

ATTACHMENT 65001.26

INSPECTION OF HUMAN ENGINEERING DISCREPANCY (HED) RESOLUTION VERIFICATION

PROGRAM APPLICABILITY: 2503

65001.26-01 INSPECTION OBJECTIVES

01.01 To confirm by inspection that the combined license (COL) holder (licensee) has implemented and documented a Human Engineering Discrepancy (HED) Resolution program that meets the acceptance criteria as stated in the licensee's HED Resolution Inspections, Tests, Analyses and Acceptance Criteria (ITAAC).

01.02 To verify that the licensee has justified Human Factors Engineering (HFE) discrepancies in accordance with the NRC approved HED Resolution implementation plan and to verify those HFE discrepancies that cannot be justified based on existing technical documentation have been designated and documented as HEDs (the document used to track corrective action).

01.03 To verify that the licensee is prioritizing HEDs in accordance with the NRC approved HED Resolution implementation plan.

01.04 To verify that the licensee is documenting and tracking HEDs, including the appropriate characteristics of the Human-System Interface (HSI), justification, and technical bases for any design changes through resolution in accordance with the NRC approved HED Resolution implementation plan.

01.05 To verify that the licensee has completed an HED analysis that evaluates the effects of HEDs on all plant systems, on HED scope, and on personnel functions in accordance with the NRC approved HED Resolution implementation plan. The evaluation should also assess the impact of HEDs on individual HSIs and plant procedures.

01.06 To verify that the licensee has created and implemented design solutions (including changes to procedures, training, staffing, etc.) to correct HEDs that are consistent with the system and personnel requirements identified in the Preparatory Analysis (i.e., Operating Experience Review, Function and Task Analysis, and HSI Characterization).

01.07 To verify that the licensee has created and implemented design solutions to correct HEDs that consider the interrelationships between individual HEDs that in combination have potential safety significance even if considered separately they do not.

01.08 To verify that the licensee has evaluated HED resolutions by completing the appropriate verification and validation of the changes.

01.09 To facilitate follow-up review of solutions to previously identified compliance issues and design discrepancies (e.g., inspection findings from other related ITAAC inspections).

65001.26-02 INSPECTION REQUIREMENTS

02.01 Background. Inspection of ITAAC associated with a COL is intended to support the Commission finding stipulated in 10 CFR Part 52.103(g), specifically that the COL acceptance criteria (ITAAC acceptance criteria) have been met, and that the facility has been designed and built to conform to the licensing basis. The Commission policy for Design Acceptance Criteria (DAC), as defined in SECY-92-053, allows a licensee to provide HFE design process milestones as ITAAC in lieu of a completed design. The HFE DAC-related ITAAC are inspected as the development process for the HFE design progresses and the licensee completes the ITAAC throughout the facility post-COL (construction) phase.

An HFE program, such as that described in NUREG-0711, provides the structure for ensuring that the HFE aspects of a plant are developed, designed, and evaluated on the basis of a structured, disciplined analysis using accepted HFE principles. Verification and Validation (V&V) evaluations are the part of a HFE program which comprehensively determine whether the design conforms to HFE design principles and if it enables plant personnel to successfully perform their tasks to achieve plant safety and other operational goals. HED Resolution is an important element of the V&V process.

HED Resolution (also referred to as Issue Resolution Verification in earlier versions of NUREG-0711) is the part of the V&V process in which the licensee identifies elements of the HFE design that do not conform with the design specifications, task requirements, or performance standards necessary to ensure safe operation. Licensees may also identify HEDs through their Corrective Action Program (CAP).

The process prioritizes the discrepancies, then develops corrective actions to address the safety significant discrepancies. Additionally, the process verifies the implementation of design changes and identifies unwanted interactions between systems that can introduce new safety and/or human performance concerns. A complete description of the HED evaluation process is in NUREG-0711 chapter 11.

The inspection described by this IP is intended to provide reasonable assurance that the licensee has identified and prioritized HEDs and is tracking and resolving these HEDs in accordance with the NRC-approved HED Resolution implementation plan. The resolution of HEDs can have cascading effects on design and construction of the plant. It is important to provide the licensee feedback on their HED process so that any deficiencies in the process can be corrected as early as possible. Therefore, four inspection samples will occur throughout the design and construction of the plant. In addition to the four specific samples described here, the inspector may also consider any other HEDs, such as those created during Human Performance Monitoring or the Corrective Action Process when data are available. The inspector will also review the results summary report submitted by the licensee as part of the ITAAC closure process.

Other elements of the HFE program (e.g. HFE Design Verification, HSI Task Support Verification, Integrated System Validation, Task Analysis, Function Allocation, etc.) are inputs to the HED tracking system. The inspector responsible for inspecting the HED program may use inspection reports or enforcement findings from these HFE program elements if available to select an inspection sample. However, the inspector should not solely rely upon them.

Official agency documents may not be available prior to the beginning of this inspection. Instead, the inspector should discuss findings with the inspectors who conducted the related V&V inspections. Particular HEDs of interest may include:

- HEDs that the licensee has had difficulty resolving.
- HEDs associated with aspects of HSIs that could not be inspected during previous inspections. For instance, the inspector can follow up on uninspected components of interest from the HSI Task Support inspection. Dynamic aspects of HSIs such as system response time or refresh rate that could not be inspected during the HSI Task Support Verification inspection can be selected for the current inspection.

The licensee's commitments to implement the HED Resolution process are contained in the HED Resolution Implementation Plan provided as part of the Design Certification Document and included, by reference, in the COL application. COL applicants who do not reference a certified design must provide an implementation plan. Appendices are included in this procedure are based upon the commitments for each design-specific HED resolution program.

02.02 Inspection Requirements.

a. General Inspection Requirements.

HED inspection activities should be conducted at strategic points throughout the design and construction of the plant to ensure that HEDs are being discovered, documented, and resolved according to the NRC approved implementation plan throughout the process.¹

Prior to the inspection, the inspector should gather pertinent information (such as any applicable design guidance) and discuss inspection planning and scheduling issues with the Division of Construction Inspection and/or Office of New Reactors (NRO) HFE technical experts. For example:

- Identify and review licensee responses to applicable Generic Bulletins, Regulatory Issue Summaries and Information Notices issued since Design Certification approval.
- Discuss the status of previous NRC findings of related HFE inspections with inspectors who have completed, or are completing, activities concurrently. Related HFE inspections include:
 - IP 65001.25 – Inspection of Human Factors Engineering Design Verification – Design Acceptance Criteria (DAC) – Related ITAAC.
 - IP 65001.24 – AP1000 Human Factor Engineering (HFE) Task Support Verification.

¹ HEDs may also be generated and resolved during operation of the plant however those are addressed by a different inspection procedure.

- IP 65001.23 – Inspection of Human Factors Engineering Integrated System Validation ITAAC.
- Review any Results Summary Reports that have been submitted by the licensee in accordance with related V&V and/or Design Implementation ITAAC to verify that the commitments documented in the associated design specific appendix have been met.
- If HEDs of interest have been generated during other HFE processes (such as Human Performance Monitoring) it may be necessary for the inspector to review the associated implementation plan for additional information regarding licensee commitments that are specific to the corresponding plan.

Contact the licensee for information needed to prepare the inspection plan such as:

- Licensee planned activities and schedule (used to focus inspection and determine inspection sample and to coordinate so that the inspection is not overly intrusive).
- Availability of reports and supplemental documents needed for inspection such as, but not limited to:
 - Any necessary design documentation related to HSI Task Analysis or HFE Design Verification.
 - ISV scenarios of interest in assessing the adequacy of HED resolutions.
- Availability of licensee personnel during the period tentatively scheduled for the inspection.
- Changes to the HFE V&V program since any previous NRC inspection (e.g., policy, personnel, program description, implementing documents) or approval of the implementation plan.

This inspection uses four discrete inspection samples taken at various times as described later in this procedure. The inspector should assess the processes used to identify, document, track, and resolve HEDs as well as the appropriateness of the resolutions conform to the HED Resolution implementation plan. The inspector should (See Figure 11.2 of NUREG-0711):

1. Identify a sample of HEDs to inspect (based on various sources such as: previous inspection findings, OER, resident inspector insight, generic issues, etc.).
2. Verify that the prioritization of HEDs is adequate and consistent with the licensee's implementation plan.

3. Verify that resolutions to HEDs are commensurate with the significance of the identified issues (see b. on p 2 of IP 71152).
4. Verify that HED issues are being identified by the licensee at an appropriate threshold and entered into the HED tracking system.
5. Verify that the licensee has adequately considered the consequences to plant and personnel performance including cumulative effects of many HEDs that may not meet prioritization thresholds on their own.
6. Verify that a sample of unresolved HEDs in the tracking system has been appropriately classified and that the licensee has taken appropriate short-term corrective actions. Any unresolved HEDs should have realistic schedules for completion.
7. Verify that resolved HEDs have undergone the appropriate V&V analyses.

Finally, the inspector will review the submitted Results Summary Report for completeness and accuracy.

- b. Requirements for Performance of Inspection. The inspection will be performed in accordance with this Inspection Procedure and the associated design specific appendix. Adjustments to the inspection plan will be communicated to the Division of Construction Inspection (RII) to minimize impact to the licensee and to assist in revising related inspection planning efforts accordingly.

Specific Guidance. No specific guidance.

- c. Requirements for Inspection Reporting. An inspection report and any findings will be prepared and approved in accordance with Inspection Manual Chapter 0613.

Specific Guidance. No specific guidance.

65001.26-03 INSPECTION GUIDANCE

03.01 Sample Selection Guidance

This inspection utilizes a 4-part longitudinal sampling strategy. The inspector should select samples of HEDs from the entire range of HFE processes that generate HEDs and include a broad range of controls, displays, alarms and operational tasks. A sample should be taken during each of the four V&V activities: HFE Design Verification, HSI Task Support Verification, Integrated System Validation, and Final HFE Design Verification.

Licensees may have great variation in the number, complexity, and timing within the design process of the HEDs that are generated. Therefore, specific numbers of HEDs to include in each sample are not provided here. The inspector should use his/her judgment in deciding the

best way to allocate resources for this inspection. The inspector should initially develop an inspection plan for all four samples and adjust it according to the inspection results.

For instance, if a licensee has addressed all Priority 1 HEDs by the time of the ISV the inspector may choose to spend additional time inspecting the sample taken during ISV and reducing the time spent during the Final HFE Design Verification inspection. Similarly, the inspector may conduct the HSI Task Support Verification sample and HFE Design Verification sample simultaneously (assuming that both of these activities are complete and the licensee has submitted the RSR).

In this case, the inspector may decide to reduce the time spent on both of those samples to increase the time available for the ISV sample.

The inspector should ensure that there is time to confirm that all Priority 1 HEDs are resolved at the time of the Final HFE Design Verification sample. While the inspector may choose to spend the majority of the time collecting the ISV sample he/she should not eliminate any sample from the inspection plan. Early feedback such as that provided from the HFE Design Verification and HSI Task Support Verification samples has the potential to provide early design changes that will positively influence safety.

The inspector should consider the following while selecting each sample:

- Select HEDs commensurate with safety importance (Priority 1 HEDs).
- Select HEDs that are likely to have a cumulative influence on safety when combined with other HEDs even if they are not safety-significant when considered individually.
- Select HEDs that have been resolved to verify the adequacy of the resolution.
- Select HEDs that have NOT been resolved to verify that the resolution plan appears reasonable.
- Select HEDs that are associated with problems that have been particularly difficult for the licensee to address.
- Select HEDs related to Generic Issues common to the industry.
- Select HEDs associated with a variety of plant functions, systems, and HSIs.

It is important for the inspector to remember that a licensee must use the same verification and validation methods in the preparatory analysis to resolve the HEDs. This means that the inspector may need to refer to the implementation plan associated with the activity that generated any particular HED.

Specific guidance for each sample is described in the sections below.

03.02 Inspection Sample 1: HEDs Sampled During HFE Design Verification & Inspection
Sample 2: HEDs Sampled During HSI Task Support Verification.

No specific guidance.

03.03 Inspection Sample 3: HEDs Sampled During Integrated System Validation and Unresolved HEDs from Previous Inspections.

The integrated system validation component of V&V is the part of the HFE process that tests the design to ensure that it supports operator task completion. Teams of operators will complete operational tasks in the simulator. This provides a unique opportunity to verify that HEDs identified early in the design process have been resolved in a meaningful way. This is a particularly valuable opportunity for the inspector to follow up on those HEDs associated with HSI Task Support Verification inspection because the inspector can compare the Task Analyses (the results of a documented process that defines elements of HSIs), the HED design resolution, and the operator task performance using the improved HSIs.

For instance, the Task Analysis may indicate that HSIs must have a particular response time or refresh rate. The Task Support Verification will verify if the HSI has been designed to respond accordingly, however the inspector will most likely not be able to confirm that the actual HSI responds accordingly. The ISV provides an opportunity to observe and measure the response of such components. The ISV inspection will focus on verifying that the HSI does, in fact, respond as designed. The HED inspection can provide an opportunity to observe the response of the HSI and to verify that the HED process was effective. Careful coordination between inspectors may help to reduce effort.

Although the licensee may choose to resolve HEDs that are discovered late in the design process with a design change, it is more likely that the licensee will prefer changes to procedures or administrative controls rather than costly changes to the design. The inspector should assess the appropriateness of these changes while considering the potential safety of the design changes.

03.04 Inspection Sample 4: HEDs Sampled During Final ITAAC Closure

The inspector should identify any remaining HEDs that may have been identified in the later part of the design process or those that remain unresolved from previous samples. All HEDs that are important to safety should be resolved or they must have a reasonable documented schedule for resolution. HEDs that are not important to safety are not required to be resolved unless it is a part of the licensing basis.

In some cases the licensee may not identify any HEDs late in the design process. If no additional HEDs have been identified the inspector can reallocate resources to look at additional previously resolved HEDs and the bases for their resolution. The inspector may choose to look at HEDs generated from other parts of the HFE process such as Task Analysis, Human-System Interface Design, or others.

65001.26-04 RESOURCE ESTIMATE

The total estimated hours to complete this inspection for one COL licensee is 80 staff hours total. Time spent for each sample should be approximately evenly distributed; however, the inspector may redistribute time for each sample as needed.

65001.26-05 PROCEDURE COMPLETION

Implementation of this IP is complete when the planned sample of attributes for the specified appendices has been completed.

65001.26-06 REFERENCES

1. 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."
2. IP 71152, "Problem Identification and Resolution." (ML13030A098)
3. NUREG-0711, Rev 2, "Human Factors Engineering Program Review Model," 02/2004.
4. NUREG-0800 (SRP), Section 14.3.9, "Human Factors Engineering - Inspections, Tests, Analyses, and Acceptance Criteria."
5. NUREG-0800 (SRP), Section 18, "Human Factors Engineering."
6. Inspection Manual Chapter 0613, "Documenting 10 CFR Part 52 Construction and Test Inspections." (ML082490463)
7. SECY-92-053 "Use of Design Acceptance Criteria During 10 CFR Part 52 Design Certification Reviews."

END

Appendix 1:

Inspection Guide for AP1000 Human Factors Engineering Issue Resolution Verification

Appendix A contains proprietary information and is therefore not publicly available. NRC staff may access Appendix A by clicking [\[here\]](#) or through the Agencywide Documents Access and Management System (ADAMS) (ADAMS Accession No. ML13022A148).

Revision History Sheet for IP 65001.26

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment and Feedback Resolution Accession Number
N/A	ML13022A149 02/14/2013 CN 13-005	Initial issuance, which will be used as a basis for ITAAC inspections related to a licensee's HED resolution program. Appendix A will be used for ITAAC inspections related to AP1000 Issue Resolution Verification.	N/A	ML13022A151