SIEMENS

December 12, 1996
RAC:96:076

Document Control Desk
ATTN: Chief, Planning, Program and Management Support Branch
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Overheads Used at December 12, 1996 SPC/NRC Meeting

Attached are the overheads presented by Siemens Power Corporation in the meeting between the NRC and SPC on December 12, 1996. The meeting discussed the RCCA insertion problems encountered with some Westinghouse designed fuel, and how the SPC design process should address the concerns.

Some of the information in the overheads is considered by Siemens Power Corporation to be proprietary. Therefore, both proprietary and nonproprietary versions of the overheads are attached. Also attached is an affidavit as required by 10 CFR 2.790(b), to support the withholding of this proprietary information from public disclosure.

If you have any questions, or if I can be of additional assistance, please call me at (509) 375-8290.

Very truly yours,

Bob Copeland

R. A. Copeland
Product Licensing

/smg

Attachments

cc: Ms. M. Chatterton (USNRC)
Mr. T. E. Collins (USNRC)
Mr. Egan Wang (USNRC)
Mr. E. Weiss (USNRC)
Mr. H. D. Curet (SPC)

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Change: PDR LTR 1 ENCL 1 NP

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RD-8-2 Siemens

AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON)

I, R. A. Copeland being duly sworn, hereby say and depose:

1. I am in the Product Licensing group for Siemens Power Corporation ("SPC"), and as such I am authorized to execute this Affidavit.

2. I am familiar with SPC's detailed document control system and policies which govern the protection and control of information.

3. I am familiar with the overheads attached to the letter from R. A. Copeland (SPC) to the Document Control Desk (USNRC) dated December 12, 1996, with the subject, "Overheads Used at December 12, 1996 SPC/NRC Meeting," referred to as "Document." Information contained in this Document has been classified by SPC as proprietary in accordance with the control system and policies established by SPC for the control and protection of information.

4. The Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by SPC and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in the Document as proprietary and confidential.

5. The Document has been made available to the U.S. Nuclear Regulatory Commission in confidence, with the request that the information contained in the Document will not be disclosed or divulged.

6. The Document contains information which is vital to a competitive advantage of SPC and would be helpful to competitors of SPC when competing with SPC.

7. The information contained in the Document is considered to be proprietary by SPC because it reveals certain distinguishing aspects of SPC mechanical design methodology which secure competitive advantage to SPC for fuel design optimization and marketability, and includes information utilized by SPC in its business which affords SPC an opportunity to obtain a competitive advantage over its competitors who do not or may not know or use the information contained in the Document.

8. The disclosure of the proprietary information contained in the Document to a competitor would permit the competitor to reduce its expenditure of money and manpower and to improve its competitive position by giving it valuable insights into SPC mechanical design methodology and would result in substantial harm to the competitive position of SPC.

9. The Document contains proprietary information which is held in confidence by SPC and is not available in public sources.

10. In accordance with SPC's policies governing the protection and control of information, proprietary information contained in the Document has been made available, on a limited basis, to others outside SPC only as required and under suitable agreement providing for nondisclosure and limited use of the information.

11. SPC policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

12. Information in this Document provides insight into SPC mechanical design methodology developed by SPC. SPC has invested significant resources in developing the methodology as well as the strategy for this application. Assuming a competitor had available the same background data and incentives as SPC, the competitor might, at a minimum, develop the information for the same expenditure of manpower and money as SPC.

THAT the statements made hereinabove are, to the best of my knowledge, information, and belief, truthful and complete.

FURTHER AFFIANT SAYETH NOT.

R.A. Copeland
____

SUBSCRIBED before me this 9th day of December, 1996.

Sue M. Galpin
____

Sue M. Galpin
NOTARY PUBLIC, STATE OF WASHINGTON
MY COMMISSION EXPIRES: 2/27/00

SUE M. GALPIN
COMMISSION EXPIRES
NOTARY
PUBLIC
FEB. 27, 2000
STATE OF WASHINGTON

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NRC Meeting on Control Rod Insertion

Siemens Power Corporation

December 12, 1996

Meeting Purpose: Describe SPC Guide Tube Design Process and Recent RCCA Issue

- Demonstrates no operational guidelines needed on SPC fuel
- SPC wants to identify the NRC issues and respond with generic submittal
- SPC design addresses guide tube growth, buckling, and mechanical compatibility with core structure
- Review of information available on recent RCCA insertion delays and SPC operational experience:
  - shows the SPC designs maintain adequate clearance for unrestrained RCCA insertion
  - conservative relative to assemblies where delays seen

Agenda

- Introduction--RA Copeland
- Description of SPC Design Process--A Reparaz
- SPC Design Validation--A Reparaz
- Conclusions--A Reparaz
- Utility Activities/Reviews--Utilities
- Follow-on Activities--All

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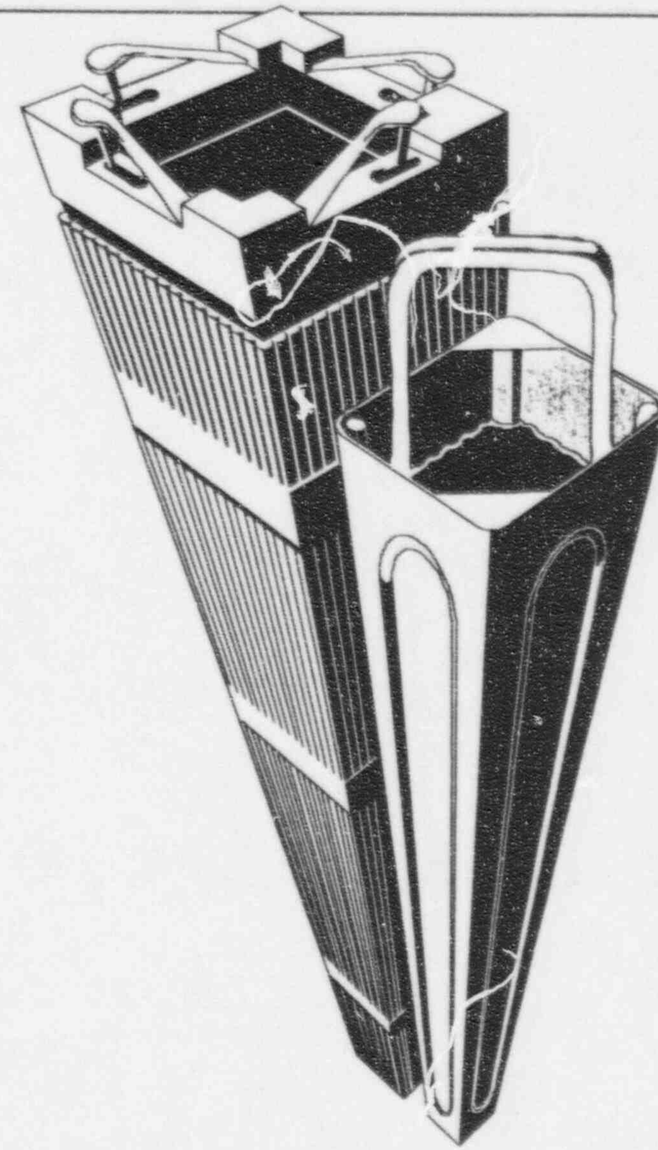
Siemens Presentation on RCCA Insertion Compatibility for Westinghouse Reactors



A. Repáraz, Manager

Product Mechanical Engineering

Siemens Power Corporation - Nuclear Division

12/10/96
AR:96-085

Outline of SPC Presentation on RCCA Insertability

- Problem Statement
- SPC Experience
- SPC Design Considerations
- Manufacturing Controls
- SPC Growth Data
- Operating Considerations
- Drop/Drag Measurement Data

Root Cause Conclusions*

All conclusions are based upon Westinghouse data and models for Westinghouse fuel

- The incomplete RCCA insertions observed at Wolf Creek have been caused by excessive compressive loads on the fuel assembly guide thimble tubes leading to excessive thimble tube distortion.
- For Wolf Creek, the increased compressive load was caused by unusual fuel assembly growth over and above what would normally be expected as a result of irradiation exposure.
- The unusual growth component is a combination of growth due to oxide accumulation and accelerated growth, both of which are temperature sensitive.
- The unusual growth is observed only in high temperature plants on those high burnup fuel assemblies that have certain types of power histories.

*Note: This page taken from the Westinghouse presentation on the "Root Cause of Incomplete Control Rod Insertions at Westinghouse Reactors," Sumit Ray, Westinghouse Commercial Nuclear Fuel Division

SPC Experience

- No indication of slow or incomplete RCCA insertion has ever been reported in any SPC fuel
- SPC fuel assembly exposure experience in controlled positions:

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SPC Fuel Assembly Design Considerations

- Assembly design assessments include:
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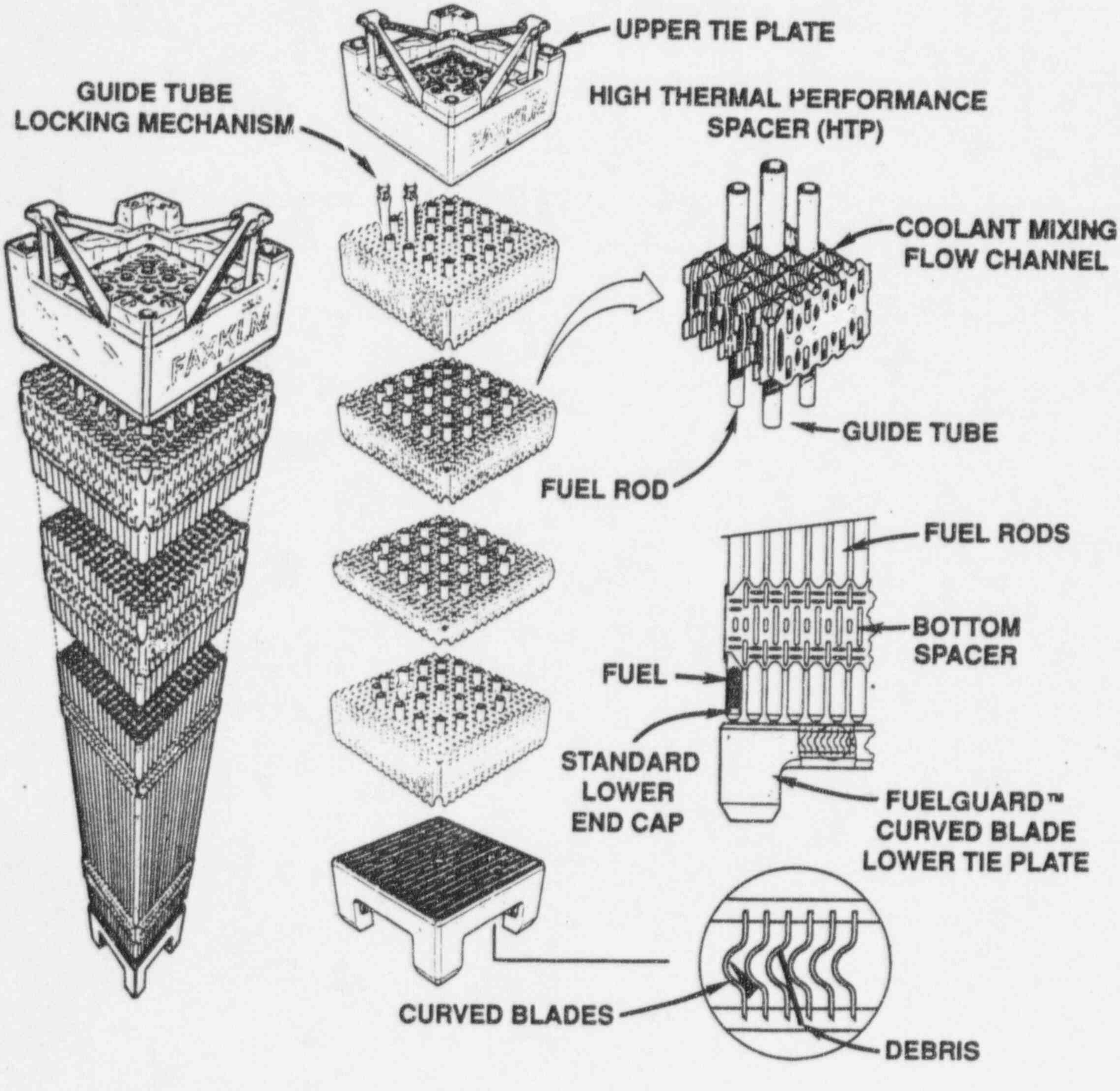
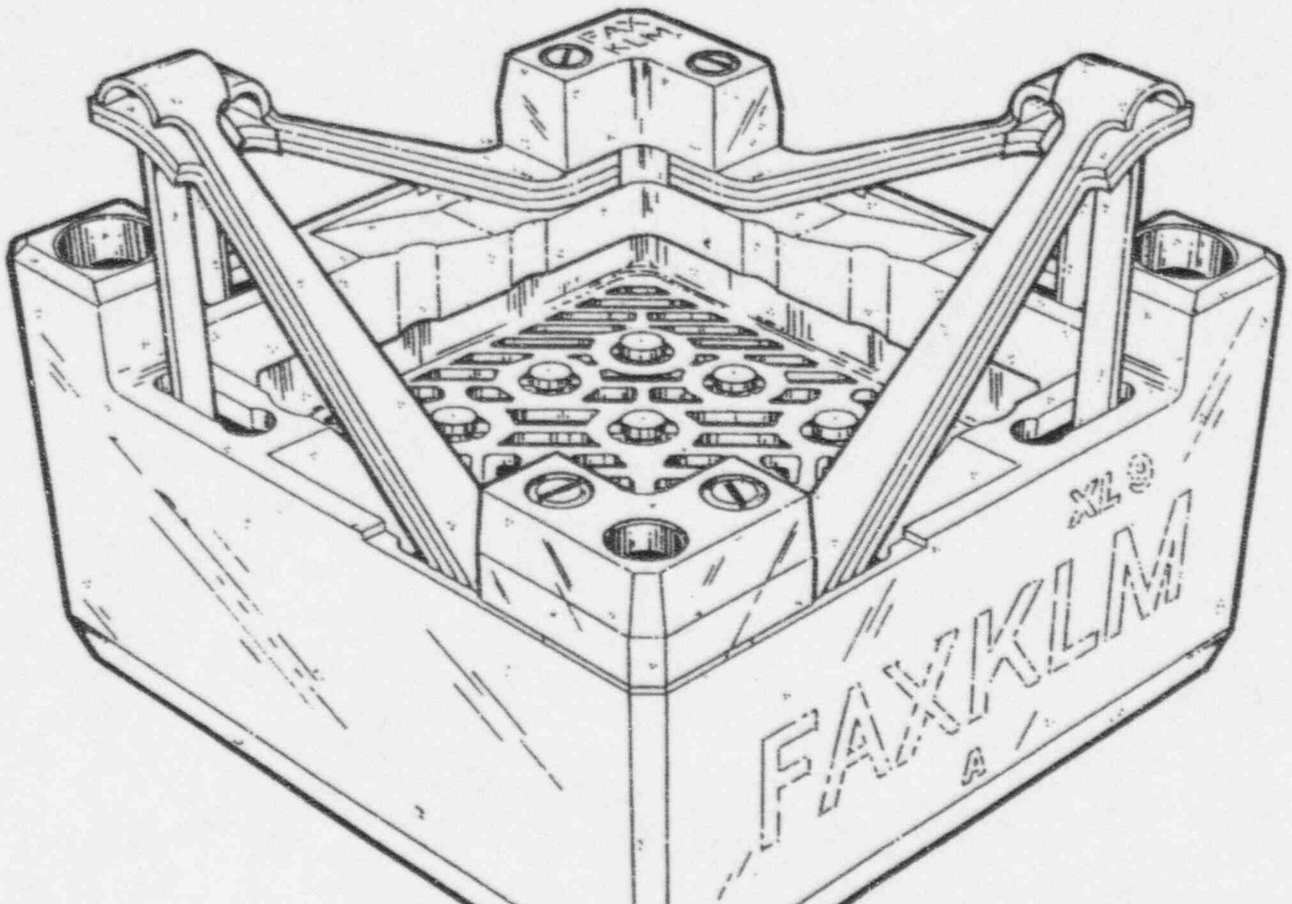
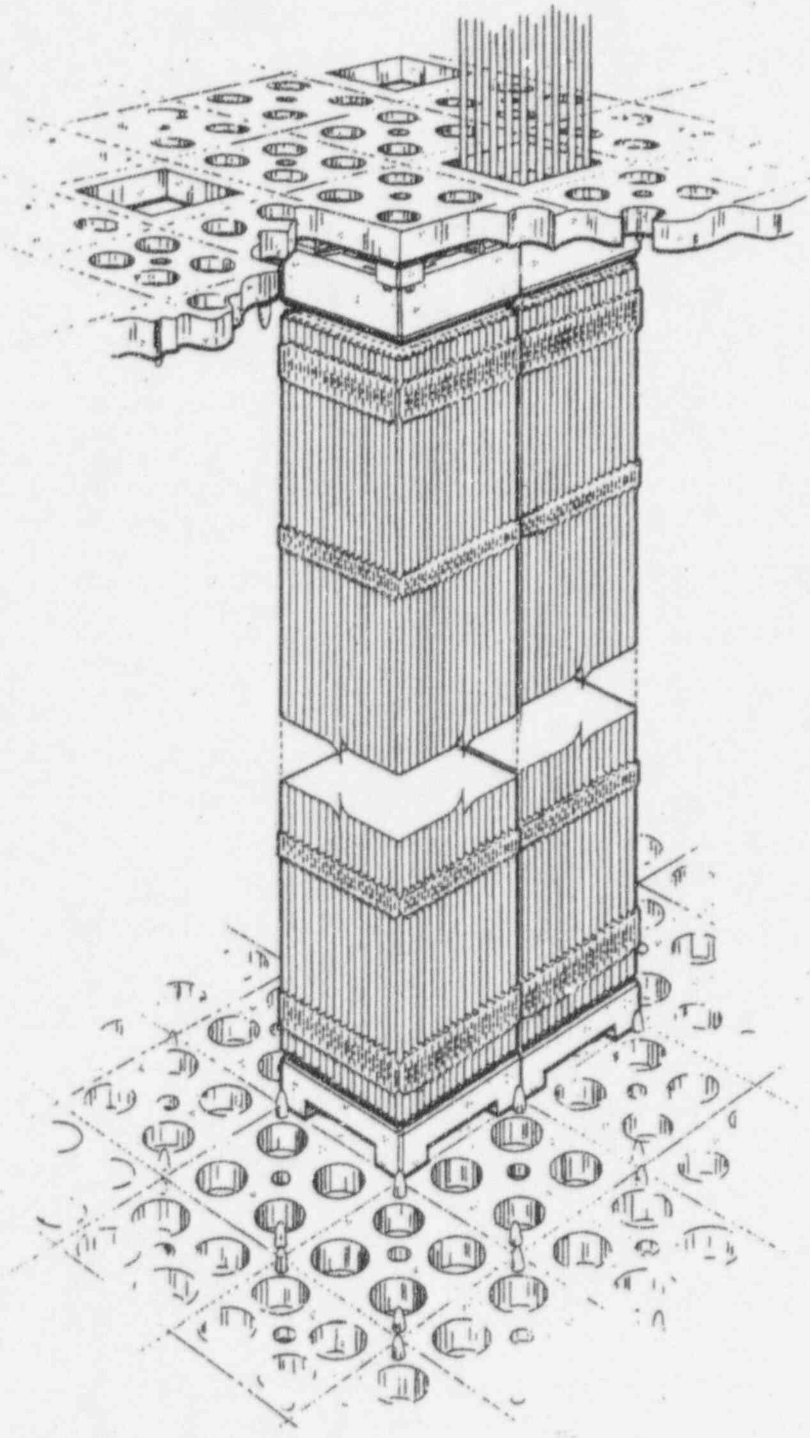
HTP 17x17 PWR Fuel Assembly



Detail of Upper Tie Plate Design



Assembly in the Core



Detail of Upper Core Interface

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Typical SPC Fuel Assembly Growth Allowances

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Core Structure Compatibility

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Potential Interference Points

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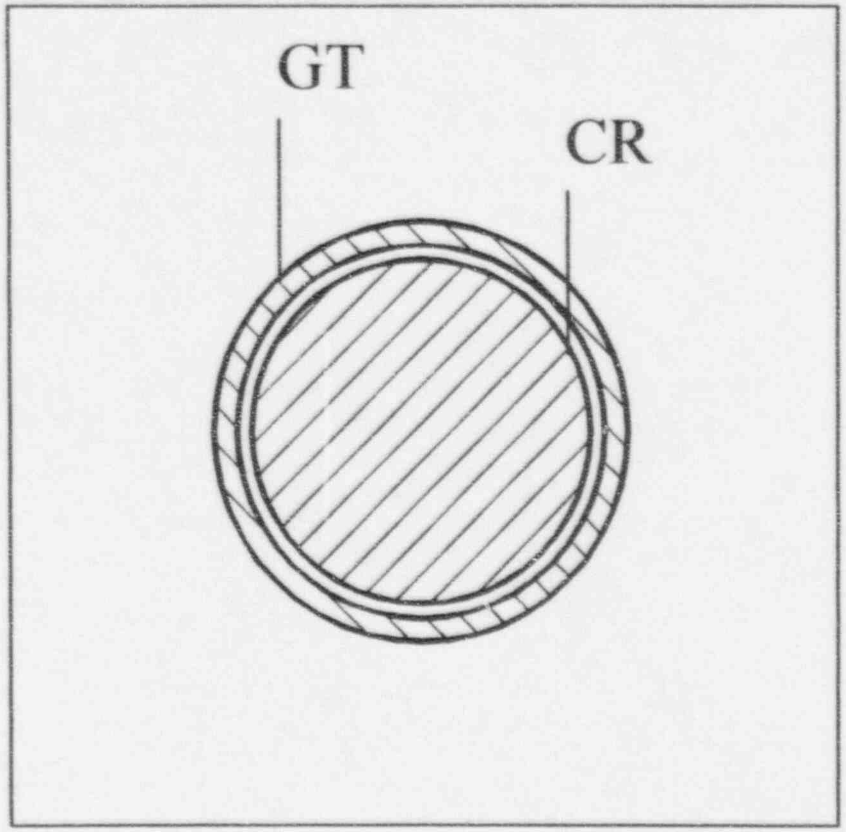
Typical Westinghouse Guide Tube Dimensions



SPC has more clearance and slightly more cross-sectional area and buckling strength.

Typical guide tube dimensions follow.

Typical 14x14 Guide Tube Dimensions

Item	Westinghouse Value	SPC Value	SPC Delta

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Typical 15x15 Guide Tube Dimensions

Item	Westinghouse Value	SPC Value	Delta wrt SPC

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Typical 17x17 Guide Tube Dimensions

Item	Westinghouse Value*	SPC Value	Delta wrt SPC

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* Westinghouse V5H fuel assembly design

SPC Design Considerations

Factors that affect straightness of guide tube during irradiation:

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SPC Design Considerations (cont.)

Parameters which affect the growth of guide tubes:

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SPC Design Considerations (cont.)

SPC fuel design features that affect guide tube growth and straightness

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Corrosion/Hydriding Levels for Structural Components

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Typical Measured Guide Tube Oxide Thickness (Siemens, KWU)

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Guide Tube Buckling Calculations

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SPC Drag Test Setup

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SPC Drag Test Using a Simulated RCCA and Typical 17x17 Cage Assembly (Test #1, Spacers and IFMs Bracketed)

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SPC Drag Test Using Simulated RCCA and Typical 17x17 Cage Assembly (Test #2, HTP Spacer Bracketed Only)

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Typical 17x17 Holddown Spring Force and Guide Tube Strength Characteristics

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Assembly Growth

- Assembly growth is conservatively calculated for maximum holddown load and axial clearance calculations

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Assembly Growth (cont.)

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SPC Growth Model Development

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SPC Growth Model Development (cont.)

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Measured CE Design Fuel Assembly Growth

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Measured CE Design, with Guide Bars, Fuel Assembly Growth

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Measured Westinghouse Design Fuel Assembly Growth

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SPC Design Growth Curve for Westinghouse Type Fuel Assemblies

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Measured Fuel Rod Growth

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Calculated Irradiation Growth

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Design Summary

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RCCA Drop Time and Drag Results

- RCCA drop time and drag results show excellent behavior with no identifiable trends with burnup

RCCA Drag Force 14x14

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RCCA Drop Times 14x14 SPC Fuel Assemblies

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RCCA Drag Force in Dashpot 15x15

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RCCA Drop Times 15x15 SPC Fuel Assemblies

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17x17 Drag Data

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RCCA Drop Time to Dashpot 17x17

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RCCA Drop Time 17x17

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RCCA Drop Times 17x17

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Conclusion

- SPC utilizes appropriate methodology and allows adequate design margins for control rod insertion as demonstrated by the in-reactor validation data.
- SPC designs are compatible with RCCAs at all burnups. No burnup restrictions or additional data collection are required for SPC fuel in control positions in Westinghouse design reactors.

Follow-on Activities

- SPC will submit a letter:
  - Describing designs and design bases that preclude RCCA insertion problems
  - Showing operation is within SPC experience
  - Providing reactor RCCA testing to support SPC conclusions

- NRC Actions