

# Software Requirements Specification for HGHC

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# 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    |
|--------------------|-------------|------------|
| $^{\circ}\text{C}$ | 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     | $\frac{\text{W}}{\text{m}^2\text{°C}}$ |
| $h_g$    | Effective heat transfer coefficient between clad and fuel surface | $\frac{\text{W}}{\text{m}^2\text{°C}}$ |
| $h_p$    | Initial gap film conductance                                      | —                                      |
| $k_c$    | Clad conductivity   | —                                      |
| $\tau_c$ | Clad thickness  | —                                      |

# 2 Introduction

Heat transfer through the cladding of a nuclear fuel element influences performance and safety. Engineers therefore rely on dependable calculations of the heat transfer coefficients used for simulating the temperature. This document describes the requirements of a program called HGHC.

The following section provides an overview of the Software Requirements Specification (SRS) for HGHC. This section explains the purpose of this document.

## 3 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.

### 3.1 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.

#### 3.1.1 Theoretical Models

There are no theoretical models.

#### 3.1.2 General Definitions

There are no general definitions.

#### 3.1.3 Data Definitions

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

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

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### **3.1.4 Instance Models**

There are no instance models.