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September 2, 2009

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555-0001

Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station
Renewed Facility Operating Licenses Numbers DPR-38, DPR-47, and DPR-55;
Docket Numbers 50-269, 50-270, and 50-287
Responses to Request for Additional Information for the License Amendment Request to Revise Portions of the Updated Final Safety Analysis Report Related to the Tornado Licensing Basis; License Amendment Request: 2006-009

References:

1. Letter from Dave Baxter, Site Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, to the U. S. Nuclear Regulatory Commission, "License Amendment Request to Revise Portions of the Updated Final Safety Analysis Report Related to the Tornado Licensing Basis," dated June 26, 2008.
2. Letter from John Stang, Project Manager, Office of Nuclear Reactor Regulation, U. S. Nuclear Regulatory Commission, to Dave Baxter, Site Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, "Request for Additional Information Regarding the Licensee amendment Request for Upgrading the Licensing Basis for Tornado Mitigation (TAC NOS. MD9026, MD9027, MD9028)," dated July 6, 2009.

On June 26, 2008, Duke Energy Carolinas, LLC (Duke) submitted a License Amendment Request (LAR) to revise certain sections of the Oconee Updated Final Safety Analysis Report (UFSAR) associated with the tornado licensing basis [Ref. 1]. Specifically, this LAR proposes a number of plant modifications to enhance the station's capability to withstand the effects of a damaging tornado, revises the UFSAR sections associated with the tornado licensing basis (LB), and incorporates the tornado missile probabilistic methodology (TORMIS).

On July 6, 2009, Duke received a Request for Additional Information (RAI) in regards to the LAR [Ref. 2]. This submittal contains Duke's responses to that RAI. Within this document, the attachment contains Duke's responses to the RAI and supporting documentation is provided in the enclosure.

If you have any questions in regard to this letter, please contact Stephen C. Newman, Regulatory Compliance Lead Engineer, Oconee Nuclear Station, at (864) 873-4388.

A053
NRR

I declare under penalty of perjury that the foregoing is true and correct.
Executed on September 2, 2009.

Sincerely,

Dave Baxter, Vice President
Oconee Nuclear Station

Attachment: Duke Responses to RAI.

Enclosure: Tables, Drawings, and Diagrams bc w/attachment/enclosure:

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Attachment

Duke Responses to RAI

RAI -1

Provide the following information for the new protected service water (PSW) transformer, switchgear, load center and the circuit breakers: 1) equipment design ratings, 2) a summary of the analyses preformed to show the loading, short circuit values and the interrupting ratings, voltage drop, and protection and coordination, 3) the existing station auxiliary service water (ASW) switchgear ratings, and 4) the periodic inspection and testing requirements for electrical equipment. Provide applicable schematic and single line diagrams.

Duke Response

Note: As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

1. The 13.8kV/4.16kV switchgear is a double ended unit substation. Each unit substation consists of normal and alternate 13.8kV power source breakers, a 13.8kV/4.16kV step down transformer, and a 4.16kV main breaker connected to its respective 4.16kV switchgear buss. The two 4.16kV switchgear busses may be connected through a 4.16kV tie breaker. Switching power source breakers is performed by manual dead bus transfer. The design ratings for the PSW electrical equipment are as follows:

   a. 13.8kV/4.16kV Unit Substation

      Each ABB transformer is 13.8/4.16kV, 10/13.3MVA, 60Hz, 3 phase, solid cast, dry type transformer complete with neutral grounding resistor, AA-FA 133% overload rating with temperature monitor, NEMA 1 enclosure, and 185 degree C insulation class. The transformer primary is 13.8kV delta, 110kV BIL, and the secondary is 4.16kV wye, 75kV BIL. There are a total of five taps non-load changing (-5%, -2.5%, 0%, +2.5%, and +5%).

      The 13.8kV Square-D switchgear is a 1200A silver-plated copper bus in a NEMA 1 enclosure with 95kV BIL impulse withstand voltage, minimum short circuit current of 48KA RMS symmetrical, one minute withstand voltage of 36kV RMS. The 4.16kV switchgear is continuous rated 2000A silver-plated copper bus, 3 phase, 3 wire, low resistance grounded wye, 4.16kV nominal, 4.76kV maximum, minimum short circuit current 49KA RMS symmetrical, impulse withstand voltage 60kV BIL, one minute withstand voltage of 19kV RMS.

      The 13.8kV Square-D switchgear breakers are 15kV maximum voltage nominal system voltage 13.8kV, 3 phase, 3 wire, 1000MVA, 1200A. The 4.16kV Square-D switchgear main and tie breakers are 4.76kV maximum, 350MVA, and 2000A. The Square-D feeder breakers are 4.76kV maximum, 350MVA, and 1200A.

b. 600VAC Load Center

The 600VAC load center ABB transformer is 4.16kV/600VAC, 5MVA, 60Hz, 3 phase, delta – wye cast coil dry type transformer with solidly grounded neutral, NEMA 1 enclosure, 80 degree C temperature rise, and insulation class of 220° C.

The 600VAC Square-D switchgear is 3 phase, 4 wire, solidly grounded neutral, 5000A copper bus.

The 600VAC Square-D load center main breaker is 600VAC, 5000A with Power Metering type 6.0P Micrologic Trip Unit, 5000A sensor plug, and an A rating plug. Feeder breakers are 600VAC, 1600A or 800A, with Power Metering Type 6.0P Micrologic Trip Units, with a 1200A/600A/400A sensor plug and with A/C/G rating plugs.

2. Loading, short circuit values, interrupt ratings, and voltage drops for the PSW transformer, switchgear, load center, and circuit breakers will be analyzed in an Electrical Transient Analysis Program (ETAP) calculation associated with PSW design packages, which are under development. Protection and coordination for the PSW transformer, switchgear, load center, and circuit breakers will be in accordance with Duke and industry standards. Details will be prepared in a separate calculation.

3. The existing station Auxiliary Service Water (ASW) switchgear breaker ratings are four (4) 1200A breakers, and four (4) 600A breakers (Ref. dwg O-702-A1).

4. The PSW transformer, switchgear, load center, and circuit breakers will be periodically inspected, maintained, and tested in accordance with the Duke Nuclear Fleet, vendor, and industry (e.g. EPRI) recommendations, to maintain equipment reliability and qualification, and to satisfy Technical Specification surveillance requirements.

Applicable schematic and single line diagrams [Enclosure] are:

- O-702-A1 – One Line Diagram 6900V & 4160V Station Auxiliary System

[The following drawing is PRELIMINARY and has not been approved]:

- O-6700 – One-Line Diagram Main PSW Switchgear
- O-6707 – One-Line Diagram 600V PSW Bldg, MCC XPSW Loadcenter OCPSW1

RAI -2

Provide the following information concerning the proposed PSW instrumentation and control (I&C) power and the interface with the existing plant vital I&C power: 1) design of the DC system for the PSW system including how the DC control power for the new PSW load center, switchgear and the transformer will be provided, 2) the impact on existing DC vital system including loading on the existing battery and the battery charger, 3) describe the analysis performed to determine the capacity of the batteries and the battery charger, voltage requirements at the equipment terminals, electrical protection and co-ordination, and 4) the periodic inspection and testing requirements. Provide applicable schematic and single line diagrams.

Duke Response

> Note: As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

1. The PSW DC system includes two batteries, two battery chargers, one 125 VDC distribution center, 125 VDC panels located in the PSW building and plant, a DC ground detector and battery test boxes.

   Each battery consists of 60 C&D LCY-39 flooded lead-acid cells with one battery aligned to the PSW DC system at a time and the other battery maintained on float voltage in standby and isolated from the PSW DC system.

   The two 300 ADC battery chargers are manufactured by SCI/AMETEK. The PSW DC system design will allow either charger to be aligned to either battery.

   The PSW DC system will provide DC control power to the PSW switchgear and load centers via the 125 DC PSW distribution center and panels and also provide DC control power for new PSW equipment located in the plant.

2. Additional loading imposed by new PSW components on the existing plant Vital I&C DC system is minimal ADC and consists of new main control room indication and power supplies. The majority of the new DC PSW loads will be fed from the PSW DC system and there will be no electrical interconnection between the PSW DC and existing Vital I&C DC systems.

3. The analysis used for selecting the battery and battery charger sizes and ratings is found in preliminary calculation OSC-9190 (Protected Service Water DC System Analysis Calculation).

   The battery size was conservatively selected using IEEE-485 and including as a design requirement the ability to jumper out up to two cells from the nominal 60 cell battery while still maintaining sufficient capacity to feed the design basis load. Additionally, the IEEE-485 methodology resulted in a selected cell size of LCY-37 which was increased to LCY-39 which provides additional design margin for the PSW DC system.

The battery charger size was selected using IEEE-946 methodology and is based on a battery recharge time of eight (8) hours. Battery terminal voltage is based on a minimum value of 105 VDC. PSW DC system protection and coordination will be included in other calculations associated with PSW design packages which are under development.

PSW DC system protection and coordination will be in accordance with industry and Duke standards.

4. The PSW DC system will be periodically inspected, maintained and tested per vendor and industry (e.g. EPRI) recommendations to maintain equipment reliability and qualification and satisfy Technical Specification surveillance requirements.

   The PSW batteries will undergo weekly, monthly, quarterly and annual battery surveillances and inspection including voltage, specific gravity, electrolyte level and temperature, battery condition and service and performance discharge tests. Battery racks will also be subject to periodic inspection and maintenance.

   The PSW Battery chargers will undergo periodic inspections and testing such as float and equalization voltage adjustment, circuit board calibration, cleaning and periodic parts replacement and load testing.

   The PSW 125 VDC distribution center, panels and ground detection system will undergo periodic testing, calibration and cleaning.

Applicable schematics and single line diagrams are: O-6700-01, O-6701, O-6702, and O-6703.

RAI -3

In Enclosure 2, Section 3.3.4 of the LAR, the licensee states that the Keowee Hydroelectric Units (KHUs) will provide power supply to the PSW switchgear through underground cables. Provide analyses to show the kilo volt ampere (kVA) loading, new circuit breaker rating, short circuit values, and voltage drop. In addition, provide information on the electrical protection and coordination, and the periodic inspection and testing requirements. Further, explain how the redundancy and independence of the Class 1E power system is maintained as a result of the proposed modification. Provide applicable schematic and single line diagrams.

Duke Response

Note: As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

1. The loading, short circuit values, interrupt ratings, and voltage drops for the underground cables will be analyzed in an Electrical Transient Analysis Program (ETAP) calculation associated with PSW design packages, which are under development.

2. Protection and coordination for the underground cables will be in accordance with industry and Duke standards. Details will be prepared in a separate calculation.

3. The underground cables will be evaluated for inclusion in the Oconee Nuclear Station (ONS) Insulated Cables and Connections Aging Management Program where periodic inspections and testing schedule for these cables will be established (See response to RAI # 6 [below] for additional information).

4. The PSW electrical system has a normal (13.8kV Fant Line) and alternate (13.8kV Keowee Hydro Unit) 13.8kV power source breaker to each PSW Unit Substation. The redundancy of the PSW power system is provided through these two power sources. The Keowee Hydro Unit 13.8kV power source cables to the PSW electrical system will be routed in a combination of precast concrete trench boxes, duct banks, and manholes. The power feeds from Keowee Hydro Unit to both Oconee Nuclear Station and the PSW electrical equipment are isolated by separate breakers and disconnect switches. Independence is maintained as required by Duke Design Criteria DC 3.13.

Applicable schematic and single line diagrams are:

- DC 3.13 – ONS Cable and Wiring Separation Criteria

[The following drawings are PRELIMINARY and have not been approved]:

- O-6700 – One-Line Diagram Main PSW Switchgear
- K-700 – Keowee Hydro Station – One-Line Diagram

RAI -4

The licensee states in the LAR that the PSW system will be fully operational from the respective unit's main control room and will be activated when existing redundant emergency systems are not available. Describe how the alarms, indications, and the electrical controls will be provided from the main control rooms of Units 1 and 2 to the proposed PSW switchgear. Explain how the controls are provided for Unit 3. Provide applicable electrical schematics and evaluations highlighting the design features.

Duke Response

Note:	As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

The PSW pump will be manually started from the Unit 2 Main Control Room. Unit 1, 2, and 3 will control their respective PSW powered injection valves, HPI pumps, and RCS vent valves from their respective control room via power transfer and control switches. All appropriate control and monitoring functions will be alarmed at the plant Operator Aid Computer (OAC) or on the respective Unit's Stat alarm panels. Details will be included in the associated PSW design change packages, which are under development.

Applicable one-line diagrams and electrical schematics highlighting the design features are as follows:

The following drawing is PRELIMINARY and has not been approved.

- O-6700 – One-Line Diagram Main PSW Switchgear

RAI -5

Provide information on how the licensing basis for physical independence and separation criteria are met for the PSW electrical system.

Duke Response

Note:	As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

The licensing basis for physical independence and separation criteria for the PSW electrical system meet the requirements of Duke Design Criteria DC 3.13, " Oconee Nuclear Station Cable and Wiring Separation Criteria," that provides guidance for cable routing and installation.

Refer to DC 3.13 [Enclosure].

RAI -6

The licensee states in the LAR that the new PSW system switchgear will receive power from the KHUs via a tornado-protected underground feeder path. Provide the following information: 1) the type of underground cable installation, i.e., direct burial or in duct banks, manholes etc., 2) how the licensee will ensure that the proposed new underground cables remain in an environment that they are qualified for, 3) periodic inspections and testing planned for cables to monitor their performance, and 4) details regarding cable size, type, maximum loading requirements, and cable protection devices.

Duke Response

> Note: As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

1. The underground cable route from Keowee Hydro to the PSW building will be a combination of precast concrete trench boxes, duct banks and manholes. None of the cables will be direct buried.

2. The Keowee underground path to the PSW switchgear will be designed to preclude water entry that could wet the cables. The concrete trenches will have drains. The duct banks will be sloped towards manholes where drains or sump pumps are provided. Periodic inspections will be performed on the Keowee to PSW underground path to evaluate the condition of the trenches, duct banks, manholes and drainage system.

3. The cables will be evaluated for inclusion in the ONS Insulated Cables and Connections Aging Management Program. Since the underground path from Keowee to the PSW switchgear cable installation is designed to prevent significant exposure to moisture and is inaccessible, it is expected that the cables will not meet the criteria for periodic diagnostic testing. If subsequent periodic inspection of the Keowee to PSW switchgear underground trenches, duct banks and manholes determines that these inaccessible cables are exposed to significant moisture, testing will be performed.

4. The 13.8 kV circuit from Keowee to the PSW switchgear consists of six single conductor cables. Each conductor is 750 kcmil copper with Class B compact round stranding. The conductor shield is a thermoset semi-conducting compound extruded over the conductor. The insulation is ethylene propylene rubber (EPR) that provides an insulation level of 173% about the 15 kV nominal insulation rating. The insulation is rated at 90°C continuous and 130°C emergency overload. The insulation shield is a semi-conducting thermoset compound extruded over the insulation. Two layers of non-magnetic bronze tape shield are applied over the insulation shield. A thermoset chlorosulfonated

polyethylene (Hypalon) jacket is applied over the cable core.

Maximum allowable cable loading will be determined by Duke ampacity criteria and engineering calculation. Cable protection will be determined by Duke protective relaying criteria and standard industry practice.

RAI -7

Provide information concerning the design details for the new 100/13.8 kV substation, the PSW transformer and switchgear building power feeds, its protection, controls and alarms features. Provide applicable single line diagram and electrical schematics.

Duke Response

Note: As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

The new 100/13.8 kV substation is fed via an overhead 100 kV path from the Duke Lee Central switching station. The substation is a 13.44 MVA 100/13.8 kV oil-filled fan cooled transformer. The transformer primary side is equipped with a circuit switcher that is remotely controlled from the Duke Transmission Control Center (TCC). Various transformer and substation parameters are remotely available to the TCC. The transformer is equipped with secondary side protection.

The 13.8 kV circuit from the substation to the ONS owner controlled area is an overhead path constructed per Duke Power Delivery standards. The 13.8 kV overhead path then transitions to underground duct bank and enters the protected area and PSW building where it terminates at the PSW switchgear. See preliminary one-line diagram O-6700 for additional details on the Main PSW 13.8/4 kV System.

Refer to O-6700 – One-Line Diagram Main PSW Switchgear [Enclosure].

RAI -8

The licensee states in Enclosure 2, Figure 1 of the LAR, that two new power feeds will be installed to the auxiliary building (AB) with one power supply to the Unit 1, 2, and 3 AB equipment high pressure injection (HPI) pumps and vital I&C normal battery chargers and other power supply to the backup power to the Units 1, 2, and 3 pressurizer heaters. Provide the following information concerning this installation: 1) compare and contrast the existing power supply requirements for the above loads, 2) how the electrical separation, independence, and redundancy requirements are maintained, 3) summary of the voltage analyses for the equipment/components affected by this modification, 4) design details for the new power feeds to AB, 5) periodic inspections and testing schedule for the these cables to monitor their performance, and 6) provide the electrical schematics and one-line drawings for these power feeds.

Duke Response

> Note: As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

1. A comparison and contrast of the existing power supply requirements for the above loads will be performed in a separate calculation associated with PSW design packages, which are under development.

2. The electrical separation, independence, and redundancy requirements are maintained in accordance with the requirements of Duke Design Criteria DC 3.13, "Oconee Nuclear Station Cable and Wiring Separation Criteria," that provides guidance for cable routing and installation.

3. Analysis of the voltages for the equipment/components affected by this modification will be analyzed in an Electrical Transient Analysis Program (ETAP) calculation associated with PSW design packages, which are under development.

4. Design details for the new power feeds to the HPI pump motors, battery chargers, and pressurizer heaters are indicated on the drawings identified in item #6 below.

5. The new cables will be evaluated for inclusion in the Oconee Nuclear Station (ONS) Insulated Cables and Connections Aging Management Program where periodic inspections and testing schedule for these cables will be established to monitor their performance.

6. Electrical schematics and one-line drawings for these power feeds are:

   - O-702 – Unit 1 One-Line Diagram 6900V & 4160V Station Auxiliary System
   - O-1702 – Unit 2 One-Line Diagram 6900V & 4160V Station Auxiliary System
   - O-2702 – Unit 3 One-Line Diagram 6900V & 4160V Station Auxiliary System

[The following drawings are PRELIMINARY and have not been approved]:

- O-6700 – One-Line Diagram Main PSW Switchgear
- O-6701 – One Line Diagram Station Auxiliary Ckts 600V MCC 1XPSW
- O-6702 – One Line Diagram Station Auxiliary Ckts 600V MCC 2XPSW

- O-6703 – One Line Diagram Station Auxiliary Ckts 600V MCC 3XPSW
- O-703-D – Unit 1 One-Line Diagram Station Auxiliary Ckts 600V
- O-703-E – Unit 1 One-Line Diagram Station Auxiliary Ckts 600V
- O-1703-C – Unit 2 One-Line Diagram Station Auxiliary Ckts 600V
- O-1703-D – Unit 2 One-Line Diagram Station Auxiliary Ckts 600V
- O-2703-C – Unit 3 One-Line Diagram Station Auxiliary Ckts 600V
- O-2703-D – Unit 3 One-Line Diagram Station Auxiliary Ckts 600V

RAI -9

Provide confirmation that the maximum float/equalizing voltage does not exceed the equipment maximum DC voltage rating.

Duke Response

Note:	As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

Duke does not perform online equalization charging on batteries therefore equipment overvoltage will not be a concern since the battery being equalized will be isolated from the DC system. Float voltage setting will be based on vendor recommendations and engineering calculation and controlled by maintenance procedures to ensure that equipment maximum DC ratings will not be exceeded.

RAI -10

Describe in detail how the 125 VDC vital I&C primary and backup power cables and the KHU emergency start circuitry will be rerouted from the turbine building (TB) to the AB.

Duke Response

Note:	As of the date of this response, various aspects of the PSW's design, including equipment rating and parameters, are not final and are subject to change. In addition to the information below, specific details related to the PSW design features will be made available for future inspection at the Oconee Nuclear Station.

All of the Unit 1,2, and 3 125 VDC Vital I&C Battery System primary cables and Unit 1, 125 VDC Vital I&C Battery System backup cables to Unit 3, will be replaced with new cables routed solely inside the Auxiliary Building through areas protected from HELB and Tornado design basis events. The new cable routing will not affect the system functional characteristics and the termination points and each end of the cables will not change.

This design change provides new routing for the Keowee Hydro Units (KHU) emergency start cables. The existing underground spare cables between KHU and the Oconee Station will be used. For tie-in to control and logic, these underground cables will be extended with new cables between KHU termination cabinets to KHU control panels and Oconee termination cabinets to control panels in the Auxiliary Building. New emergency start cables will be installed from the 230 kV switchyard relay house via a new protected underground duct bank to the PSW switchgear building and, underground via protected duct bank, to the Auxiliary Building control panels.

Refer to drawings labeled RAI #10 in the Enclosure.

RAI -11

Provide the following clarifying information concerning the use of the tornado missile probabilistic methodology (TORMIS):

a. A basis for stating LAR contains an expansion of the use of the TORMIS methodology.
b. A basis for stating the NRC staff acknowledged Duke's specific application of the TORMIS methodology.
c. Provide clarification as to the LAR being based on the NRC staff having accepted the probabilistic analysis as the current licensing basis (CLB), for tornado mitigation. If this is correct please provide the documentation stating the acceptance.

Duke Response

Duke has utilized the TORMIS methodology in previous responses to tornado missile-related NRC inquiries; however, these submittals did not result in TORMIS being incorporated into the tornado LB. Duke proposes to 'expand' its use by formally incorporating the TORMIS methodology into Oconee's tornado LB.

RAI -12

Provide a basis for the use of the TORMIS methodology in identifying and/or excluding system structures and components (SSC) requiring or not requiring tornado protection as part of the ONS licensing basis.

Duke Response

For the proposed Oconee licensing basis, all SSCs supporting the tornado mitigation strategy are protected deterministically; except for specific plant features (addressed by TORMIS) having a sufficiently low probability of damage (collectively) that would otherwise require the addition of costly tornado missile protective barriers or other plant modifications in order to meet deterministic protection requirements.

Transitioning from the CLB to the proposed tornado licensing basis, those SSCs requiring additional physical protection that can be upgraded in a cost-effective manner have been or will be upgraded. However, a number of SSCs require very costly upgrades. In some cases, Duke has chosen to apply the TORMIS methodology and in other cases Duke has selected to implement costly modifications.

For clarification, the first sentence in Enclosure 2, Section 3 of the LAR, is modified as follows:

> *This LAR incorporates revisions to the tornado CLB and includes a number of plant modifications, UFSAR revisions, and an expansion of the use of the tornado missile probabilistic methodology (TORMIS) in determining which systems, structures, or components require* ***added*** *physical protection from tornado-generated missiles at the site.*

This change clarifies that the use of TORMIS at Oconee is for the evaluation of plant upgrades (for exemption) rather than to imply that TORMIS is used to determine which SSCs are subject to protection requirements.

RAI -13

The ONS UFSAR dated December 31, 2007, contains the following statements: UFSAR Section 3.2.2, "System Quality Group Classification:"

"In addition, there was considerable correspondence between Duke and the NRC in the years post-TMI discussing Oconee's ability to survive tornado generated missiles. Based primarily on PRA justifications, the NRC staff concluded that the secondary side heat removal function complied with the criterion for protection against tornado missiles."

UFSAR Section 10.4.7.3.6, "EFW Response Following a Tornado":

"A probabilistic risk assessment was developed to address the plant's capability to provide secondary decay heat removal via the EFW [emergency feedwater], SSF [Standby shutdown facility], ASW [auxiliary service water], and station ASW Systems, (see Section 10.4.7.3.8) in the event of a tornado. Reference 3 [ONOE-11376, changes to support multiple unit alignment to the Auxiliary Steam Header] concludes that the Standard Review Plan probabilistic criterion is met based upon the probability of failure of the EFW and station ASW Systems combined with the protection against tornado missiles afforded the SSF ASW System."

As discussed in RAI 1, the NRC staff finds no basis or additional information justifying these statements.

Provide as basis for the above cited section of the ONS UFSAR.

Duke Response

The following wording in UFSAR Section 3.2.2, "...Based primarily on PRA justifications, the NRC staff concluded that the secondary side heat removal function complied with the criterion for protection against tornado missiles," is currently incorrect in that the NRC based their decision (as stated on page 6 of the 1989 SER), "...on its review of the licensee's probabilistic analysis for loss of secondary decay heat removal due to tornado missiles, the staff concludes that the probability of failure of the EFW and ASW systems combined with the protection against tornado missiles afforded the SSFASW system, satisfies the SRP probabilistic criterion, and is therefore, acceptable." However, this section of the UFSAR is being replaced in its entirety and the incorrect wording does not appear in the proposed UFSAR 3.2.2 change.

For UFSAR Section 10.4.7.3.6, the justifying reference should be "Reference 7" rather than "Reference 3." Reference 7 is the NRC SER which summarizes the results [see wording in previous paragraph] of Oconee's response to TMI Action Plan, NUREG-0737, Item II.E.1.1, Auxiliary Feedwater System Evaluation, dated July 28, 1989.

Both of these UFSAR items have been entered into Oconee's corrective action program for resolution.

RAI -14

Provide a basis for not including all unprotected SSCs in the TORMIS analysis or revise the TORMIS analysis to include all unprotected SSCs as potential targets.

Duke Response

The revised Oconee tornado mitigation strategy primarily utilizes the SSF for SSDHR and RCMU following a loss of all normal and emergency systems which usually provide these functions. The SSF systems can maintain all three units in a safe shutdown condition for up to 72 hours while damage control measures are completed to restore any unavailable PSW or HPI related equipment needed to cool down the units to approximately 250 °F.

All unprotected SSCs associated with the SSF required to maintain safe shutdown for 72 hours after a tornado event are included in the TORMIS evaluation. Other SSCs that do not support the SSF are conservatively assumed to be in a failed state (Prob. = 1) although they provide redundancy (defense-in-depth) which further reduces the actual probability of a release in excess of 10CFR100 limits (see Attachment 4 - Section 5.1). Because these alternate means of achieving safe shutdown are assumed failed, the PSW/HPI systems and other support systems such as Keowee emergency power and I&C power are not included in the TORMIS computer model. In this way, all potentially vulnerable SSCs are considered in the TORMIS evaluation and the overall damage frequency is conservatively estimated.

Section 5.2 of Attachment 4 of the LAR was intended to document three specific target sets which required special treatment due to special circumstances rather than to imply that they were excluded from the scope of the TORMIS evaluation. These special circumstances include instances where functional redundancy, physical separation, and other qualitative considerations were taken into account, or where limitations of the TORMIS computer code prevented the development of a suitable model to evaluate the targets. Below, additional information and clarifications are provided for each of these target sets.

MS Support Columns

The Main Steam support pedestals (3 per unit) were individually modeled in the TORMIS simulation. However, as described in the LAR, the loss of a single column alone will not result in a failure of the required safety function. Therefore, the probability of losing 2 columns at the same time was evaluated and found to be negligible. Because the TORMIS code is limited to evaluating only 2 targets at a time for union and intersection probabilities, the outermost pair of columns for each unit were evaluated for coincident impact. The outer pair of columns was selected because they are closer to vehicle missile storage locations and have the highest potential for vehicle impact. This is referred to in the LAR as a sensitivity case (1 pair per unit). The results of these runs returned a total damage probability of 0.0 for each unit. With a very large sample size and a zero result for the most exposed pair of columns, additional runs were not required to conclude that the overall damage probability for all combinations of 2 of 3 columns being damaged at the same time is also negligible.

CCW Piping

The CCW suction source for the SSF was included as part of the overall missile evaluation and was qualitatively evaluated because of code limitations that prevented explicitly modeling it in the missile simulations. Specifically, the CCW piping is in the Turbine Building basement which is below plant grade and the TORMIS code is not capable of evaluating the trajectory of a missile below plant grade (z=0).

The conclusion of the qualitative assessment is that the probability of an SSF failure to mitigate a tornado event due to CCW piping damage is negligible and may be ignored in the simulation model. This conclusion is based on the following considerations:

1) The CCW piping is in the turbine building basement and has substantial protection in all but a limited number of locations.

2) The system can tolerate significant damage (large break flow) and still maintain adequate reverse gravity flow from the CCW discharge at Lake Keowee to support SSF operation until the SSF submersible pump can be installed.

SSF Trench Vent Pipes

The SSF trench vent pipes were included as part of the overall missile evaluation, but were not explicitly modeled in the simulation because a qualitative evaluation concluded the probability of damage was negligible. Additional information is provided below to support this conclusion.

A further review of the design analysis for the vent was conducted and found that only a single vent pipe (1 of 3) is needed. This analysis is conservative in 2 significant ways. First, it assumes a differential pressure of 3 psid rather than 1.2 psid as required by Regulatory Guide 1.76 Revision 1. Second, it does not account for leakage from around the individual trench cover blocks which is expected to be significant based on observation and the relatively small venting flow area required.

It is also noted that these vents are widely separated; Units 1 and 2 are separated by approximately 200 feet and Units 2 and 3 by approximately 275 feet. Since the primary concern for these targets is vehicle missile impact, the probability of coincident damage to all three vents can be shown to be negligible by comparison to the analysis of the MS Support Columns discussed above. In that case, a pair of much larger columns was shown by analysis to have a negligible probability of coincident damage while separated by only 34 feet.

RAI -15

The NRC staff needs the following information concerning Enclosure 2 of the LAR:

a. Enclosure 2, Item 3.3.4, second paragraph states the new 100/13.8 kV substation is strategically placed to reduce the probability of concurrent tornado damage to the station switchyard. Provide an explanation of what is meant by strategically placed.
b. Enclosure 2, Item 3.5 of the LAR states Duke will reconstitute the original wind analysis to ensure the tanks can withstand UFSAR Class 1 wind criteria. As required, vulnerable area so the tanks and flow paths will be physically modified to protect against UFSAR Class 1 tornado missiles. Provide a schedule for completion of the reconstitution of the original wind analysis. Also, provide a description of all modifications made to protect the borated storage tank and flow paths.
c. Enclosure 2, Item 3.6 identified one change addressed by this LAR is: eliminating crediting the spent fuel pool, to HPI flow path for reactor coolant make-up. No mark-up of the UFSAR for this proposed change was included in the LAR. Provide a proposed mark-up of the UFSAR for this change.
d. Enclosure 2, Item 3.8 calls for analyzing a "double column set" and providing modifications. Provide a description of the analysis and the modifications.
e. Enclosure 2 Item 3.9 discusses protection of the atmospheric dump valves. Provide a description of protective measures for the atmospheric dump valves.
f. Enclosure 2, item 3.10 calls for improving "...protection of the SSF double doors..." Provide a description of the protection and basis for the improvements.

Duke Response

a. The location of the new 100/13.8 kV substation was selected to provide wide separation from existing ONS backup power supplies to prevent coincident tornado damage of all power supplies at the same time. The 230 kV switchyard is supplied from multiple directions including 2 circuits from Jocassee (from the north) while Keowee Hydro is located east of ONS, and the new 100/13.8kV substation was placed south of ONS. There is a minimum of approximately 3,000 feet between these power supplies. Using Regulatory Guide 1.76, Rev. 1, Region I data and equation 1b, the resultant wind speed at the perimeter of the 3,000 foot circle would be approximately 64 mph which is within the design capability of Oconee's power supplies.

b. The wind analysis of the BWST's is currently being developed and is expected to be finished September 2009. Modifications to protect the vulnerable areas of the tanks and flow paths began in July 2009. The new BWST protective structures will be structural steel enclosures surrounding the BWST's. The structures will be approximately 50 ft. x 50 ft. and approximately 12 ft. high. The protective steel structures will be fastened to a substantial reinforced concrete foundation. Excavation of these foundations, the first modification activity, began in July 2009.

c. The UFSAR marked-up page showing the replacement of the High Pressure Injection (HPI) pump from the Spent Fuel Pool (SFP) flowpath is already contained in the submitted Tornado LAR package (see Attachment 2 [Marked-up pages], page 3.2-4, item "b").

d. The analysis of the "double column set" has been completed. The analysis concluded that the columns are structurally adequate for Class I tornado. The columns are not required to be reinforced. The analysis indicated, however, that the columns experience some lateral deflection under tornado load. Modifications will be provided to address this deflection by removing rigid links between the column and the MS piping so that the deflection does not adversely affect MS piping.

e. The atmospheric dump valves (ADV's) will be deterministically protected for Class 1 tornado. At this point, the modification scope for protecting the ADV's has not been developed; therefore details of protective measures are not yet available. The ADV's are planned to be protected as part of the new MSIV installations.

f. The SSF double door will be upgraded, replaced, or supplemented to meet TORMIS tornado missile criteria. At this point, the modification scope for door improvements has not been developed; therefore details are not available. The door will be improved to perform as it is modeled in the TORMIS analysis.

RAI -16

Provide a description of the measures taken to protect the main steam isolation valves.

Duke Response

The new MSIV's will be deterministically protected for Class 1 tornado. At this point, the modification scope for the MSIV's has not been developed; therefore details of protective measures are not yet available.

Enclosure

Tables, Drawings, and Diagrams

RAI-1

- O-702-A1 – One Line Diagram 6900V & 4160V Station Auxiliary System (Rev. 21)
- O-6700 – One-Line Diagram Main PSW Switchgear (Rev. A)
- O-6707 – One-Line Diagram 600V PSW Bldg, MCC XPSW Loadcenter LCPSW1 (Rev. A).

RAI-2

- O-6700-01 – One-Line Diagram – Main PSW 125 VDC Power Distribution Center for PSW Building (Rev. A)
- O-6701 – One Line Diagram – Station Auxiliary Circuits 600V MCC 1XPSW (Rev. A)
- O-6702 – One Line Diagram – Station Auxiliary Circuits 600V MCC 2XPSW (Rev. A)
- O-6703 – One Line Diagram – Station Auxiliary Circuits 600V MCC 3XPSW (Rev. A).

RAI-3

- DC 3.13 – ONS Cable and Wiring Separation Criteria (Rev. 9)
- O-6700 – One-Line Diagram Main PSW Switchgear (Rev. A) [see RAI-1 above]
- K-700 – Keowee Hydro Station – One-Line Diagram (Rev. 31A).

RAI-4

- O-6700 – One-Line Diagram Main PSW Switchgear (Rev. A) [see RAI-1 above].

RAI-5

- DC 3.13 – ONS Cable and Wiring Separation Criteria (Rev. 9) [see RAI-3 above].

RAI-7

- O-6700 – One-Line Diagram Main PSW Switchgear (Rev. A) [see RAI-1 above].

RAI-8

- O-702 – Unit 1 One-Line Diagram 6900V & 4160V Station Auxiliary System (Rev. 31)
- O-1702 – Unit 2 One-Line Diagram 6900V & 4160V Station Auxiliary System (Rev. 21)
- O-2702 – Unit 3 One-Line Diagram 6900V & 4160V Station Auxiliary System (Rev. 23)
- O-6700 – One-Line Diagram Main PSW Switchgear (Rev. A) [see RAI-1 above]
- O-6701 – One Line Diagram Station Auxiliary Ckts 600V MCC 1XPSW (Rev. A) [see RAI-2 above]
- O-6702 – One Line Diagram Station Auxiliary Ckts 600V MCC 2XPSW (Rev. A) [see RAI-2 above]

- O-6703 – One Line Diagram Station Auxiliary Ckts 600V MCC 3XPSW (Rev. A) [see RAI-2 above]
- O-703-D – Unit 1 One-Line Diagram Station Auxiliary Ckts 600V (Rev. 56A)
- O-703-E – Unit 1 One-Line Diagram Station Auxiliary Ckts 600V (Rev. 63A)
- O-1703-C – Unit 2 One-Line Diagram Station Auxiliary Ckts 600V (Rev. 27A)
- O-1703-D – Unit 2 One-Line Diagram Station Auxiliary Ckts 600V (Rev. 48A)
- O-2703-C – Unit 3 One-Line Diagram Station Auxiliary Ckts 600V (Rev. 40B)
- O-2703-D – Unit 3 One-Line Diagram Station Auxiliary Ckts 600V (Rev. 55B).

RAI-9

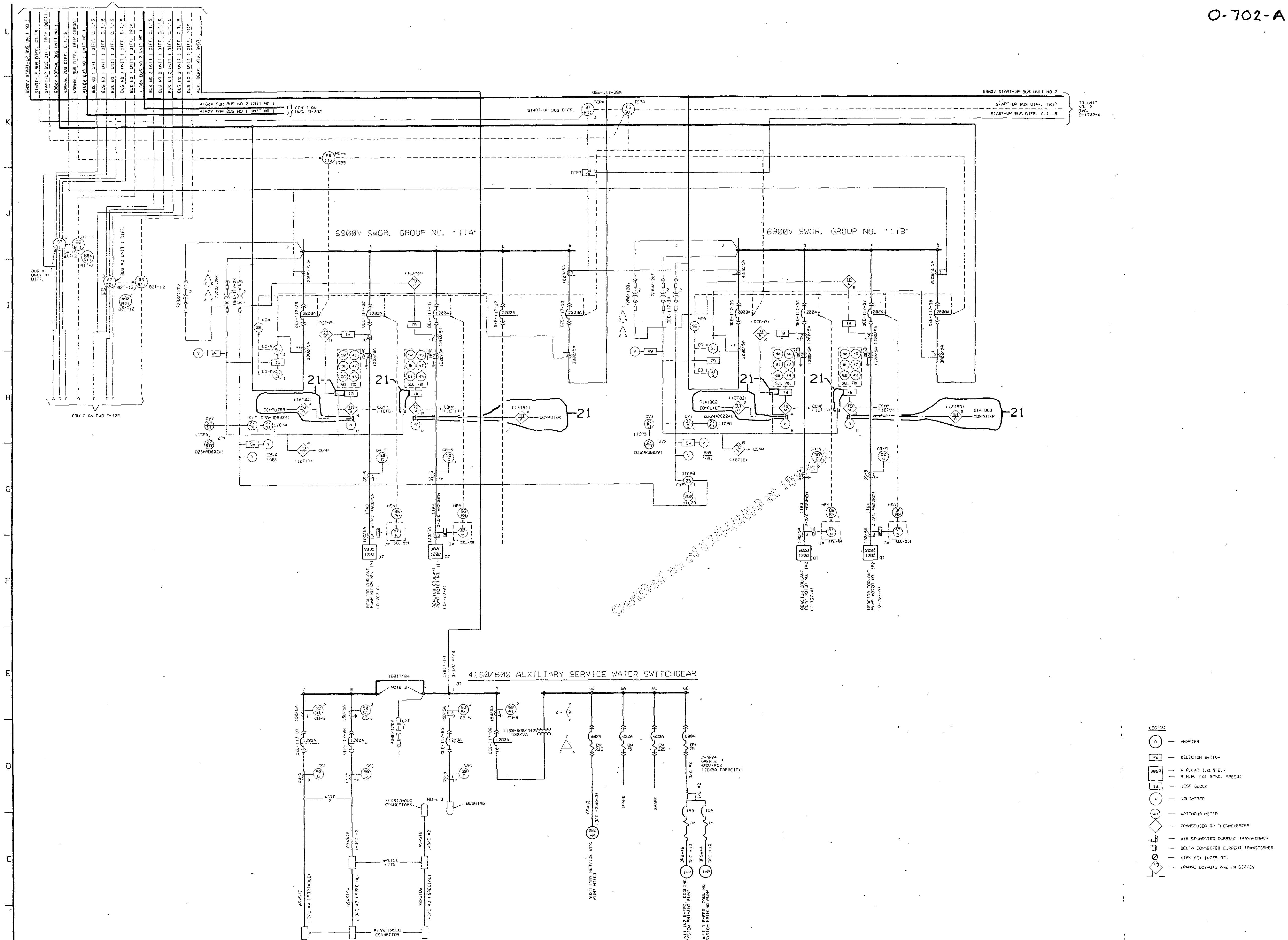
- DC 3.13 – ONS Cable and Wiring Separation Criteria (Rev. 9) [see RAI-3 above]
- O-6700 – One-Line Diagram Main PSW Switchgear (Rev. A) [see RAI-1 above]
- K-700 – Keowee Hydro Station – One-Line Diagram (Rev. 31A) [see RAI-3 above].

RAI-10

- Cable Routing Diagram (Schematic) – Elevation Looking East
- Cable Routing Diagram (Schematic) – U1 Auxiliary Building Elevation 796'-6"
- Cable Routing Diagram (Schematic) – U2 Auxiliary Building Elevation 796'-6"
- Cable Routing Diagram (Schematic) – U3 Auxiliary Building Elevation 796'-6"
- Cable Routing Diagram (Schematic) – Plan Elevation 783'-9" (Columns 81-84)
- Cable Routing Diagram (Schematic) – Plan Elevation 783'-9" (Columns 84-87)
- OD500940 - KHU Cable Drawing [as revised 4/21/2009].

O-702-A1

RAI #1



QA CONDITION 1

VTO

(1TA, 1TB, ASWS)

NOTES:

1. NOT USED
2. FIELD TO INSTALL STRESS CONES AT THESE LOCATIONS.
3. ELASTIMOLD CONNECTORS SHOULD BE LEFT CONNECTED
4. ELASTIMOLD 151LR CONNECTORS ARE TO BE TAPED TO CABLE TO PREVENT LOOSENING; 154LR AND 156LR CONNECTORS DO NOT REQUIRE TAPING (REF. PIP 02-2972).

ABBREVIATIONS:

AM - AT OR NEAR MOTOR
OT - RUN POWER CABLE OUT TOP OF SWITCHGEAR
OB - RUN POWER CABLE OUT BOTTOM OF SWITCHGEAR

21	PIP #05-01421, ED. EX. G.6	FMW	8-1-05	JRK	8-3-05	TLB	8-15-05	V	DSW	V
20	EDITORIAL EXEMPTION G.13 & PIP 05-03674	MDF	5-24-05	RAS	5-24-05	MB	5-25-05	I	TNG	I
19	OE-17657, *OE-17658, *OE-17659, $OE-17660	MDF	4-13-05	JMB	4-13-05	MB	4-14-05	A	JTE	A

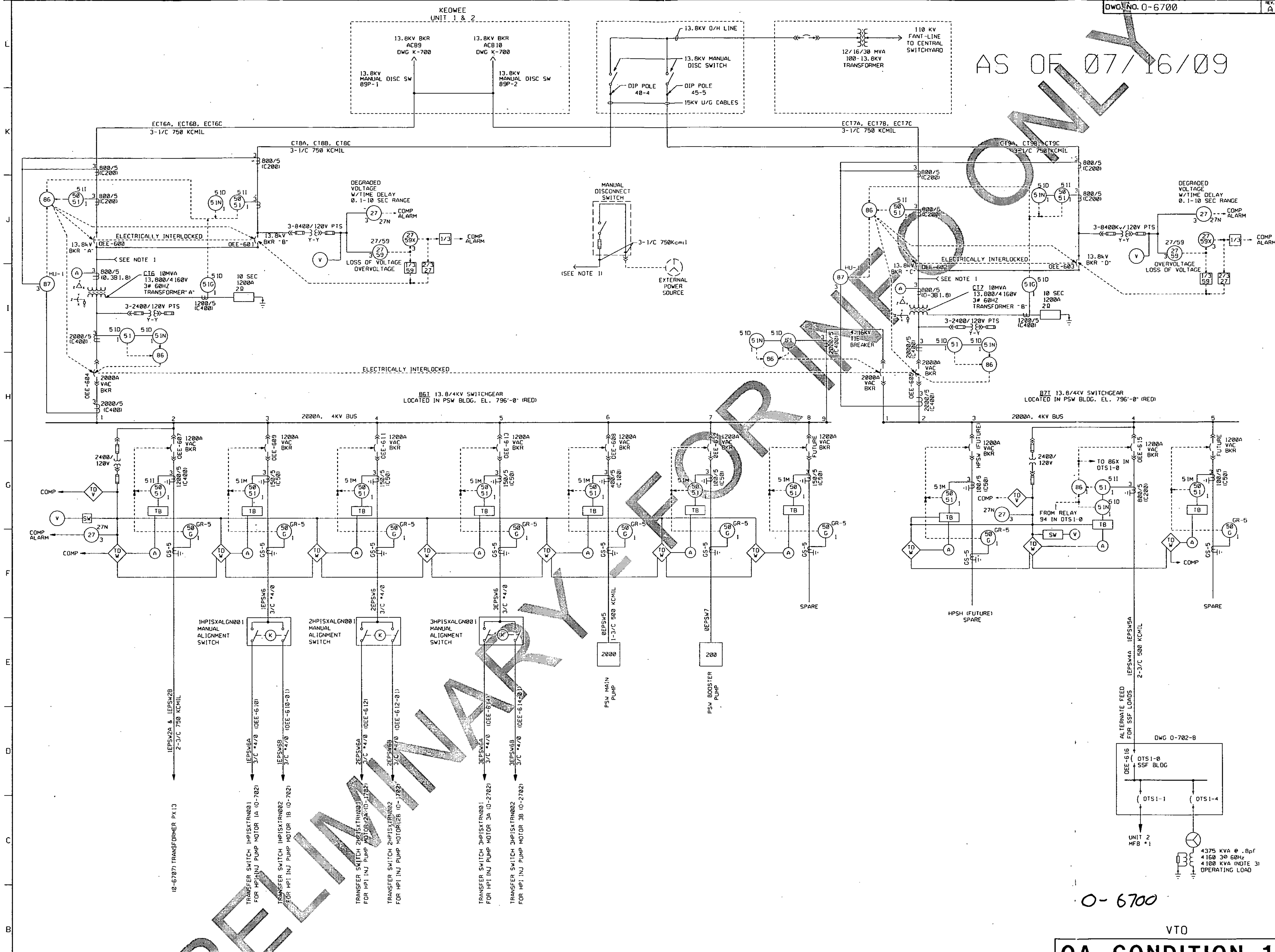
DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 1
ONE LINE DIAGRAM
6900V & 4160V STA AUXILIARY SYS

RAI-1
RAI-3, 4
RAI-7
RAI-8
RAI-9

DWG. NO. 0-6700 REV. A

AS OF 07/16/09

PRELIMINARY - FOR INFO ONLY



NOTE:
1. CABLE WITH ELASTMOLD QUICK DISCONNECT LONG ENOUGH TO REACH EITHER TRANSFOMER CT6 OR CT7 PRIMARY WILL BE COILED AND SECURED BELOW PSW BLDG FLOOR GRATING IN CABLE VAULT.

REFERENCE DRAWINGS

0-702	ONE LINE DIAGRAM (SWITCHGEAR 1TC & 1TE)
0-1702	ONE LINE DIAGRAM (SWITCHGEAR 2TC & 2TE)
0-2702	ONE LINE DIAGRAM (SWITCHGEAR 3TC & 3TE)
OEE-117-47 & 76	ELEMENTARY DIAGRAM (PUMP MTR 1A & 1B)
OEE-217-19 & 48	ELEMENTARY DIAGRAM (PUMP MTR 2A & 2B)
OEE-317-19 & 48	ELEMENTARY DIAGRAM (PUMP MTR 3A & 3B)

O-6700

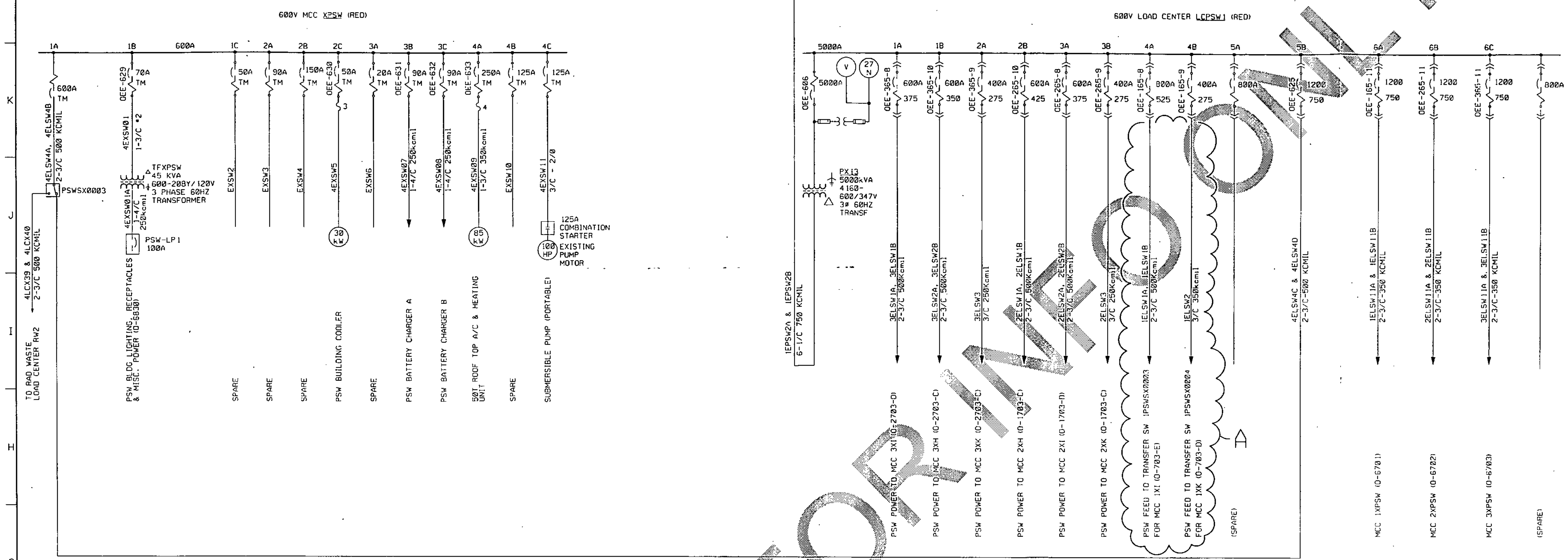
VTO

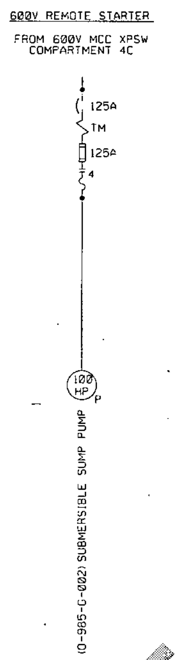
QA CONDITION 1

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNITS 1, 2, & 3

ONE-LINE DIAGRAM
MAIN PSW SWITCHGEAR
13.8/4KV SYSTEM

RAI-1





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2. EITHER DESIGN CHANGE OD500924 SHALL BE IMPLEMENTED BEFORE OD500922 OR OD500924 SHALL BE WORKED CONCURRENTLY WITH OD500922.

HOLD FOR VENDOR INFO

REFERENCE DRAWINGS

O-703-D & E	ONE LINE DIAGRAM (MCC 1XK & 1XI)
O-1703-C & D	ONE LINE DIAGRAM (MCC 2XH, 2XK, & 2XI)
O-2703-C & D	ONE LINE DIAGRAM (MCC 2XH, 2XK, & 2XI)
O-752-A13 & A32	C/D (MCC 1XI & 1XK)
O-1752-A9, A13, & A32	C/D (MCC 2XH & 2XI, & 2XK)
O-2752-A9, A13, & A32	C/D (MCC 3XH & 3XI, & 3XK)
OEE-149-3,5,11	HEATER BANK 1,3,4
OEE-249-3,8,14	HEATER BANK 1,3,4
OEE-349-(LATER)	HEATER BANK
~~O-3703~~	~~ONE LINE DIAGRAM RW2~~
A O-6720-A	C/D MAN XFER SW 1PSWSX0003, 4

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VTO

QA CONDITION 1

NO.	REVISIONS	DRN	DATE	CHKD	DATE	APPR	DATE
A	OWNER INSPECTION AND APPROVAL	—	—	—	—		
A	LE OD100924 VENDOR- SARGENT & LUNDY LLC P.O. 90906-00012						

INSPECTED: CIVIL WAIVED | ELEC. | MECH. WAIVED

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNITS 1, 2, & 3

ONE-LINE DIAGRAM
600V PSW BUILDING
MCC XPSW & LOAD CENTER LCPSW1

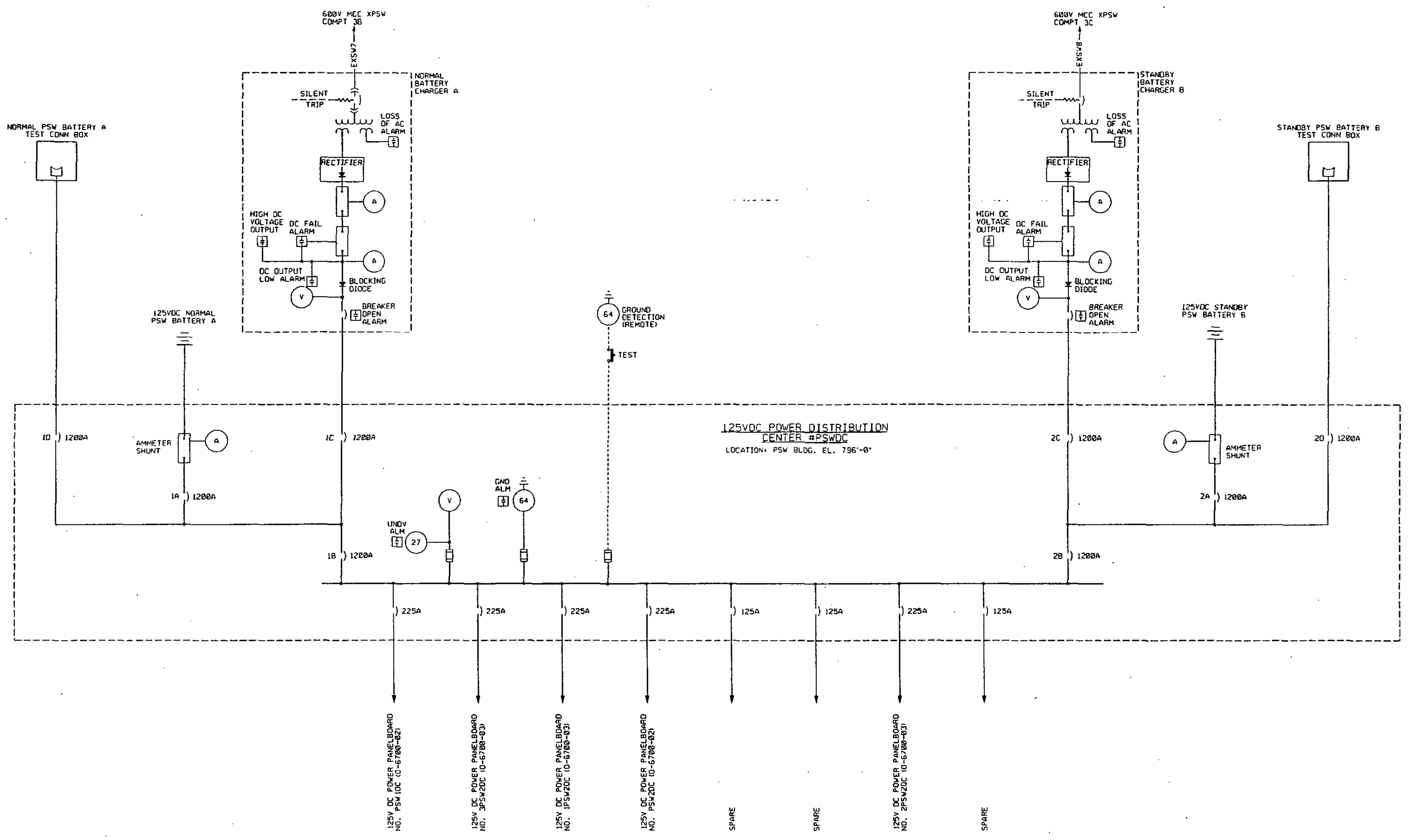
DESIGNER H. FRASER DATE 2-6-09 — INSP. CIVIL - WAIVED DATE
DRAWN J. TAYLOR DATE 2-6-09 — INSP. MECH - WAIVED DATE
CHECKED R. DELLANGELO DATE 2-6-09 — APPR. [signature] DATE 2/7/09

SCALE NONE | DWG. NO. O-6707 | REV. A

ERN: OX009MS2

RAI #2

DWG. NO. 0-6700-01 REV. A



REFERENCE DRAWINGS:

- OEE-610 —— E/D HPI PUMP ELECT. TRANSFER SW (UNIT 1)
- OEE-612 —— E/D HPI PUMP ELECT. TRANSFER SW (UNIT 2)
- OEE-614 —— E/D HPI PUMP 3A ELECT. TRANSFER SW 3ETSA
- OEE-614-01 —— E/D HPI PUMP 3B ELECT TRANSFER SW. 3ETSB
- O-6700 —— ONE LINE DIAGRAM PSW B6T & B7T
- O-6700-02 —— ONE LINE DIAGRAM, PSW 125V DC POWER
- O-6700-03 —— ONE LINE DIAGRAM, PSW 125V DC POWER

NOTES:

1. ALL CIRCUIT BREAKERS TO BE MOLDED CASE, FIXED MOUNTED WITH GREATER THAN OR EQUAL TO 26 KAIC AT 125VDC.

PRELIMINARY

ISSUED FOR BID PURPOSES ONLY

PRELIMINARY

VTO

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QA CONDITION 1

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 1, 2 & 3

ONE LINE DIAGRAM
MAIN PSW 125VDC POWER DISTRIBUTION CENTER
FOR PSW BUILDING

NO.	REVISIONS	DRN	DATE	CHKD	DATE	APPR	DATE
A	OWNER INSPECTION AND APPROVAL						
A	EC MINOR REV. PER CHANGE #OD500921 SARGENT & LUNDY LLC. P.O. 90926-						

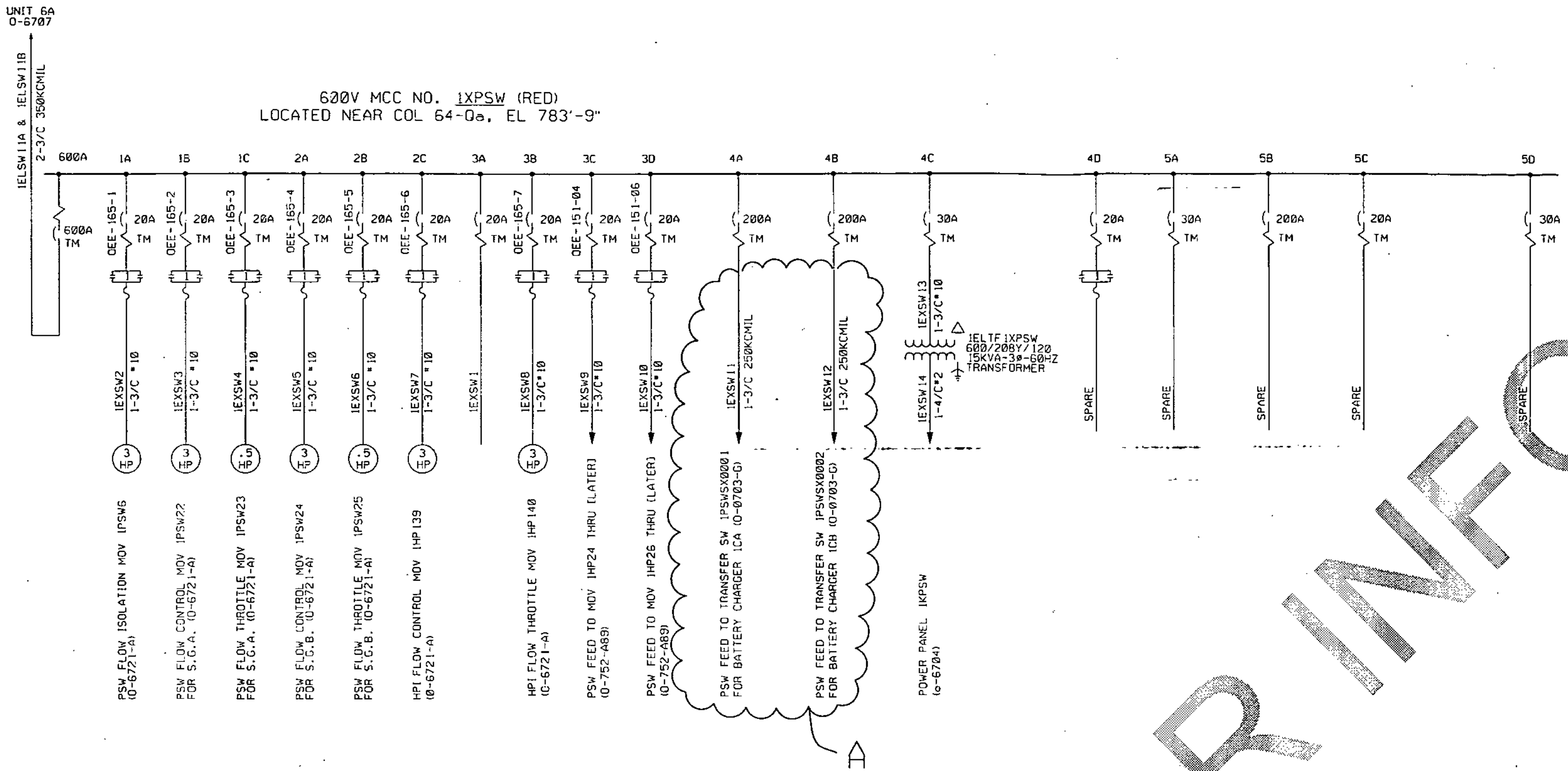
INSPECTED: CIVIL — WAIVED; ELEC.; MECH. — WAIVED

DESIGNER ____ DATE ____ INSP. ____ DATE ____
DRAWN ____ DATE ____ INSP. ____ DATE ____
CHECKED ____ DATE ____ APPR. ____ DATE ____
SCALE

DWG. NO. 0-6700-01 REV. A

ERN:OX009MP8

RAI-2



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HOLD FOR VENDOR INFO

PRELIMINARY FOR INFO ONLY

NOTES:

REFERENCE DRAWINGS:

0-752-A-015 —— C/D - MCC NO. 1XS1
0-752-A-019 —— C/D - MCC NO. 1XS2
0-759-E —— C/D - BATTERY CHARGERS AND STATIC INVERTERS
0-6707 —— ONE LINE DIAGRAM FOR PSW (LCPSW1)
~~0-0703-G —— ONE LINE DIAGRAM 1XS1 & 1XS2~~
A 0-6719-A —— C/D AUTO TRANSFER SWITCH 1PSWSX0001 & 1PSWSX0002

LEGEND
R - REMOTE
P - POWER
C - CONTROL

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QA CONDITION 1

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A	LE OD100924 VENDOR- SARGENT & LUNDY LLC P.O. 90925-00012						

INSPECTED: CIVIL — WAIVED; ELEC.; MECH. — WAIVED

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 1

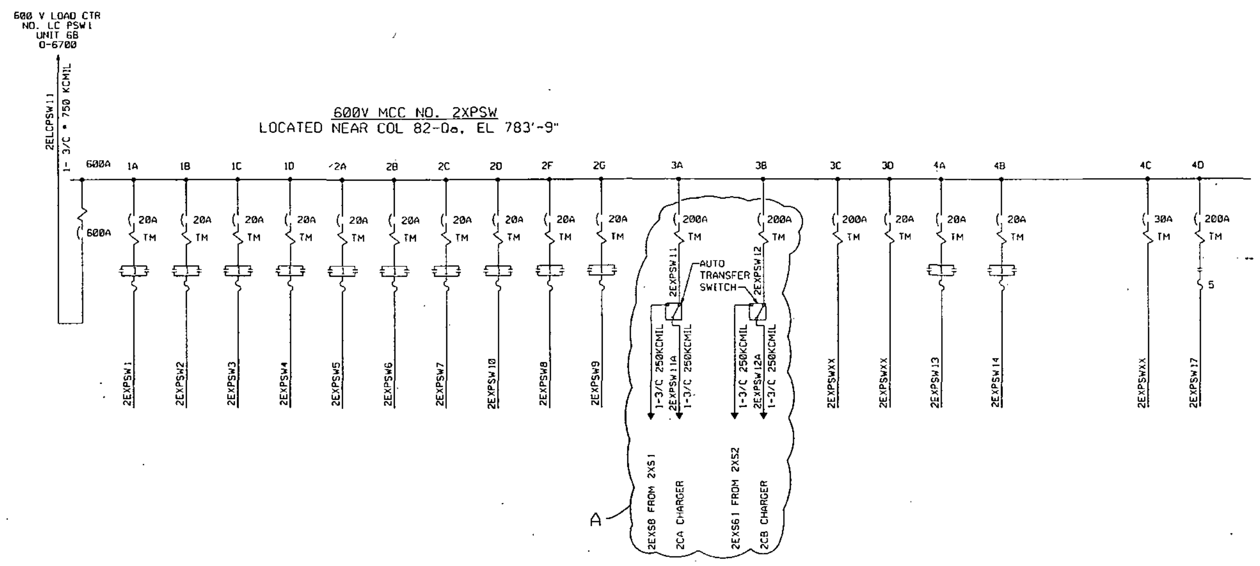
ONE-LINE DIAGRAM
STATION AUXILIARY CIRCUITS 600V
MCC 1XPSW

DESIGNER L. FRASER DATE 2-6-09 INSP. CIVIL - WAIVED DATE
DRAWN J. TAYLOR DATE 2-6-09 INSP. MECH - WAIVED DATE
CHECKED R. DELLANGELO DATE 2-6-09 APPR. [signature] DATE 2/7/09
SCALE DWG. NO. 0-6701 REV. A

ERN: OX009MKR

RAI-2

DWG. NO. 0-6702 REV. A



REFERENCE DRAWINGS:
0-1752-A-015 —— I/D - MCC NO. 2XS1
0-1752-A-019 —— I/D - MCC NO. 2XS2
0-1759-E —— I/D - BATTERY CHARGERS AND STATIC INVERTERS
0-1908 —— AUX. BLDG.ELECT. EQUIP. PLAN BELOW 796'-6"
0-6700 —— ONE LINE DIAGRAM FOR PSW (LC PSW1)

LEGEND
R - REMOTE
P - POWER
C - CONTROL

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VTO

QA CONDITION 1

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 2

ONE-LINE DIAGRAM
STATION AUXILARY CIRCUITS 600V
MCC 2XPSW

NO.	REVISIONS	DRN	DATE	CHKD	DATE	APPR	DATE	CIVIL	ELEC.	MECH.
A	OWNER INSPECTION AND APPROVAL									
A	EC OD500925 VENDOR- SARGENT & LUNDY LLC P.O. 90926									

DESIGNER ______ DATE ______ INSP. ______ DATE ______
DRAWN ______ DATE ______ INSP. ______ DATE ______
CHECKED ______ DATE ______ APPR. ______ DATE ______
SCALE

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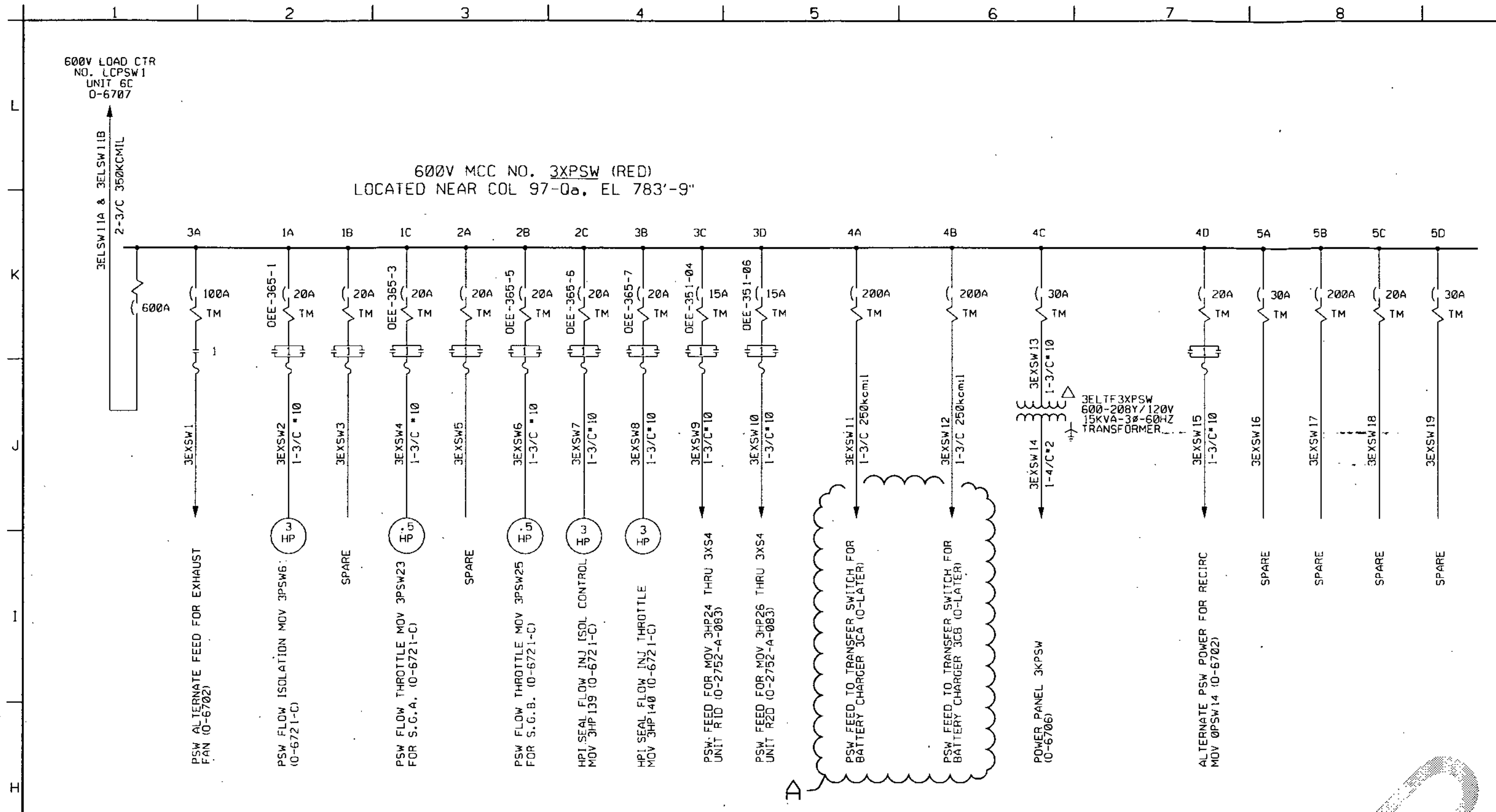
ERN: OX009ML4

RAI-2

DWG. NO. 0-6703 REV. A



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PRELIMINARY - FOR INFO ONLY

NOTES:

REFERENCE DRAWINGS:
0-2703-1 ——— ONE LINE DIAGRAM MCC 3XS4
0-2752-A-015 ——— I/O - MCC NO. 3XS1
0-2752-A-019 ——— I/O - MCC NO. 3XS2
0-2759-E ——— I/O - BATTERY CHARGERS AND STATIC INVERTERS
0-6707 ——— ONE LINE DIAGRAM LOADCENTER (LC PSW1)
0-6706 ——— ONE LINE DIAGRAM POWER PANEL 3KPSW
0-6719-D ——— C/O AUTO TRANSFER SWITCH 3PSWSX001 & 2

A

LEGEND
R - REMOTE
P - POWER
C - CONTROL

0-6703

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VTO

QA CONDITION 1

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 3
ONE-LINE DIAGRAM
STATION AUXILARY CIRCUITS 600V
MCC 3XPSW

RAI-3
RAI-5
RAI-9

Duke Power[SM]
A Duke Energy Company

Power Generation
Electrical Engineering Discipline Design Manual

DC-3.13. Oconee Nuclear Station Cable and Wiring Separation Criteria

Revision No.: 9

Below is a list of pages valid for this Engineering Criteria. An asterisk (*) indicates those pages affected by this revision.

Pages	Revision
1	9
2*	9
3*	9
4*	9
5*	9
6	9
7	9
8*	9
9*	9
10	9
11*	9
12*	9
13*	9
14*	9

Revision Description: Revision 9 adds a new cable color designation (Red) for the Protected Service Water Project. Revised per PIP O-07-4683, CA 7 to incorporate changes based on SQUG criteria for the cable support system. Revised 8.4.3 to include method for applying refrasil to cable.

Implementation		Date: 12/01/08
Originated By:	Gary D. Chronister	Date: 9/09/08
Checked By:	W. Thomas / J. T. Edgar	Date: 9/09/08
Approved By:	R. L. Murphy	Date: 9/09/08
NSD EDP Coord:	D. T. Griffin	Date: 1/21/09

Table of Contents

1.0 Title

Cable and Wiring Separation Criteria

2.0 Purpose

The purpose of this criteria is to provide standardization for the responsible Engineering group's routing of cables, field installation of cabling systems (both the cable itself as well as the support system), and serve as a basis for QA inspection of completed installation of cabling and cable support systems, installed after the effective date of this criteria. It also includes the design, installation, and QA inspection of wiring inside the Main Control Boards after the effective date of Revision 1 (3/1/90), and the design, installation, and QA inspection of wiring inside any electrical enclosure after the effective date of Revision 3 (04/01/99).

3.0 Scope

All QA 1 cable installed at Oconee after 7/15/87, and Keowee after 3/15/95 shall meet as a minimum, the criteria discussed below.

All QA 1, Main Control Board wiring installed at Oconee after 03/01/90 shall meet, as a minimum, the criteria in Section 7.0. All Keowee Control Board wiring installed after 3/15/95 shall meet, as a minimum, the criteria in Section 7.0.

All wiring installed after 4/1/99 at Oconee and Keowee, inside electrical enclosures, other than the Main Control Boards, shall meet as a minimum, the criteria in Section 8.

Cabling or wiring installed prior to these dates is not subject to this criterion and its installation criteria will continue to be the UFSAR as a basis for acceptability. Any new safety related cabling, or wiring which cannot fully meet these criteria in design or installation shall be fully documented by the responsible Engineering group in correspondence File OS-224 as to the reason why the criteria cannot be met, and justification of the adequacy of the proposed design or installation. All cabling and wiring, regardless of installation date, shall comply with UFSAR commitments. Cabling associated with the SSF shall comply with criteria DC-15.01 in addition to the requirements in this document.

Note: *It is fully intended that almost all cabling and wiring will meet this criteria and that very few cases will require exception documentation by the responsible Engineering group performing the cable and/or wiring installation.*

4.0 Definitions

4.1 Barrier

Physical material installed on, around or between cables and/or trays to provide isolation from one cable to another. Examples are conduit, metal tray covers, 22 Gauge or thicker sheet metal, 1/8" glastic, 1/8" epoxy glass sheeting, 1/8" metal plate, Refrasil, and mineral insulated cable.

Note: *Cable armor although providing substantial protection is NOT considered a barrier for the purpose of Sections 5 and 6. This definition of a barrier is applicable only to cable and the cable support system. For barrier definition related to wiring refer to Section 8.*

4.2 Cable

One or more conductors encased by an overall armor (braided or interlocked). Non-armored cables are not to be installed within the regular cable support system.

4.3 Cable Tray

Rectangular, metallic, cable support device with solid sides and open bottom with supporting cross members.

4.4 Cable Tray Fittings

Metallic hardware such as splice plates, tees, turns, elbows, "X" fittings, etc. used with rectangular tray sections.

4.5 Cable Terminator

Metallic hardware used at equipment, junction boxes, control panels, etc. to terminate the cable armor and provide strain relief attachment to the equipment.

4.6 Cable Trench

Concrete cable raceway under floors and in outside yard areas to route and protect cable from physical damage. A trench will normally have removable covers. A trench may or may not have cable support structures (tray, electray, conduit or Unistrut) mounted within.

4.7 Cable Trough

Typically an enclosed channel of formed solid metal with a removable or hinged cover and open at the ends. Troughs are used to provide cable separation via the metal walls for cable transition past cables of another color. Troughs are typically used to change elevation or elevation and horizontal direction from one point to another while providing separation from adjacent cable trays. Troughs are usually mounted on the sides of cable tray and/or cable tray supports.

4.8 Conduit

Metallic pipe or tubing in which cable can be inserted for support and protection.

4.9 Conduit Fittings

Metallic hardware such as couplings, elbows, condulets, pull boxes, etc. used with conduit sections.

4.10 Electray

Rectangular metallic cable support device with short solid sides and semi-open bottom. Electray is of one-piece construction and is usually 6" or smaller in width and made from either mechanically formed aluminum or galvanized steel.

4.11 Mutually Redundant

A piece of equipment or a system that duplicates the essential function of another piece of equipment or system to the extent that either may perform the required function regardless of the state of operation or failure of the other (Ref. 10.7). At Oconee, this is typically equipment or systems in which there are a minimum of two channels or trains performing the same safety function and which are totally independent of each other. Systems such as Reactor Protection (RPS) have four completely independent channels. Systems such as Emergency Feedwater (EFW) have two completely independent trains. PSW has only one train however the PSW Main pump circuits, Booster pump circuits and associated valve circuits are mutually redundant to the SSF ASW pump and valve circuits.

Note: *Redundancy can be accomplished by the use of identical channels or trains of identical equipment, equipment diversity (AC vs. DC), or functional diversity. At Keowee, this term is applied on a Unit basis. For example, mutual redundancy is two cables performing the same function, one for Unit 1 and the other* *for Unit 2. Likewise, a piece of equipment or a component that provides a QA1 function on Unit 1 is mutually redundant to its Unit 2 counterpart.*

4.12 Openings/Shafts/Sleeves

Penetrations through wall, floors, and ceilings, which allow the cabling to pass through. Sleeves are openings through a floor or wall where cables pass. The sleeve is typically lined with a length of steel piping if round or other steel shapes if square. Round openings are typically used in floor penetrations while square is the more common shape for wall penetrations. Sleeves typically contain a single color of cable or a single color of cable plus black cable. In certain circumstances, a second color of cable will be installed in the sleeve. Square penetrations are installed in walls or floors to accommodate cable tray(s) instead of individual cables. Multiple colors as well as black cables may be present in these openings. (See Section 6.12).

4.13 Transition Area

The unsupported section of cable in transition from the cable tray, electray, trough or conduit system. Transition areas may also be used to refer to sections of cable tray, electray, where cable(s) enter and/or exit the tray. This also includes any cable(s) outside the cable tray support system.

5.0 Cabling System General Design

5.1 Cable System Color Coding

5.1.1 Oconee

The cable system separation criteria are based upon the relationship of different cabling use or functions. Cables furnished for installation at **Oconee** are color coded to aid in identifying their use and/or channel association.

The color-coding of cable is accomplished through the use of paints, inks, tapes, or factory supplied colored jacketing. The color-coding shall be applied over the length of the cable to ensure that the visual observation of the installation maintains these separation requirements. The cable shall be color coded in accordance with OSS-0218.00-00-0016, Section 16.0 prior to the installation. Following the installation, the designated cable color shall be readily apparent or the cable shall be repainted or taped at the ends and transition areas in accordance with OSS-0218.00-00-0016. Black jacketing on cable is the existing industry standard and is not defined or considered as a "color" throughout this criterion. Unjacketed cable types specified as black do not require paint or tape to identify the cable color. Bare armor cable will be considered as black unless otherwise color-coded. **The use of tape for color-coding cable inside containment is NOT permitted.**

The color code is as follows:

Black:	Non Safety related applications
Green:	4kV Main Feeder Bus #1 (Unit 1 Only)
Brown:	4kV Main Feeder Bus #2 (Unit 1 Only)
Gray:	Switchgear 1TC, 2TC, 3TC
	Load Centers 1X8, 2X8, 3X8
	Motor Control Centers 1XS1, 2XS1, 3XS1
	ESG Channels 1, 3, 5, 7 (Odd)
	DC Panelboards 1DIA, 2DIA, 3DIA

	Vital Power Panelboards 1KVIA, 2KVIA, 3KVIA
	RPS Channel A
	Standby Shutdown Facility
	120/208VAC Power Panelboards 1SKJ, 2SKJ, 3SKJ
	120/240VAC Power Panelboards 1SKM, 2SKM, 3SKM
Yellow:	Switchgear 1TD, 2TD, 3TD
	Load Centers 1X9, 2X9, 3X9
	Motor Control Centers 1XS2, 2XS2, 3XS2
	ESG Channels 2, 4, 6, 8 (Even)
	DC Panelboards 1DIB, 2DIB, 3DIB
	Vital Power Panelboards 1KVIB, 2KVIB, 3KVIB
	RPS Channel B
	120/208VAC Power Panelboards 1SKK, 2SKK, 3SKK
	120/240VAC Power Panelboards 1SKN, 2SKN, 3SKN
Blue:	Switchgear 1TE, 2TE, 3TE
	Motor Control Centers 1XS3, 2XS3, 3XS3
	DC Panelboards 1DIC, 2DIC, 3DIC
	Vital Power Panelboards 1KVIC, 2KVIC, 3KVIC
	ESG Channel Even-Odd
	Transformer 1X10, 2X10, 3X10
	RPS Channel C
	120/208VAC Power Panelboards 1SKL, 2SKL, 3SKL
	120/240VAC Power Panelboards 1SKP, 2SKP, 3SKP
Orange:	DC Panelboards 1DID, 2DID, 3DID
	Vital Power Panelboards 1KVID, 2KVID, 3KVID
	RPS Channel D
Red:	Protected Service Water System
	Switchgear B6T, B7T
	Load center PX 13
	MCC XPSW, 1XPSW, 2XPSW, 3XPSW
	Power Panelboards 1KPSW, 2KPSW, 3KPSW
	DC Pnlbds, PSW1DC, 1PSW2DC, 2PSW2DC, 3PSW2DC

5.1.2 Keowee

Cables furnished for installation at Keowee will be color coded to aid in identifying their unit assignment and QA classification. The color code will be as follows:

Gray:	Unit 1, QA1 Cabling, Safety Channel A
Yellow:	Unit 2, QA1 Cabling, Safety Channel B
Black:	Units 1 & 2, Non-QA1 Cabling
Red:	Units 1 & 2, Protected Service Water Cabling

Note: *Switchyard cable color coding varies from these inplant color codes. To avoid confusion, switchyard colors are not discussed in this criterion and are provided on Electrical Elementary drawing OEE-14-1A.*

5.2 Cable Separation Methodology

5.2.1 Oconee

Separation of the colored cabling may be accomplished by two basic methods - distance or barriers. Distance is measurable free air separation between cables, whereas barriers are a physical device provided when the minimum free air measurement cannot be met. These two separation methods are based upon the use of armor protected cable, i.e., aluminum sheath, bronze tape, served wire and braided or interlocked armor.

5.2.2 Keowee

Separation of the colored cabling will be accomplished by routing mutually redundant cables in separate cable trays. Mutual redundant cables will not come in contact with each other. If required, a barrier will be installed between cables to prevent contact.

5.3 Cable Support Systems

5.3.1 Oconee

All safety related cable at Oconee is installed within a cable support system. The main cable support system is designed to meet a minimum of five (5) inches free air distance between different colored cables for adequate cable separation. In the event a cable support system installation results in tray installed with less than 5 inches free air distance between a full lower tray and the bottom of an upper tray (hence, cables less than 5" from bottom of tray above), a 1/8" fire retardant barrier (or other equivalent barrier material as described in Section 4.1) shall be installed on the bottom of the tray above.

5.3.2 Keowee

The Keowee cable support system has power and control cables routed within the same tray without the use of a barrier. Installations of power cabling after 3/15/95 will meet Section 6.2 of this document. Control cables may be installed within the existing cable tray system, which contains both power and control. Mutual redundancy separation requirements will be maintained.

Exception: *Due to the existing overfill condition in the Unit 1 Cable Room, the five (5) inch free air space rule has been modified to a three (3) inch free air space rule. In the event that the top cable in the lower tray is less than three (3) inches from the bottom cable in the tray above, a 1/8" fire retardant barrier shall be installed between the trays. The barrier shall be attached to the bottom of the upper tray* *and fitted around cables, which may pass through the barrier when in transition. Cables in this transition shall not touch the cables from the adjacent tray.*

5.3.3

Cables will be continuously supported by the cable support system. Individual cables may be bundled together in the cable support system using tie wraps. Power cables may be bundled provided they meet the guidance of Section 6.2 regarding cable ampacity derating. When 6 inch or smaller electray is on its side or inverted, stainless steel tie wraps shall be used as described below to retain the cable bundles in the cable support system. When ladder type cable tray (6" and larger) is used on its side for cable routing, the cables shall be tie wrapped to the ladder support rungs. Cables may be bundled and then tie wrapped to the ladder rungs.

Because electray is not fabricated with individual bottom rungs, stainless steel ties shall be used every 2 feet to provide cable retention to the electray. 3/16" nominal SS ties shall be used on 4" and smaller electray, while 5/16" nominal SS ties shall be used on 6" electray. 5/16" SS ties may be used on 6" cable tray to retain the cabling within the tray in conjunction with the individual cable or cable bundle tie down to the rungs. The use of stainless steel tiewraps and cable bundling has been evaluated and documented in File OS-224 for the purpose of retaining cabling in the cable support system when it is on its side or inverted.

As of 12/16/97, only stainless steel tie wraps shall be used inside the Oconee reactor buildings for all new cable installations. This includes securing individual cables in cable tray as well as securing bundled cable in electray. Nylon tie wraps are no longer permitted to be used to secure cables in cable tray or electray in the reactor building.

5.3.4

Cables which enter or leave the tray system enroute to a device must be supported. Safety cables within this application shall be required to maintain a limited separation criteria. Cables of different safety colors may be within five (5) inches of each other when entering or accessing a common enclosure. Colored cables shall be precluded from making contact with each other. Cable terminators on the common enclosure may touch each other. Cables the same color and associated black cables which are classified control or instrumentation may be bundled together and held with tie-wraps for neatness and efficiency. Power cables shall not be bundled together unless meeting the ampacity derating criteria of Section 6.2 and specific approval is provided by the responsible Engineering group and documented in correspondence to file OS-224, the Design Inputs Calculation for a Nuclear Station Modification, or Documentation of Design Inputs for Minor Modifications (Ref. 10.8). Support intervals of cables shall be determined by the following table:

Cable Support Intervals

Cable Diameter Inches	Maximum Unsupported Distance
Single Cable or bundle	
Less than ½	24 inches
½ through 1	42 inches
Greater than 1 through 2	60 inches
Greater than 2 through 3	78 inches
Greater than 3	96 inches

6.0 Cabling System Criteria

6.1

Power and Control Cables as defined in DC-3.02 shall be routed in cable support systems designated for this use to prevent high energy power cables from adversely affecting instrumentation and/or control functions. In the event the responsible Engineering group determines that both power and control cable must run in the same tray or opening, a barrier will be provided in the cable routing design to provide separation and shielding.

The metal barriers, or barrier strips, should be installed using factory supplied mounting hardware. In the event that this hardware is not used, then #10x16x3/4" Cross Recessed (Phillips Head) Panhead, Zinc plated, Carbon Steel or Stainless Steel self drilling & tapping screws can be used. Screws shall be installed into the cable tray ladder rung/cross brace. One screw shall be installed at each end of the barrier section into the rung and every other rung in between. Screws may end up installed on adjacent rungs. QA1, QA4 and Non-QA1 cable tray installations may use Non-QA1 screws. QA1 screws can be used if available. In addition, when more than one barrier is installed in a continuous run, factory supplied splice clips ("S" Clips) should be used to connect the continuous run of barriers end to end. If "S" clips are not used, then an alternate method using a 1/2" overlap on connecting lengths of barriers is acceptable. When using the 1/2" overlap joint method, plastic/rubber trim material may be used to provide additional retention at the top of the lapped section to prevent the joint from separating. If plastic/rubber trim is used, then it must overlap the lapped section by 3" on each side. Adhesive may be used to provide additional bonding of the trim to the barrier. Either method is acceptable for QA1, QA4 and Non-QA1 installations. The "S" clips are available both Non-QA and QA1. Installation of the clips or trim is considered Non-QA. "S" Clips or the overlapping joint methodology provide joint support to minimize the potential of cable jacket scuffing due to barrier misalignment during cable pulling.

When transitioning elevations, making bends or radii, or anywhere there is a cable tray fitting, it is acceptable to overlap greater than 1/2" at the barrier joints. Also, the use of fasteners in adjacent cable tray rungs is acceptable. "Pop" rivets should be used in the vertical section of the barrier to aid in the fabrication of the transition barriers when they have been cut to make bends.

6.2

A minimum spacing of one fourth the diameter of the larger adjacent cable may be provided, and is preferred, between individual power cables. Power cable at Oconee has historically been installed in this manner. This spacing is an average distance and may vary slightly between tiedown points due to training and transition areas. If cables touch, the contact should be limited to less than two feet or the cable will be required to meet the following requirements for cable spacing not maintained.

<u>Cable Spacing not maintained (Cable installations after 12/16/97):</u>

When cable spacing cannot be maintained, or it is desired to install cable without any spacing, the installation shall comply with the following requirements which themselves are based on guidance contained in ICEA P46-246 (Ref. 10.10) and/or the National Electric Code (Ref. 10.9). Power cable installed at Oconee is initially derated by 30% (Ref. 10.3) and sized to accommodate voltage drop considerations (Ref. 10.11). This sets the installed ampacity loading factor of any given power cable no higher than 70% of rated ampacity per References 10.9 and 10.10. In many cases, actual ampacity usage may be even lower (i.e. 40% of rating).

Power cable shall be installed in a single layer in ladder type cable tray or ventilated electray and the sum of the cable diameters shall not exceed the cable tray or electray usable width. Power cable may be stacked in cable tray or in electray provided the ampacity ratings meet the requirements of Table VIII of Reference 10.10.

When power cable is installed without the 1/4 diameter of the larger adjacent cable spacing or is stacked, the installation must be evaluated for ampacity loading. This must be documented in correspondence file OS-224, or in the Design Input Calculation for Nuclear Station Modifications, or in Documentation of Design Inputs for Minor Modifications (Ref. 10.8). Power classified cables may be installed together within the same tray without regard to voltage.

6.3

Control and instrumentation cables as defined in DC-3.02 may be installed within the same cable tray designated as control. Cable tray fill is based on a full cable tray equivalent and loading on the cable tray support system. Due to the installation and training of cable, voids may exist within a tray cross section. This has led to the appearance of many cable trays as being overfilled (cables exceeding the top level of the side rails).

This situation primarily occurs in transition areas where cables enter or exit the tray system, or where offsets are present such as elbows or tees. This may also occur in straight runs where cables were not properly trained through the tray.

Cable trays that contain cables exceeding the top of the side rails on the straight run of the tray are subject to evaluation prior to installation of any additional cables. An evaluation can be performed on a visual basis, considering the physical characteristics of the cable tray and the installation of the cables.

DBD OSS-0254.00-00-4019 (Design Basis Specification for the Cable Tray Supports) was issued as revision 3 in March, 2004. This revision incorporated the SQUG analysis and reflected its use as the design basis for the cable support system at Oconee and Keowee.

The loading for the tray system is established at a value of 35 lbs. per sq. ft. for all cable trays. The 35 lb per sq ft loading is reflective of previous weights established for seismic qualification. Tray loading values are considered to be trays filled to 100% capacity.

The SQUG review of cable tray for the Reactor Buildings analyzed the supports based on an as built configuration and does not qualify the tray to full loading. As cables are added to the tray system inside containment a SQUG review is required for all cables routed inside containment so the calculation can be revised for the added weight.

Cable tray overfill conditions were recognized to exist and worst cases were analyzed during the initial SQUG review. No operability issues with the overloaded trays were identified at that point in time. (OSS-0254.00-00-4019, 2.3.4, Cable Tray Overfill)

Cables installed in short side rail electray may be bundled together and held in the tray by stainless steel tiewraps and exceed the side rail depth. The electray must provide continuous support for the cables as outlined in section 5.3.3.

6.4

Trenches may simultaneously contain power, control and instrumentation cables. If cable tray, electray, or conduit is not provided for cable support, power cables within a trench shall be racked on the side of the trench or on unistrut cross members per Section 6.2 of this criteria. Control and instrumentation cables shall be laid in the bottom of the trench. Mutually redundant safety cables shall be located on opposite sides of the trench.

Exception: *The trenches serving the blockhouse from the Turbine Building do not have provisions for racking of power cables. The responsible Engineering group will provide specific instructions for the addition of any safety cables in this area.*

6.5

Black and red cables may be routed within a colored tray but then may not be routed with a different safety color anywhere within its remaining length. Red cables are not considered mutually redundant to any other cable except as identified in Section 4.11. Red cables are not to be routed in the West Penetration Rooms or the Cask Decontamination Rooms. The alternate feeder from the PSW to the SSF may be routed without any color separation requirements from SSF cables.

6.6

Colored cables may be installed within a black designated tray which has been seismically qualified when a barrier has been installed to separate the colored cable from the black cabling.

6.7

Colored cables within the tray system transition areas (i.e., tees, elbows, etc.) shall maintain five (5) inches of free air space between itself and any other colored cables. Unit 1 Cable Room shall maintain three (3) inches. Barriers shall be installed any time the free air distance requirement cannot be met.

6.8

Mutually redundant safety related cables shall be run in separate trays and shall maintain the separation requirement of Section 6.7.

6.9

Redundant safety channel cables will be routed in the appropriately designated separate colored trays. An exception to this requirement can be specified where necessary by the responsible Engineering group to allow the installation of different colored cables within the same tray. This exception may or may not require the use of barriers. Engineering must document this exception in correspondence file OS-224 and provide specific design requirements for proper installation on the individual cable routing/installation sheets.

6.10

Reactor Building cabling for nuclear instrumentation, ES instrumentation and RPS instrumentation shall be installed within their respective channel colored instrumentation trays. These four colored trays are routed in separate directions to maintain at a minimum seven (7) feet of distance between redundant channels. Cables leaving the tray in transition to a device must maintain this seven (7) foot separation. In addition, these four tray may have low signal level (typically < 50 Volts and < 100 milliamps) safety related post accident monitoring instrumentation cables of the appropriate color installed within these trays. Barriers may be installed within these instrumentation trays to allow installation of safety related control cables of the same color.

6.11

In the Penetration and Cable Rooms, cables from each protective channel are routed in trays separate from those carrying cables from any other protective channel. Included in these trays are instrumentation cables from the Reactor Building, control and interconnecting cables associated with that protective channel, andnon-protective instrumentation and control cables.

6.12

Cables in transition through floor or wall sleeve type openings shall meet the same separation criteria as the tray system. Barriers shall be installed within the sleeve openings to separate a colored cable from black cables. Only one color of cable should be in a given opening with black cable. The responsible

Engineering group may determine that a second color, in addition to the one already installed or planned for installation with black cabling, must also be run through the sleeve opening. In this event, the second colored cable will be installed within rigid conduit and located, if applicable, with the black cabling within the opening. The conduit shall extend in length and/or location within the sleeve until the distance criteria can be met. Engineering must document this exception in correspondence file OS-224. Mutually redundant safety related cables shall not pass through the same opening. This requirement does not apply to multiple cable tray installations, which pass through wall or floor openings.

6.13

Safety related cabling installed at the Oconee Nuclear Station or the Keowee Hydro Station shall meet the separation requirements defined within this criteria. The responsible Engineering group will analyze and document to correspondence file OS-224 any unique or special cable routing or separation requirement which cannot be installed per this specification prior to implementation.

7.0 Main Control Board Internal Wiring Criteria

Wiring, control components (switches, pushbuttons, etc), indicators, recorders, etc. shall be installed so as to maximize the physical separation distance between mutually redundant safety related wiring, devices and components. In no case shall mutually redundant safety related wiring or devices be in physical contact.

Oconee: Wiring shall be marked at 18-inch (maximum) intervals using flame retardant colored plastic tags for the four safety channels. These tags shall be approximately 1 1/2 X 2 1/8 inches in size and have permanently embossed or hot stamped on them the wording "Safety Channel A (B, C, or D)." Color coding for these tags shall be Gray, Yellow, Blue, and Orange for Channels A, B, C, and D respectively. The Protected Service Water System safety wiring shall use "Red" colored tags. Further explanation of color codes and channels can be found in Section 5.1.

Keowee: Wiring shall be marked at 18 inch (maximum) intervals using flame retardant colored plastic tags for the appropriate safety channel. These tags shall be approximately 1 1/2 X 2 1/8 inches in size and have permanently embossed or hot stamped on them the wording "Safety Channel A (B)". Color coding for these tags shall be Gray for Unit 1, Safety Channel A, and Yellow for Unit 2, Safety Channel B. The Protected Service Water System safety wiring shall use "Red" colored tags. Further explanation of color codes and channels can be found in Section 5.1.

Note: *The Main Control Boards are defined as the Unit Boards, Vertical Boards, Auxiliary Benchboards, and Electrical Boards for Oconee, and the Control Boards and Electrical Boards for Keowee. Barrier use as described below is permissible in the Main Control Boards at Oconee and Keowee. Justification and adequacy must be addressed in file OS-224.*

8.0 Wiring Separation Requirements for Electrical Enclosures or Cabinets

8.1 Scope

The requirements of this section apply to any electrical enclosure. Main Control Boards separation is covered in Section 7.

8.2 Definitions: (Applicable to Sections 7 & 8 only)

8.2.1 Apparatus

An integrated group of materials or devices used for a particular purpose.

8.2.2 Barrier

EMT conduit, rigid conduit, 1/16 inch thick metal plate, 1/8 inch thick glastic, flexible conduit, interlocked armor cable, stainless steel braided armor cable, Refrasil UT-96-2 tape, 0.05 inches thick, 2 inches wide with adhesive backing. "Panduit", or other wire training devices, while used to maintain separation, are not to be considered as barriers unless 1/8 inch thick and unslotted.

8.2.3 Device

An item intended to carry, or help carry, but not utilize electrical energy. Units such as switches, circuit breakers, fuse holders, receptacles, etc. that distribute or control, but do not consume electricity are termed devices.

8.2.4 Enclosure

The case or housing of an apparatus surrounding an installation to prevent personnel from accidentally contacting energized parts, or to protect the equipment from physical damage.

8.2.5 Wiring

Insulated wire comprised of a slender rod or filament of drawn metal surrounded by a substance permanently offering a high resistance to the passage of energy through the substance. May also be known as hookup wire, SIS wire, or white wire.

8.2.6 Cable

One or more conductors with or without fill material surrounded by an overall armor (typically braided or interlocked).

8.3 Criteria:

8.3.1

Wiring and control devices are to be installed so as to maximize the physical separation distance between mutually redundant safety related wiring. In no case, shall mutually redundant safety related wiring or devices be in physical contact. When separation cannot be maintained a barrier must be installed.

8.3.2

All QA 1 designated wiring is to be physically identified in accordance with Section 7. If the wiring is enclosed by use of a barrier, the tag shall be attached to the barrier's exterior to identify the channel contained inside.

8.3.3

Non essential and PSW System wiring may be run in wire ways or bundled with QA 1 wiring. The wires may only be run with one color without the use of a barrier.

8.3.4

If wiring is not completely enclosed by a barrier, the wiring may not protrude above the top of the barrier.

8.3.5

No separation distance is required between adjacent wiring and a barrier.

8.3.6

Where more than one mutually redundant channel or train is connected to one device, the wiring shall be separated through the device. (separate terminal blocks/links, control switch contacts, relay decks, etc.)

8.3.7

Duke Power modifications to vendor scope panels should conform to the separation criteria specified herein where practicable. If the separation criteria is not practicable, the original vendor separation methods should be observed by use of the vendor established wire- ways, wire tracks, and wire troughs.

8.3.8

Any exception to these criteria shall be documented in a memo to file OS-224, justifying the installation and its acceptability. This is also applicable to 8.3.7 above, if separation is not maintained.

8.4 Barrier Installation

8.4.1

Where metallic barriers are used between redundant devices the barrier shall be tied to station ground with a minimum #12 conductor.

8.4.2

EMT conduit, rigid conduit, glastic, flexible conduit are to be installed based on enclosure design and seismic considerations.

8.4.3

Refrasil UT-96-2 tape, 0.05 inches thick, 2 inches wide with adhesive backing may be used if applied in the following manner.

8.4.3.1

To achieve wireway to wiring separation, install material on wiring if practical. If not practical, install on wire way.

8.4.3.2

To achieve wireway to wireway separation, install material on either wireway.

8.4.3.3

To achieve cable to cable separation.

8.4.4 Wrapping Method: (Refrasil Tape)

8.4.4.1

For wireways or wire bundles, the material shall be wrapped in two layers with a minimum of 1/4 inch overlap between adjacent wraps. The second layer is to be wrapped using the same method but in a direction perpendicular to the first layer. This will insure a double thickness with no gaps. The material is to be secured with standard nylon ty- raps, spaced at a maximum of twelve-inch intervals or at each end of the wrap (whichever distance is smaller).

8.4.4.2

Where continuous wrapping is impossible (e.g., where wire ways are welded to a surface along the length of the wire way), the following method is to be used. The material shall be attached in two layers, in strips, using adhesive backing with 1/4 inch minimum overlap between adjacent strips. The second layer is to be installed in the same manner but in a direction perpendicular to the first layer.

8.4.4.3

If space between wireways, and/or wiring is extremely tight the material may be wrapped lengthwise in two layers and overlapped by 1/4 inch.

9.0 Implementation

9.1

The implementation date of this installation specification revision is shown on page CS-1. Installations made prior to this date are considered acceptable provided the installations were made in accordance with previous revisions. (See also Section 3.0 Scope.)

10.0 References

10.1 Duke Power Company, Design Criteria DC-3.02, Cabling Classifications

10.2 Duke Power Company, Design Criteria DC-3.06, Conduit Systems for Power Plants

10.3 Duke Power Company, Design Criteria DC-3.12, Cable Ampacity Design Criteria

10.4 Duke Power Company, Design Criteria DC-3.13, Oconee Nuclear Station Cable and Control Board Separation Criteria

10.5 Duke Power Company, Design Criteria DC-3.14, Cable Classification and Separation for Non-Interlocked Armored Cable

10.6 Specification OSS-0218.00-00-0025, Specification for the Installation of Field Run Cable Support Systems

10.7 IEEE Std 603-1980, IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations

10.8 Nuclear System Directive - NSD301, Nuclear Station Modifications

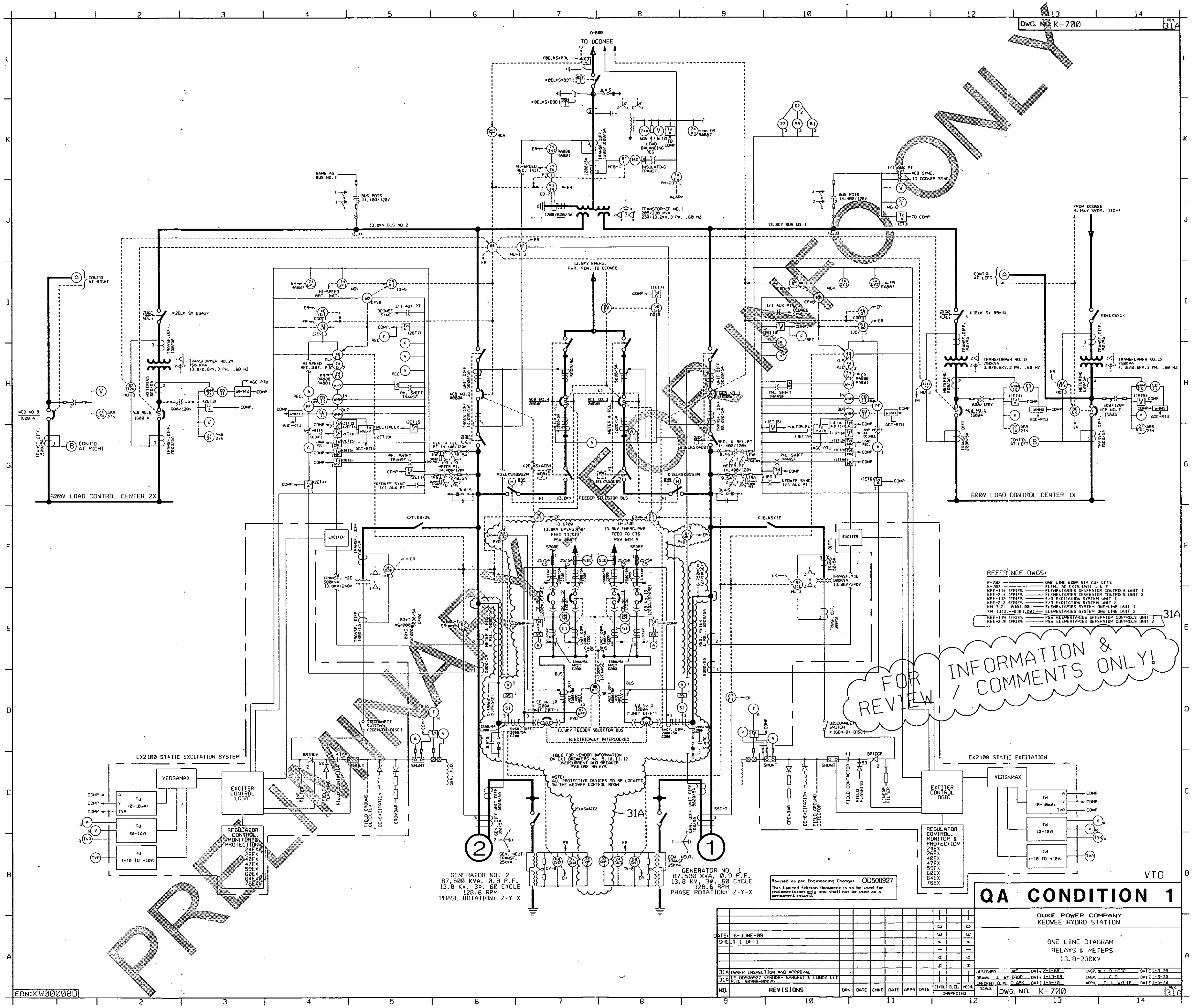
10.9 National Electrical Code, 1996

10.10 Insulated Cable Engineers Association (ICEA), Publication IEEE S-135, ICEA P-46-426

10.11 Duke Power Company, Calculation Guide, CA-2.01, Calculations for Voltage Drop and Voltage Dip Determination

10.12 Memo to File: OS-224, Electrical Cable Separation for Keowee Hydro Station, dated March 15, 95.

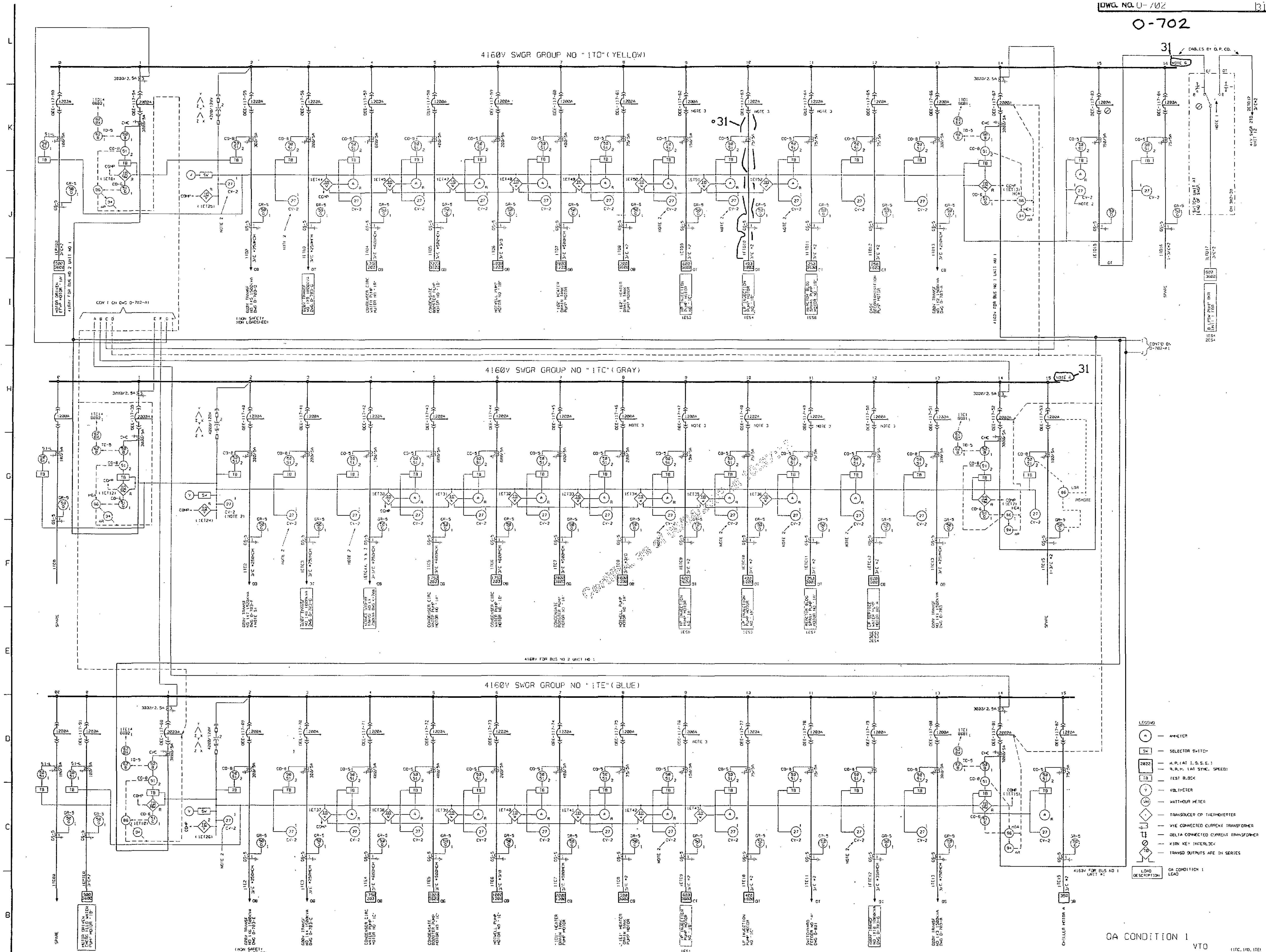
RAI-3


DWG. NO. K-700
TO OCONEE
13.8KV BUS NO.2
13.8KV BUS NO.1
TRANSFORMER NO.1
13.8KV EMERG. PWR. FDR. TO OCONEE
TRANSFORMER NO.2X
TRANSFORMER NO.1X
TRANSFORMER NO.CX
CONT'D AT RIGHT
CONT'D AT LEFT
600V LOAD CONTROL CENTER 2X
600V LOAD CONTROL CENTER 1X
13.8KV FEEDER SELECTOR BUS
ELECTRICALLY INTERLOCKED
HOLD FOR VENDOR INFORMATION ON CKT BREAKERS No. 9, 10, 11, 12 OVERCURRENT AND BREAKER FAILURE RELAYS
NOTE: ALL PROTECTIVE DEVICES TO BE LOCATED IN THE KEOWEE CONTROL ROOM
EX2100 STATIC EXCITATION SYSTEM
EX2100 STATIC EXCITATION
VERSAMAX
EXCITER CONTROL LOGIC
REGULATOR CONTROL, MONITOR & PROTECTION
24EX
26EX
40EX
47EX
59EX
60EX
64EX
76EX
GENERATOR NO. 2
87,500 KVA, 0.9 P.F.
13.8 KV, 3Ø, 60 CYCLE
128.6 RPM
PHASE ROTATION: Z-Y-X
GENERATOR NO. 1
87,500 KVA, 0.9 P.F.
13.8 KV, 3Ø, 60 CYCLE
128.6 RPM
PHASE ROTATION: Z-Y-X
REFERENCE DWGS:
PRELIMINARY FOR INFO ONLY
FOR INFORMATION & REVIEW / COMMENTS ONLY!
Revised as per Engineering Change: OD500927
This Limited Edition Document is to be used for implementation only and shall not be used as a permanent record.
VTO
QA CONDITION 1
DUKE POWER COMPANY
KEOWEE HYDRO STATION
ONE LINE DIAGRAM
RELAYS & METERS
13.8-230KV
DATE: 6-JUNE-09
SHEET 1 OF 1
31A OWNER INSPECTION AND APPROVAL
31A LE OD500927 VENDOR- SARGENT & LUNDY LLC P.O. 90906-00025
NO. REVISIONS DRN DATE CHKD DATE APPR DATE
CIVIL ELEC. MECH. INSPECTED
DESIGNER JWS DATE 2-1-68
DRAWN J. WALDROP DATE 1-19-68
CHECKED D.M. CLARK DATE 1-5-70
INSP. W.H.O./DSR DATE 1-5-70
INSP. L.C.D. DATE 1-5-70
APPR. C.J. WILIE DATE 1-5-70
SCALE
DWG. NO. K-700
REV. 31A
ERN:KW000080

DWG. NO. O-702

O-702

RAI-8



NOTES:

1. THE NO LOAD MANUAL TRANSFER SWITCH IS EQUIPPED WITH KIRK INTERLOCK ARRANGEMENT SUCH THAT BREAKERS 1TD-15 & 2TD-12 (DWG O-1702) MUST BE IN OPEN POSITION BEFORE TRANSFER SWITCH CAN BE OPERATED

NOTES CONT'D

4.

QA CONDITION 1

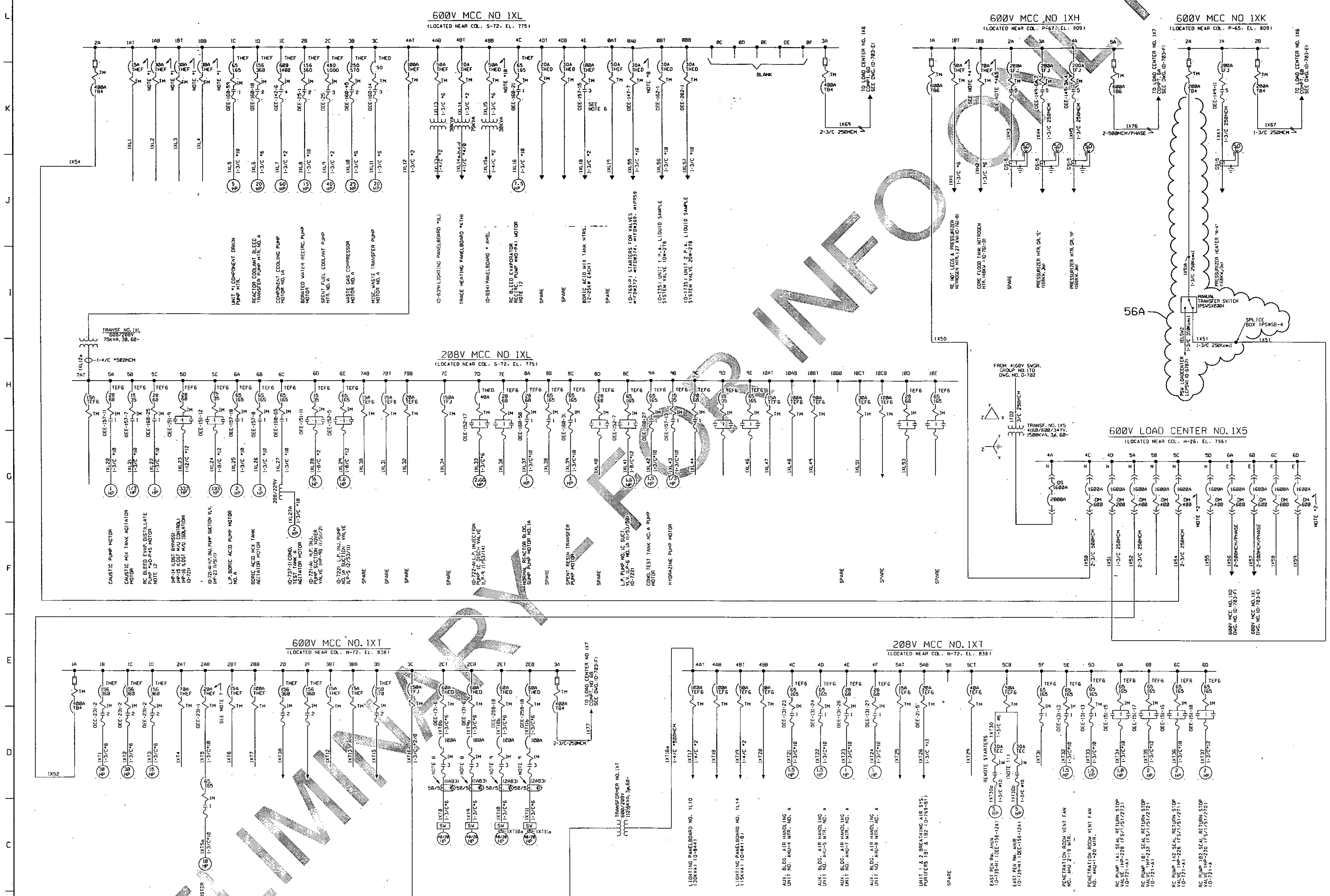
VTO

(1TC, 1TD, 1TE)

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 1

ONE LINE DIAGRAM

RAI-8



LEGEND:

NOTES:

1. BREAKER CHANGE IN MCC *1XL COMP. *1AT, 1AB, 1BT, 1BB ARE COVERED UNDER ITEM *509-9
2. BKR. IN COMPT. *5C OF 1X5 IS TO BE INTERCHANGED WITH BKR. OF COMPT. *6D OF 1X5.
3. FIELD TO REPLACE PRESENTLY MOUNTED SIZE 2 FVNR STARTER WITH 150A TYPE TFJ BREAKER COVERED UNDER ITEM *509-14.
4. FIELD TO REPLACE PRESENTLY MOUNTED BREAKERS IN COMPTS. *1BT & 1BB OF MCC *1XH BY THOSE COVERED UNDER ITEM *509-17.
5. FIELD TO REPLACE 50A C.B. IN COMPT. 1BB WITH 70A C.B. FROM SPARES CREATED BY ITEM *509-17.
6. SEE ITEM *510-87 FOR 50A BKRS. IN COMPTS. 0AT & 0AB
7. FIELD TO INSTALL 20A BREAKER FROM FIELD STOCK.
8. 30A BREAKER ORDERED ON ITEM 7310-0307-00.0031
9. CT's TO BE CONNECTED WITH TWO (2) TURNS ON PRIMARY TO OBTAIN REFERENCED 50/5 RATIO.
10. FIELD TO SWAP EXISTING 100A BREAKER WITH 50A BREAKER FROM STOCK.
11. FIELD TO SET THE CIRCUIT BREAKER TRIP SETTING ON POSITION '2'.
12. BREAKER LOAD IS OUT OF SERVICE. SEE OEE FOR DETAILS.

Revised as per Engineering Change: OD100924
This Limited Edition Document is to be used for implementation only and shall not be used as a permanent record.

REF. DRAWINGS:

0-752-A9 — MCC *1XH C/D 1-4
0-752-A10 — MCC *1XH C/D 5
0-752-A29 — MCC *1XL C/D 1-4
0-752-A30 — MCC *1XL C/D 5-8
0-752-A31 — MCC *1XL C/D 9, 10 & 0
0-752-A32 — MCC *1XK C/D 1 & 2
0-752-A60 — MCC *1XT C/D 1-5
~~0-752-A61 — MCC *1XT C/D 6~~
0-6707 — ONE LINE DIAG.(LCPSW1)
0-6720-A — TRANSFER SW 1PSWSX0004 C/D

56A

1X5, 1XH, 1XK, 1XL, 1XT

VTO

NO.	REVISIONS	DRN	DATE	CHKD	DATE	APPR	DATE	CIVIL	ELEC.	MECH.
56A	OWNER INSPECTION AND APPROVAL	—	—	—	—					
56A	LE OD100924 VENDOR- SARGENT & LUNDY LLC P.O. 90906-00012	HCE	2-7-09	RD	2-7-09	CAS	2/7/09		W	
56	ED. EXEMPT. G.18, PIP 07-01659	JHA	7-18-07	JRK	7-18-07	JDB	7-18-07	D	W	D
55	00500563	JHA	7-24-06	MLM	7-24-06	GDC	7-25-06	E	W	E
54	OE-16497	TLF	11-16-05	MLM	11-16-05	GDC	11-16-05	V	FEC	V
53	OE-16477	SAL	11-06-03	JEW	11-06-03	KFB	11-06-03	I	PNF	I
52	OE-15411	TLF	10-20-03	PCS	10-20-03	GDC	10-20-03	A	EJW	A
51	OE-17683	TLF	8-11-03	CWC	8-11-03	GDC	8-13-03	W	EJW	W
50	OE-14031	JHA	6-20-02	PCS	6-20-02	GDC	6-24-02		FEC	
ORIG.	ORIGINAL DRAWING RETIRED	JHA	6-17-02							

INSPECTED

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 1

ONE LINE DIAGRAM
STATION AUXILIARY CIRCUITS 600V

DESIGNER DM FURR	DATE 12-19-69	INSP. JR HALL	DATE 12-19-69
DRAWN DM FURR	DATE 12-19-69	INSP. WH OWEN	DATE 12-19-69
CHECKED CE DOWDEY	DATE 12-19-69	APPR. CJ WYLIE	DATE 12-19-69

SCALE

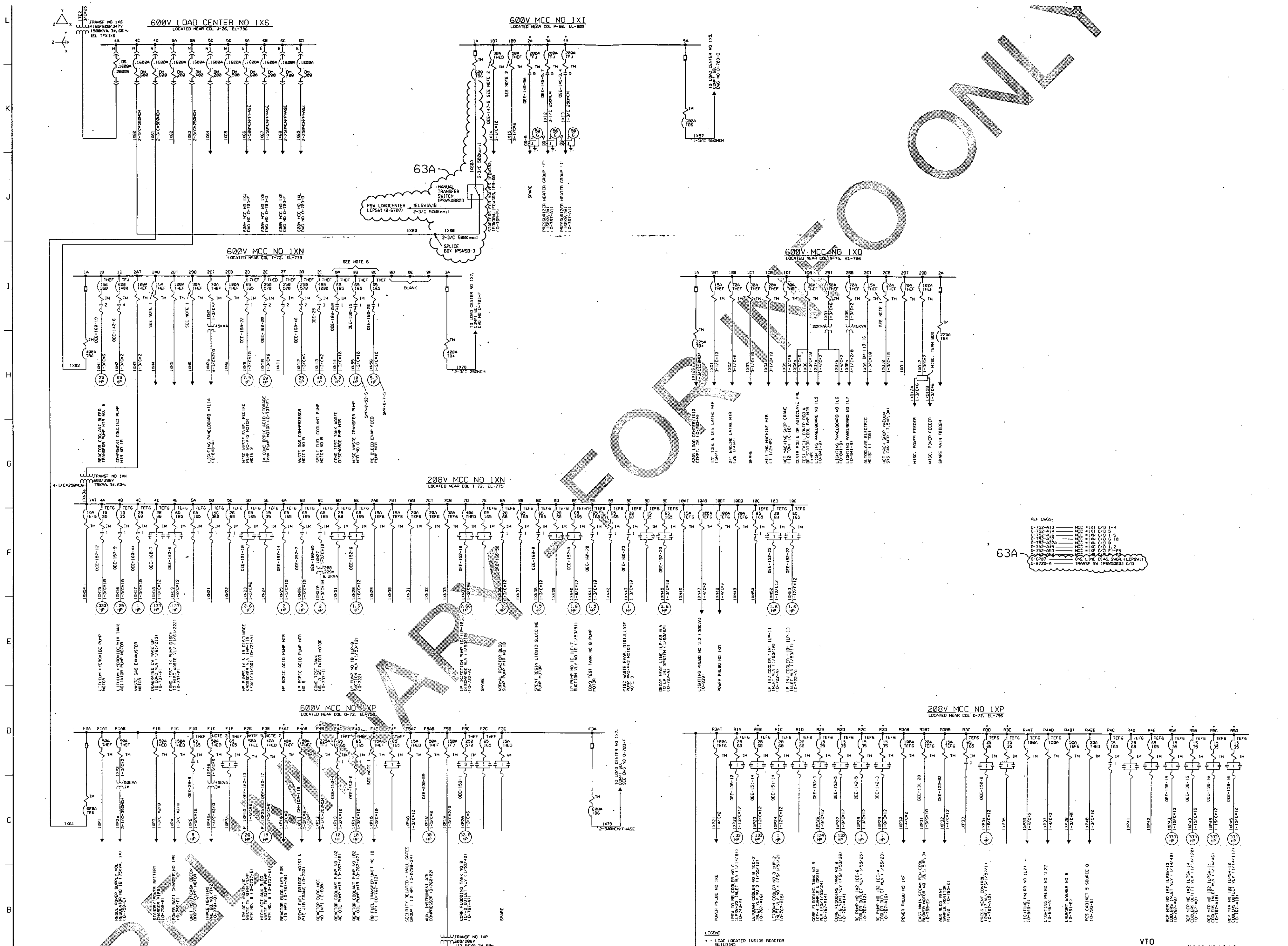
DWG. NO. 0-703-D

REV. 56A

ERN: OX000896

OED-6

RAI-8



NOTES:

1. BREAKER CHANGE IN MCC #1XN, COMPT #2AB & 2BB AND MCC #1XP, COMPT #F4E AND MCC # 1XO, COMPT #2CT COVERED UNDER ITEM #509-9.
2. FIELD TO REPLACE PRESENTLY MOUNTED CB IN COMPT #1BB & 1BT OF MCC #1XI WITH THOSE COVERED UNDER ITEM #509-17.
3. FIELD TO REPLACE PRESENTLY MOUNTED 20A CB IN COMPT #F1E OF MCC #1XP WITH A 50A CB.
4. FIELD TO REPLACE PRESENTLY MOUNTED 70A CB IN COMPT #F3B OF MCC #1XN WITH 30A CB COVERED UNDER ITEM #509-36.
5. FIELD TO REPLACE EXISTING 100A CB IN COMPT #F2B OF MCC #1XP WITH 50A CB.
6. SEE ITEM #510-95 FOR 3 SIZE 1 FVNR STARTERS.
7. FIELD TO REPLACE PRESENTLY MOUNTED 30A CB IN COMPT #F3B OF MCC #1XP WITH 40A CB.

9. BREAKER LOAD IS OUT OF SERVICE. SEE OEE FOR DETAILS.

LEGEND

* - LOAD LOCATED INSIDE REACTOR BUILDING

Revised as per Engineering Change: OD100924

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VTO

1XI, 1XN, 1XP, 1XO, 1X6

NO.	REVISIONS	DRN	DATE	CHKD	DATE	APPR	DATE
63A	OWNER INSPECTION AND APPROVAL						
63A	LE OD100924 VENDOR- SARGENT & LUNDY LLC P.O. 90906-00012	HCF	2-6-09	RD	2-6-09	7/65	2/7/09

WAIVED — INSPECTED: CIVIL / ELEC. W / MECH.

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 1

ONE LINE DIAGRAM
STATION AUXILIARY CIRCUITS 600V

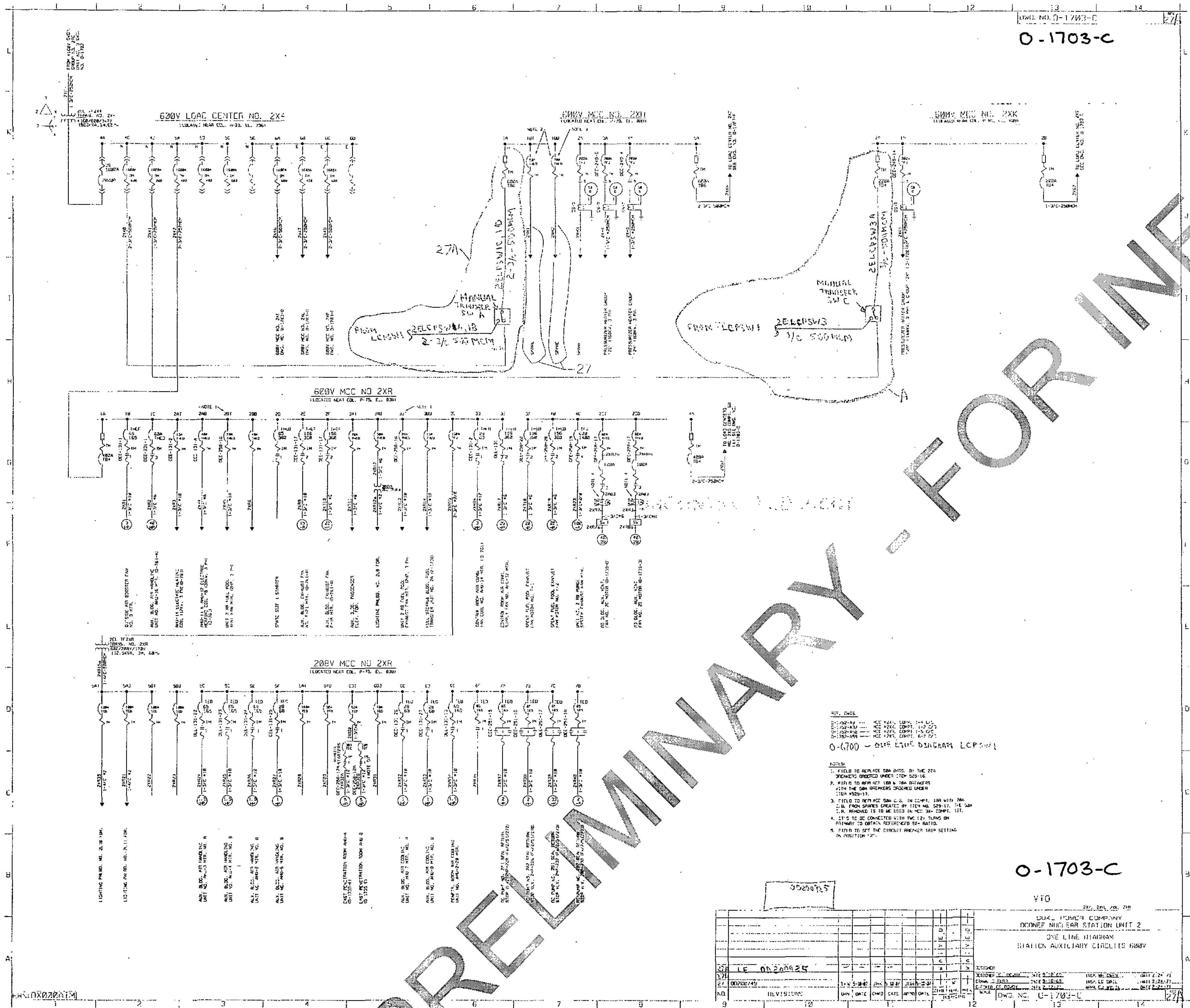
DESIGNER DM FURR DATE 12-19-69 — INSP. JR HALL DATE
DRAWN D FURR DATE 12-19-69 — INSP. WH OWEN DATE
CHECKED CE DOWDEY DATE 12-19-69 — APPR. CJ WYLIE DATE

SCALE — DWG. NO. O-703-E — REV. 63A

ERN: CX000897

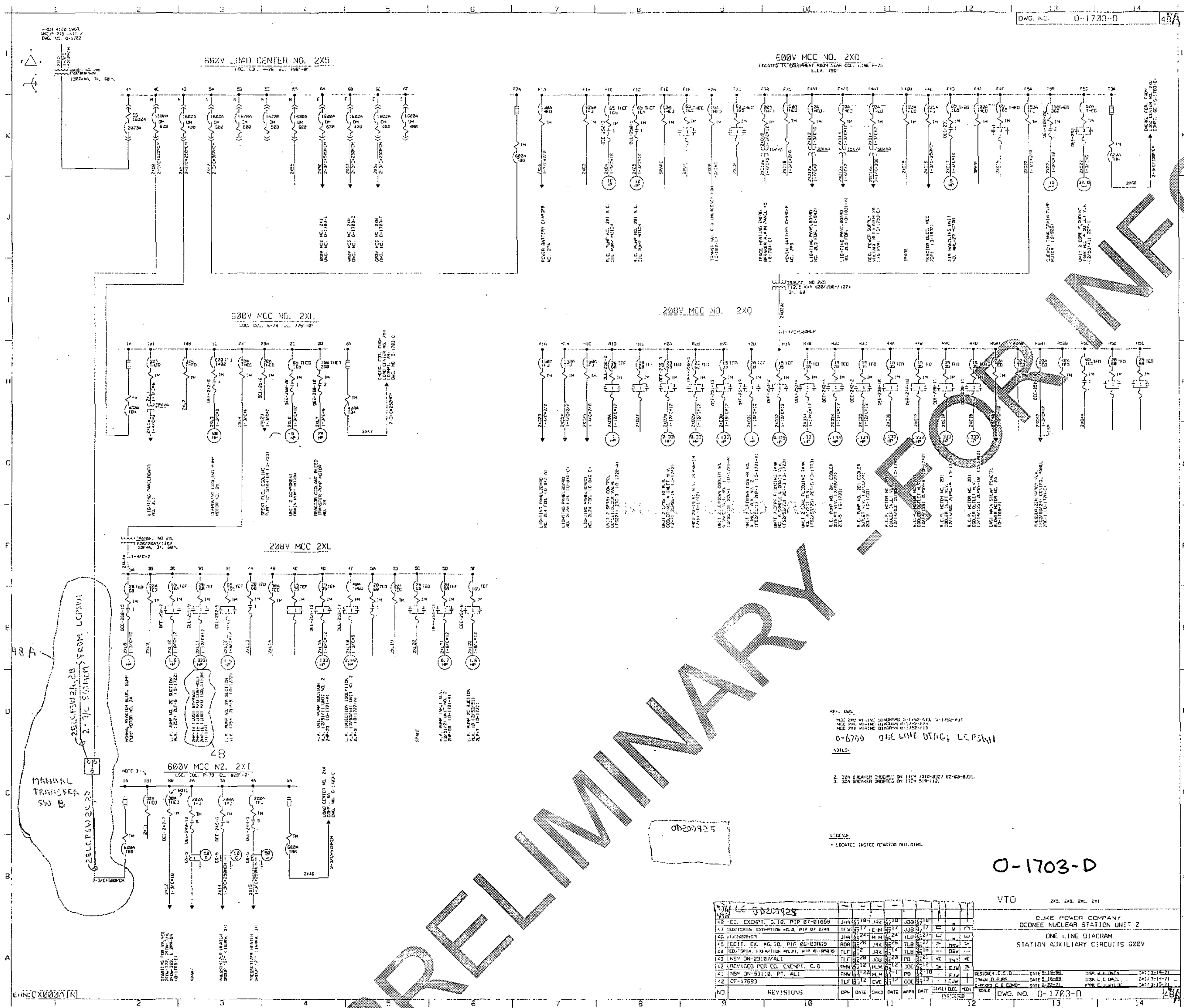
OED-6

RAI-8



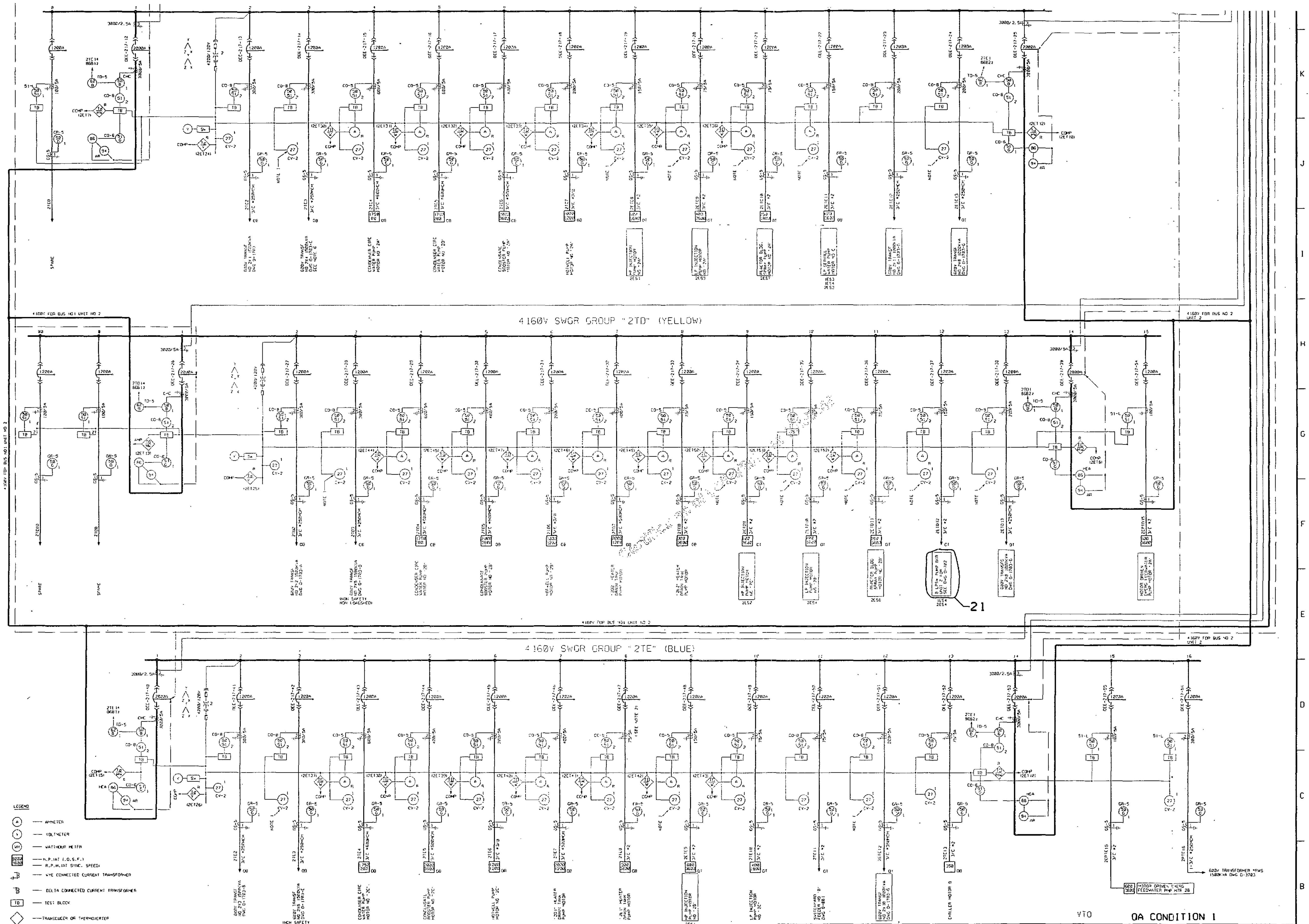
DWG. NO. O-1703-C
0-1703-C
600V LOAD CENTER NO. 2X4
600V MCC NO. 2XH
600V MCC NO. 2XK
600V MCC NO 2XR
208V MCC NO 2XR
27A
27
MANUAL TRANSFER SW A
MANUAL TRANSFER SW C
FROM LCPSW1
2ELCPSW1A 1B
2-3/c 500 MCM
FROM 2LCPSW1
2ELCPSW3
3/c 500 MCM
REF. DWGS.
O-1752-A9 --- MCC #2X4, COMPT. 1-4 C/C
O-1752-A32 --- MCC #2X4, COMPT. 1-2 C/C
O-1752-A58 --- MCC #2XR, COMPT 1-5 C/C
O-1752-A59 --- MCC #2XR, COMPT. 6-7 C/C
O-1700 - ONE LINE DIAGRAM LCPSW1
NOTES:
1. FIELD TO REPLACE 50A BKRS. BY THE 22A BREAKERS ORDERED UNDER ITEM 529-16.
2. FIELD TO REPLACE 100 & 70A BREAKERS WITH THE 50A BREAKERS ORDERED UNDER ITEM #529-17.
3. FIELD TO REPLACE 50A C.B. IN COMPT. 10R WITH 70A C.B. FROM SPARES CREATED BY ITEM NO. 529-17. THE 50A C.B. REMOVED IS TO BE USED IN MCC 3X- COMPT. 1ST.
4. CT'S TO BE CONNECTED WITH TWO (2) TURNS ON PRIMARY TO OBTAIN REFERENCED 52- RATIO.
5. FIELD TO SET THE CIRCUIT BREAKER TRIP SETTING ON POSITION "2".
0-1703-C
00200925
VTO
2X4, 2XH, 2XK, 2XR
DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 2
ONE LINE DIAGRAM
STATION AUXILIARY CIRCUITS 600V
27A LE 00200925
27 00200749
NO. REVISIONS
DWG. NO. O-1703-C
27A

RAI-8



DWG. NO. 0-1703-D 48A
600V LOAD CENTER NO. 2X5
600V MCC NO. 2XO
600V MCC NO. 2XL
208V MCC NO. 2XO
208V MCC 2XL
600V MCC NO. 2XI
48A
48
MANUAL TRANSFER SW B
0-6790 ONE LINE DIAG; LCPSW1
0D200925
LEGEND
* LOCATED INSIDE REACTOR BUILDING
0-1703-D
VTO
2X5, 2XO, 2XL, 2XI
48A LE 0D200925
49 EC. EXEMPT. 5.10, PIP 07-01659
47 EDITORIAL EXEMPTION #6.8, PIP 07 2740
46 OC502563
45 EDIT. EX. #6.10, PIP 06-03009
44 EDITORIAL EXEMPTION #6.21, PIP 01-05035
43 NSM ON-23107/AL1
42 REVISED PER CO. EXEMPT. C.8
41 NSM ON-53110, PT. AL1
40 CE-17683
NO. REVISIONS
DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 2
ONE LINE DIAGRAM
STATION AUXILIARY CIRCUITS 600V
DWG. NO. 0-1703-D

RAI-8



LEGEND

- AMMETER
- VOLTMETER
- WATTHOUR METER
- H.P.(AT 1.0.S.F.)
- R.P.M.(AT SYNC. SPEED)
- WYE CONNECTED CURRENT TRANSFORMER
- DELTA CONNECTED CURRENT TRANSFORMER
- TB — TEST BLOCK
- TRANSDUCER OR THERMOVERTER
- SW — SELECTOR SWITCH
- KIRK KEY INTERLOCK
- LOAD DESCRIPTION — O A CONDITION 1 LOAD

ABBREVIATIONS

AM — AT OR NEAR MOTOR
OT — RUN POWER CABLE OUT TOP OF SWITCHGEAR
OB — RUN POWER CABLE OUT BOTTOM OF SWITCHGEAR
R — REMOTE
B1) — BUS NO 1, UNIT NO 2
B2) — BUS NO 2, UNIT NO 2

NOTES

1. UNDERVOLTAGE RELAYS REMOVED AND TRIP CIRCUIT DISCONNECTED FROM CASE.
2. SEE ITEM #523-2 FOR REPLACEMENT CT'S IN UNIT 8 OF SWGR. 2TE.
3. (DELETED)
4. PHASE SEQUENCE VOLTAGE RELAY REMOVED AND TRIP CIRCUIT DISCONNECTED.
5. ALL 4KV 1200A BREAKERS ARE INTERCHANGABLE WITH THE EXCEPTIONS OF: 2TC UNITS 8, 9, 10, 11, 2TD UNITS 9, 10, 11, 12, 2TE UNIT 9 THESE BREAKERS ARE ONLY INTERCHANGABLE AMOUNG THEMSELVES BECAUSE THEY HAVE INTERNAL RESISTORS FOR PROPER OPERATION OF THEIR COIL MONITOR RELAYS
6. BREAKER WILL AUTOMATICALLY RECLOSE AFTER A LOADSHED EVENT.

VTO

OA CONDITION 1

NO.	REVISIONS	DRN	DATE	CHKD	DATE	APPR	DATE
21	EDITORIAL EXEMPT #G.6	TLF	5-27-04	MLM	6-3-04	GOC	6-7-04
20	REV. PER NSM ON-23092/00, PT. AL1	SAL	10-24-02	JHS	10-25-02	MGS	10-25-02
ORIG.	ORIGINAL DRAWING RETIRED	SAL	10-24-02				

INSPECTED: CIVIL — WAIVED; ELEC. — TLB, JDP; MECH. — WAIVED

DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 2

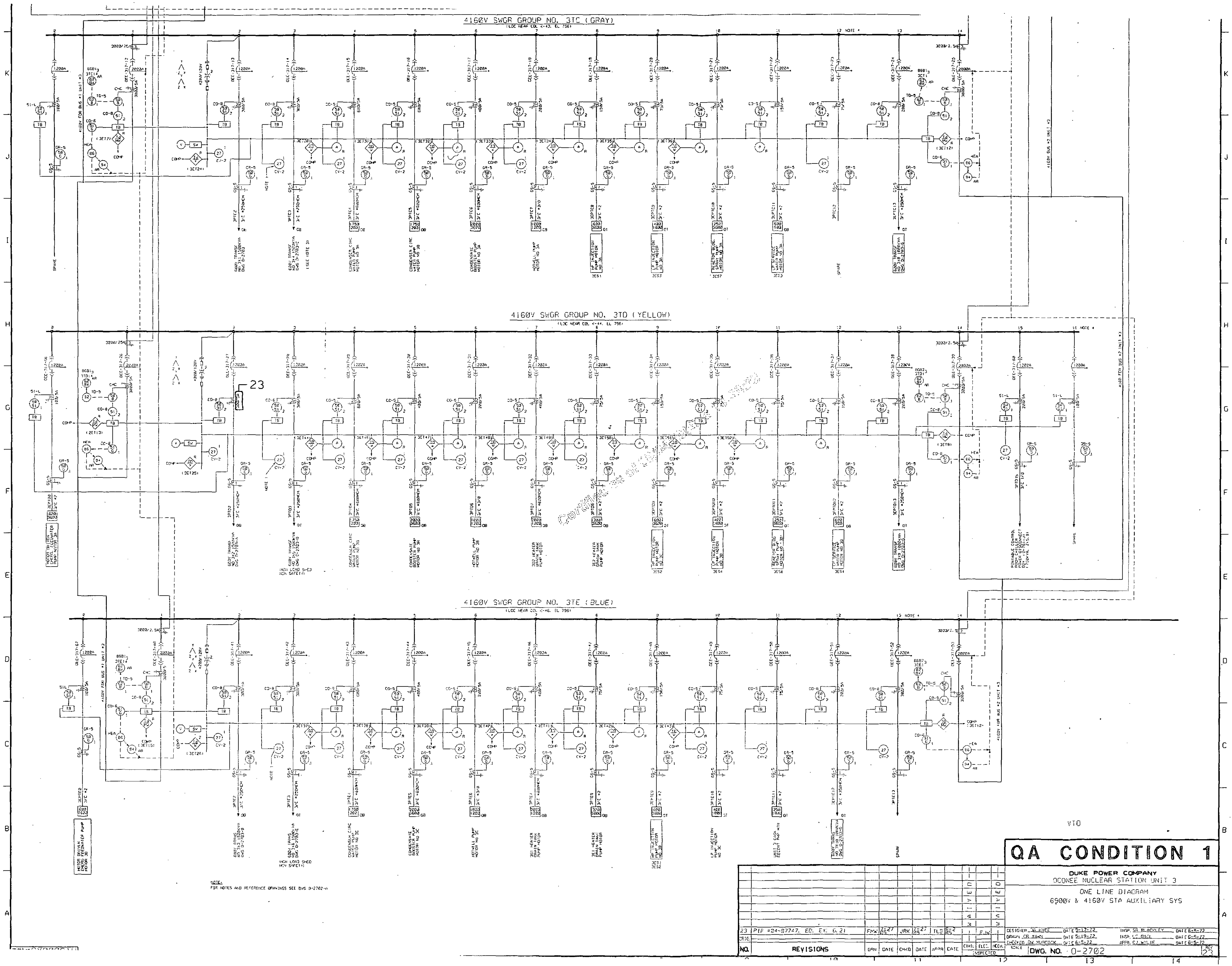
ONE LINE DIAGRAM
6900V & 4160V STA AUXILIARY SYS

DESIGNER ____ DATE ____
DRAWN D FURR DATE 6-4-69
CHECKED WJ FOLEY DATE 6-4-69
INSP. WH OWEN DATE 6-4-69
INSP. LC DAIL DATE 6-4-69
APPR. CJ WYLIE DATE 6-3-69

SCALE — DWG. NO. O-1702 — REV 21

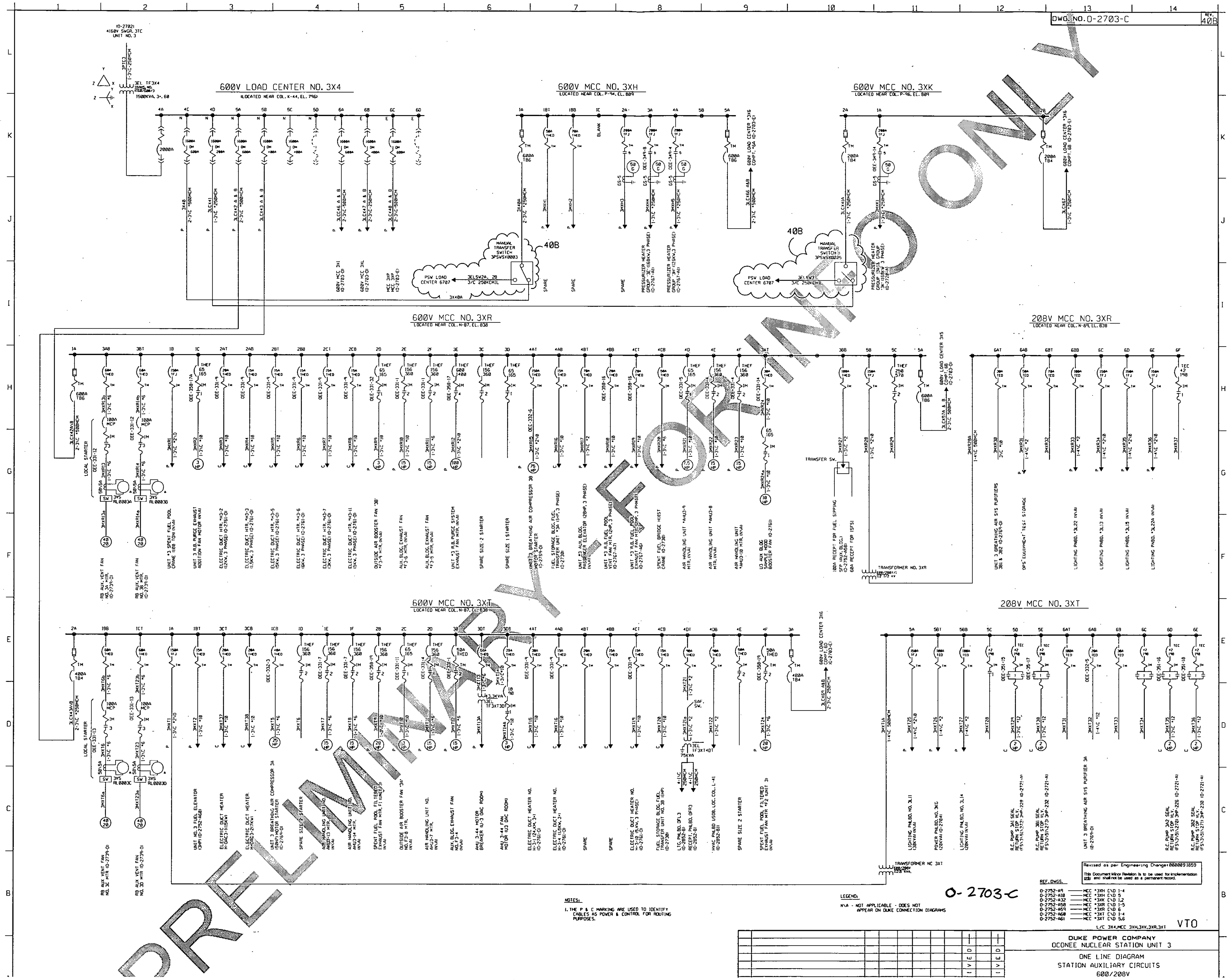
ERN: OX000AIH

RAI-8



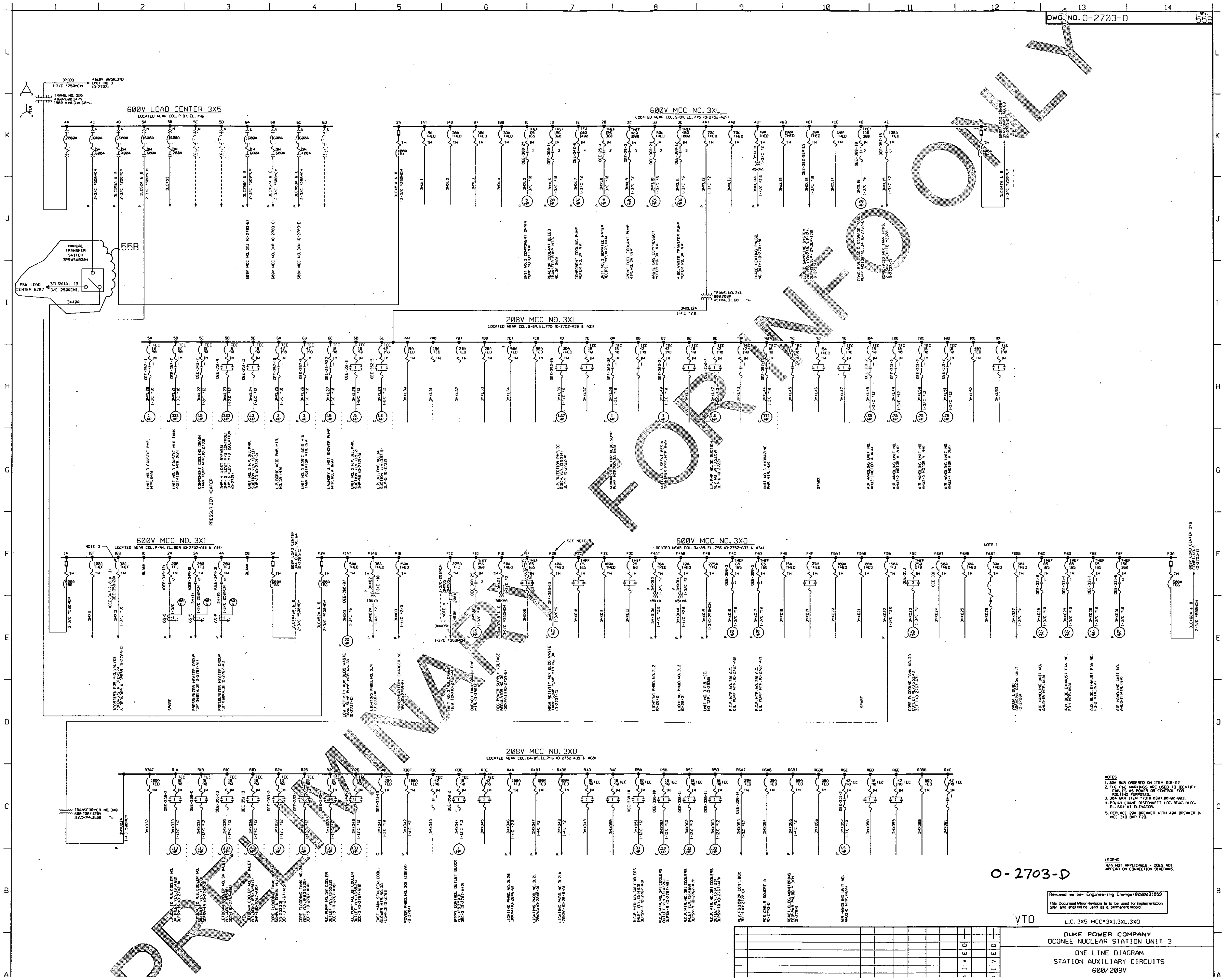
4160V SWGR GROUP NO. 3TC (GRAY)
4160V SWGR GROUP NO. 3TD (YELLOW)
4160V SWGR GROUP NO. 3TE (BLUE)
23
NOTE:
FOR NOTES AND REFERENCE DRAWINGS SEE DWG O-2702-A
VTO
QA CONDITION 1
DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 3
ONE LINE DIAGRAM
6900V & 4160V STA AUXILIARY SYS
23 PIP #04-07747, ED. EX. 0.21
NO. REVISIONS DRN DATE CHKD DATE APPR DATE
CIVIL ELEC. MECH. INSPECTED
WAIVED
DESIGNER DB RYCE DATE 5-17-72
DRAWN CB YAWN DATE 5-19-72
CHECKED DW MURDOCK DATE 6-5-72
INSP. SB BLACKLEY DATE 6-5-72
APPR. CJ WYLIE DATE 6-5-72
DWG. NO. O-2702
REV 23

RAI-8

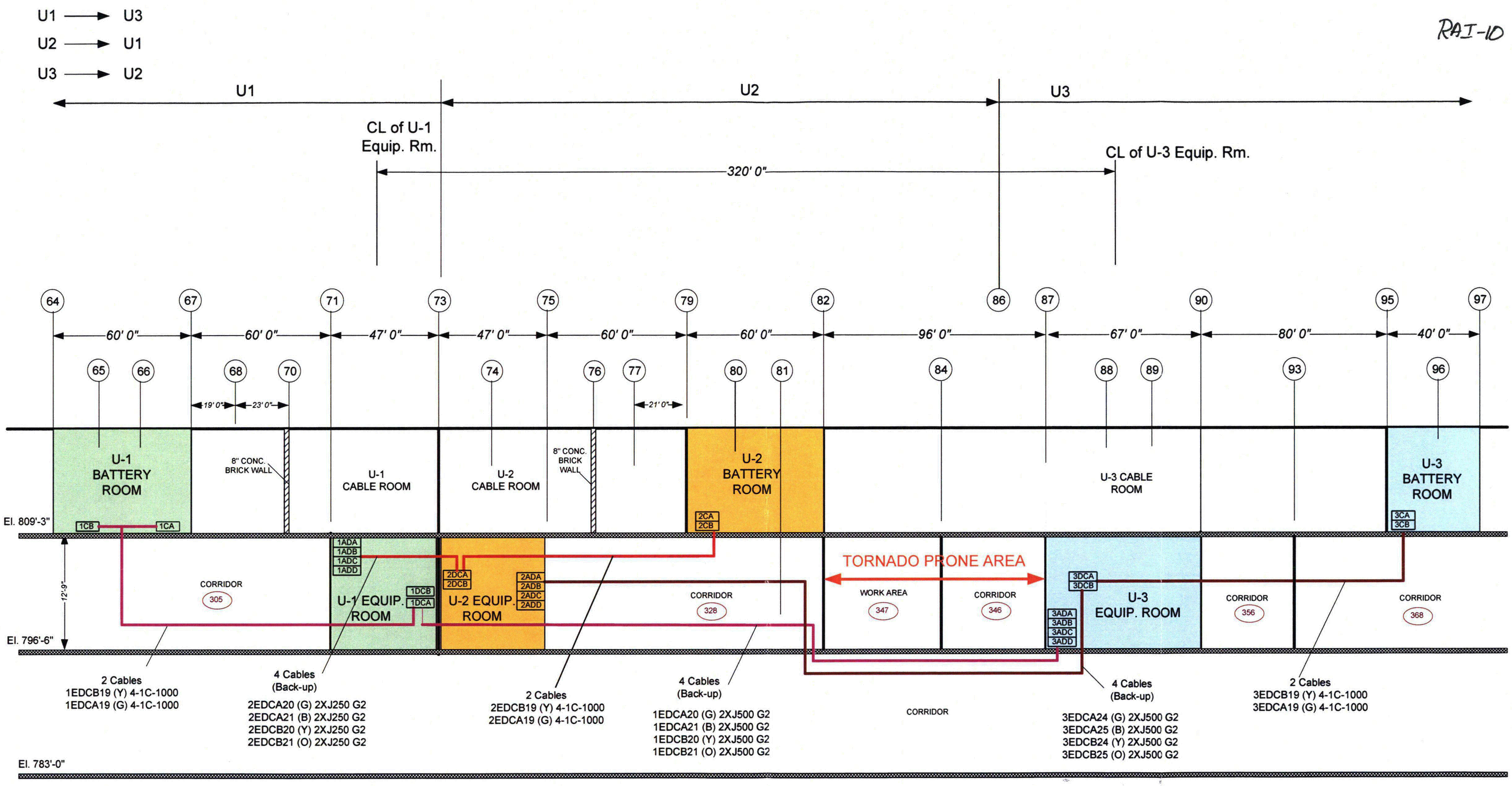


DWG. NO. 0-2703-C
REV. 40B
600V LOAD CENTER NO. 3X4
LOCATED NEAR COL. K-44, EL. 796
600V MCC NO. 3XH
600V MCC NO. 3XK
600V MCC NO. 3XR
LOCATED NEAR COL. N-87, EL. 838
208V MCC NO. 3XR
600V MCC NO. 3XT
208V MCC NO. 3XT
MANUAL TRANSFER SWITCH
PSW LOAD CENTER 6707
TRANSFORMER NO. 3XR
TRANSFORMER NC 3XT
600/208V
112.5 KVA.
NOTES:
1. THE P & C MARKING ARE USED TO IDENTIFY CABLES AS POWER & CONTROL FOR ROUTING PURPOSES.
LEGEND:
N\A - NOT APPLICABLE - DOES NOT APPEAR ON DUKE CONNECTION DIAGRAMS
0-2703-C
Revised as per Engineering Change: 0000091859
This Document Minor Revision is to be used for implementation only and shall not be used as a permanent record.
REF. DWGS.
0-2752-A9 — MCC *3XH C\D 1-4
0-2752-A10 — MCC *3XH C\D 5
0-2752-A32 — MCC *3XK C\D 1,2
0-2752-A58 — MCC *3XR C\D 1-5
0-2752-A59 — MCC *3XR C\D 6
0-2752-A60 — MCC *3XT C\D 1-4
0-2752-A61 — MCC *3XT C\D 5,6
L/C 3X4, MCC 3XH, 3XK, 3XR, 3XT
VTO
DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 3
ONE LINE DIAGRAM
STATION AUXILIARY CIRCUITS
600/208V

RAI-8



DWG. NO. 0-2703-D
REV. 55B
600V LOAD CENTER 3X5
600V MCC NO. 3XL
208V MCC NO. 3XL
600V MCC NO. 3X1
600V MCC NO. 3XO
208V MCC NO. 3XO
MANUAL TRANSFER SWITCH
55B
PRELIMINARY - FOR INFO ONLY
0-2703-D
VTO
L.C. 3X5 MCC*3X1,3XL,3XO
DUKE POWER COMPANY
OCONEE NUCLEAR STATION UNIT 3
ONE LINE DIAGRAM
STATION AUXILIARY CIRCUITS
600/208V



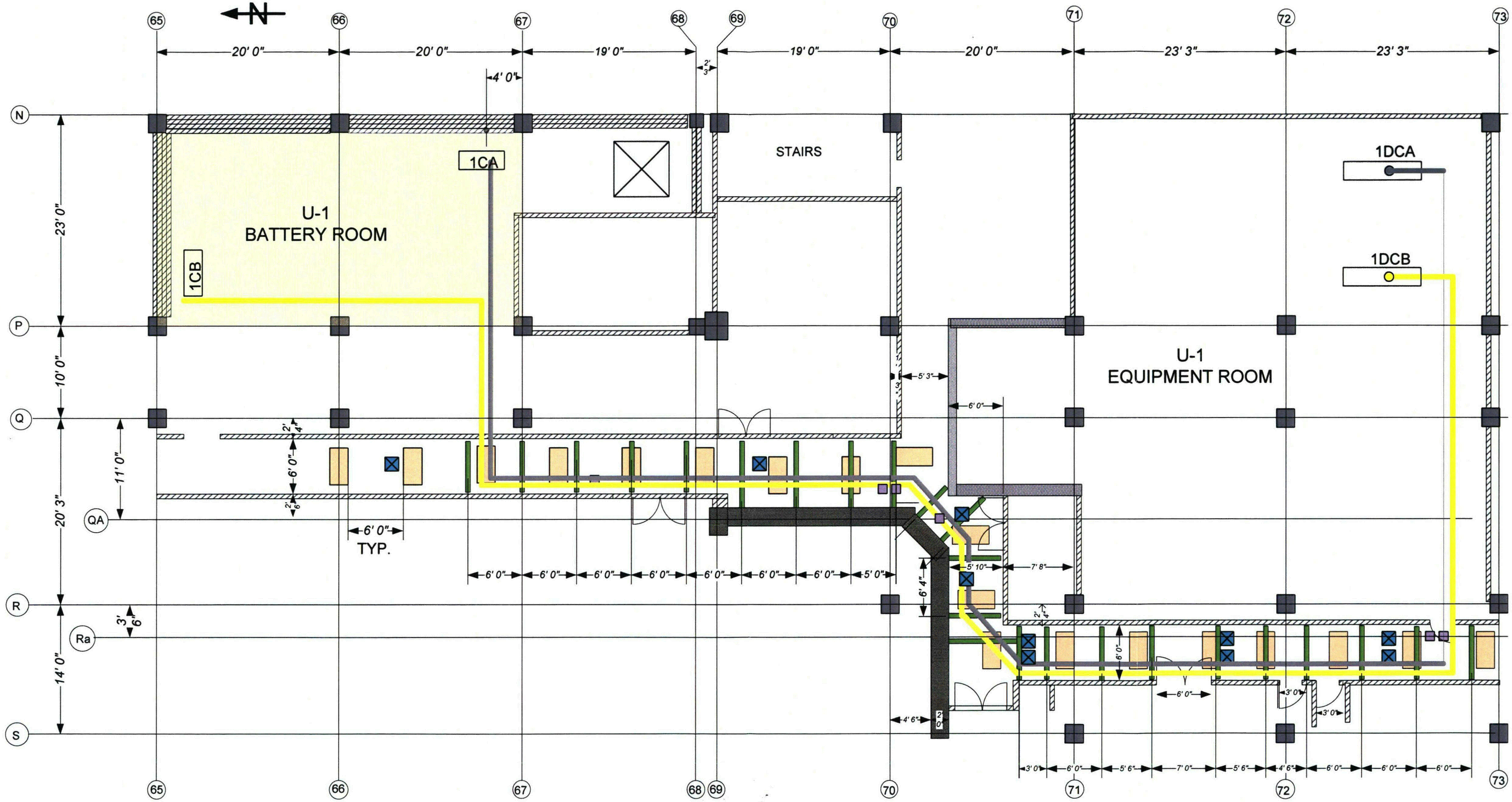
PRELIMINARY

CABLE ROUTING DIAGRAM (SCHEMATIC)
ELEVATION LOOKING EAST

= Concrete Floor or Wall

\# = Room #

RAI-10

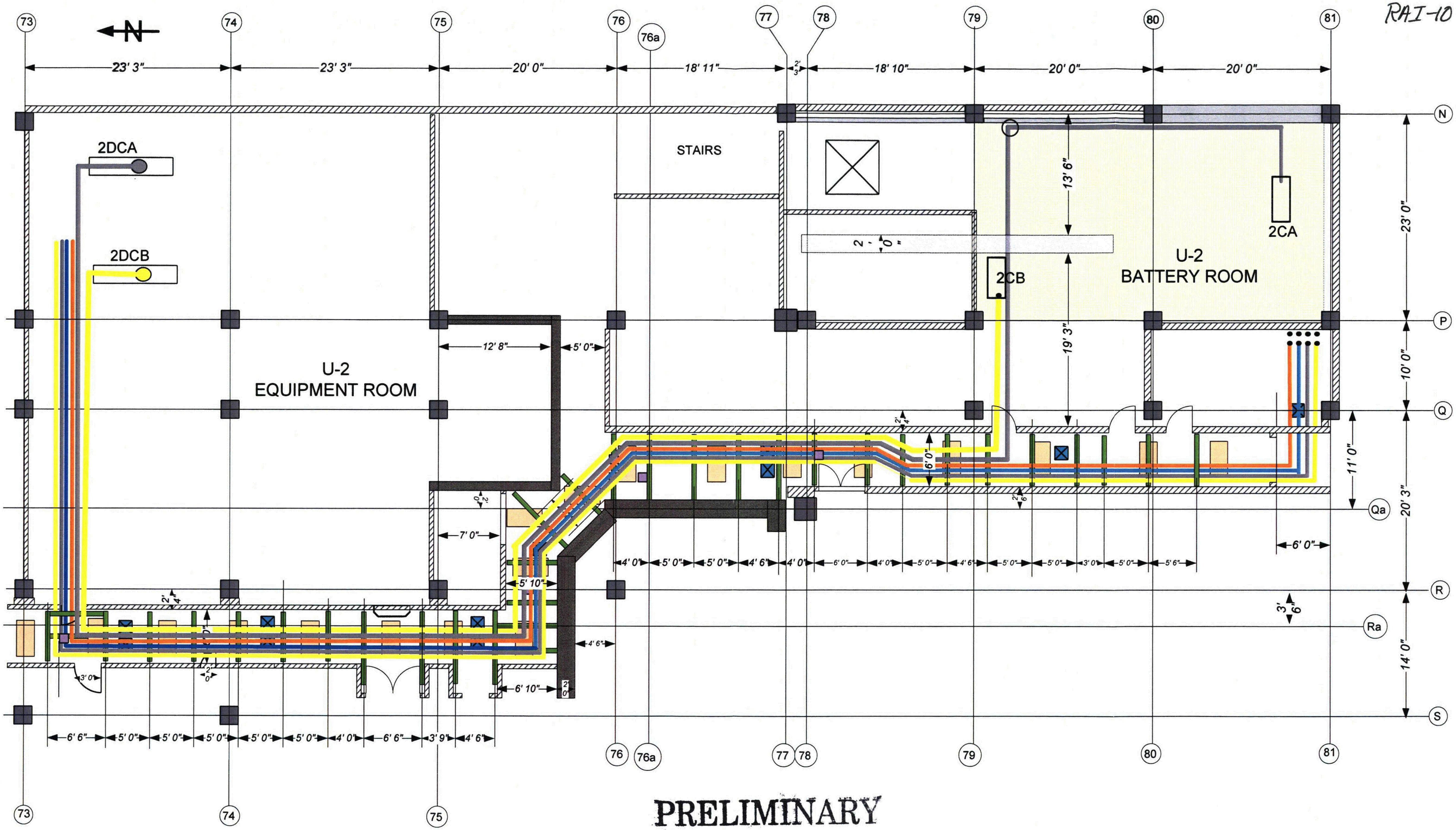


PRELIMINARY

AUXILIARY BUILDING ELEVATION 796'-6"

- NEW CABLE TRAY HANGER
- ELECTRICAL LIGHTING FIXTURE (TO BE RELOCATED)
- AC EMERGENCY LIGHTING FIXTURE (TO BE RELOCATED)
- HVAC VENT (TO BE RELOCATED)

RAI-10



PRELIMINARY

AUXILIARY BUILDING ELEVATION 796'-6"

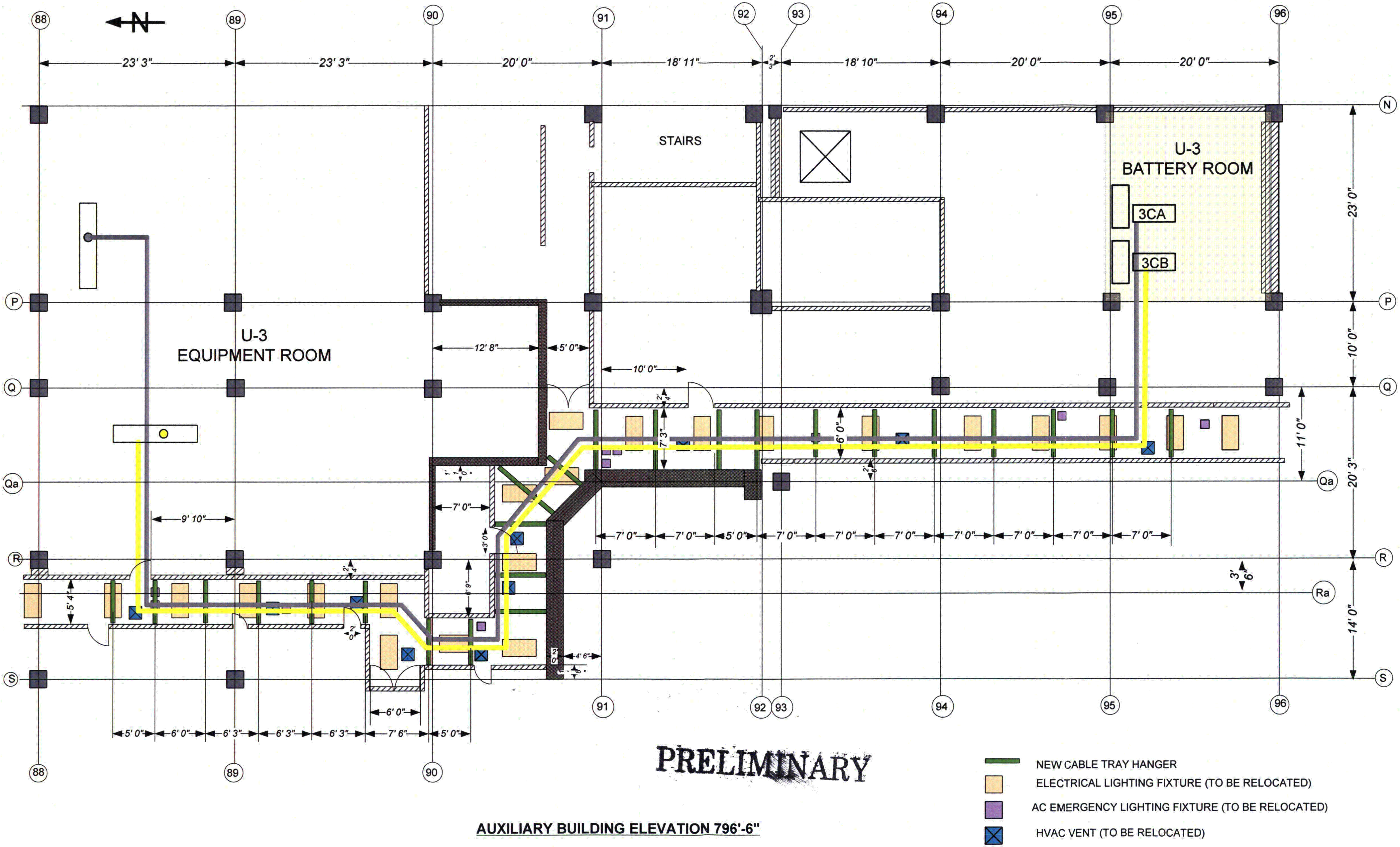
NEW CABLE TRAY HANGER

ELECTRICAL LIGHTING FIXTURE (TO BE RELOCATED)

AC EMERGENCY LIGHTING FIXTURE (TO BE RELOCATED)

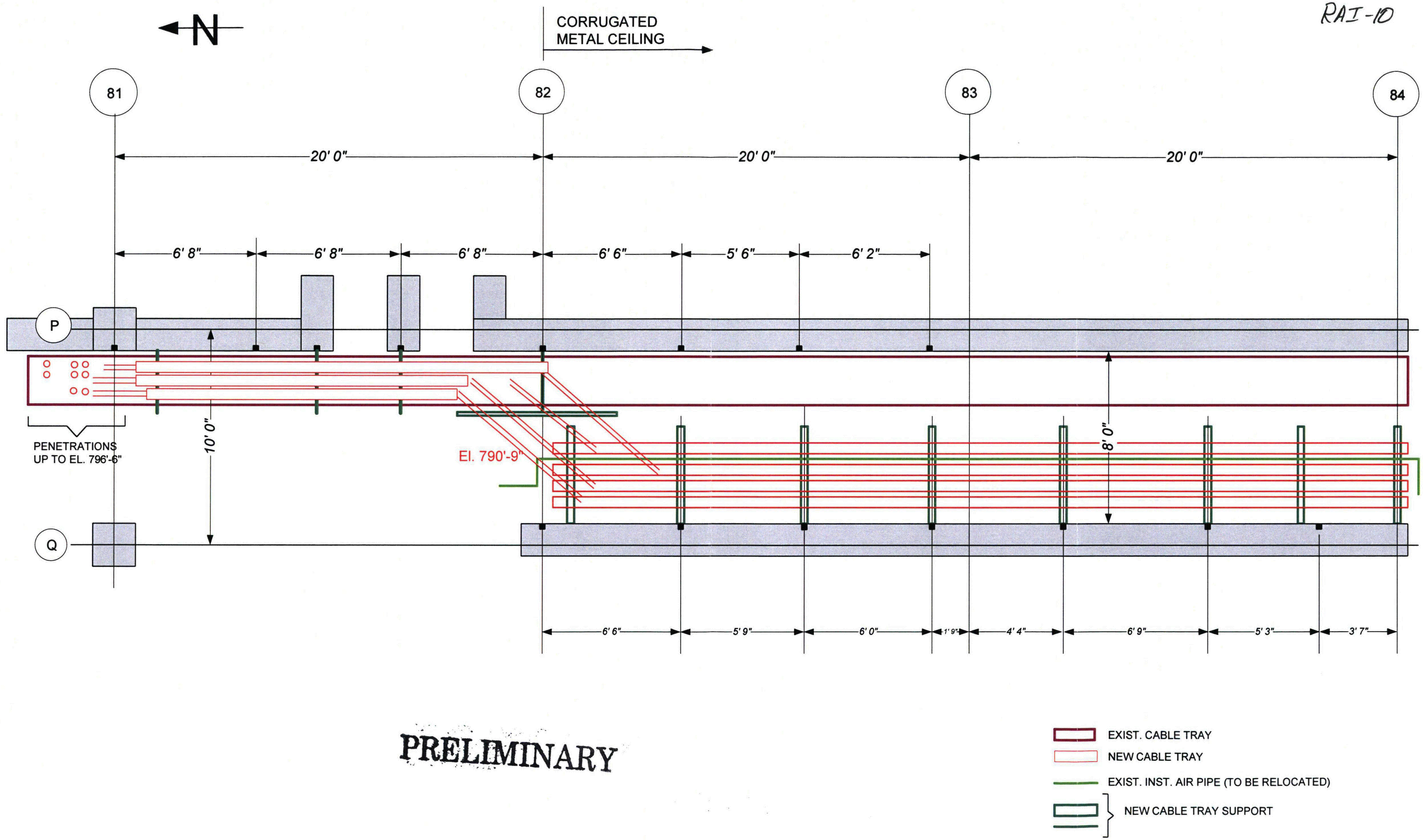
HVAC VENT (TO BE RELOCATED)

RAI-10



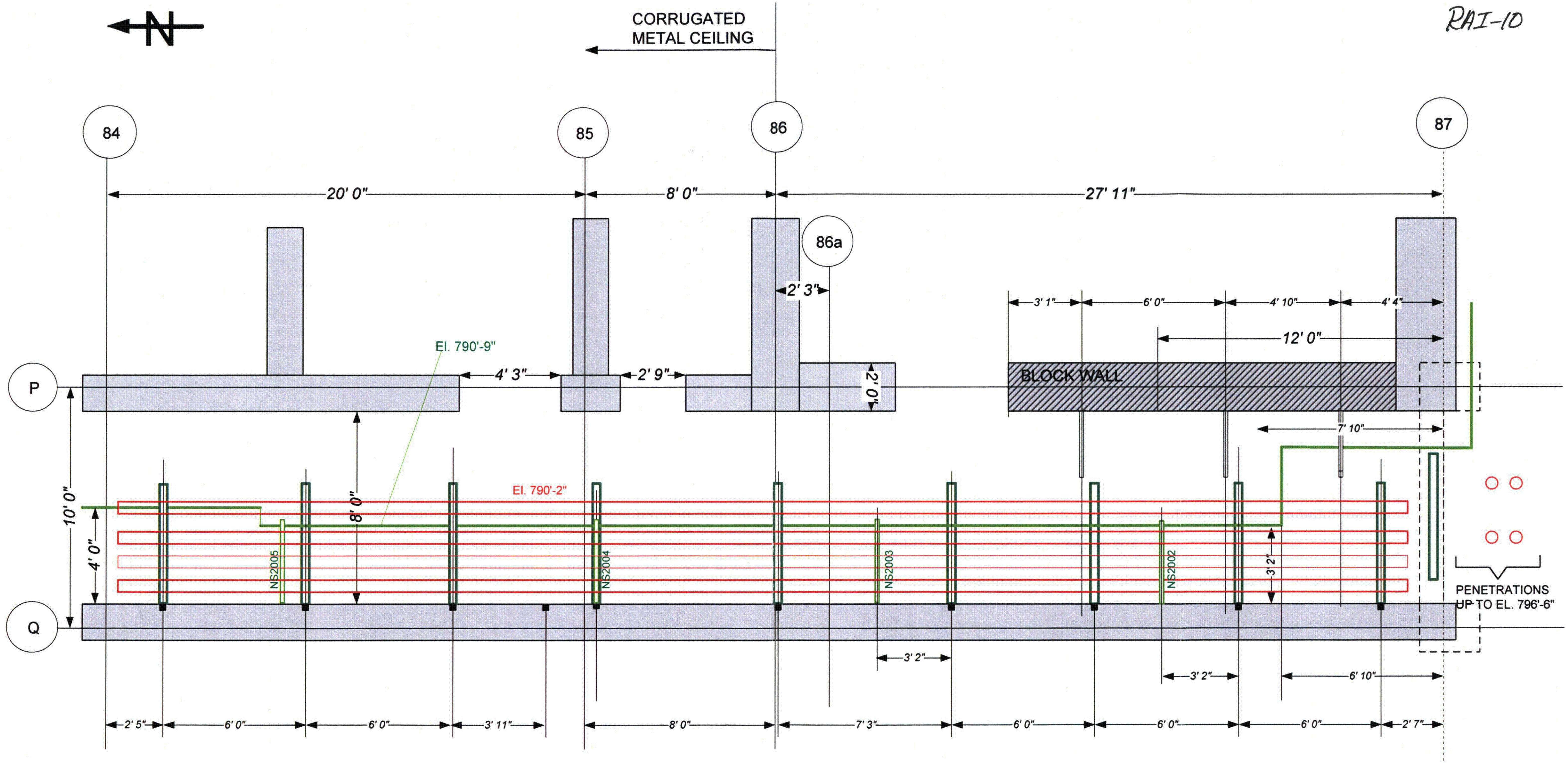
AUXILIARY BUILDING ELEVATION 796'-6"

RAI-10



PLAN EL. 783'-9"

RAI-10



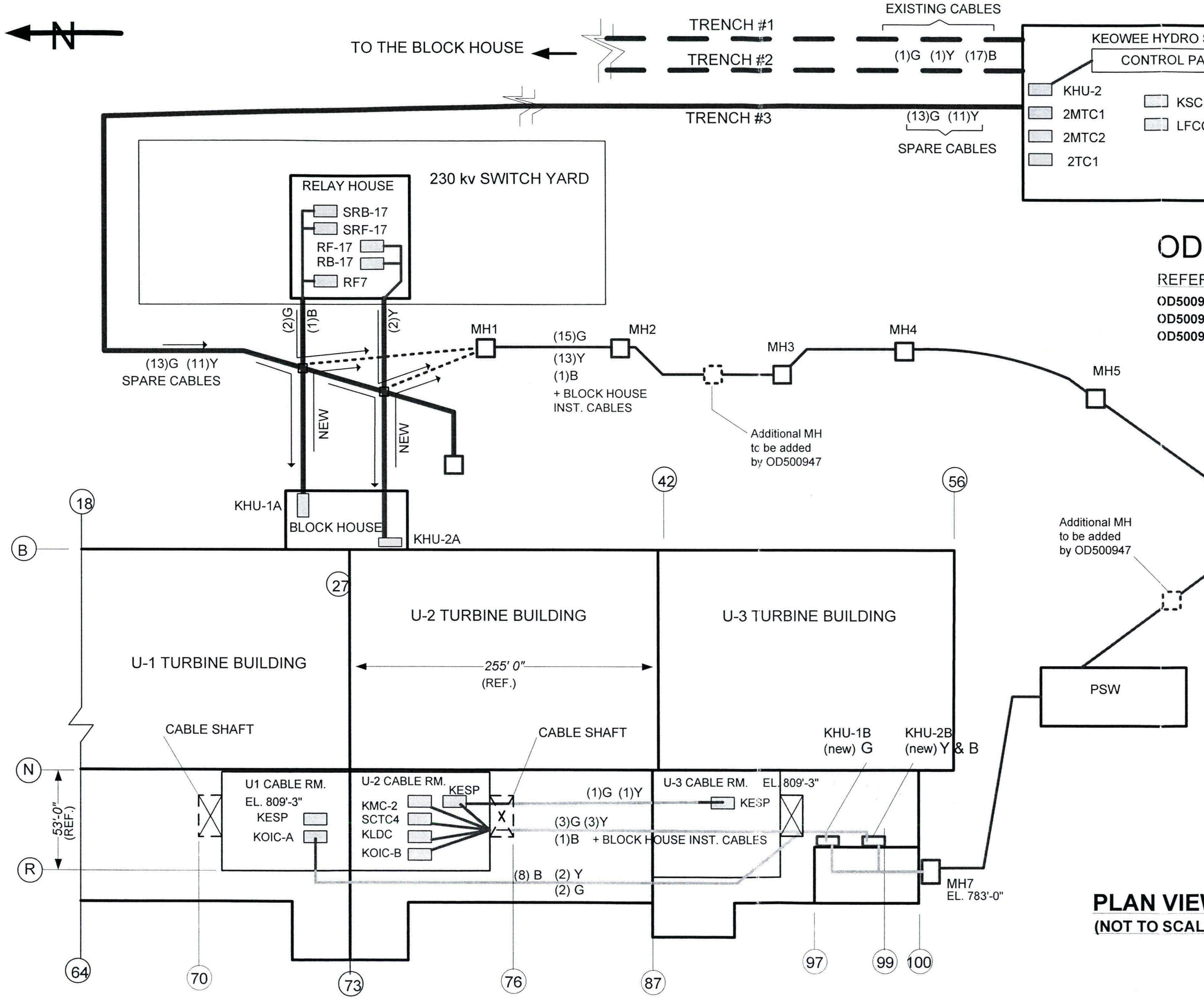
PRELIMINARY

NEW CABLE TRAY

EXIST. INST. AIR PIPE (TO BE RELOCATED)

NEW CABLE TRAY SUPPORT

PLAN EL. 783'-9"



LAST REVISED ON
4/21/09

RAI-10

OD500940 (EC91880)

REFERENCE ENGINEERING PACKAGES:

OD500947 (EC 91881) - NEW MH & TRENCH LOCATIONS.
OD500936 (EC 91879) - TRAY RUN IN THE AUX. BLDG.
OD500922 (EC 91873) – PSW POWER FEED INSTALLATION

PRELIMINARY

** ALL cable pulling will be done by this EC

▬	EXISTING TRENCH
—	NEW TRENCH (By S&L)
-----	NEW COND. RUN (By S&L)
—	NEW TRAY RUN (By S&L)
—	NEW TRAY/ COND. RUN (By this EC)

PLAN VIEW
(NOT TO SCALE)