



U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN
OFFICE OF NUCLEAR REACTOR REGULATION

12.1 ASSURING THAT OCCUPATIONAL RADIATION EXPOSURES ARE AS LOW AS IS REASONABLY ACHIEVABLE

REVIEW RESPONSIBILITIES

Primary - Radiological Assessment Branch (RAB) Emergency Preparedness and Radiation Protection Branch (PERB)¹

Secondary - None

I. AREAS OF REVIEW

The following areas of the applicant's safety analysis report (SAR) are reviewed as they relate to assuring that occupational radiation exposures (ORE) will be as low as is reasonably achievable (ALARA):

1. Policy Considerations

- a. Management policy with respect to designing and constructing the plant (preliminary safety analysis report, PSAR, design certification report, or combined license report²) and with respect to operating the plant (final safety analysis report, FSAR, combined license report³) and the planned organizational structure (FSAR and combined license report⁴).
- b. The applicable activities carried on by the individuals in management having responsibility for radiation protection (FSAR and combined license report⁵).
- c. Information describing the implementation of policy, organization, training, and design review guidance provided in Regulatory Guides 1.8, 8.8 and 8.10.

DRAFT Rev. 3 - April 1996

USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.

Information describing any proposed alternatives (PSAR and update in FSAR, design certification report, or combined license report⁶).

2. Design Considerations

- a. Information describing how experience from past designs and from operating plants has been used to develop improved radiation protection design (PSAR and update in FSAR, design certification report, or combined license report⁷).
- b. Information describing the implementation of the design guidelines of Regulatory Guide 8.8, Section C.2, and other industry-developed design guidance that includes ALARA criteria. Information describing any proposed alternatives (PSAR and update in FSAR, design certification report, or combined license report⁸).

3. Operational Considerations

- a. The methods of planning and accomplishing work, including interfaces between radiation protection, operations, maintenance, planning, and scheduling.
- b. The use of operating plant experience in planning the operational considerations for plant designs (PSAR and update in FSAR, design certification report, or combined license report⁹).
- c. Information describing the implementation of radiation protection programs, and operational guidance of Regulatory Guides 8.8 and 8.10. Information describing any proposed alternatives (PSAR and update in FSAR, design certification report, or combined license report¹⁰).

4. Radiation Protection Considerations

In accordance with the guidelines of Item III.D.3.1 of NUREG-0718, the applicant should commit in the PSAR, design certification report, or combined license report¹¹ to provide a Radiation Protection Plan consistent with the provisions of NUREG-0761.

For those areas of review identified as part of the primary responsibility of other branches, the acceptance criteria and methods of application are contained in the referenced SRP section.¹²

II. ACCEPTANCE CRITERIA

The information provided in the SAR is acceptable if it meets the requirements of 10 CFR Part 50, 50.34, and if it contains sufficient information identified in Section 12.1 of Regulatory Guide 1.70 so that the relevant requirements of 10 CFR Parts 19 and 20 are met. The relevant requirements are:

1. 10 CFR Part 19, 19.12 - "Instruction to Workers"

As it relates to workers entering restricted areas being kept informed as to the storage, transfer, or use of radioactive materials or radiation in such areas, and instructed as to the risk associated with occupational radiation exposure, precautions and procedures to reduce exposures and purpose and function of protective devices employed.

2. 10 CFR Part 20, 20.1(c) - "Purpose" 20.1101(b) - "Radiation Protection Programs" and the definition of ALARA in 20.1003¹³

As it relates to persons involved in licensed activities making every reasonable effort to maintain radiation exposures as low as is reasonably achievable (ALARA).

The following regulatory guides and NUREGs provide information, recommendations and guidance and in general describe a basis acceptable to the staff for implementing the requirements of Sections 19.12 and 20.1(c)20.1101(b)¹⁴.

1. Regulatory Guide 1.8 - "Personnel Selection and Training," as it relates to a basis acceptable to the staff for complying with the Commission's regulations with regard to the qualifications of radiation protection personnel.
2. Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operational)," as it relates to compliance with the Commission's quality assurance regulatory requirements during nuclear power plant operations.
3. Regulatory Guide 8.8 - "Information Relevant to Insuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low as is Reasonably Achievable" as it relates to a basis acceptable to the staff for meeting the requirements of 10 CFR Part 20.1(c)20.1101(b)¹⁵ by providing radiation protection information pertaining to actions taken during the design, construction, operation, and decommissioning to assure that occupational radiation exposures are kept ALARA.
4. Regulatory Guide 8.10 - Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable," as it relates to a basis acceptable to the staff for meeting the requirements of 10 CFR Part 20.1(c)20.1101(b)¹⁶ concerning the commitment by the applicant's management and vigilance by the Radiation Protection Manager and the radiation protection staff to maintain occupational radiation exposures ALARA.

5. NUREG-0718 - "Licensing Requirements for Pending Applications for Construction Permits and Manufacturing Licenses," Item III.D.3, Radiation Protection Plan, as it relates to preparation and maintenance of a current Radiation Protection Plan.
6. NUREG-0737, "Clarification of TMI Action Plan Requirements," as it relates to implementing Task Action Plan Items II.B.2 and II.F.1(3) for CP and OL applications.
7. NUREG-0761 - "Contents of Radiation Protection Plans for Nuclear Power Reactor Licensees," as it relates to guidelines for the content of a Radiation Protection Plan and elements to be included in a comprehensive radiation protection program as well as procedural details and outlines for incorporation into implementing procedures.

Specific Acceptance Criteria necessary to meet the regulations and the guide lines of the Regulatory Guides and NUREGs identified above are as follows:

1. Policy Considerations

Acceptability will be based on evidence that a policy for assuring that ORE will be ALARA has been formulated in accordance with the training requirements in 10 CFR Part 19, 19.12 and, the ALARA provisions of 10 CFR Part 20, ~~20.1(e)~~20.1101(b)¹⁷, and that the policy has been described, displayed, and will be implemented in accordance with the provisions of Regulatory Guides 8.8 (Regulatory Position C.1)¹⁸ and 8.10 (~~e.1~~Regulatory Position C.1)¹⁹, and NUREG-0761 (Sections 5), as it relates to maintaining doses ALARA. A specific individual(s) will be designated and assigned responsibility and authority for implementing ALARA policy. Alternative proposed policies will be evaluated on the basis of a comparison with the above Regulatory Guides and NUREG-0761.

2. Design Considerations

Acceptability will be based on evidence that the design methods, approach, and interactions are in accordance with the ALARA provisions of 10 CFR Part 20, ~~20.1(e)~~20.1101(b)²⁰, and Regulatory Guide 8.8 (Regulatory Position C.2)²¹, and will include incorporation of measures for reducing the need for time spent in radiation areas; maintenance; measures to improve the accessibility to components requiring periodic maintenance or inservice inspection; measures to reduce the production, distribution, and retention of activated corrosion products throughout the primary system; measures for assuring that ORE during decommissioning will be ALARA, reviews of the design by competent radiation protection personnel; instructions to designers and engineers regarding ALARA design; experience from operating plants and past designs; and continuing facility design reviews. Alternative proposed design policies will be evaluated on the basis of a comparison with the design guidance in Regulatory Guide 8.8 (~~e.2~~Regulatory Position C.2)²².

3. Operational Considerations

Acceptability will be based on evidence that the applicant has a program to develop plans and procedures in accordance with Regulatory Guides 1.33, 1.8,²³ 8.8, and 8.10, which can incorporate the experiences obtained in facility operation into facility and equipment design and into operations planning and which will implement specific exposure control techniques.

4. Radiation Protection Considerations

Acceptability will be based on evidence that the Radiation Protection Plan has been prepared in accordance with the guidelines of Task Action Plan item II.D.3.1 and supplemented by NUREG-0761, including criteria, concepts, and implementation schemes to be included as part of operational radiation protection programs for power reactors.

Technical Rationale²⁴

The technical rationale for application of the above acceptance criteria is discussed in the following paragraphs.²⁵

1. Compliance with 10 CFR Part 19, 19.12 requires that individuals that frequent or work in restricted areas shall be kept informed of radioactive materials and radiation; shall receive instructions with the objective of minimizing exposures to radioactive materials or radiation and health protection problems, precautions or procedures, and protective devices associated with each; shall be instructed to observe the applicable Commission's regulations; shall be instructed to report violations of applicable Commission's regulations; shall be instructed in response to warnings; and shall be advised of the availability of radiation exposure reports.

Paragraph 19.12 includes the specific requirement that individuals who work in, or frequent, restricted areas be instructed in precautions or procedures to minimize radiation exposure and therefore relates to the principle of keeping occupational doses as low as is reasonably achievable (ALARA) and applies to Section 12.1. With full knowledge of the hazards associated with the exposure and handling of radioactive material and the precautions that should be observed, the individual will be sufficiently knowledgeable such that radiation doses associated with his or her work duties will be kept ALARA.

Meeting these requirements will provide a level of assurance that individuals exposed to, and handling, radioactive materials will perform their work duties in a manner that will keep occupational doses ALARA.²⁶

2. Compliance with 10 CFR § 20.1101(b) requires that the licensee use, to the extent practicable, procedures and engineering controls based on sound radiation protection principles that result in occupational doses and doses to members of the public ALARA.

The regulation 10 CFR § 20.1101(b) is the principal basis for requiring licensees to adopt a policy and establish procedures designed to keep radiation exposures ALARA, and therefore is directly applicable to Section 12.1. SRP Section 12.1 describes staff positions related to the design and operation of nuclear plants including positions to maintain radiation doses in conformance with the ALARA principle. Regulatory Guides 8.8 and 8.10, which also cover ALARA principles, are referenced in the SRP. Collectively, the SRP section and the Regulatory Guides provide the management policy, design considerations, and operational considerations that, if followed, will meet the NRC requirements relative to ALARA.

Meeting these requirements will provide a level of assurance that plant operations will result in occupational doses and doses to members of the public ALARA.²⁷

III. REVIEW PROCEDURES

The information furnished in the SAR is reviewed for completeness in accordance with Regulatory Guide 1.70. ~~RABPERB~~²⁸ reviews the management policy and the planned organizational structure to determine how the guidance given in Regulatory Guides 1.8, 8.8, and 8.10 will be implemented, and considers any alternatives proposed. The review of organization structure includes a determination of whether the individuals responsible for the radiation protection program are on a high enough level of management to assure independence from operating pressures, and implementation of management's commitment for assuring that ORE will be ALARA and that radiation protection management has direct access to station management in radiation protection matters. Any concerns regarding organizational structure as related to the radiation protection manager will be communicated to the ~~Licensee Qualification Branch~~ Human Factors Assessment Branch (HHFB)²⁹, which has primary review responsibility for this item, in Chapter 13. The reviewer uses NUREG-0731 for additional guidance on acceptable operating organizations.

The reviewer evaluates information in this section in accordance with Regulatory Guide 8.8, Section C.1.b.(3), to determine whether the organizational structure provides a mechanism for the radiation protection manager and the radiation protection organization to interact with design review groups in such a manner that methods and techniques for reducing ORE will be incorporated in the design of the plant. If the future plant Radiation Protection Manager has not yet been selected, design review should be accomplished in accordance with the guidance of Regulatory Guide 8.8, unless acceptable alternatives are proposed. The reviewer determines that appropriate personnel with operating plant experience have reviewed the proposed plant design. The reviewer determines from information furnished, whether the applicant has incorporated previously accepted design features and has used operating experience to improve the design of the plant with regard to assuring that ORE will be ALARA. The reviewer also evaluates the material in this section against the requirements of 10 CFR Part 19, 19.12, 10 CFR Part 20, 20.1101(b), and the guidelines of Regulatory Guides ~~8.8 and~~³⁰ 8.10.

Based on this staff review, ~~RABPERB~~³¹ may request additional information or request the applicant to modify his submission in order to meet the acceptance criteria given in subsection II of this Standard Review Plan³².

For standard design certification reviews under 10 CFR Part 52, the procedures above should be followed, as modified by the procedures in SRP Section 14.3 (proposed), to verify that the design set forth in the standard safety analysis report, including inspections, tests, analysis, and acceptance criteria (ITAAC), site interface requirements and combined license action items, meet the acceptance criteria given in subsection II. SRP Section 14.3 (proposed) contains procedures for the review of certified design material (CDM) for the standard design, including the site parameters, interface criteria, and ITAAC.³³

IV. EVALUATION FINDINGS

The staff's review should verify that sufficient information has been provided in the SAR and amendments to meet the requirements of 50.34 to support conclusions of the following type, to be included in the staff's safety evaluation report (SER):

The staff concludes that the ALARA policy, design and operational considerations are acceptable. This conclusion is based on the applicant having met the training requirements of 10 CFR Part 19, 19.12, and the ALARA provisions of 10 CFR Part 20, 20.1(e)20.1101(b)³⁴, Regulatory Guides 8.8 (Regulatory Position C.2)³⁵ and 8.10(e)1Regulatory Position C.1³⁶, and the guidelines of Task Action Plan Item III.D.3.1 of NUREG-0718 for PSARs supplemented by the guidance of NUREG-0761.

The applicant provides a management commitment to assure that (plant name) will be designed, constructed, and operated in a manner consistent with the above criteria. The (title of person or group, e.g., Plant Health Physicist and staff) periodically reviews, updates, and modifies as appropriate plant design features and changes, as well as all operating and maintenance features, using exposure data and experience gained from operating nuclear power plants, in order to insure that occupational exposures will be kept as low as is reasonably achievable in accordance with Regulatory Guide 8.8 criteria.

The objective of the plant radiation protection design is to maintain individual doses and total person Sievert (person rem)³⁷ doses to plant workers, including construction workers, and to members of the general public as low as is reasonably achievable, and to maintain individual doses within the limits of 10 CFR Part 20. Within restricted areas all plant sources of direct radiation and airborne radioactive contamination are considered in our review.

(Utility) will incorporate the following facility and equipment design considerations at (plant name) in order to satisfy the above listed radiation protection design objectives. (List several design considerations used.) These design considerations conform with the guidelines of Regulatory Guide 8.8 and are acceptable.

Operating and maintenance personnel follow specific plans and procedures in order to assure that "as low as is reasonably achievable" goals are achieved in the operation of the plant. Engineering controls for the protection of personnel have been optimized. Operations involving high person Sievert (person rem)³⁸ exposures are carefully preplanned and carried out by personnel well-trained in radiation protection and using

proper equipment. During such maintenance activities, personnel are monitored for exposure to radiation and contamination. Their radiation exposures are reviewed and are used to make changes in future job procedures and techniques. The management staff reviews radiation exposure trends periodically to determine major changes in problem areas, and to note which worker groups are accumulating the highest exposures. The staff uses these reports to recommend design modifications or changes in plant procedures. These practices conform with those in Regulatory Guide 8.8 and 8.10 and are acceptable.

For design certification reviews, the findings will also summarize, to the extent that the review is not discussed in other safety evaluation report sections, the staff's evaluation of inspections, tests, analyses, and acceptance criteria (ITAAC), including design acceptance criteria (DAC), site interface requirements, and combined license action items that are relevant to this SRP section.³⁹

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

This SRP section will be used by the staff when performing safety evaluations of license applications submitted by applicants pursuant to 10 CFR 50 or 10 CFR 52.⁴⁰ Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications docketed six months or more after the date of issuance of this SRP section.⁴¹

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides and NUREG's with the exception that NUREG-0761 shall be implemented at a later date in accordance with Commission direction.⁴²

VI. REFERENCES

1. 10 CFR Part 19, "Notices, Instructions, and Reports to Workers; Inspections."
2. 10 CFR Part 20, "Standards for Protection Against Radiation."
3. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."
4. Regulatory Guide 1.8, "Personnel Selection and Training."
5. Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operations)."
6. Regulatory Guide 1.70, "Standard Format and Contents of Safety Analysis Reports for Nuclear Power Plants."

7. Regulatory Guide 8.8, "Information Relevant to Assuring that Occupational Radiation Exposures at Nuclear Power Stations Will be as Low as is Reasonably Achievable."
8. Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable."
9. NUREG-0718, "Licensing Requirements for Pending Applications for Construction Permits and Manufacturing Licenses."
10. NUREG-0761, "Contents of Radiation Protection Plans for Nuclear Power Reactor Licensees."

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SRP Draft Section 12.1
Attachment A - Proposed Changes in Order of Occurrence

Item numbers in the following table correspond to superscript numbers in the redline/strikeout copy of the draft SRP section.

| Item | Source | Description |
|------|-----------------------------------|---|
| 1. | Current PRB name and abbreviation | Editorial change made to reflect current PRB name, Emergency Preparedness and Radiation Protection Branch, and abbreviation, PERB. |
| 2. | SRP-UDP update item | Added reference to design certification report and combined license report. |
| 3. | SRP-UDP update item | Added reference to combined license report. |
| 4. | SRP-UDP update item | Added reference to combined license report. |
| 5. | SRP-UDP update item | Added reference to combined license report. |
| 6. | SRP-UDP update item | Added reference to design certification report and combined license report. |
| 7. | SRP-UDP update item | Added reference to design certification report and combined license report. |
| 8. | SRP-UDP update item | Added reference to design certification report and combined license report. |
| 9. | SRP-UDP update item | Added reference to design certification report and combined license report. |
| 10. | SRP-UDP update item | Added reference to design certification report and combined license report. |
| 11. | SRP-UDP update item | Added reference to design certification report and combined license report. |
| 12. | Editorial | Added standard paragraph noting the location of acceptance criteria and description of methods of application for those areas of review identified as the primary responsibility of other branches. |
| 13. | Integrated Impact No. 638, 639 | Replace reference to 10 CFR Part 20, 20.1(c) with 10 CFR Part 20, 20.1101(b) and the definition of ALARA in 20.1003. |
| 14. | Integrated Impact No. 638, 639 | Replace reference to 10 CFR Part 20, 20.1(c) with 10 CFR Part 20, 20.1101(b). |
| 15. | Integrated Impact No. 638, 639 | Replace reference to 10 CFR Part 20, 20.1(c) with 10 CFR Part 20, 20.1101(b). |
| 16. | Integrated Impact No. 638, 639 | Replace reference to 10 CFR Part 20, 20.1(c) with 10 CFR Part 20, 20.1101(b). |
| 17. | Integrated Impact No. 638, 639 | Replace reference to 10 CFR Part 20, 20.1(c) with 10 CFR Part 20, 20.1101(b). |

SRP Draft Section 12.1
Attachment A - Proposed Changes in Order of Occurrence

| Item | Source | Description |
|------|---|---|
| 18. | Editorial | Provided a more precise identification of the ALARA program as described in Regulatory Position C.1 of Regulatory Guide 8.8. |
| 19. | Editorial | Provided a more precise identification of management commitment to ALARA as described in Regulatory Position C.1 of Regulatory Guide 8.10. |
| 20. | Integrated Impact No. 638, 639 | Replace reference to 10 CFR Part 20, 20.1(c) with 10 CFR Part 20, 20.1101(b). |
| 21. | Editorial | Provided a more precise identification of facility and equipment design features for ALARA as described in Regulatory Position C.2 of Regulatory Guide 8.8. |
| 22. | Editorial | Provided a more precise identification of facility and equipment design features for ALARA as described in Regulatory Position C.2 of Regulatory Guide 8.8. |
| 23. | Editorial | Adder reference to Regulatory Guide 1.8 for completeness. |
| 24. | SRP-UDP format item | "Technical Rationale" added to "ACCEPTANCE CRITERIA" subsection to describe the bases for referencing 10 CFR Part 19, 19.12 and 10 CFR Part 20, 20.1101. |
| 25. | SRP-UDP format item | Added lead-in sentence for "Technical Rationale." |
| 26. | SRP-UDP format item | Added Technical Rationale for 10 CFR Part 19, 19.12. |
| 27. | SRP-UDP format item | Added Technical Rationale for 10 CFR Part 20, 20.1101(b). |
| 28. | Current PRB abbreviation | Editorial change made to reflect current PRB abbreviation, PERB. |
| 29. | Current PRB name and abbreviation | Editorial change made to reflect current PRB name, Human Factors Assessment Branch, and abbreviation (HHFB). |
| 30. | Editorial | Editorial change made to more accurately identify requirements of the Regulations and guidance provided in Regulatory Guides. |
| 31. | Current PRB abbreviation | Editorial change made to reflect current PRB abbreviation, PERB. |
| 32. | Editorial | Added "of this Standard Review Plan" to accurately reflect the location of subsection II. |
| 33. | SRP-UDP Guidance, Implementation of 10 CFR 52 | Added standard paragraph to address application of Review Procedures in design certification reviews. |
| 34. | Integrated Impact No. 638, 639 | Replace reference to 10 CFR Part 20, 20.1(c) with 10 CFR Part 20, 20.1101(b). |

SRP Draft Section 12.1
Attachment A - Proposed Changes in Order of Occurrence

| Item | Source | Description |
|------|--|---|
| 35. | Editorial | Provided a more precise identification of facility and equipment design features for ALARA as described in Regulatory Position C.2 of Regulatory Guide 8.8. |
| 36. | Editorial | Provided a more precise identification of management commitment for ALARA as described in Regulatory Position C.1 of Regulatory Guide 8.10. |
| 37. | SRP-UDP format item | Replaced person rem with SI units, person Sievert. |
| 38. | SRP-UDP format item | Replaced person rem with SI units, person Sievert. |
| 39. | SRP-UDP Format Item, Implement 10 CFR 52 Related Changes | To address design certification reviews a new paragraph was added to the end of the Evaluation Findings. This paragraph addresses design certification specific items including ITAAC, DAC, site interface requirements, and combined license action items. |
| 40. | SRP-UDP Guidance, Implementation of 10 CFR 52 | Added standard sentence to address application of the SRP section to reviews of applications filed under 10 CFR Part 52, as well as Part 50. |
| 41. | SRP-UDP Guidance | Added standard paragraph to indicate applicability of this section to reviews of future applications. |
| 42. | Editorial | Deleted paragraph on implementation schedules because it referred to CP and OL applications that were under active review. The paragraph is no longer relevant. |

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SRP Draft Section 12.1
Attachment B - Cross Reference of Integrated Impacts

| Integrated Impact No. | Issue | SRP Subsections Affected |
|-----------------------|---|---|
| 638, 639 | Revise SRP subsections to replace citations of superseded Section 20.1(c) with Section 20.1101(b) and the definition of ALARA in 20.1003 of 10 CFR Part 20. | <p>Subsection II, ACCEPTANCE CRITERIA, first paragraph, subitem 2.</p> <p>Subsection II, ACCEPTANCE CRITERIA, second paragraph.</p> <p>Subsection II, ACCEPTANCE CRITERIA, second paragraph, subitem 3.</p> <p>Subsection II, ACCEPTANCE CRITERIA, second paragraph, subitem 4.</p> <p>Subsection II, ACCEPTANCE CRITERIA, third paragraph, subitem 1.</p> <p>Subsection II, ACCEPTANCE CRITERIA, third paragraph, subitem 2.</p> <p>Subsection IV, EVALUATION FINDINGS, first paragraph.</p> |