

April 2, 2021  
NRC:21:009

U.S. Nuclear Regulatory Commission  
Document Control Desk  
11555 Rockville Pike  
Rockville, MD 20852

## Update of Models in ANP-10334P-A, Revision 0

Ref. 1: ANP-10334P-A, Revision 0, "Q12™ Structural Material", September 2017.

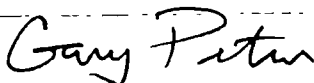
ANP-10334P-A, Revision 0 (Reference 1) contains an update process for the oxidation and hydrogen models for Q12 structural material. The NRC approved update process requires notification to the NRC for information when updates are made to these models. Enclosure 1 (proprietary) and Enclosure 2 (non-proprietary) describe the updated models.

Framatome considers some of the material contained in Enclosure 1 to be proprietary. As required by 10 CFR 2.390(b), an affidavit is enclosed to support withholding of information from public disclosure.

There are no commitments contained within this letter or its enclosures.

If you have any questions related to this information, please contact Ms. Gayle Elliott, Deputy Director, Licensing & Regulatory Affairs, by telephone at (434) 832-3347, or by e-mail at [Gayle.Elliott@framatome.com](mailto:Gayle.Elliott@framatome.com).

Sincerely,



Gary Peters, Director  
Licensing & Regulatory Affairs  
Framatome Inc.

cc. N. Otto  
Project 728

Enclosures:

1. Proprietary copy of Update of Models in ANP-10334P-A, Revision 0
2. Non-proprietary copy of Update of Models in ANP-10334P-A, Revision 0
3. Notarized Affidavit for Withholding of Proprietary Information



requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by Framatome to determine whether information should be classified as proprietary:

- (a) The information reveals details of Framatome's research and development plans and programs or their results.
- (b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.
- (c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for Framatome.
- (d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for Framatome in product optimization or marketability.
- (e) The information is vital to a competitive advantage held by Framatome, would be helpful to competitors to Framatome, and would likely cause substantial harm to the competitive position of Framatome.

The information in this Document is considered proprietary for the reasons set forth in paragraphs 6(d) and 6(e) above.


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

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

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: April 1, 2021

  
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Gayle Elliott

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**Enclosure 2**  
**Update of Models In ANP-10334P-A, Revision 0**

**1.0 Introduction**

ANP-10334P-A (Reference 1) contains an update process for the oxidation and hydrogen pickup models. New data have been obtained and evaluated against the models in Sections 8.2 through 8.4 of Reference 1. The models underestimated the guide tube oxide thickness and hydrogen pickup, and therefore these models have been updated.

Section 12.3 of the NRC approved topical report ANP-10334P-A requires NRC notification for information when the models are updated.

**2.0 Updates**

The following updates replace the applicable models in Section 8.2 of Reference 1.

- The best estimate for the oxide thickness on Q12 guide tubes is updated to:

[ ]  
where  $e_{rod}$  is the oxide thickness for fuel cladding in micrometers ( $\mu\text{m}$ ).

- The upper design limit for oxide thickness of Q12 guide tubes is updated to:

[ ]  
where  $e_{rod}$  is the oxide thickness for fuel cladding in micrometers ( $\mu\text{m}$ ).

The following updates replace the applicable models in Section 8.4 of Reference 1.

- The best estimate of the hydrogen pickup in Q12 structural components is updated to:

[ ]  
where  $H_0$  is the initial hydrogen content in the material (as measured by chemical analyses during manufacturing) and  $H_{pickup}$  is the theoretical increase in hydrogen content due to two-sided corrosion (in weight parts per million (wt. ppm)), as defined in Section 8.4 of Reference 1.

- The upper design limit of the hydrogen pickup in Q12 structural components is updated and is applicable [ ]

[ ]  
where  $H_0$  is the initial hydrogen content in the material (as measured by chemical analyses during manufacturing) and  $H_{pickup}$  is the theoretical increase in hydrogen content due to two-sided corrosion (in wt. ppm), as defined in Section 8.4 of Reference 1.

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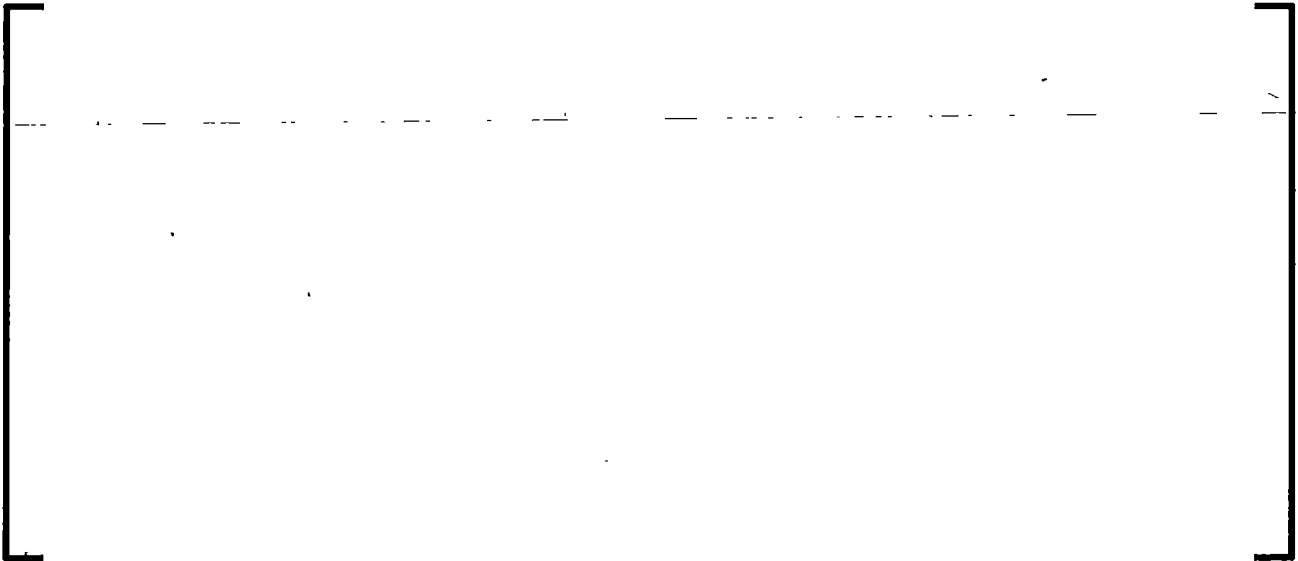
Figure 8-6 and Figure 8-8 of Reference 1 are also being updated. [

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Figure 2-1      Figure 8-6: Comparison between Measurement and Prediction for the Oxidation Model for Q12™ Guide Tubes



Figure 2-2      Figure 8-8: Comparison between Measurement and Prediction for the Hydrogen Pickup Model for Q12™ Guide Tubes and Spacer Grids



### 3.0 Reference

[1] ANP-10334P-A, Revision 0, "Q12™ Structural Material", September 2017.

Q12 is a trademark or registered trademark of Framatome or its affiliates, in the US or other countries.