

NRC INSPECTION MANUAL

DQASIP

INSPECTION PROCEDURE 70300

PREOPERATIONAL TEST PROCEDURE REVIEW

PROGRAM APPLICABILITY: 2513

70300-01 INSPECTION OBJECTIVES

Provide uniform criteria for evaluating preoperational test procedures to ensure their technical and administrative adequacy.

70300-02 INSPECTION REQUIREMENTS

This procedure provides a checklist, which can assist an inspector to perform a thorough administrative and human factors review of a test procedure. Many of the items in this checklist may not have a regulatory basis, but do identify good practice.

02.01 Does the title describe the purpose of the procedure?

02.02 Does the procedure provide the following information on a cover page or first page?

- a. procedure title and number
- b. revision number
- c. unit number (if applicable)
- d. approval signature and date

02.03 Does each page provide the following information?

- a. procedure number and/or title
- b. revision number
- c. unit number
- d. page number

02.04 Is the last page of the procedure clearly identifiable by marking; e.g., Page ____ of ____; Final Page?

02.05 Does the procedure provide a statement of purpose or a brief description which clearly specifies the function it performs?

02.06 Does the procedure provide job planning information in an introductory section preceding the instructions?

- a. Other actions or procedure which must be completed before use.
- b. Plant, system, or equipment conditions which must exist before use.
- c. Precautions which must be observed in performing the procedure.
- d. The specific equipment (by part number and/or unique nomenclature) to which the procedure is applicable.
- e. Special tools and test equipment required to perform the procedure (by part number and/or unique nomenclature).
- f. Other documents (e.g., procedures, drawings, schematics) required to perform procedure.

02.07 If critical coordination of activities of two or more persons is required to perform the procedure, does the procedure provide a means for coordinating their activities? For example, is critical communication between persons located remotely from each other specified?

02.08 Does the procedure provide adequate quality control hold points?

02.09 Does the procedure provide for verification and signoff of actions? Are the verifications predominantly performed by persons other than those performing the action?

02.10 Are the instructions written in short, concise, identifiable steps as opposed to multi-step paragraphs?

- a. Evaluate the complexity of the instructions by determining the average number of actions (verbs) called out per step. Base estimate on a sample of 20 percent of the steps, or if the sample size is less than 10, use all steps.

Is the average number of actions per step 1.5 or less?

- b. Evaluate the level of specificity of a procedure by determining the percent of steps in a selected sample that meet all of the following criteria:
 1. The action to be taken is specifically identified (open, close, torque, etc.).
 2. Limits (if applicable) are expressed quantitatively (2 turns, 100-inch lbs., etc.).
 3. The equipment or parts are identified completely (HPCI-MO-17, etc.).

Base the estimate on a sample of 20 percent of the steps in a given procedure or a minimum of 10 steps.

Do at least 90 percent of the steps evaluated meet all the above criteria (1, 2, and 3)?

- 02.11 If precautions or explanations are applicable to the performance of specific steps or to a series of steps, are they placed immediately ahead of the step(s) to which they apply?
- 02.12 Are graphs, charts, and tables adequate for readability and interpolation or extraction of values?
- 02.13 Do worksheets provide enough space to record data and perform necessary calculations?
- 02.14 Does the procedure (or related data sheets or worksheets) provide for the independent verification and signoff of computations?
- 02.15 Are acceptance criteria and limits stated in quantitative terms?
- 02.16 Are units expressed as ranges rather than as point values whenever possible?
- 02.17 Are the acceptance criteria and limits compatible with limits specified in requirements documents?
- 02.18 If computations are required by the procedure, are they based on technically accurate, complete, and up-to-date formulas?
- 02.19 If items (valves, breakers, relays, solenoids, jumpers, fuses, switches) require alignment to perform the procedure, do the alignment instructions in the procedure meet all of the following criteria?
- a. Each item requiring alignment is individually specified. (Note: It is not acceptable to refer personnel to previous steps.)
 - b. Each item is identified with a unique number or nomenclature.
 - c. The position in which the item is to be placed is specified.
 - d. The position in which the item is placed is verified and checked off or signed off.
- 02.20 If any of the above alignment instructions are for system restoration, is the verification performed by someone other than the person performing the alignment?
- 02.21 If any follow-on action, test, or procedure must be performed upon the completion of this procedure, does the procedure or a related document (e.g., work order) instruct the user about what follow-on action is required and whom to notify?
- 02.22 Does the procedure provide instructions for reasonable contingencies? For example, if equipment is operating outside the range specified by the procedure, is the person instructed about action to be taken?
- 02.23 Are equipment numbers and/or nomenclature used in the procedure the same as those which are displayed on the equipment? (Use 10 percent of the steps in a given procedure for sample size.)
- 02.24 Are the units of measurement used in the procedure the same as those displayed on equipment? (Use 10 percent of the steps in a given procedure for sample size.)
- 02.25 Determine whether the amount and kind of information (level of detail) provided by the procedure are adequate for the intended users.

Are the following criteria met?

- a. Can the procedure be performed in the sequence it is written?
- b. Will the user be able to locate and identify all equipment referred to in the instructions?
- c. Where general rather than specific instructions are provided, will the user be able to explain in detail how to perform the general instructions?
- d. Can the user perform the procedure without obtaining additional information from persons or documents not specified by the procedure?
- e. Can the user perform the procedure without obtaining direct assistance from persons not specified by the procedure?

70300-03 INSPECTION GUIDANCE¹

This procedure can be used as a checklist to help an inspector perform a thorough administrative and human factors review of the procedure.

03.01 The title is the first information read by the user and therefore, should describe the contents of the procedure. A clear and unique title will make it easier to identify a given procedure among other similar procedures. The use of titles that are descriptive of the purpose of the procedure will reduce the probability of selecting an incorrect procedure.

03.02 Performance errors have occurred because users have selected incorrect or out-of-date procedures. Descriptive titles and revision information will aid in the selection of correct and current procedures. If this is a multiple-unit site, separate and identifiable procedures for each unit will reduce the potential of performing procedures on the wrong unit.

03.03 Page identification information facilitates effective document control and allows users to check that their procedures are complete and that the pages are in the correct order.

03.04 The last page of a procedure is most vulnerable to becoming detached and lost. It should be made obvious to the user if the last page is missing.

03.06 The provision of job planning information will enable personnel to make adequate preparations for performing the procedure and reduce the probability of taking on-the-job "shortcuts" or innovations because of incomplete job planning.

03.07 Many procedures require close coordination of actions among several persons located remotely from each other. However, by reading the procedure, it is frequently not possible to determine which person is being instructed by a particular step. Also, the procedure might not specify critical communications to ensure that the step has been initiated or completed. To the extent that complex, multi-person activities are not specified, errors in communications and omissions of actions can result.

03.08 Procedure should provide for inspecting equipment at appropriate points during the testing process to verify that the procedure is being performed correctly.

03.09 Verification is the primary method for ensuring compliance with procedures. Self-verification by checking, initialling, or signing steps serves as an aid or reminder to the

¹ The digits following the "03" numbers in this section refer to the equivalent digits following the "02" numbers in Section 70300-02, "Inspection Requirements." For example, 037 offers specific guidance for Inspection Requirement 027.

procedure user to perform the step. However, it is too easily subject to abuse to serve as a compliance control. If it is important to ensure compliance with an action because of the consequences of a performance error, verification by someone other than the person performing the action is in order. It is required if an error might otherwise remain undetected.

03.10 Studies have shown that the speed of reading and the comprehension of written instructions are improved if the instructions are presented in short, concise sentences. Ideally, an instruction should consist of an action verb and the object of the action--plus action limits and object identifiers, and if necessary, object locators. Additional information (such as that contained in explanations and descriptions) that is intended to aid the user to accomplish the action more effectively should ordinarily be presented in the form of a note preceding the action instruction.

- a. The number of actions is simply the number of verbs in a step or paragraph. For example, the instruction, "Turn switch XXX to position number 2, observe value on pressure gauge XX, and record value" has three actions. The more actions that are expressed, the less likely they will be recalled accurately, particularly if they are unrelated actions. Ideally, a step should contain only one action unless the actions are related, in which case up to three actions in a step are acceptable. Related actions are a group of actions required to produce a single result. The example illustrates three related actions. Their single objective is to obtain a value.
- b. The criteria list the basic characteristics of a specific (versus general) instruction. Fewer errors of interpretation or omission result from instructions with high specificity.

03.12 Performance errors have occurred when charts and tables were misinterpreted. Such misinterpretation is often traceable to poor quality of these materials. The material is either: (1) inadequately reproduced or (2) inadequately constructed. The following guidelines are provided to evaluate readability.

Reproduction: In some cases, copies are so many generations removed from the original or master copy that lines in graphs, charts, and tables have deteriorated or disappeared, making it difficult to track or interpolate values. Letters and numbers can undergo similar deterioration. Also materials have sometimes been reduced in size so that readability is impaired. Letters and numbers should be at least 1/8 inch in height, unbroken, and clear. All lines in the reproductions should be as visible as they are in the original or master copies. First, compare the reproductions with the originals or master copies. Then evaluate the readability of the reproductions under the conditions of illumination in which personnel use them.

Original Construction: Letters and numbers should be typed rather than hand-written. Lines on graph paper should be reproducible on licensee reproduction equipment. On graphs, units of measurement used in plotted values should be compatible with divisions on graph paper. That is, if plotted values progress in units of five (e.g., 5, 10, 15, etc.) it is better to separate the values by five lines than by four lines. To facilitate accuracy of locating values in charts and tables look for such aids as: (1) partitioning tables with lines; (2) arranging values in subgroups, e.g., inserting spaces between subgroups of five values; and (3) placing connecting lines between values or between nomenclature and values.

03.16 When equipment does not permit the setting of point values, or when a range of values is acceptable, the acceptance criteria should be expressed in terms of ranges. However, they should be expressed in a form to avoid errors of addition, subtraction, or conversion. Example:

Preferable
119 to 131
125 gpm (119 - 131) (Best)

Not Preferable
125 ± 6 gpm
125 ± 4.8% gpm (Worst)

03.19 Two of the primary factors associated with misalignment are nonspecific instructions and not physically verifying position. The criteria listed are aimed at improving specificity and verification. In some procedures it was found that instructions were adequate for initial alignment but shortchanged realignment by simply directing personnel to "reposition valves listed in step 5." In this instance, personnel were not provided a means within the procedure for verifying valve positions. The instruction should have relisted the valves, specified their new positions, and provided for checkoff or signoff for each valve.

03.20 It was found that up to three-fourths of undetected alignment errors occur during restoration. Independent physical verification of position is less likely to be performed during this process. The requirement for independent verification is aimed at reducing this error. The independent verification should involve physically checking the positions--not be confined to simply checking log entries and tags.

03.22 Many procedures are written as though all acceptance criteria will be met. They do not address the exceptions. Personnel should be instructed within the procedure what actions to take in the event criteria are not met.

03.25 NRC inspectors are required to evaluate whether or not procedures are adequate for use by qualified personnel. Because of lack of definitions of adequacy and personnel qualifications, this assessment cannot be made definitively. There is considerable room for different interpretations and disagreement between inspectors and licensees. The listed observations permit an objective assessment of procedural adequacy.

03.26 Accounting: Inspection effort in utilizing this inspection procedure will be recorded on the 766 System by the specific system inspection procedure number.

END