**CACIE Tool #05** – ***Steady-State Output Card Generator Tool  
OC\_SS\_gen.f***

**Version** **1.0**

**QA**: **TEST** or **NA** or **QA**

1. **Description and Purpose**

The Steady State Output Card Generator Tool reads input.sij, input.nij and input.top files generated by the CAST tool and generates an Output Control card for the steady-state simulation. The Steady State Output Card Generator Tool determines the reference nodes for a defined model domain. The reference nodes correspond to the center of the model domain and the center of each domain quadrant. If the model and/or quadrant centers are not located exactly at node centers, then the closest node center is chosen. The closest node center is determined by first evaluating i values, then j values. If a center location is equidistant from two node centers, then either node center is selected randomly.

The reference nodes are assigned vertically to the bottom of the domain, layer 20 and at successive layers at intervals of 20. The final layer interval corresponds to the elevation of the uppermost active layer at a reference node location (e.g., 1, 20, 40, …, 200, 208).

Reference node output includes: Rock/Soil Type, Integrated Water Mass, Aqueous Saturation, Aqueous Moisture Content, Aqueous Pressure, Aqueous Hydraulic Head, Diffusive Porosity, XNC Aqueous Volumetric Flux (Node Centered), YNC Aqueous Volumetric Flux (Node Centered), ZNC Aqueous Volumetric Flux (Node Centered).

A single plot file output time of 10,000 years is specified. Plot file output includes: rock/soil type, aqueous saturation, aqueous moisture content, aqueous pressure, aqueous hydraulic head, diffusive porosity, xnc aqueous volumetric flux (node centered), ync aqueous volumetric flux (node centered), znc aqueous volumetric flux (node centered), final restart.

1. **Functional Requirements**

FR-1: Read model name as command line input.

FR-2: Open “SS\_Output\_Control.dat” as outfile1 file.

FR-3: Open “input.sij” as infile1 file

FR-4: Read infile1, determine grid and quadrant center coordinates.

FR-5: Open “input.nij” as infile2 file

FR-6: Read infile2, determine grid and quadrant center i/j index values. i left/center/right and j bottom/center/top.

FR-7: Open “input.top” as infile3 file

FR-8: Read infile3, find top active layer for grid and quadrant centers.

FR-9: Write Output Control Card.

1. **Software Requirements Specifications**

FORTRAN

1. **Software Design Description**

The software design description of the tool will be documented in this section. The results of a Code Walkthrough with an independent third party will be summarized in this section.

Arguments:

ModelName – Name of the model being processed (used only in an informational comment).

Input Files:

input.sij

input.nij

input.top

Output files:

SS\_Output\_Control.dat

.sh file: runSS\_OC.sh

* ../../tools/ca-ssoccard/OC\_SS\_gen.exe $1 [variable $1 is model name]

1. **Requirements Traceability Matrix**

A requirements traceability matrix for the tool will be documented in this section. At a minimum, the matrix will include IDs of: Functional Requirements and the corresponding Acceptance Test, along with an indication of the test result (Pass/Fail).

Table 1 presents the requirements traceability matrix for the OC\_SS\_gen tool.

| **Table 1. OC\_SS\_gen.exe Tool Requirements Traceability Matrix** | | |
| --- | --- | --- |
| **Functional Requirement** | **Acceptance Test** | **Test Case** |
| QA Level | IT-1 | Installation Test |
| FR-1 | ATC-1 | Check that the model name is included in the first comment in the “SS\_Output\_Control.dat” output file. |
| FR-2 | ATC-2 | Check that output file “SS\_Output\_Control.dat” was written by the OC\_SS\_gen tool. |
| FR-3  FR-4  FR-5  FR-6 | ATC-3 | Check that reference nodes for model and quadrant centers are at the center coordinates, or as close as possible, considering that model and quadrant centers may not fall exactly on a node center.  NOTE: The closest node center is determined by first evaluating i values, then j values. If a center location is equidistant from two node centers, then either node center is selected randomly. |
| FR-7  FR-8 | ATC-4 | Check that the uppermost reference node at each i,j location is the top active node for that i,j location. |
| FR-9 | ATC-5 | Check that Node 1,1,1 is included as a reference node. |
| Check that the “Number of Reference Nodes” matches the number defined. |
| Check that the “Number of Reference Node Variables” matches the number defined. |
| Check that reference nodes are included for the model and quadrant centers for layer 1, the topmost active layer, and every layer number that is a multiple of 20 and less than the topmost active layer. |
| Check that the reference node variables are the expected parameters (See list in CACIE Tool #05 – Steady-State Output Card Generator Tool, Description and Purpose). |
| Check that there is a single plot file year at 10,000 years. |
| Check that the “Number of Plot File Variables” matches the number defined. |
| Check that the plot file variables are the expected parameters (See list in CACIE Tool #05 – Steady-State Output Card Generator Tool, Description and Purpose).. |

1. **Test Plan and Cases**

The test plan for the tool will be documented in this section. Each test will have a unique ID and criteria for determining if the test result is pass or fail. The TEST ID will be referenced in the RTM and ATR. An installation test, labeled **IT-1**, will be used by the Tool Runner to confirm the version of the tool being used is running correctly before launching it with the user’s parameters.

The Unit Testing done on the tool will be documented here, also.

The test plan for the OC\_SS\_gen.exe tool is as follows.

| **Table 2. OC\_SS\_gen.exe Tool Test Plan** | | |
| --- | --- | --- |
| **TEST ID** | **Test Case** | **Test Result (Pass/Fail)** |
| IT-1 | Installation Test |  |
| Navigate to [Testing\_Directory]\compiled\_code | | |
| Compile OC\_SS\_gen.f into an executable by entering the following command:  ./runner\_compile\_OC\_SS\_gen\_olive.exe.sh | | |
| Note the following in the acceptance test report:   * [Testing\_Directory] * Code version of OC\_SS\_gen.f that was compiled * Path to executable | | |
| Navigate to [Testing\_Directory]\test\_model\ss | | |
| Enter the following command:  ./runner\_runSS\_OC.sh | | |
| ATC-1 | Check that the model name is included in the first comment in the “SS\_Output\_Control.dat” output file. |  |
| ATC-2 | Check that output file “SS\_Output\_Control.dat” was written by the OC\_SS\_gen tool. |  |
| ATC-3 | Check that reference nodes for model and quadrant centers are at the center coordinates, or as close as possible, considering that model and quadrant centers may not fall exactly on a node center. |  |
| ATC-4 | Check that the uppermost reference node at each i,j location is the top active node for that i,j location. |  |
| ATC-5 | Check that Node 1,1,1 is included as a reference node. |  |
| Check that the “Number of Reference Nodes” matches the number defined. |  |
| Check that the “Number of Reference Node Variables” matches the number defined. |  |
| Check that reference nodes are included for the model and quadrant centers for layer 1, the topmost active layer, and every layer number that is a multiple of 20 and less than the topmost active layer. |  |
| Check that the reference node variables are the expected parameters (See list in CACIE Tool #05 – Steady-State Output Card Generator Tool, Description and Purpose). |  |
| Check that there is a single plot file year at 10,000 years. |  |
| Check that the “Number of Plot File Variables” matches the number defined. |  |
| Check that the plot file variables are the expected parameters (See list in CACIE Tool #05 – Steady-State Output Card Generator Tool, Description and Purpose). |  |

1. **Acceptance Test Report**

The test report will state whether the tool is qualified for use, summarize test case results, and report all resolved incidents and resolution of unresolved incidents.

1. **User Guide**

A guide for using the tool will be documented in this section.

To run this code:

1. Copy the shell script runSS\_OC.sh from the shells directory to the ss sub‑directory for the model being processed. The ss sub‑directory must contain input.top, input.sij and input.nij.
2. Run the script using “./runSS\_OC.sh ModelName”, where the command line argument ModelName is the name of the model being processed.
3. Check that the file “SS\_Output\_Control.dat” was created in the ss sub‑directory.

See the CA/CIE Model Cookbook for more detailed instructions.