), of the three standards set forth in 10CFR50.59(c) as discussed below:

A. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   Implementation of the proposed amendment does not significantly increase the probability or the consequences of an accident previously evaluated. The ECCS containment sump functions in the mitigation of a Loss of Coolant Accident (LOCA). It is not an accident initiator.

   Commitments to Regulatory Guide 1.82, Rev 0, as currently described in the UFSAR, are being revised to establish appropriate exceptions associated with the modified ECCS sump strainer design. This modified ECCS containment sump assembly, consisting of a complex geometry, and crediting all effective strainer surface area, was designed using the methodology contained in NEI 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology," Rev 0, and the associated NRC Safety Evaluation Report.

Removal of the implied licensing basis requirement to physically separate the containment sump into two halves or provide ECCS train separation within the same containment sump will not impact the assumptions made in Chapter 15 of the McGuire UFSAR. There are no changes in any failure mode or effects analysis associated with this change. Since there are no credible failures which could result in the introduction of debris within the strainer assembly, the need to provide this physical separation is not warranted.

Although the configurations of the existing ECCS containment sump trash racks and screen and the replacement sump strainer assemblies are different, they serve the same fundamental purpose of passively removing debris from the sump's suction supply of the supported system pumps. Removal of trash racks does not impact the adequacy of the pump NPSH assumed in the safety analysis. Likewise, the change does not reduce the reliability of any supported systems or introduce any new system interactions. The greatly increased surface area of the modified strainer is designed to reduce head loss.

Thus, based on the above, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

B. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed amendment will not create the possibility of a new or different kind of accident. The ECCS containment sump strainer serves as a passive component of the ECCS accident mitigation system. It is, therefore, not an accident initiator. The modified design requirements result in a strainer that performs the same functions in the same manner as the original design, such that no different kind of accident is created.

A change to McGuire Technical Specification Surveillance Requirement 3.5.2.8 does not alter the nature of events postulated in the Safety Analysis Report nor do they introduce any unique precursor mechanisms.

Therefore, the proposed changes will not create the possibility of a new or different kind of accident from any accident previously evaluated.

C. Does the proposed amendment involve a significant reduction in the margin of safety?

Response: No.

Margin of safety is related to the confidence in the ability of the fission product barriers to perform their design functions during and following an accident situation. These barriers include the fuel cladding, the reactor coolant system, and the containment system. The performance of the containment system, fuel cladding, and the reactor coolant system will not be impacted by the proposed change.

Duke's evaluation concludes that there are no credible failure mechanisms applicable to the modified ECCS containment sump strainer design. The revised design requirements result in enhanced strainer performance under more conservative debris loading assumptions.

The proposed change to Technical Specification SR 3.5.2.8 will have no effect on the manner in which safety limits, limiting safety system settings, or limiting conditions for operation are determined nor will there be any effect on those plant systems necessary to assure the accomplishment of protective functions. The proposed change does not adversely affect the fuel, fuel cladding, Reactor Coolant System, or containment integrity.

Thus, it is concluded that the proposed changes do not involve a significant reduction in the margin of safety.

Applicable Regulatory Requirements/Criteria:

This license amendment request is supported by justification that demonstrates that the design requirements for McGuire's ECCS containment sump strainer will continue to be met following implementation of the proposed changes.

The applicable requirements are 10CFR50, Appendix A, General Design Criteria (GDC) 35, 36, 37, 38, 39, 40 and 41.

Compliance with these regulatory requirements is assured through specific commitments to Regulatory Guide 1.82, Revision 0. Commitments to this Regulatory Guide, as currently described in the UFSAR, are being revised to establish appropriate exceptions associated with the modified ECCS sump strainer design.

ENVIRONMENTAL CONSIDERATIONS

The proposed change does not involve a significant hazards consideration, a significant change in the types of or significant increase in the amounts of any effluents that may be released offsite, or a significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9).

Pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed change is not required.

PRECEDENTS

Single Shared ECCS Containment Sump/Strainer Designs

The stations listed below are currently using or plan to use a single, shared strainer design. None of the facilities listed below are committed to Regulatory Guide 1.82, Revision 0. The listing is not intended to be all inclusive but is provided to confirm that a single shared strainer concept will not be unique to McGuire:

Oconee Nuclear Station, Units 1, 2, and 3: As reflected in their UFSAR, each of the Oconee Units has a common undivided containment sump.

H. B. Robinson: As reflected in their UFSAR, Robinson has a common containment sump.

Turkey Point: Turkey Point Units 3 and 4 utilize a single set of strainer modules.

Crystal River Unit 3: As reflected in their UFSAR, Crystal River has a common undivided containment sump.

Technical Specification Containment Strainer Surveillance Requirement Revisions

Similar changes have been approved for:

Oconee Nuclear Station, Units 1 and 2, by NRC Safety Evaluation Report (SER) dated Nov 1, 2005,

Wolf Creek by NRC SER dated Oct 5, 2006, and

Comanche Peak Units 1 and 2 by NRC SER dated Oct 5, 2006.

REFERENCES

1. Letter, D. B. Vassallo, Chief, Light Water Reactors Project Branch 1-1, Division of Reactor Licensing, USNRC, to A. C. Thies of Duke Power Company, dated March 24, 1975, Subject: Review of McGuire FSAR, (question 042.27, FSAR Section 6.5.2).

2. Letter, D. B. Vassallo, Chief, Light Water Reactors Project Branch 1-1, Division of Reactor Licensing, USNRC, to W. O. Parker of Duke Power Company, dated September 30, 1975, Subject: Review of McGuire FSAR, (question 042.51, FSAR Section 6.5.2).

3. Letter, B. J. Youngblood, NRC Division of PWR Licensing, to H. B. Tucker, Duke Energy, dated May 8, 1986, Subject: McGuire Nuclear Station - Elimination of Large Primary Loop Pipe Ruptures.

4. Letter, S. A. Richards, NRC Office of Nuclear Reactor Regulation, to K. Jacobs, Westinghouse Owners Group, dated June 9, 2000, Subject: Request for Application of Leak Before Break in Response To Draft Generic Letter "Potential For Degradation of the Emergency Core Cooling and Containment Spray Systems Following a Loss-of-Coolant Accident Due to Construction and Protective Coatings Deficiencies and Foreign Material in the Containment.

The above letter states that although Leak-Before-Break (LBB) methodology is not generically approved for all GSI-191 concerns, any previously issued approval for use of LBB methodology is acceptable.

ATTACHMENT 4

Figures

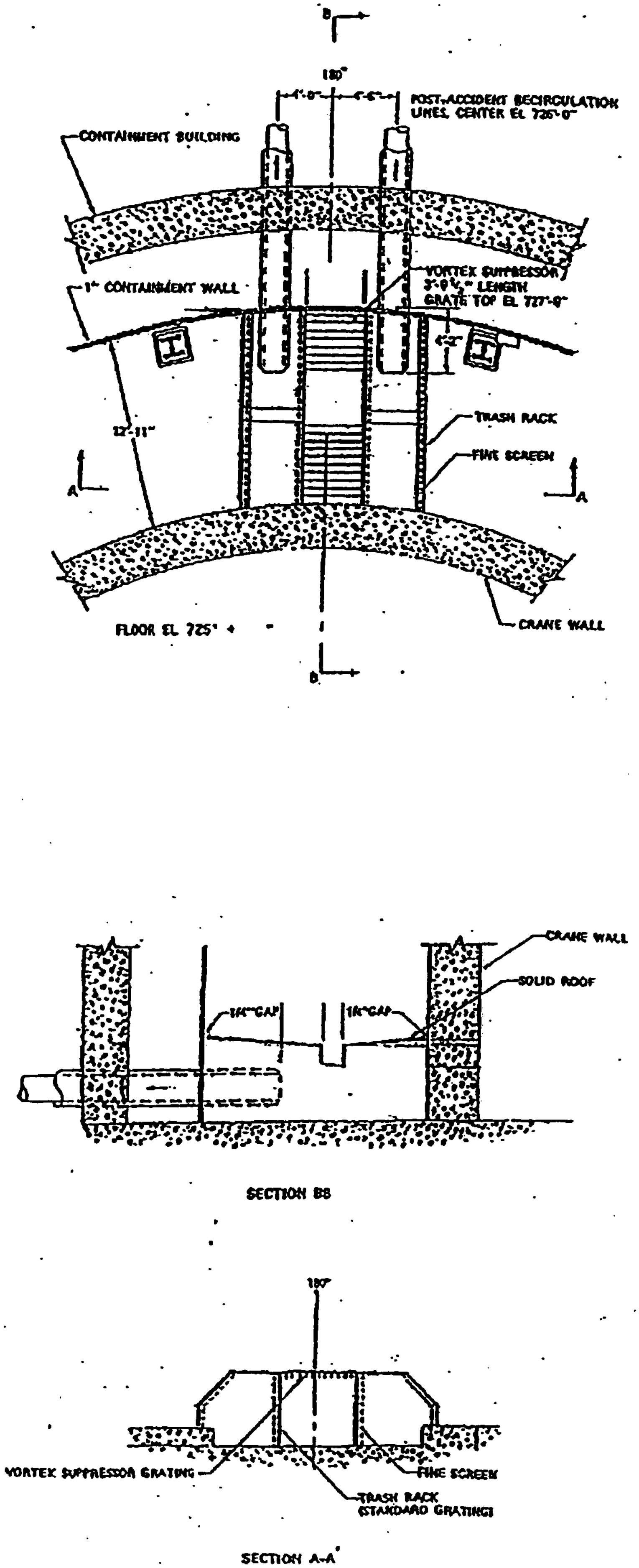
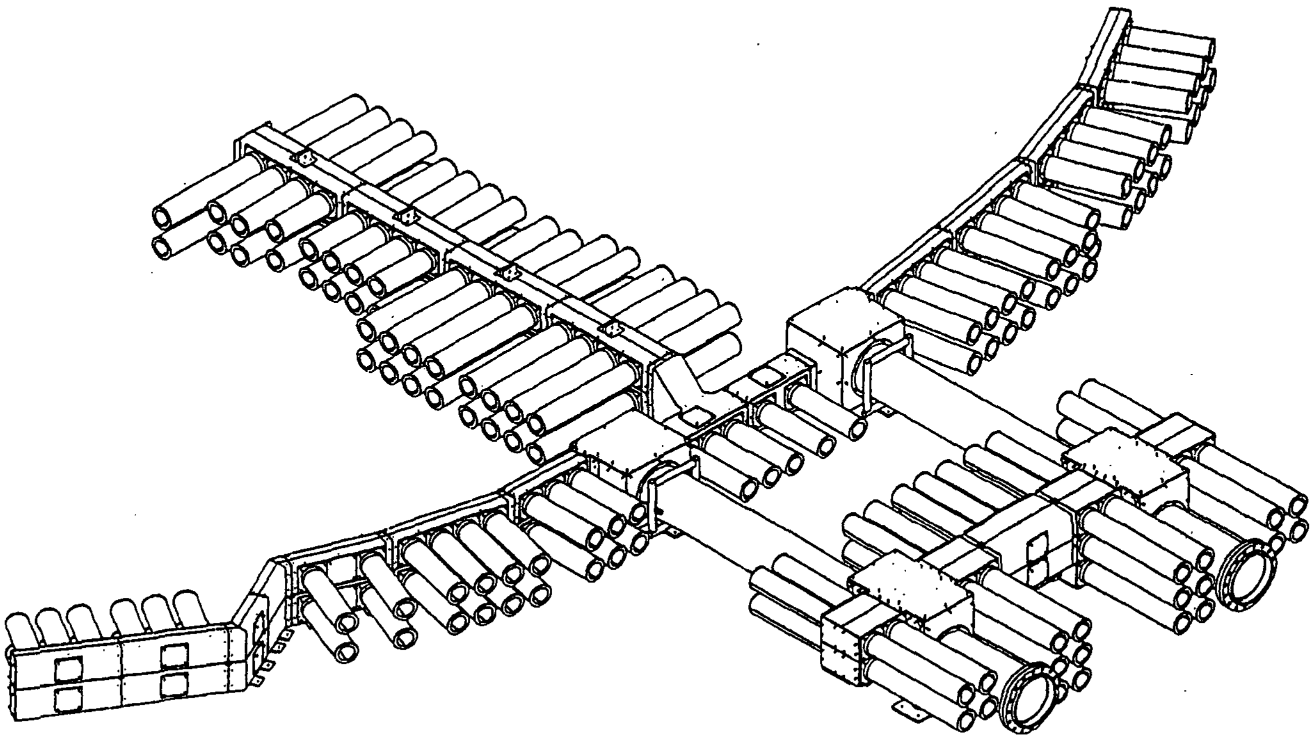


Figure 1

Original ECCS Sump Strainer
(UFSAR Figure 6-196)



GENERAL NOTES:

1. ALL MATERIALS SHALL BE STAINLESS STEEL. THE USE OF THE DUAL CERTIFIED 304/304L MATERIAL IS ACCEPTABLE.
2. ALL ANGLES SHALL BE ASTM [illegible], TYPE 304 OR EQUIVALENT.
3. ALL PLATES SHALL BE ASTM A240, TYPE 304 OR EQUIVALENT.
4. ALL TUBE STEEL SHALL BE ASTM A554, TYPE 304 OR EQUIVALENT.
5. ALL THREADED STUD MATERIAL SHALL BE ASTM A479 TYPE 304 OR EQUIVALENT.
6. ALL NUTS SHALL BE ASTM A194 GR. 8, OR EQUIVALENT.
7. ALL HILTI KWIK BOLT 3 SHALL BE STAINLESS STEEL.
8. ALL WASHERS SHALL BE STAINLESS STEEL, 18-8/316 OR EQUIVALENT.
9. 18" DIA PIPE, FLANGES, AND STUD/NUT MATERIAL AS FOLLOWS [illegible]
10. NOT USED
11. ALL HEX BOLTS SHALL BE ASTM A193 GR. B8 CL.1.
12. WITH THE EXCEPTION OF THE TUBE PLENUM, HOLES FOR EXPANSION ANCHORS SHALL NOT BE PRE-DRILLED IN ORDER TO ACCOMMODATE MAXIMUM FIELD FLEXIBILITY DURING INSTALLATION.
13. ANCHOR BOLTS SHALL BE INSTALLED IN ACCORDANCE WITH SPEC NO. [illegible]
14. ERECTION OF STRUCTURAL STEEL AND MISCELLANEOUS STEEL SHALL BE IN ACCORDANCE WITH SPEC. NO. [illegible]
15. TOLERANCES FOR ELEVATIONS TO BE ±[illegible] UNLESS NOTED OTHERWISE. DIMENSION TOLERANCE SHALL BE +/- [illegible] (U.N.O.)
16. ANY GAPS OR OPENINGS BETWEEN CONNECTING PARTS OF THE STRAINER THAT PROVIDE ENTRY TO THE STRAINER INTERNALS SHALL NOT EXCEED [illegible] INCH DIAMETER. THE MAXIMUM GAP OR SLOT (NON-CIRCULAR OPENING) SHALL BE LESS THAN [illegible] HEIGHT (SHORTER DIMENSION). GAPS, SLOTS, OR OPENINGS SHALL BE LIMITED TO THE EXTENT POSSIBLE. PROVIDE SEAL WELD AS NECESSARY TO MEET ABOVE REQUIREMENT.
17. TOP HATS ASSEMBLY CAN BE OUT OF PLUMB +/- [illegible] MAX. A MINIMUM OF [illegible] CLEARANCE SHALL BE MAINTAINED BETWEEN STRAINER TOP HATS AND OTHER EQUIPMENT OR STRUCTURE.
18. ALL THREADED STUD SHALL BE INSTALLED WITH FULL PENETRATION, ALL AROUND WELD.
19. TORQUE VALUE FOR BOLTS & THREADED STUDS SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE:

THREADED STUD/ BOLT SIZE	NON-LUBRICATED (FT-LBS) (SEE NOTE C)	LUBRICATED (FT-LBS) (SEE NOTE A, B, C, & D)
[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible] (TORQUE VALUES)	

A. REFERENCE: "GOOD BOLTING PRACTICES" BY ELECTRIC POWER RESEARCH INSTITUTE.
B. LUBRICANT SHALL BE APPLIED TO THREAD AND CONTACT SURFACE.
C. AVERAGE NUT FACTOR K (NON-LUBRICATED) = 0.2, K (LUBRICATED) = 0.15 TO 0.17.
D. CLEAN-UP AND REMOVE ALL RESIDUE AFTER WORK-UP IS COMPLETED.

20. PROVIDE ADDITIONAL NUTS OR JAM NUT OR STAKE THREAD TO SECURE BOLT/STUD.
21. BASE PLATE DIMENSION INCORPORATES THE TOLERANCES FOR ANCHOR BOLT LOCATION.
22. WHERE APPROPRIATE, STUDS MAY BE SUBSTITUTED WITH THROUGH BOLTS, WITH BOLT HEAD OR HEX NUT TACK WELDED TO THE MEMBER. NO GAPS SHALL EXIST BETWEEN THE BOLT HEAD/NUT AND CONNECTING MEMBER.
23. HOLES ON CONNECTING MEMBERS MAY BE COUNTERSUNK TO CLEAR WELDS AT STUD LOCATIONS. COUNTERSINK SHALL BE LIMITED TO [illegible] MAX. WITH 45° TAPER.
24. THREADED STUD MATERIAL ASTM A479 TYPE 304 MAY BE SUBSTITUTED WITH TYPE [illegible]. TYPE [illegible] MATERIAL SHALL MEET THE REQUIREMENTS OF ASTM [illegible]
25. TACK WELDS AND CLOSURE WELDS NEED NOT COMPLY WITH WELDING SPECIFICATIONS.
26. CLOSURE WELD IS PROVIDED TO SEAL GAP TO MEET GAP CRITERIA PER NOTE 16.
27. FIELD TO GRIND/ROUND OFF EXPOSED SHARP CORNERS/EDGES AS REQUIRED.

REFERENCE DRAWINGS:

MC-[illegible], REACTOR BUILDING UNIT-1, BASE SLAB - CONCRETE PLAN @ EL. [illegible].

MC-[illegible], REACTOR BUILDING UNIT-1, RECIRCULATION INTAKE SCREEN MISCELLANEOUS STEEL.

DUKEMNS003-C-[illegible] THRU [illegible]
DUKEMNS003-C-[illegible]

QA CONDITION 1

REV.	REASON FOR CHANGE	DRN	CHK	REV	APP	DATE
0	INITIAL ISSUE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

ENERCON SERVICES, INC.
Kennesaw, GA 30144

DUKE POWER COMPANY
McGUIRE NUCLEAR STATION - UNIT 1

CONTAINMENT BUILDING
SUMP STRAINER
GENERAL NOTES

SCALE	DRAWING NO.	REV.
NTS	DUKEMNS003-C-201	0

MODIFIED ECCS SUMP STRAINER

Figure 2

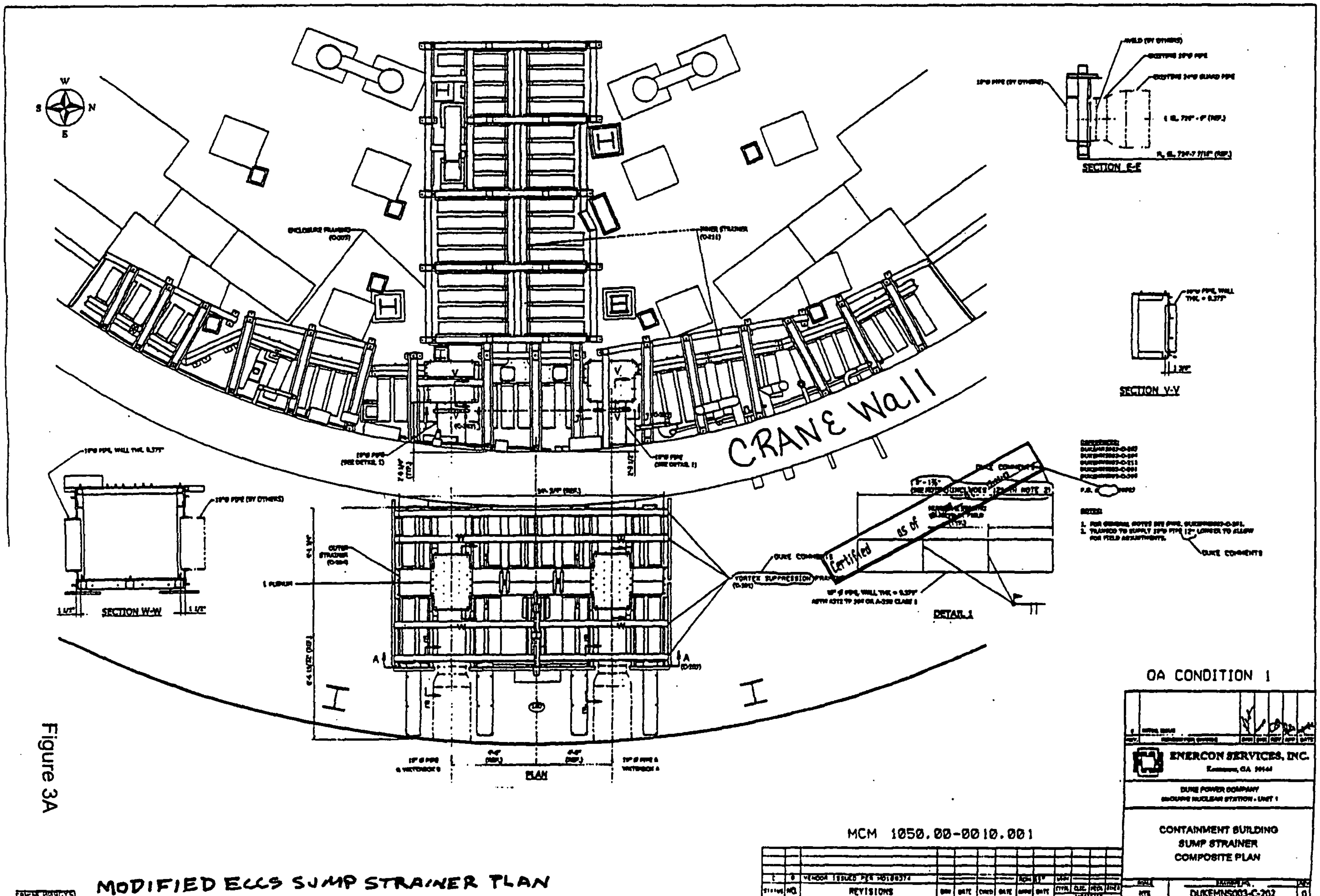
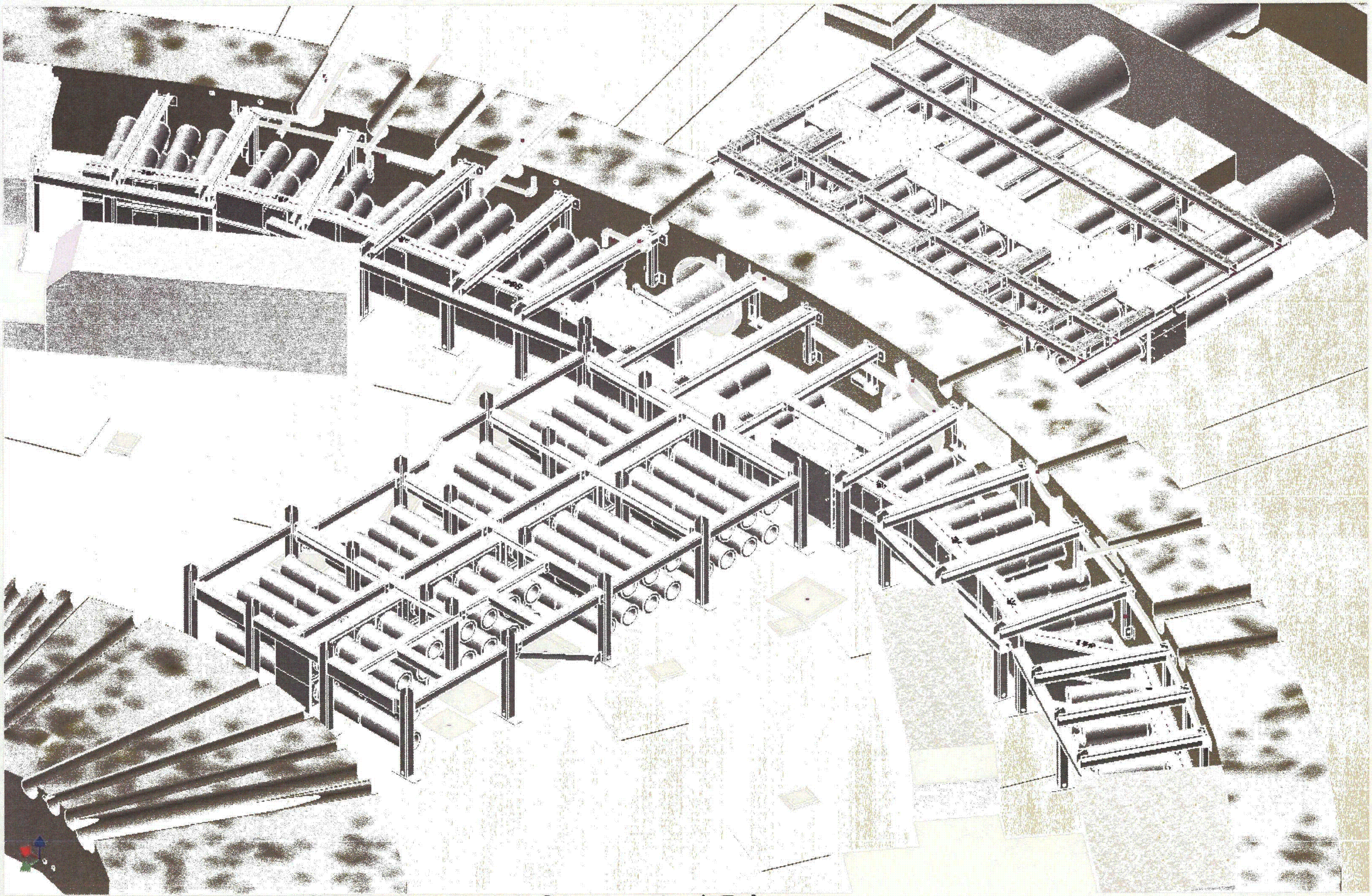


Figure 3A

MODIFIED ECCS SUMP STRAINER PLAN
(ENCLOSURE NOT SHOWN)



MODIFIED ECCS SUMP STRAINER PROJECTED VIEW
(ENCLOSURE NOT SHOWN)

FIGURE 3B

Simplified Strainer Element Flow Schematic
Tophat Cross-Sectional View

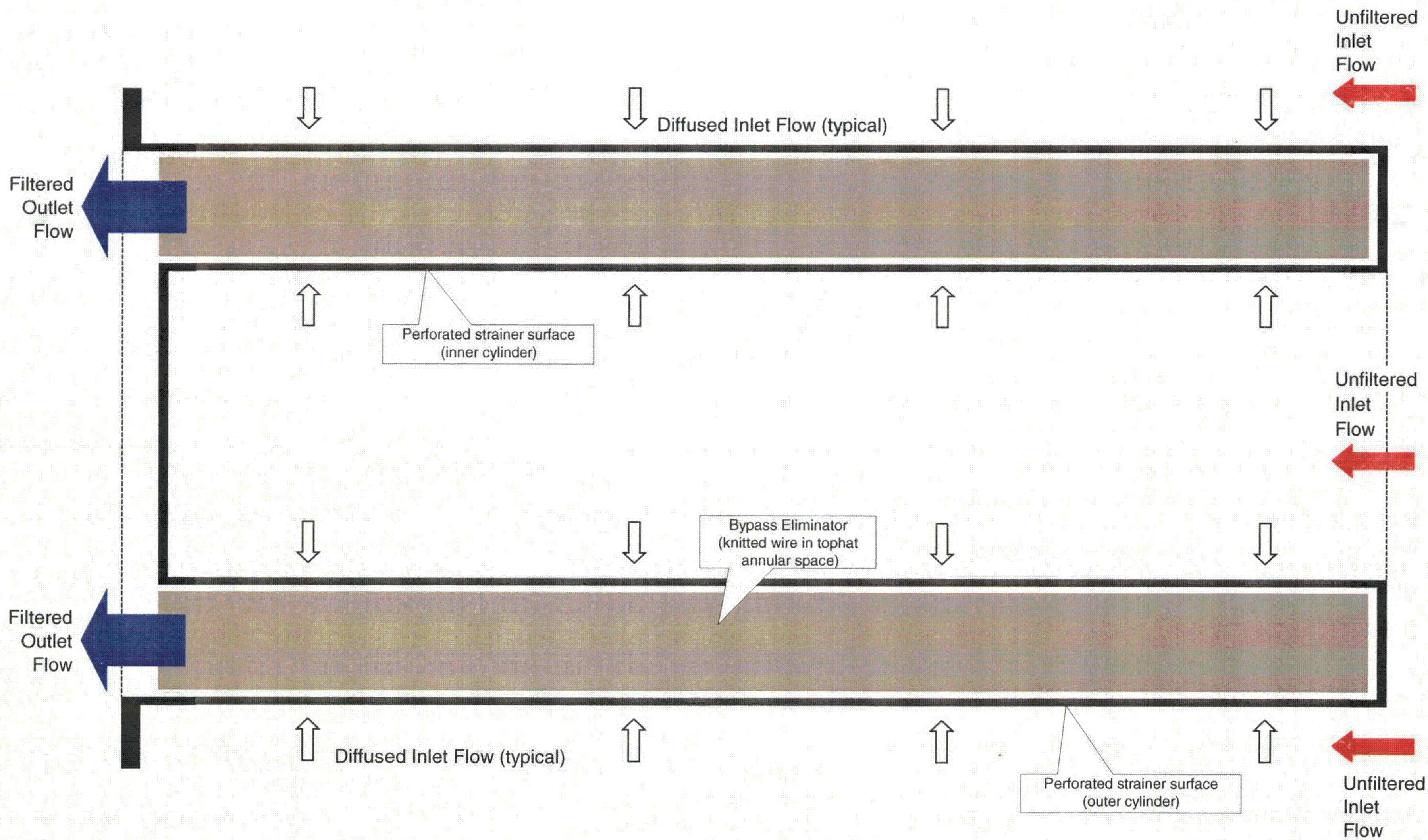
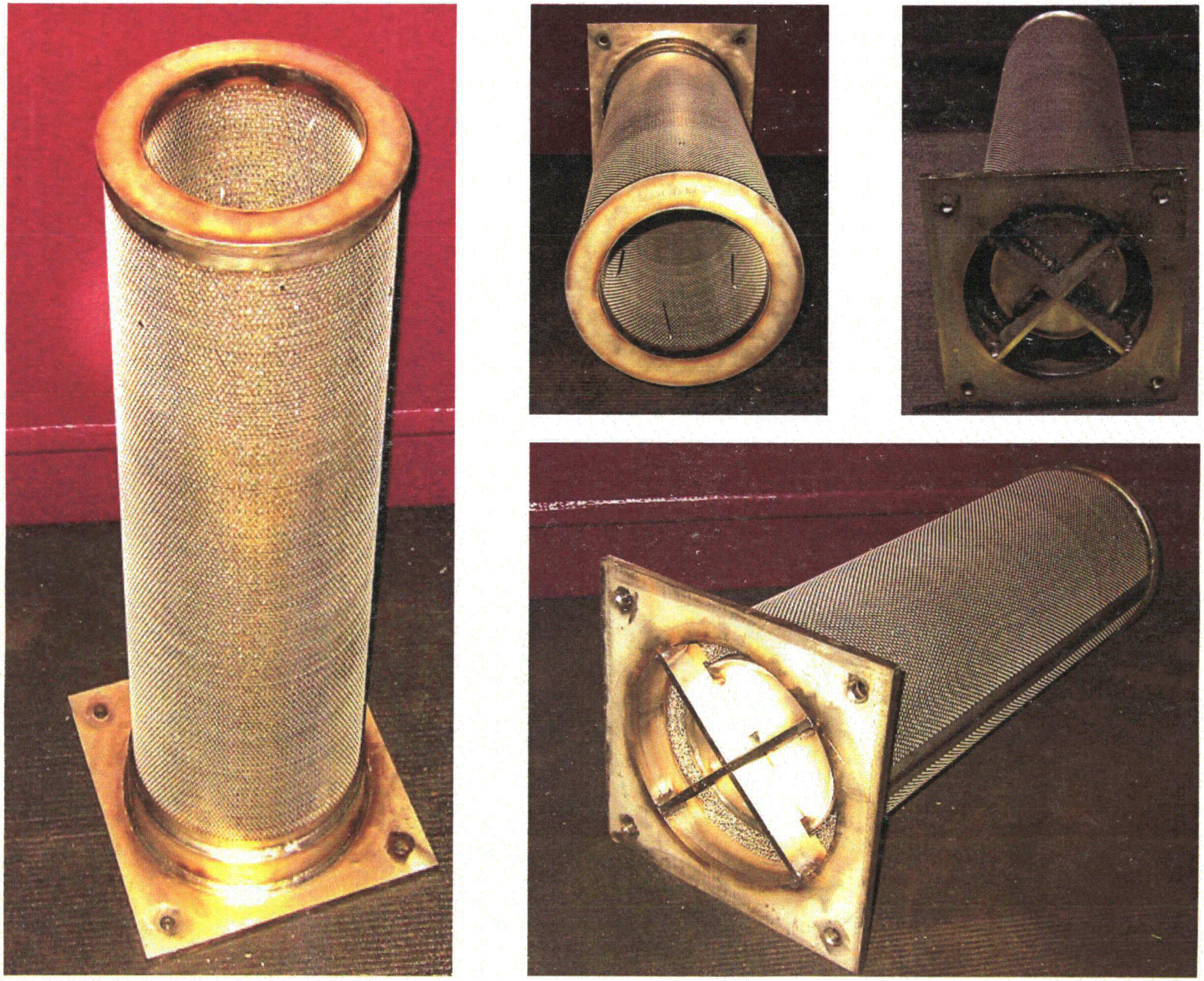


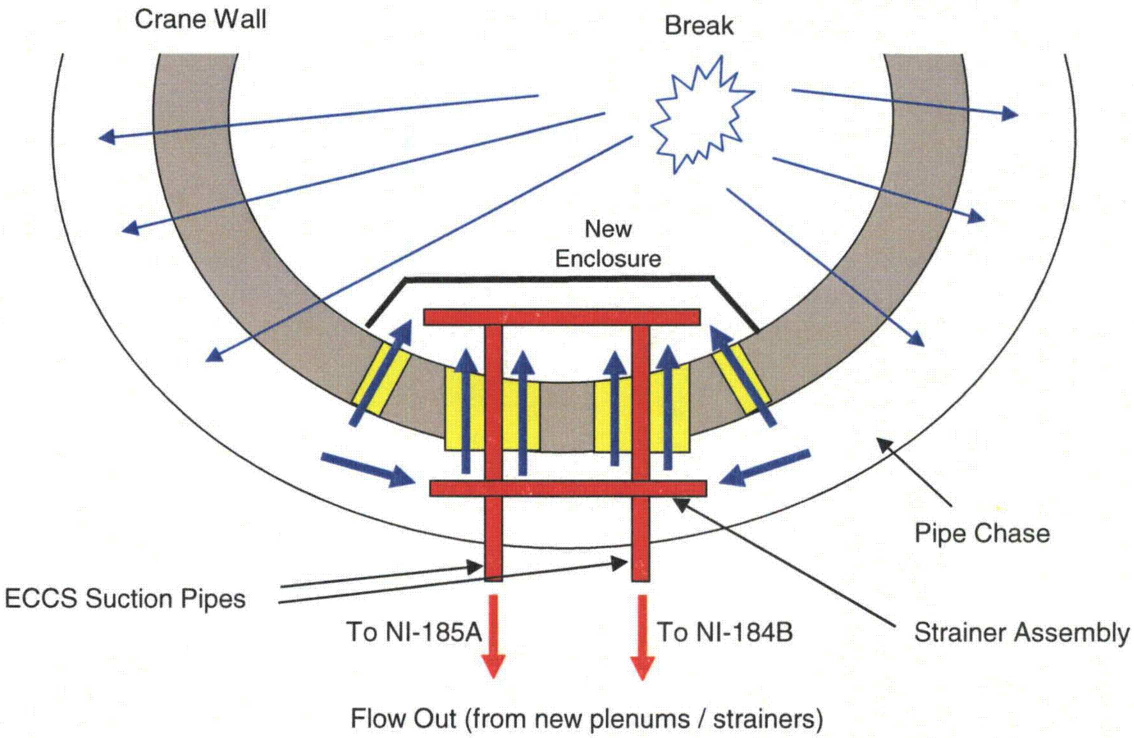
FIGURE 5



STRAINER ELEMENT (TOPHAT) DETAIL VIEWS

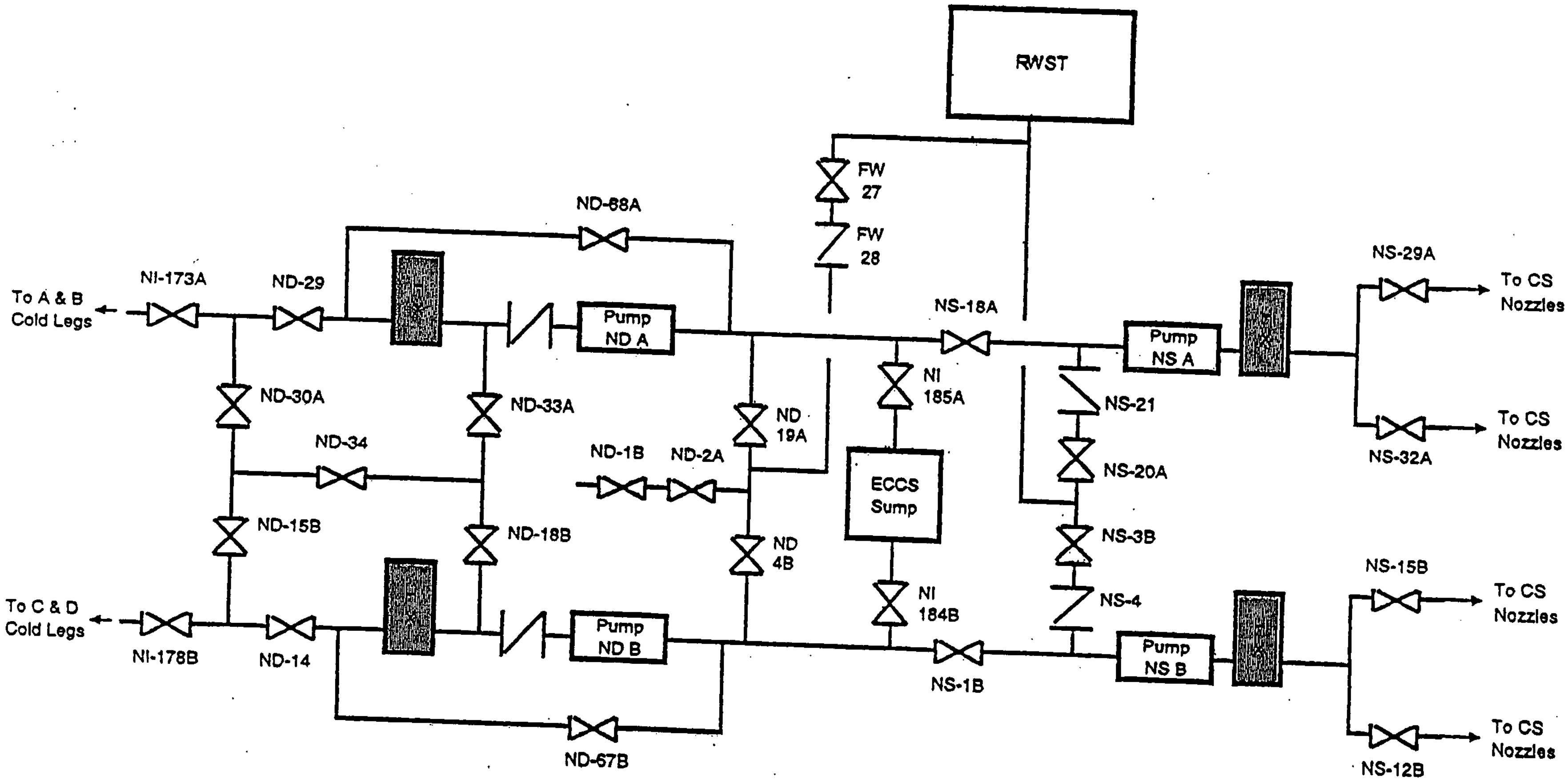
FIGURE 4

Simplified LBLOCA
Containment Flow Schematic



1) Flow (and suspended debris) from break originating inside crane wall passes thru crane wall penetrations to flood pipechase.
2) Pipechase water provides flow to new strainer (both the pipechase portion, and the shielded portion inside crane wall)
3) 'Reverse flow' from pipechase back to inside crane wall is primarily provided by newly opened 30" crane wall sleeves. After extending the 18" sump lines thru these sleeves, a 12" annulus space will remain.

Figure 6



Simplified RHR and CS System Flow Diagram

ND - Residual Heat Removal (RHR)
NI - Safety Injection
NS - Containment Spray (CS)
FW - Refueling Water
RWST - Refueling Water Storage Tank

Figure 7

ATTACHMENT 5

Regulatory Commitments

REGULATORY COMMITMENTS:

The following table identifies those actions committed to by McGuire in this document. Any other statements made in this licensing submittal are provided for informational purposes only and are not considered to be regulatory commitments. Please direct any questions you may have in this matter to K. L. Ashe at (704) 875-4535.

REGULATORY COMMITMENTS	Due Date
Install pipe rupture restraints on McGuire Unit 1 Residual Heat Removal System (Modification MD 100374)	Prior to McGuire Unit 1 Beginning of Cycle 19 Mode 4 operations
Install pipe rupture restraints on McGuire Unit 2 Residual Heat Removal System (Modification MD 200915)	Prior to McGuire Unit 2 Beginning of Cycle 19 Mode 4 operations