

# Software Requirements Specification for HGHC

W. Spencer Smith

August 10, 2023

## Contents

|          |  |          |
|----------|--|----------|
| <b>1</b> | <b>Reference Material</b>                        | <b>2</b> |
| 1.1      | Table of Units . . . . .                         | 2        |
| 1.2      | Table of Symbols . . . . .                       | 2        |
| <b>2</b> | <b>Specific System Description</b>               | <b>2</b> |
| 2.1      | Solution Characteristics Specification . . . . . | 3        |
| 2.1.1    | Theoretical Models . . . . .                     | 3        |
| 2.1.2    | General Definitions . . . . .                    | 3        |
| 2.1.3    | Data Definitions . . . . .                       | 3        |
| 2.1.4    | Instance Models . . . . .                        | 4        |

# 1 Reference Material

This section records information for easy reference.

## 1.1 Table of Units

The unit system used throughout is SI (Système International d’Unités). In addition to the basic units, several derived units are also used. For each unit, the [Table of Units](#) lists the symbol, a description, and the SI name.

Table 1: Table of Units

| Symbol | Description | SI Name    |
|--------|-------------|------------|
| °C     | temperature | centigrade |
| m      | length      | metre      |
| W      | power       | watt       |

## 1.2 Table of Symbols

The symbols used in this document are summarized in the [Table of Symbols](#) along with their units. The choice of symbols was made to be consistent with the nuclear physics literature and with that used in the FP manual.

Table 2: Table of Symbols

| Symbol   | Description   | Units                          |
|----------|---|--------------------------------|
| $h_b$    | Initial coolant film conductance                                  | —                              |
| $h_c$    | Convective heat transfer coefficient between clad and coolant     | $\frac{W}{m^2 \cdot ^\circ C}$ |
| $h_g$    | Effective heat transfer coefficient between clad and fuel surface | $\frac{W}{m^2 \cdot ^\circ C}$ |
| $h_p$    | Initial gap film conductance                                      | —                              |
| $k_c$    | Clad conductivity   | —                              |
| $\tau_c$ | Clad thickness  | —                              |

# 2 Specific System Description

This section first presents the problem description, which gives a high-level view of the problem to be solved. This is followed by the solution characteristics specification, which presents the assumptions, theories, and definitions that are used.

## 2.1 Solution Characteristics Specification

The instance models that govern HGHC are presented in the [Instance Model Section](#). The information to understand the meaning of the instance models and their derivation is also presented, so that the instance models can be verified.

### 2.1.1 Theoretical Models

There are no theoretical models.

### 2.1.2 General Definitions

There are no general definitions.

### 2.1.3 Data Definitions

This section collects and defines all the data needed to build the instance models.

| Refname     | DD:htTransCladFuel   |
|-------------|--|
| Label       | Effective heat transfer coefficient between clad and fuel surface  |
| Symbol      | $h_g$  |
| Units       | $\frac{W}{m^2 \cdot ^\circ C}$   |
| Equation    | $h_g = \frac{2k_c h_p}{2k_c + \tau_c h_p}$   |
| Description | $h_g$ is the effective heat transfer coefficient between clad and fuel surface<br>( $\frac{W}{m^2 \cdot ^\circ C}$ )<br>$k_c$ is the clad conductivity (Unitless)<br>$h_p$ is the initial gap film conductance (Unitless)<br>$\tau_c$ is the clad thickness (Unitless) |

|             |  |
|-------------|--|
| Refname     | DD:htTransCladCool   |
| Label       | Convective heat transfer coefficient between clad and coolant  |
| Symbol      | $h_c$  |
| Units       | $\frac{\text{W}}{\text{m}^2\text{°C}}$   |
| Equation    | $h_c = \frac{2k_c h_b}{2k_c + \tau_c h_b}$   |
| Description | <p><math>h_c</math> is the convective heat transfer coefficient between clad and coolant<br/> <math>(\frac{\text{W}}{\text{m}^2\text{°C}})</math><br/> <math>k_c</math> is the clad conductivity (Unitless)<br/> <math>h_b</math> is the initial coolant film conductance (Unitless)<br/> <math>\tau_c</math> is the clad thickness (Unitless)</p> |

#### 2.1.4 Instance Models

There are no instance models.