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EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-210A

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DUTIES OF THE RADIATION MONITORING TEAM:  
CR-3 AND GENERATING COMPLEX PERSONNEL AND AREA MONITORING

APPROVED BY: Procedure Owner

John L. Stephenson  
(SIGNATURE ON FILE)

DATE: 7/18/00

PROCEDURE OWNER: Manager, Radiological Emergency Planning

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**1.0**      **PURPOSE**

1.1      Provides instructions for the Radiation Monitoring Team (RMT), performing personnel and area monitoring for the generating complex, in the event of a radiological emergency.

**2.0**      **REFERENCES**

**2.1**      **DEVELOPMENTAL REFERENCES**

- 2.1.1      10CFR20, Appendix B
- 2.1.2      10CFR50.47, Emergency Plans
- 2.1.3      10CFR50, Appendix E, Emergency Planning and Preparedness for Production and Utilization Facilities
- 2.1.4      American Conference of Governmental Industrial Hygienists Handbook, Threshold Limit Value
- 2.1.5      EM-104, Operation of the Operational Support Center
- 2.1.6      EM-210B, Duties of the Radiation Monitoring Team: Environmental Sampling and Plume Tracking
- 2.1.7      HPP-409, Inventory and Availability of Emergency Supplies/Equipment
- 2.1.8      Manual of Protective Action Guides and Protection Actions for Nuclear Incidents, EPA-400-R-92-001, Environmental Protection Agency (October, 1991)
- 2.1.9      NUREG-0654, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants
- 2.1.10     Radiological Emergency Response Plan
- 2.1.11     Response Technical Manual, "RTM-96," Vol. 1 Rev. 4, Section J
- 2.1.12     RSP-101, Basic Radiological Safety Information and Instructions for "Radiation Workers"
- 2.1.13     RSP-600, Alara Program

### **3.0 PERSONNEL INDOCTRINATION**

**NOTE: A Safety Assessment was performed for this procedure. A determination was made that this procedure is outside the scope of 10CFR50.59.**

#### **3.1 DEFINITIONS**

- 3.1.1 Dose Assessment Coordinator - Lead TSC Chemistry or Radiation Protection designee directing Chemistry and Radiological assessment personnel and advising the Emergency Coordinator on these issues.
- 3.1.2 Qualified - Successfully completed appropriate Radiation Monitoring Team training and currently listed on Emergency Call Roster.
- 3.1.3 TLV/TWA - Threshold Limit Value/Time-Weighted Average (TLV/TWA) - The time-weighted average concentration for a normal 8-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

#### **3.2 RESPONSIBILITIES**

- 3.2.1 The Emergency Coordinator (EC) or designee:
  - o Determines where the RMT is to be dispatched.
  - o Authorizes exposure limits in excess of administrative limits.
  - o Ensures ALARA considerations are stressed.
  - o Seeks guidance from the Dose Assessment Coordinator, as required, on radiological matters.
  - o Approves Emergency RWP and Emergency Team Authorization forms in accordance with EM-104.
- 3.2.2 The Dose Assessment Coordinator or designee:
  - o Determines areas to be surveyed.
  - o Updates the OSC Health Physics Coordinator of current or changing plant conditions.
  - o Assesses survey results and keeps the EC informed of inplant radiological conditions.
- 3.2.3 The OSC Health Physics Coordinator coordinates activities of the RMT members not performing environmental sampling and plume tracking.

3.2.4 These RMT members provide monitoring for the Generating Complex personnel as required and ensure implementation of this procedure.

### 3.3 LIMITS AND PRECAUTIONS

3.3.1 The RMT complies with the re-entry requirements of and follows the guidelines for exposure of emergency workers during re-entry activities as contained in EM-104.

3.3.2 Personnel shall not enter evacuated areas without portable survey instruments and personnel monitoring devices. Personnel accompanied by a member of the RMT are not required to carry a portable survey instrument.

3.3.3 RMT members must be qualified - listed on current Emergency Roster.

3.3.4 OSC Health Physics Coordinator must be notified if thyroid dose reaches 5 REM or is projected to reach 25 REM.

## 4.0 INSTRUCTIONS

### 4.1 OSC HEALTH PHYSICS COORDINATOR FUNCTIONS

The OSC Health Physics Coordinator and RMT leader functions are described in EM-104, Operation of the Operational Support Center.

### 4.2 RMT FUNCTIONS

**NOTE: The RMT receives verbal or written instructions from the OSC Health Physics Coordinator. Additional written instructions for the RMT are inside the monitoring kits**

4.2.1 ASSEMBLE at Health Physics area (95' Control Complex) during an Alert Classification for assignment to the OSC or Control Room.

4.2.2 REPORT directly to the OSC for assignment to RMT during a Site Area or General Emergency declaration.

4.2.3 OBTAIN instruments, dosimetry, portable transceiver(s), clothing, and supplies from the Health Physics area or from the Emergency Kits if in the TSC/OSC.

4.2.4 ESTABLISH Radiation Controlled Areas and appropriate access and work precautions where elevated levels of radiation, contamination, and/or airborne radioactivity may exist.

- 4.2.5 PREVENT personnel from crossing lines of controlled access and request unauthorized individuals to evacuate from the controlled area.
- 4.2.6 SUPERVISE the release of personnel who evacuate on-site assembly areas and DECONTAMINATE as necessary.
- 4.2.7 ISSUE respiratory protection equipment and personnel monitoring devices as required.
- 4.2.8 SUPPORT the Emergency Medical Technicians and Fire Brigade to include contamination control, as required.
- 4.2.9 FILL out Emergency Team Authorization (ETA) Form as identified in EM-104.
- 4.2.10 REVIEW any survey data available for the area(s) to be traversed.
- 4.2.11 OBTAIN dose limit for entry.
- 4.2.12 ATTEND pre-job briefing and review re-entry checklist prior to dispatch in accordance with EM-104.
- 4.2.13 PERFORM radiological surveys as directed by the OSC Health Physics Coordinator.
- 4.2.14 MONITOR areas traversed en route to designated areas using ion chamber survey meter and note any area where unusual dose rates exist. Record results on appropriate survey sheets (available in Emergency Kits) or on a form with equivalent information.

NOTE: 1) Air samples must be at least 12 cubic feet.

2) The maximum flow rate for collecting a gross iodine sample is 5 cfm if using silver zeolite or 10 cfm if using charcoal.

3) The use of charcoal cartridges should be avoided if possible because of noble gas interference.

- 4.2.15 Upon arrival at the designated area, CONDUCT a dose rate, contamination, and airborne survey, as needed. RECORD results on appropriate survey sheets.[NOCS 1030]
- 4.2.16 REPORT dose rate survey results to OSC by portable transceiver or plant communications, as requested.
- 4.2.17 IF dose rates exceed predetermined values,  
OR survey is complete,  
OR if there are any type of stress related problems (i.e., physiological, psychological).  
THEN RETURN to the OSC.

- 4.2.18 REPORT any of the following to the OSC Health Physics Coordinator:
- o Personnel over exposures or suspected over exposures.
  - o Contamination or airborne problems in the TSC/OSC.
  - o Changing conditions in the field.
  - o Shortage of equipment or materials due to failure or contamination, especially dose rate instruments and breathing air cylinders.
- 4.2.19 COLLECT and REPLACE TLDs at stations as appropriate.
- 4.2.20 ENSURE ETA is updated upon return.
- 4.2.21 IF the TSC/OSC or Alternate TSC/OSC CO<sub>2</sub> level reaches 5000 ppm or O<sub>2</sub> levels reach 19.5%,  
THEN CONSIDER ventilating, reducing staff, or evacuating the area,  
AND CALCULATE the 8 hour Time Weighted Average (TWA) for CO<sub>2</sub>
- 4.2.22 IF the 8 hour TLV/TWA for CO<sub>2</sub> is exceeded,  
THEN ensure the TSC Medical representative is notified of possible overexposure.
- 4.2.23 IF the TSC/OSC or Alternate TSC/OSC CO<sub>2</sub> level reaches 20,000 ppm or O<sub>2</sub> levels drop to <19.5%,  
THEN VENTILATE or EVACUATE the building within two hours.
- 4.2.24 IF the TSC/OSC or Alternate TSC/OSC CO<sub>2</sub> level reaches 30,000 ppm,  
THEN VENTILATE,  
OR EVACUATE the building within the next 15 minutes.
- 4.2.25 IF the TSC/OSC is evacuated to Control Complex,  
THEN TAKE the CO<sub>2</sub>/O<sub>2</sub> instrument to Control Room for monitoring.

4.3 SAMPLE ANALYSIS

4.3.1 TAKE samples to an appropriate counting station.

NOTE: See "Formulas and Instrumentation Data Sheet" (Enclosure 2) as required, for proper formulas and appropriate efficiencies and conversion factors.

4.3.2 Using normal counting techniques, ANALYZE samples collected, using whatever counting system is available. Refer to a, b, c below when using TSC/OSC counting station.

- a. Particulate filter from air sample  
\*MS-2/RM-14/E-120 with SH-4 sample holder.
- b. Iodine (Silver Zeolite) cartridge  
MS-2/\*RM -14/E-120 with SH-4 sample holder/SAM-II.
- c. Smears  
\*MS-2/RM-14/E-120 with SH-4 sample holder.

(\* ) Indicates preferred counting instrument.

4.3.3 RETAIN selected used filters in envelopes (available in the emergency kits) for precise laboratory analysis. Label samples with as much information as possible (e.g., time, location, weather conditions, etc.).

4.3.4 REPORT results of survey data to the OSC Health Physics Coordinator.

4.3.5 REPORT results of any radioiodine sample analysis taken in occupied area (Control Room, TSC/OSC, etc) in which the results are in excess of  $8.0 \times 10^{-7}$   $\mu\text{Ci/cc}$  I-131 for consideration of use of potassium iodide (KI) blocking.

4.3.6 USE the formula in Enclosure 2 to estimate thyroid dose from air sample results.

4.3.7 TEST radiation instruments to be used and DOCUMENT calibration due dates below.

INSTRUMENT	CALIBRATION DUE DATE

#### 4.4 RAPID THYROID DOSE ESTIMATE BY DIRECT MEASUREMENT USING SAM-II/RD22

- 4.4.1 ENSURE SAM II/RD 22 background counts are between 0-10 cpm.
- 4.4.2 ESTABLISH a low background counting area for SAM-II/RD 22.
- 4.4.3 RECORD the demographic data (Enclosure 4) for each individual being assessed for thyroid dose.
- 4.4.4 MEASURE the thyroid count rate by holding the RD 22 probe horizontal next to the thyroid (immediately below the Adam's apple (throat area) using a minimum count time of 1 minute.
- 4.4.5 RECORD the thyroid count rate in cpm on Enclosure 4.
- 4.4.6 ESTIMATE the thyroid dose by:  
$$\text{Thyroid dose in REM} = (\text{thyroid count rate from step 4.4.4} \div 54,970 \text{ cpm per } \mu\text{Ci}) * 6.5 \text{ REM per } \mu\text{Ci (adult)}$$
- 4.4.7 RECORD the estimated thyroid dose on Enclosure 4.
- 4.4.8 IF the thyroid dose estimate is greater than 5 REM (cladding failure or core melt conditions), THEN NOTIFY the Health Physics Coordinator for consideration of the use of KI blocking, as directed by the Medical Representative.

#### 4.5 VEHICLE DECONTAMINATION

##### 4.5.1 Personal Vehicles

**NOTE:** The following should take place prior to dismissing personnel to the parking lot for evacuation.

- 4.5.1.1 IF a radiological release has occurred or is in progress, THEN PERFORM a quick beta, gamma survey of a representative sample on the exterior of vehicles in the parking lot.
- 4.5.1.2 IF the results of this survey indicates no contamination, THEN NOTIFY the OSC Health Physics Coordinator that personnel are cleared for unrestricted egress.

4.5.1.3 IF results of this survey indicates contamination  
THEN CONTACT the OSC Health Physics Coordinator,  
AND REPORT personal vehicle contamination levels.

CONSIDER one of the following for implementation:

- On-site decontamination and monitoring
- Direct employees to take cars to Citrus or Levy washdown stations for decontamination and monitoring.  
IF this method is chosen,  
THEN request OSC Health Physics Coordinator to have the Dose Assessment Coordinator coordinate with the EOF.
- IF personnel vehicles are unavailable for use,  
THEN request coordination with the EOF for transportation off-site.

#### 4.6 DOCUMENTATION

- 4.6.1 FORWARD documentation and surveys created as a result of this procedure to the OSC Health Physics Coordinator. Care must be taken to ensure the documents are free from contamination prior to transmittal. Contaminated documents must be bagged, copied, and the originals discarded as radioactive waste. The copies must then be marked "ORIGINALS CONTAMINATED."
- 4.6.2 TRANSMIT documentation and surveys to Records Management under EM-210A.

RADIATION MONITORING TEAM CHECKLIST

OSC Manned Date: \_\_\_\_\_ Time: \_\_\_\_\_

OSC Health Physics Coordinator: \_\_\_\_\_

CHECK  
(when completed)TASK

- Technician assigned to Main Assembly Area  
(personnel frisking/decontamination)[NOCS 24200]
- ENSURE sufficient EAD's obtained form 95' Control Complex
- Control Point established in TSC/OSC
- Counting Station set up
- CO<sub>2</sub>/O<sub>2</sub> Monitor set up (Refer to Enclosure 3 for symptoms)
- Ensure sufficient equipment & supplies are available
- RDMS/RMG Data Base Computer Operable  
(If "NO", see Note 1)
- Technician Call-out complete (if required) &  
Work Schedules established.
- Technician Doses reviewed
- Emergency RWP written/approved
- Sufficient number of SCBA's available  
(If "NO", see Note 2)
- Sufficient number of spare SCBA bottles  
(If "NO", see Note 3)
- Sufficient number of Dose Rate Instruments  
(If "NO", see Note 2)

## NOTES:

- 1) Notify the Dose Assessment Coordinator that Dose Margins/Power Block Radiation Levels are unknown.  
Date: \_\_\_\_\_ Time: \_\_\_\_\_ Initials: \_\_\_\_\_
- 2) Notify the Dose Assessment Coordinator that a Re-entry should be made to obtain additional equipment.  
Date: \_\_\_\_\_ Time: \_\_\_\_\_ Initials: \_\_\_\_\_
- 3) Notify the Dose Assessment Coordinator that arrangements must be made to have SCBA bottles refilled. Refer to HPP-515.  
Date: \_\_\_\_\_ Time: \_\_\_\_\_ Initials: \_\_\_\_\_

## FORMULAS AND INSTRUMENTATION DATA SHEET

## FORMULAS:

$$\mu\text{Ci} / \text{cc} = \frac{(\text{Net cpm})(4.5 \times 10^{-7} \mu\text{Ci} / \text{dpm})(\text{CEF})}{(\text{Eff})(\text{Volume cc})(\text{Y.F.})}$$

$$\text{dpm} = \frac{(\text{Net cpm})}{(\text{Eff.})}$$

Net cpm = Gross cpm - Background cpm

Volume cc = Volume ft<sup>3</sup> x 2.832 E4 cc/ft<sup>3</sup>

Y.F. = 1.19 for SAM - II use only  
(Accounts for difference in yields  
Ba<sup>133</sup>/I<sup>131</sup>)

## COLLECTION EFFICIENCY FACTORS (CEF)

FLOW RATE (CFM) *	SILVER ZEOLITE	CHARCOAL	PART FILTER
1	1.11	1.11	1.05
2	1.11	1.11	1.05
3	1.18	1.25	1.05
4	1.25	1.43	1.05
5	1.33	1.67	1.05
6	—	1.82	1.05
7	—	2.13	1.05
8	—	2.33	1.05
9	—	2.50	1.05
10	—	2.86	1.05

\*Should use calibrated flow rates when possible

## EFFICIENCIES:

PART	MS-2	RM-14/E-120	SAM-II
IODINE	.0015	.0015	.03

$$\text{MDC}_{(\text{TSC})} = 1.96 \sqrt{\frac{C_B}{T_S} + \frac{C_B}{T_B}}$$

$$\text{MDC}_{(\text{ESV})} = 3\sqrt{C_B}$$

C<sub>B</sub> = Background count rate cpm

T<sub>S</sub> = Sample count time min

T<sub>B</sub> = Background count time min

## THYROID DOSE FROM AIR SAMPLE RESULTS:

(based on 24 hour exposure)

REM Thyroid =

(I-131 μCi/cc) (2.88E+7 cc breathed/24

hrs) (1 REM/μCi)

THUMB RULES: Dose rate can be estimated as follows: 20 mR/min for each R/HR.

## INSTRUMENT START-UPS: [NOCS 24170]

## MS-2

- o Power unit up - switch in back
- o Verify dial settings per calibration sticker
- o Ensure proper HP-210 probe used with SH-4 sample holder
- IF TSC: Run background (5 min. minimum) and calculate MDC.
- IF ESV: Run 1 minute background at each sample counting location and calculate MDC per simplified formula.
- o Response check detector

## SAM-II

- o Prior to applying power, note all dial settings and turn high voltage to zero
- o Power unit up - switch in back
- o Increase H.V. gradually until original setting is reached or set per cal sticker
- o Ensure BKG subtract produces BKG reading between 0 and 10 cpm. Adjust using CH-2 window dial
- o Response check detector

## RM-14/E-120

- o Check battery response
- o Response check detector
- o If used for air sample counting, use SH-4 sample holder for proper geometry

## RM-16

- o Power up - switch in front
- o Check battery, connect to A.C. if available
- o Ensure PHA/Gross switch in gross mode
- o Response check detector
- o Set alarm needles with knobs in front

## AMS-2/3

- o Power up - switch in front
- o Start RAS - pump
- o Check flow between 30 and 60 Lpm's
- o Start chart recorder (if desired)
- o Response check detector

## RO-20

- o Check Batteries
- o Response check with source

EFFECTS AND SYMPTOMS OF (CO<sub>2</sub>)

<u>% CO<sub>2</sub></u>	
0.04%	Normal air (0.04% = 400 ppm)
2.0%	Deeper Breathing (20,000 ppm) <sup>1</sup>
4.0%	Deeper breathing, considerable discomfort
5.0%	Very labored breathing, nausea
7.0-9.0%	Absolutely the limit of tolerance
10.0-11.0%	Lose coordination, may lose consciousness
15.0-20.0%	Brain damage can occur within minutes
25.0-30.0%	Death within a minute

EFFECTS AND SYMPTOMS OF OXYGEN DEFICIENCY

<u>Oxygen by Volume</u>	
15-19% <sup>2</sup>	Decreased ability to work strenuously. May impair coordination and may induce early symptoms in workers with coronary, pulmonary, or circulatory problems.
12-14%	Respiration increases with exertion, pulse increases, impaired coordination, perception, and judgment.
10-12%	Respiration further increases in rate and depth, poor judgment, lips turn blue.
8-10%	Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea and vomiting.
6-8%	8 minutes 100% fatal; 6 minutes 50% fatal; 4-5 minutes recovery with treatment.
4-6%	Coma in 40 seconds, convulsions, respiration ceases, death.

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1) 2.0% (20,000 ppm) CO<sub>2</sub> is an action level per step 4.2.23.

2) <19.5% is an action level per step 4.2.23.

THYROID DOSE ESTIMATE, DIRECT MEASUREMENT SAM-II/RD22

Name: \_\_\_\_\_ SSN: \_\_\_\_\_ TLD: \_\_\_\_\_

Time and date of measurement: \_\_\_\_\_

Counting Information:

SAM-II Serial Number: \_\_\_\_\_ RD22 Serial Number: \_\_\_\_\_

Calibration Date: \_\_\_\_\_ Background: Sat [ ] Unsat [ ]  
(0-10 cpm)

Observed thyroid counts: \_\_\_\_\_ Counting time in min: \_\_\_\_\_

Observed thyroid count rate: \_\_\_\_\_ cpm

Calculate thyroid dose by:Thyroid cpm \_\_\_\_\_  $\div$  54,970 cpm/ $\mu$ Ci \* 6.5 rem/ $\mu$ Ci = \_\_\_\_\_ rem

Estimated time since start of intake: \_\_\_\_\_ hours

(If estimated time since start of intake &lt; 5 hours, the calculated dose is non-conservative.)

Comments:

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## PROCEDURE DEVELOPMENT AND REVISION RECORD

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Procedure: EM0210A

New Rev: 4

PRR#: 18304

Title: DUTIES OF THE RADIATION MONITORING TEAM:  
CR-3 AND GENERATING COMPLEX PERSONNEL AND AREA MONITORING

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### NON-INTENT CHANGES

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

---

Throughout	Added NOCS Commitment references and capitalized ACTION words per Writer's Guide
2.0	Deleted Implementing References and added Developmental References for NUREG 0654, 10CFR50.47, 10CFR50, Appendix E.
4.2.21 - 4.2.22	Clarified to calculate for 8 hour Time Weighted Average.
Enclosure 3	Delete Effects and Symptoms of Atmospheric Pressure. Identified during RMT training that this statement was not needed.
Step 3.3.4	Revised statement so it would be a limit and precaution statement instead of Action statement per Writer's Guide.
4.2.15 Note	Changed air samples to be at least 12 cubic feet instead of 10-50. To be consistent with EM-210B.
4.2.23 and 4.2.24	Changed 4.2.23 to ventilate or evacuate within two hours. Added step 4.2.24 to ventilate or evacuate within 15 minutes if CO2 levels reach 30,000 ppm. As requested by HP.
4.2.25	Added step to say: If the TSC/OSC is evacuated to Control Complex, Then take the CO2/O2 instrument to Control Room for monitoring. Satisfies NUPOST item 52325.
4.4.3	Clarified to take thyroid count below Adams apple (throat area).
Step 4.3.7	Added step to test instruments to be used and document calibration due dates. Writer's Guide requirement.
4.5.1.3	Change the word "relay" to Report personnel vehicle contamination levels.
Enclosure 1	Add item to checklist to: Ensure sufficient EAD's obtained from 95' Control Complex. PC00-722, CAP#1.
Enclosure 2	Add instructions for use of RO-20 instrument.
4.3.2.b	Changed preferred instrument from SAM II to RM-14. Per request of Health Physics.
4.4.1 and Enclosure 4	Clarify step to ensure background is between 0-10 cpm.
4.2.1	Clarify Health Physics techs may be assigned to Control Room.

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---

## MINOR CHANGES

If Minor Changes are included, check the applicable box(es) and provide a list of affected steps.  
The following corrections are incorporated throughout:

- |   |   |
|---|---|
| <input type="checkbox"/> Sentence Structure   | <input type="checkbox"/> Redundant words or phrases                 |
| <input type="checkbox"/> Punctuation  | <input type="checkbox"/> Abbreviations                              |
| <input checked="" type="checkbox"/> Capitalization  | <input type="checkbox"/> Obviously incorrect units of measure       |
| <input type="checkbox"/> Spelling   | <input type="checkbox"/> Inadvertently omitted symbols (#, %, etc.) |
| <input type="checkbox"/> Organizational Changes: position titles,<br>department names, or telephone numbers | <input type="checkbox"/> Obvious step numbering discrepancies       |
|   | <input type="checkbox"/> Format                                     |

The following corrections are incorporated in the step(s) indicated: "Throughout" is used in lieu of Step# if a specific change affects a large number of steps.

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Correcting equipment nomenclature that does not agree with field labels or balance of procedure

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Changing information that is obviously incorrect and referenced correctly elsewhere

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Misplaced decimals that are neither setpoint values nor tolerances

---

Reference to a procedure when an approved procedure has taken the place of another procedure

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Fixing branching points when it is clear the branching steps were originally intended but were overlooked or incorrectly stated due to step number changes

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Adding clarifying information such as NOTES and CAUTIONS

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Adding words to clarify steps, NOTES, or CAUTIONS which clearly do not change the methodology or intent of the steps