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POWER SYSTEMS

Docket No. STN 50-470F

March 22, 1985
LD-85-014

Mr. H. Thompson, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Revisions to CESSAR-F

References:
(1) "Impact of PVNGS Hardware Problems on CESSAR-F", letter LD-83-085, A. E. Scherer (C-E) to D. G. Eisenhut (NRC), September 9, 1983.
(2) Final Report on Palo Verde Nuclear Generating Station Reactor Coolant Pumps, Combustion Engineering, Inc., CEN-271(V)-P, Revision 1-P, August 1984.
(3) Final Report on Palo Verde Unit 1 Resistance Temperature Detector Thermowell, Combustion Engineering, Inc., CEN-225(V)-P, Revision 1-P.
(4) Report on Palo Verde Unit 1 Safety Injection Nozzle Thermal Liner, Combustion Engineering, Inc., CEN-264(V)-P.
(5) Final Report on the Performance Evaluation of the Palo Verde Control Element Assembly Shroud, Combustion Engineering, Inc., CEN-267(V)-P, Revision 1-P, August 1984.

Attachments:
(A) CESSAR-F Revision for Removal of the Safety Injection Nozzle Thermal Sleeve.
(B) CESSAR-F Revision for Removal of the CEA Guide Tube Brackets.

Dear Mr. Thompson:

During pre-core hot functional testing at the Palo Verde Nuclear Generating Station (PVNGS), four areas were discovered which required design changes to System 80™ hardware. In September 1983, Combustion Engineering (C-E) made an assessment of the effect of these changes on CESSAR-F and concluded that the impact would likely be minor [Reference (1)]. In December 1983, the Final Design Approval for CESSAR-F was issued, with the requirement that any design changes which impact CESSAR-F be submitted to the NRC for review and approval. In 1984, the final reports for the four areas impacting System 80 [References (2) to (5)] were submitted on the PVNGS docket and were reviewed by the NRC.

The final reports on the four areas were recently reviewed by C-E with respect to CESSAR-F revisions. Each of the four areas is addressed below, however, only two of them resulted in changes to CESSAR-F (Attachments (A) and (B) to this letter). As predicted, the changes to CESSAR-F are minor.

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Reactor Coolant Pump Diffuser and Impeller Repairs

Subsequent to the Pre-Core Hot Functional Test at Palo Verde 1, three deficiencies were identified [Reference (2)]. Corrective action included (1) additional bolting and pre-tensioning of the bolts which fasten the diffuser to the pump casing, (2) re-contouring the diffuser vane tips and (3) backfiling and welding repair of the pump impeller.

The reactor coolant pumps are described in Section 5.4.1 of CESSAR-F. The details of the pump and impeller design affected by the repairs are beyond that described in CESSAR-F and, therefore, revisions to Section 5.4.1 are not needed.

Resistance Temperature Detector Thermowell Design Revision

Damaged Resistance Temperature Detector (RTD) thermowells were discovered subsequent to pre-core hot functional testing [Reference (3)]. This problem was resolved by redesigning (strengthening) the thermowell while still meeting the performance requirements of the original equipment.

The detailed design of RTD thermowells is not described in CESSAR-F since such a level of detail is beyond the scope of CESSAR-F. Revisions to CESSAR-F are, therefore, not necessary.

Safety Injection Nozzle Thermal Sleeve Removal

It was discovered that, as a result of pre-core hot functional testing, one safety injection nozzle thermal sleeve became loose and a second sleeve fell from the nozzle [Reference (4)]. An analysis of transients with the thermal sleeves absent showed that the sleeves were not required to obtain acceptable performance over the life of the plant.

The nozzle thermal sleeves are referred to in Section 5.4.3 of CESSAR-F. Since the safety injection nozzle thermal sleeves are not required, specific mention of thermal sleeves has been removed from Section 5.4.3. A sentence has been added to state that nozzles are analyzed to ensure that the expected transients can be accommodated. This revision is provided in Attachment (A).

CEA Guide Bracket Removal

Inspection of reactor internals after pre-core hot functional testing at Palo Verde 1 showed that the CEA guide brackets, located at the top of the upper guide structure, were susceptible to vibration cracking [Reference (5)]. This problem was resolved by removing the guide brackets and placing snubbers between the upper guide structure barrel and the CEA shroud structure, as indicated in Attachment (B). The CEA guide brackets served to align the CEAs and extension shafts only during assembly and disassembly of reactor internals.

Their removal, therefore, does not affect normal plant operation. The function of the guide brackets during assembly and disassembly of internals can be accomplished by a separate alignment tool.

The mechanical design and seismic analysis of the reactor internals are described in Sections 3.7 and 3.9 of CESSAR-F. Revisions to these sections are provided in Attachment (B).

C-E expects to include the changes provided in Attachments (A) and (B) in Amendment 10 to CESSAR-F, which is scheduled for printing by June 1985. To meet this schedule, we request NRC Staff concurrence by April 30, 1985 that the revisions in Attachments (A) and (B) close out the condition in the Final Design Approval.

If you have any questions, please call me or Mr. S. E. Ritterbusch of my staff at (203) 285-5206.

Sincerely,

COMBUSTION ENGINEERING, INC.

A. E. Scherer
Director
Nuclear Licensing

AES:jld
Attachments

Attachment A

CESSAR-F Revision for Removal of the

Safety Injection Nozzle Thermal Sleeve

5.4.3 REACTOR COOLANT PIPING

5.4.3.1 Design Basis

Applicable design codes are found in Table 5.2-1. The reactor coolant loop piping is designed and analyzed for all transients specified in Section 3.9.1. Insert A ~~In addition, certain nozzles are subjected to local transients which are included in the design and analysis of the areas affected. Thermal sleeves are installed in the surge nozzle, safety injection nozzles and charging nozzle to accommodate these additional transients~~.

In addition to being specified as Seismic Category I, the piping is designed to ensure that critical vibration frequencies are well out of the range expected during normal operation and during abnormal conditions. Additional presentations relating to seismic and dynamic analysis and criteria for the reactor coolant piping is contained in Sections 3.7.2 and 3.9.2, respectively.

5.4.3.2 Description

Each of the two heat transfer loops contains five sections of pipe: one 42-in. internal diameter pipe between the reactor vessel outlet nozzle and steam generator inlet nozzle, two 30-in. internal diameter pipes from the steam generator's two outlet nozzles to the reactor coolant pumps suction nozzle, and two 30-in. internal diameter pipes from the pumps discharge nozzle to the reactor vessel inlet nozzles. These pipes are referred to as the hot leg, the suction legs, and the cold legs, respectively. The other major pieces of reactor coolant piping are the surge line, a 12-in. pipe between the pressurizer and the hot leg, and the spray line, a 4-inch pipe at the pressurizer end reduced to a 3-inch pipe and connected to two (2) cold legs.

The 42-in. and 30-in. pipe diameter are selected to obtain coolant velocities which provide a reasonable balance between erosion-corrosion, pressure drop, and system volume. The surge line is sized to limit the frictional pressure loss through it during the maximum in-surge so that the pressure differential between the pressurizer and the heat transfer loops is no more than 5 percent of the system design pressure. The spray line sizing is discussed in Section 5.4.10.

To reduce the amount of field welding during plant fabrication, the 42-in. and 30-in. pipes are supplied in major pieces, complete with shop-installed instrumentation nozzles and connecting nozzles to the auxiliary systems. Where required, the nozzles are supplied with safe ends to facilitate field welding of the connecting piping. ~~To reduce thermal shock, thermal sleeves are provided for all nozzles 2 inches or greater in diameter where fluid enters the Reactor Coolant System from an auxiliary system.~~

Flow restricting orifices (7/32" dia. x 1" long) are provided in the nozzles for the RCS instrumentation and sampling lines to limit flow in the event of a break downstream of a nozzle.

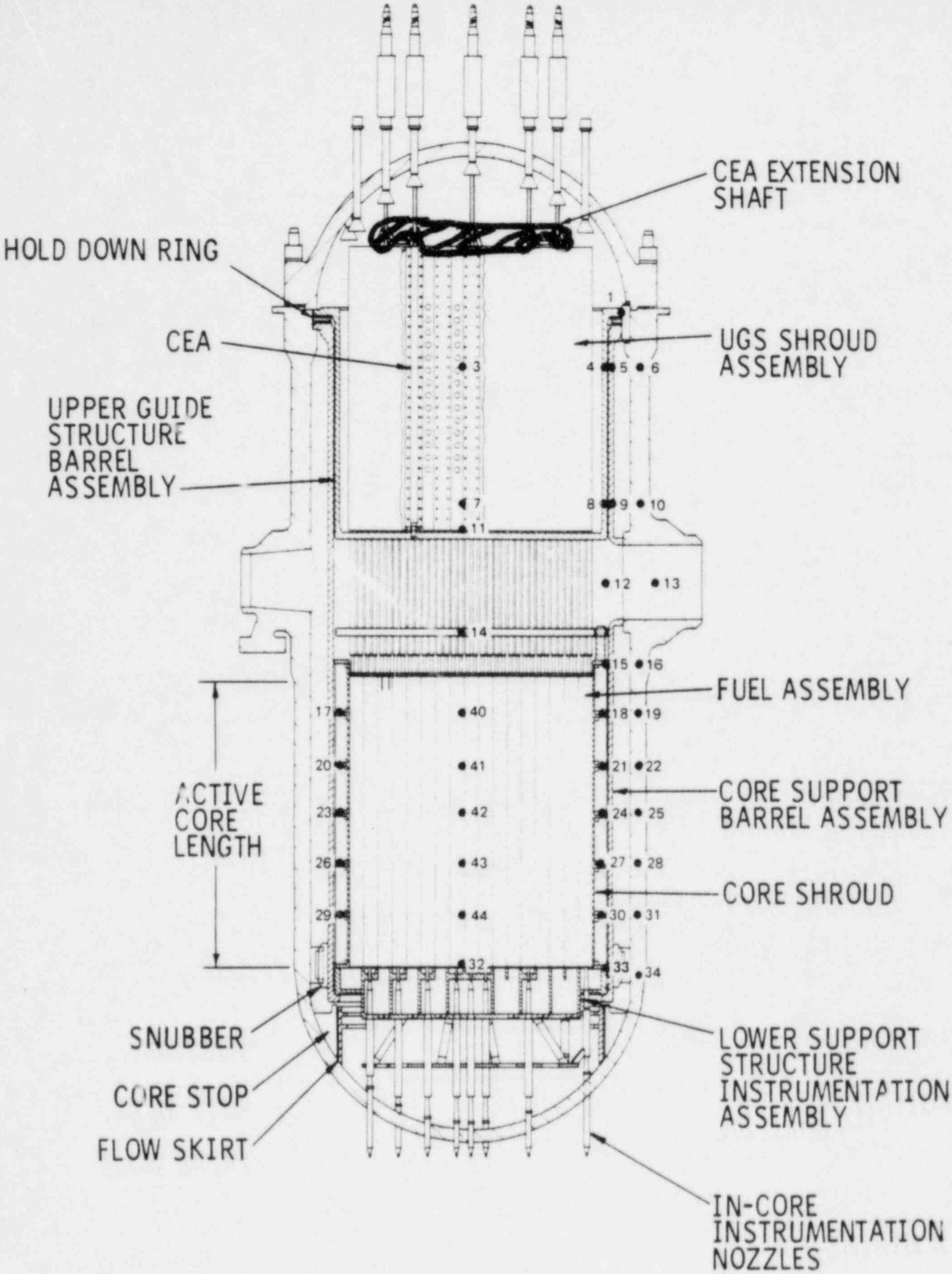
Insert A

In addition, those nozzles subjected to local thermal transients, caused by fluid entering the Reactor Coolant System from an auxiliary system, are analyzed to ensure that the nozzles can accommodate the additional transients.

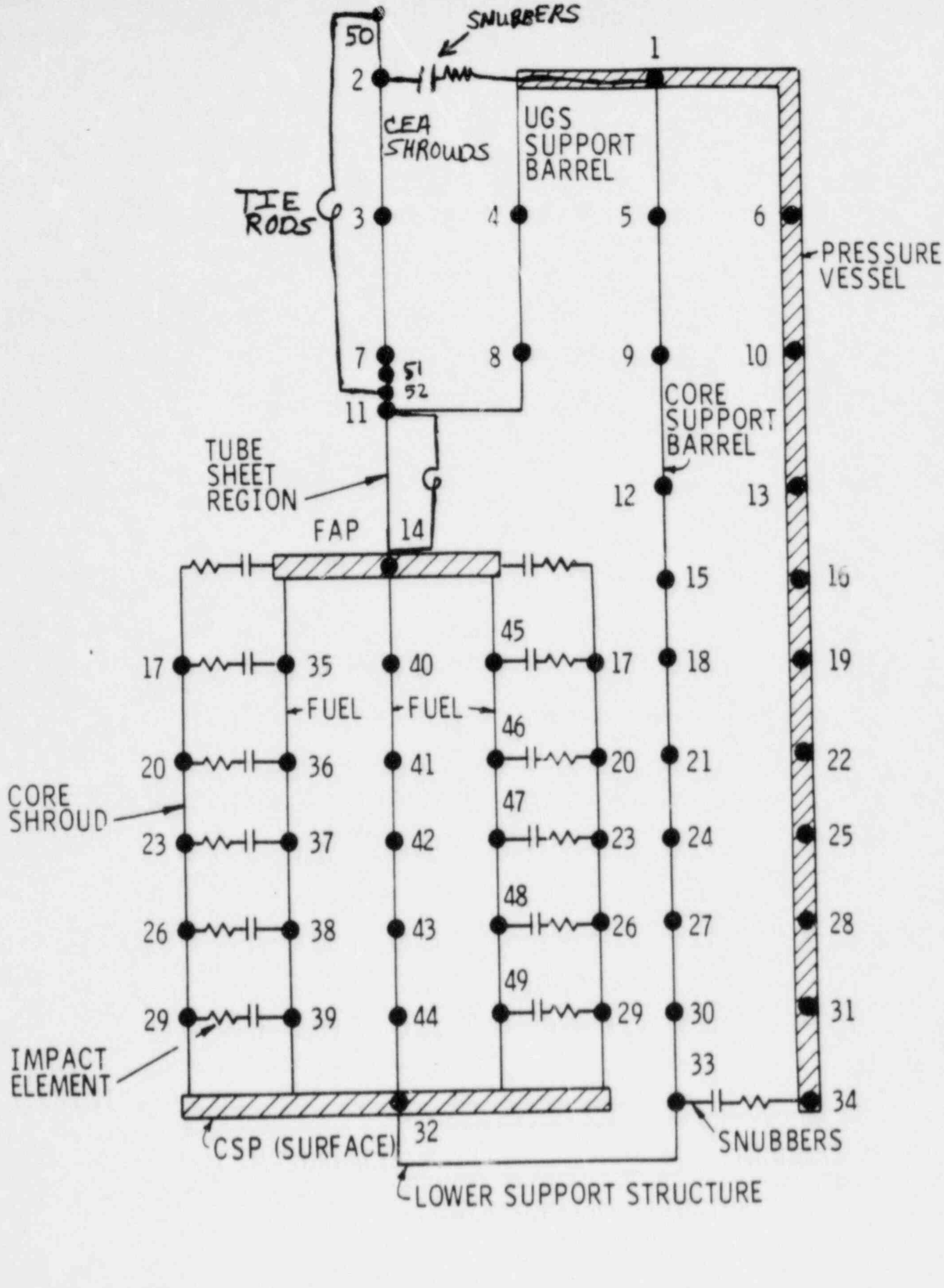
Attachment B

CESSAR-F Revision for Removal of the

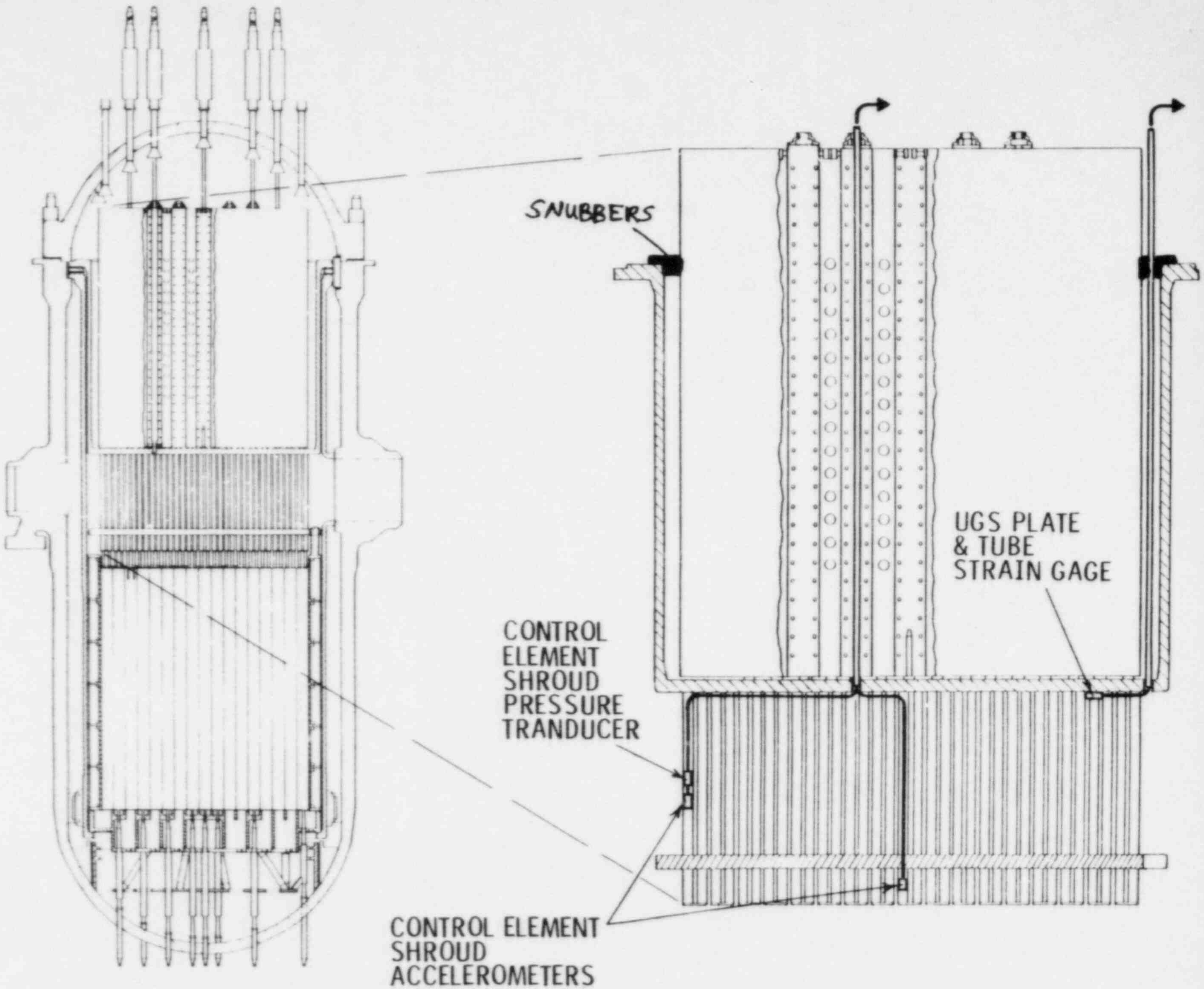
CEA Guide Tube Brackets



C-E SYSTEM 80	REACTOR INTERNALS HORIZONTAL SEISMIC MODEL	Figure 3.7.3-1



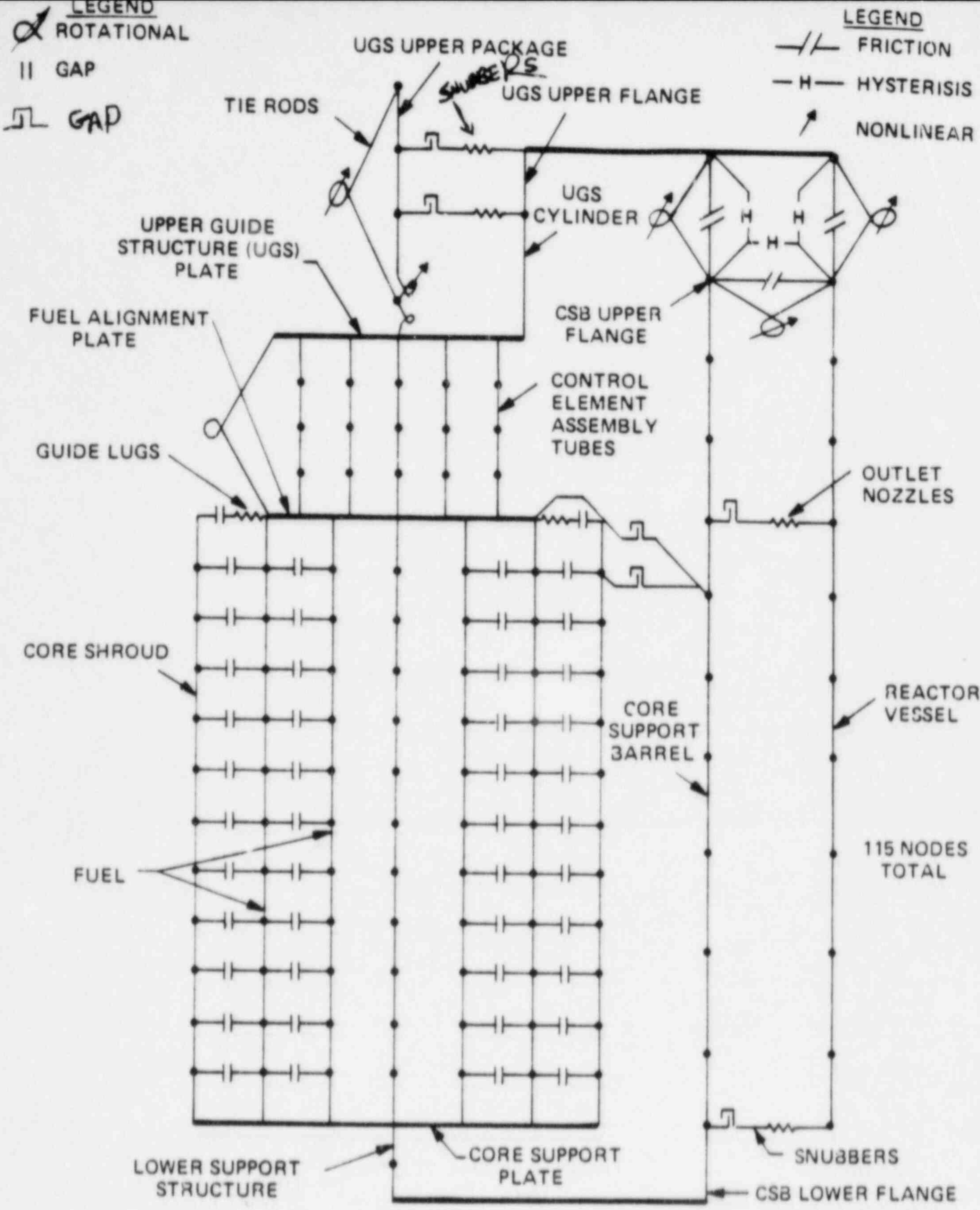
C - E SYSTEM 80	REACTOR INTERNALS NONLINEAR HORIZONTAL SEISMIC MODEL	Figure 3.7.3-4



C-E SYSTEM 80

UPPER GUIDE STRUCTURE
TYPICAL PVMP INSTRUMENTATION

Figure
3.9.2-9



~~Amendment No. 5~~
~~November 20, 1981~~

C - E SYSTEM 80	DETAILED LATERAL INTERNALS CESHOCK MODEL	Figure 3.9.2-11

3.9.5.1.2 Upper Guide Structure Assembly

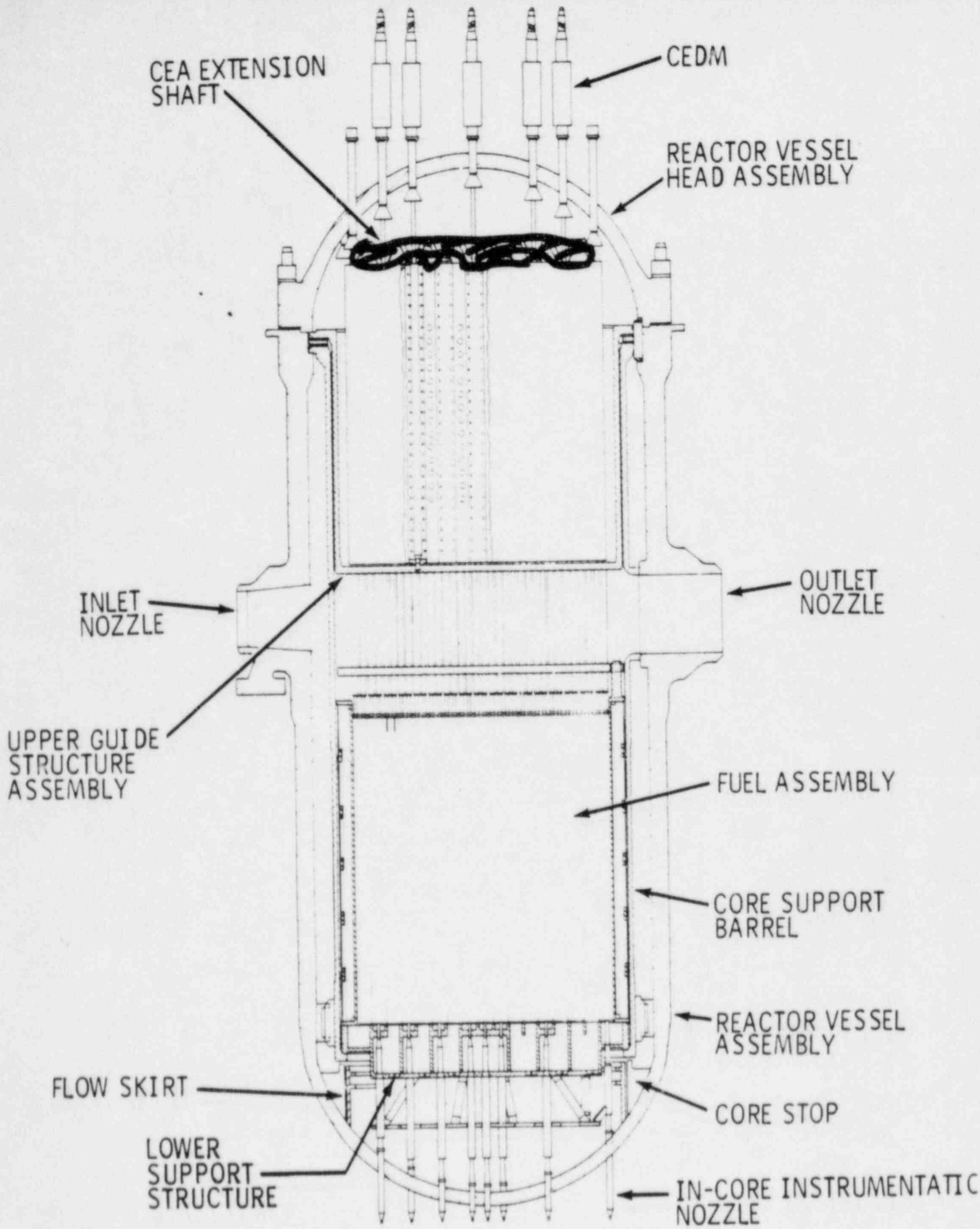
The UGS assembly aligns and laterally supports the upper end of the fuel assemblies, maintains the control element spacing, holds down the fuel assemblies during operation, prevents fuel assemblies from being lifted out of position during a severe accident condition and protects the control elements from the effects of coolant cross flow in the upper plenum. The upper guide structure (UGS) assembly is handled as one unit during installation and refueling.

The UGS assembly consists of the UGS support barrel assembly and the CEA shroud assembly (Figure 3.9.5-6). The UGS support barrel assembly consists of UGS support barrel fuel alignment plate, UGS base plate and control element shroud tubes. The UGS support barrel consists of a right circular cylinder welded to a ring flange at the upper end and to a circular plate (UGS base plate) at the lower end. The flange, which is the supporting member for the entire UGS assembly, seats on its upper side against the pressure vessel head during operation. The lower side of the flange is supported by the holdown ring, which seats on the core support barrel upper flange. The UGS flange and the holddown ring engage the core support barrel alignment keys by means of four accurately machined and located keyways equally spaced at 90 degree intervals. This system of keys and slots provides an accurate means of aligning the core with the closure head and thereby with the CEA drive mechanisms. The fuel alignment plate is positioned below the UGS base plate by cylindrical control element shroud tubes. These tubes are attached to the UGS base plate and the fuel alignment plate by rolling the tubes into the plates and welding. The fuel alignment plate is designed to align the lower ends of the control element shroud tubes which in turn locate the upper ends of the fuel assemblies. The fuel alignment plate also has four equally spaced slots on its outer edge which engage with Stellite hardfaced lugs protruding from the core shroud to provide alignment. The control element shroud tubes bear the upward force on the fuel assembly holddown devices. This force is transmitted from the alignment plate through the control element shroud tubes to the UGS barrel base plate.

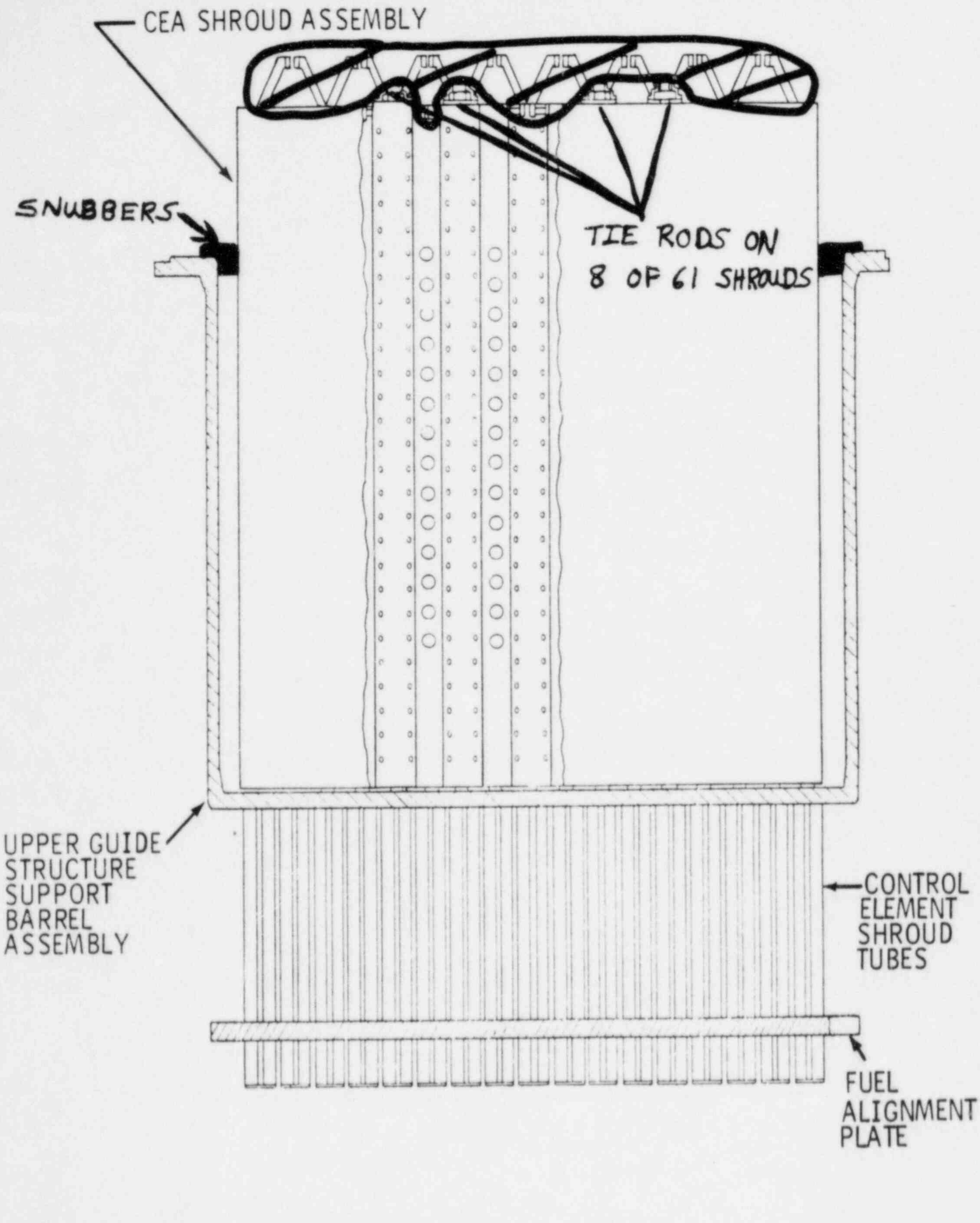
The CEA shroud assembly limits cross flow and provides separation of the CEA assemblies. The assembly consists of an assemblage of large vertical tubes connected by vertical plates in a grid pattern. The shroud assembly is mounted on the UGS base plate and is held in position by eight tie rod tube assemblies which are threaded into the UGS base plate at their lower end. The tie rods are bolted against plates located at the top of the CEA shroud assembly and are pretensioned. ~~Guides for the CEA extension shafts are provided at the tops of the tubes.~~ They tubes and connecting plates are furnished with multiple holes to permit hydraulic communication.

vertical vertical Lateral movement of the vertical tube and plate assembly is minimized by four snubbers symmetrically located between this assembly and the top of the UGS support barrel.

The holddown ring provides axial force on the flanges of the upper guide structure assembly and the core support structure in order to prevent movement of the structures under hydraulic forces. The holddown ring is designed to accommodate the differential thermal expansion between the pressure vessel and the internals in the vessel ledge region.



C-E SYSTEM 80	REACTOR VERTICAL ARRANGEMENT	Figure 3.9.5-1



C - E SYSTEM 80	UPPER GUIDE STRUCTURE ASSEMBLY	Figure 3.9.5-6