**CACIE Tool #NN** – ***Steady State STOMP Input File*** ***Generator Tool***

***SS\_input\_gen.f***

**Version** **1.0**

**QA**: **QA**

1. **Description and Purpose**

The Steady State STOMP Input File Generator Tool reads information from the following files

* CAST generated ***input*** file located in the ***…/ModelName/build*** directory;
* ***ca\_ss\_boundary\_card.dat*** file located in the ***.../ModelName/ret*** directory;
* ***SS\_Output\_Control.dat*** file in the **.*../ModelName/ss*** directory

and generates the STOMP Input file ***input\_SS*** for the steady-state simulation.

In constructing the steady state STOMP input file ***input\_SS***, the following cards are written from the ***input*** file:

Simulation Title Card;

Solution Control Card;

Grid Card;

Inactive Nodes Card;

Rock Soil Zonation Card;

Mechanical Properties Card;

Hydraulic Properties Card;

Saturation Function Card;

X-Aqueous Relative Permeability Card;

Y-Aqueous Relative Permeability Card;

Z-Aqueous Relative Permeability Card;

Initial Conditions Card;

Surface Flux Card.

The Boundary Conditions Card information is taken from the ***ca\_ss\_boundary\_card.dat*** which replaces recharge rates Boundary Conditions in the *input* file.

The Output Control Card information is written from the ***SS\_Output\_Control.dat*** which replaces Output Control Card in the *input* file.

1. **Functional Requirements**

The following are the functional requirements of the *SS\_input\_gen.f* tool:

FR-1: Open “input\_SS” as outfile1 file.

FR-2: Open “../build/input” as infile1 file

FR-3: Read infile1 and write the cards from this file into the outfile1.

FR-4: Open “../ret/ca\_ss\_boundary\_card.dat ” as infile2 file.

FR-5: Read infile2 and write the Boundary Conditions card information to the outfile1.

FR-6: Open “SS\_Output\_Control.dat” as infile3 file

FR-7: Read infile3 and write the Output Control card information to the outfile1.

1. **Software Requirements Specifications**

FORTRAN

1. **Software Design Description**

*Input Files:*

../build/input

../ret/ca\_ss\_boundary\_card.dat

ss/SS\_Output\_Control.dat

*Output file:*

ss/input\_SS

Execution:

The following is the shell script configuration that will be passed as an argument to the Tool Runner for qualified runs (this needs to be run from the directory containing the input directories specified in the input files above):

SS\_input\_gen\_linux-intel-64.exe

1. **Requirements Traceability Matrix**

Table 1 presents the requirements traceability matrix for the *SS\_input\_gen.f* tool .

| **Table 1. *SS\_input\_gen.f* Tool Requirements Traceability Matrix** | | |
| --- | --- | --- |
| **Functional Requirement ID** | **Acceptance Test ID** | **Test Case** |
| QA Level | CACIE-SS\_input\_gen.f -IT-1 | Installation Test |
| FR-1 | CACIE-SS\_input\_gen.f -TC -1  -TC -2 | Check that the output file *input\_SS* gets generated |
| FR-2  FR-3 | CACIE-SS\_input\_gen.f -TC -1  -TC -2 | Check that the following cards are written correctly to the *input\_SS* file and are identical to the information in the *../build/input f*ile:  Simulation Title Card;  Solution Control Card;  Grid Card;  Inactive Nodes Card;  Rock Soil Zonation Card;  Mechanical Properties Card;  Hydraulic Properties Card;  Saturation Function Card;  X-Aqueous Relative Permeability Card;  Y-Aqueous Relative Permeability Card;  Z-Aqueous Relative Permeability Card;  Initial Conditions Card;  Surface Flux Card. |
| FR-4  FR-5 | CACIE-SS\_input\_gen.f -TC -1  -TC -2 | Check that the Boundary Card information in the *input\_SS* card corresponds to the information in the *../ret/ ca\_ss\_boundary\_card.dat*, as well as, the addition of the bottom model boundary condition is added*.* |
| FR-6  FR-7 | CACIE-SS\_input\_gen.f -TC -1  -TC -2 | Check that the Output Control Card information in the *input\_SS* card corresponds to the information in the *ss/ SS\_Output\_Control.dat.* |

1. **Test Plan and Cases**

The installation test plan for the *SS\_input\_gen.f* tool is presented in Table 2 and the acceptance test plan for the *SS\_input\_gen.f* tool is presented in Table 3.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 2.**  ***SS\_input\_gen.f* tool Installation Test Plan** | | | |
| ***SS\_input\_gen.f Installation Testing***  **CACIE- *SS\_input\_gen.f* – IT-1** | | **Date:** | |
| **Tool Runner File Location for this test:**   * \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ c9\_pond\_test1 * \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ u\_plant\_test2 | | **Test Performed By:** | |
| **Testing Directory:** \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing | | | |
| **Test Step** | **Test Instruction** | **Expected Result** | **Test Result (Pass/Fail)** |
| **Tools Code Repository Directory**: \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools-Testing\tools\ca-modinput | | | |
| Navigate to the testing directory:   * \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ c9\_pond\_test1\ss * \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ u\_plant\_test2\ss | | | |
| 1 | Invoke Tool runner and test the tool using *runner\_create\_SS\_input\_file.sh* as follows:  *Runner\_create\_SS\_input\_file.sh* | | |
| 2 | Verify Tool Runner is invoked and executed |  |  |

| **Table 3**  ***SS\_input\_gen.f* tool Acceptance Test Plan** | | | | | |
| --- | --- | --- | --- | --- | --- |
| ***SS\_input\_gen.f Installation and Acceptance* Testing**  **CACIE- *SS\_input\_gen.f* – IT and AT-1 and 2** | | | **Date:** | | |
| **Tool Runner File Location for this test:**   * \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ c9\_pond\_test1 * \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ u\_plant\_test2 | | | **Test Performed By:** | | |
| **Testing Directory:** \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing | | | | | |
| **Test Step** | | **Test Instruction** | **Expected Result** | | **Test Result  (Pass/Fail)** |
| Tools Code Repository Directory: \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools-Testing\tools\ca-modinput | | | | | |
| Navigate to the testing directory:   * \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ c9\_pond\_test1\ss * \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ u\_plant\_test2\ss | | | | | |
| 1 | | Invoke Tool runner and test the tool using *runner\_create\_SS\_input\_file.sh* as follows:  *runner\_create\_SS\_input\_file.sh* | | | |
| 2 | | Verify Tool Runner is invoked and executed. |  | |  |
| **CACIE- *SS\_input\_gen.f* – TC-1** | | | | | |
| Navigate to the *[Testing Directory]/ c9\_pond\_test1/ss* | | | | | |
| 1 | | Copy the following files for the *C9 Pond* model into the following sub-directories in the testing directory \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ c9\_pond\_test1:  ../build/input  ../ret/ca\_ss\_boundary\_card.dat  ../ss/SS\_Output\_Control.dat  These files are neededfor the execution of the *SS\_input\_gen.f* tool. | The files are present in the specified directories. | |  |
| 2 | | Execute the *runner\_create\_SS\_input\_file.sh*. | Script executes. | |  |
| 3 | | Confirm that output file “*input\_SS*” was generated by the *SS\_input\_gen.f* tool in the ../ss directory. | The output file “*input\_SS*” is generated. | |  |
| 4 | | Confirm that the following cards are written correctly to the *input\_SS* file and are identical to the information in the *../build/input f*ile:  Simulation Title Card;  Solution Control Card;  Grid Card;  Inactive Nodes Card;  Rock Soil Zonation Card;  Mechanical Properties Card;  Hydraulic Properties Card;  Saturation Function Card;  X-Aqueous Relative Permeability Card;  Y-Aqueous Relative Permeability Card;  Z-Aqueous Relative Permeability Card;  Initial Conditions Card;  Surface Flux Card. | The information in the *input\_SS* file for the specified cards is identical to the information in the source file ‘*input*’ located in the *../build* directory. | |  |
| 5 | | Confirm that the *Boundary Conditions Card* information in the *input\_SS* card contains the information from the *../ret/ ca\_ss\_boundary\_card.dat.* There will be an additional boundary condition at the end of the *Boundary Conditions Card* corresponding to the bottom model boundary condition*.* | Information in the *Boundary Conditions Card* generated in the *input\_SS* card contains the information from the *../ret/ ca\_ss\_boundary\_card.dat* and has the addition of the bottom model boundary condition. | |  |
| 6 | | Confirm that the *Output Control Card* information in the *input\_SS* card corresponds to the information in the *ss/ SS\_Output\_Control.dat* | Information in the *Output Control Card* generated in the *input\_SS* card is identical to the information in the *ss/ SS\_Output\_Control.dat*. | |  |
| **CACIE- *SS\_input\_gen.f* – TC-2** | | | | | |
| Navigate to the *[Testing Directory]/u\_plant\_test2/ss:* | | | | | |
| 1 | Copy the following files for the U Plant  model into the following sub-directories in the testing directory \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ u\_plant\_test2:  ../build/input  ../ret/ca\_ss\_boundary\_card.dat  ../ss/SS\_Output\_Control.dat  These files are neededfor the execution of the *SS\_input\_gen.f* tool. | | The files are present in the specified directories |  | |
| 2 | Execute the *runner\_create\_SS\_input\_file.sh*. | | Script executes. |  | |
| 3 | Confirm that output file “*input\_SS*” was generated by the *SS\_input\_gen.f* tool in the ../ss directory. | | The output file “*input\_SS*” is generated. |  | |
| 4 | Confirm that the following cards are written correctly to the *input\_SS* file and are identical to the information in the *../build/input f*ile:  Simulation Title Card;  Solution Control Card;  Grid Card;  Inactive Nodes Card;  Rock Soil Zonation Card;  Mechanical Properties Card;  Hydraulic Properties Card;  Saturation Function Card;  X-Aqueous Relative Permeability Card;  Y-Aqueous Relative Permeability Card;  Z-Aqueous Relative Permeability Card;  Initial Conditions Card;  Surface Flux Card. | | The information in the *input\_SS* file for the specified cards is identical to the information in the source file ‘*input*’ located in the *../build* directory. |  | |
| 5 | Confirm that the *Boundary Conditions Card* information in the *input\_SS* card contains the information from the *../ret/ ca\_ss\_boundary\_card.dat.* There will be an additional boundary condition at the end of the *Boundary Conditions Card* corresponding to the bottom model boundary condition*.* | | Information in the *Boundary Conditions Card* generated in the *input\_SS* card contains the information from the *../ret/ ca\_ss\_boundary\_card.dat* and has the addition of the bottom model boundary condition. |  | |
| 6 | Confirm that the *Output Control Card* information in the *input\_SS* card corresponds to the information in the *ss/ SS\_Output\_Control.dat* | | Information in the *Output Control Card* generated in the *input\_SS* card is identical to the information in the *ss/ SS\_Output\_Control.dat*. |  | |

1. **Acceptance Test Report**

To complete the Acceptance Testing use Appendix A. The two test cases are described as follows:

* Acceptance Test 1 is in Table A-1. The *C9 Pond* model is used to test the *SS\_input\_gen.f* tool which generates the “*input\_SS*” file.
* Acceptance Test 2 is in Table A-2. The *U Plant* model is used to test the *SS\_input\_gen.f* tool which generates the “*input\_SS*” file.

Details of these tests, when they were conducted, by whom, and if they Passed or Failed are present in each table in Appendix A.

1. **User Guide**

To run this code:

1. You need to have the inputs in the appropriate directory structure. Specified in Section 4: Software Design Description, under input files.
2. From a linux prompt in the base directory of the input files execute the tool as specified in Section 4: software Design Description, under Execution.
3. Check that the file “*input\_SS*” was created in the *ss* subdirectory.

**Appendix A**

**Acceptance Testing Logs**

| **Table A-1**  ***SS\_input\_gen.f* tool**  **Acceptance Test Case 1** | | | |
| --- | --- | --- | --- |
| ***SS\_input\_gen.f Installation and Acceptance* Testing**  **CACIE- *SS\_input\_gen.f* – AT-1** | | **Date:** 29 January, 2020 | |
| **Tool Runner File Location for this test:**  [\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\c9\_pond\_test1](file:///\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2_SS_input_gen_Testing\c9_pond_test1) | | **Test Performed By:**  Christopher Farrow | |
| **Testing Directory:** [\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\c9\_pond\_test1\ss](file:///\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2_SS_input_gen_Testing\c9_pond_test1\ss) | | | |
| **Test Step** | **Test Instruction** | **Expected Result** | **Test Result  (Pass/Fail)** |
| Tools Code Repository Directory: [\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools-Testing\tools\ca-modinput](file:///\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools-Testing\tools\ca-modinput) | | | |
| Navigate to the testing directory:  [\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ c9\_pond\_test1\ss](file:///\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2_SS_input_gen_Testing\%20c9_pond_test1\ss) | | | |
| 1 | Copy the following files for the *C9 Pond* model into the following sub-directories in the testing directory \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ c9\_pond\_test1:  ../build/input  ../ret/ca\_ss\_boundary\_card.dat  ../ss/SS\_Output\_Control.dat  These files are neededfor the execution of the *SS\_input\_gen.f* tool. | The files are present in the specified directories. | **Pass** |
| 2 | Execute the *runner\_create\_SS\_input\_file.sh*. | Script executes. | **Pass** |
| **Screenshot of the Tool Runner executed for this test.**  Text file present in the testing directory. | | | |
| 3 | Confirm that output file “*input\_SS*” was generated by the *SS\_input\_gen.f* tool in the ../ss directory. | The output file “*input\_SS*” is generated. | **Pass** |
| 4 | Confirm that the following cards are written correctly to the *input\_SS* file and are identical to the information in the *../build/input f*ile:  Simulation Title Card;  Solution Control Card;  Grid Card;  Inactive Nodes Card;  Rock Soil Zonation Card;  Mechanical Properties Card;  Hydraulic Properties Card;  Saturation Function Card;  X-Aqueous Relative Permeability Card;  Y-Aqueous Relative Permeability Card;  Z-Aqueous Relative Permeability Card;  Initial Conditions Card;  Surface Flux Card. | The information in the *input\_SS* file for the specified cards is identical to the information in the source file ‘*input*’ located in the *../build* directory. | **Pass** |
| 5 | Confirm that the *Boundary Conditions Card* information in the *input\_SS* card contains the information from the *../ret/ ca\_ss\_boundary\_card.dat.* There will be an additional boundary condition at the end of the *Boundary Conditions Card* corresponding to the bottom model boundary condition*.* | Information in the *Boundary Conditions Card* generated in the *input\_SS* card contains the information from the *../ret/ ca\_ss\_boundary\_card.dat* and has the addition of the bottom model boundary condition. | **Pass** |
| 6 | Confirm that the Output Control Card information in the *input\_SS* file corresponds to the information in the *ss/ SS\_Output\_Control.dat.* | Information in the *Output Control Card* generated in the *input\_SS* card is identical to the information in the *ss/ SS\_Output\_Control.dat*. | **Pass** |

| **Table A-2**  ***SS\_input\_gen.f* tool**  **Acceptance Test Case 2** | | | |
| --- | --- | --- | --- |
| ***SS\_input\_gen.f Installation and Acceptance* Testing**  **CACIE- *SS\_input\_gen.f* – AT-2** | | **Date:** 29 January, 2020 | |
| **Tool Runner File Location for this test:**  [\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\u\_plant\_test2](file:///\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2_SS_input_gen_Testing\u_plant_test2) | | **Test Performed By:**  Christopher Farrow | |
| **Testing Directory:** [\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\u\_plant\_test2\ss](file:///\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2_SS_input_gen_Testing\u_plant_test2\ss) | | | |
| **Test Step** | **Test Instruction** | **Expected Result** | **Test Result  (Pass/Fail)** |
| Tools Code Repository Directory: [\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools-Testing\tools\ca-modinput](file:///\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools-Testing\tools\ca-modinput) | | | |
| Navigate to the testing directory:  [\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ u\_plant\_test2\ss](file:///\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2_SS_input_gen_Testing\%20u_plant_test2\ss) | | | |
| 1 | Copy the following files for the U Plant  model into the following sub-directories in the testing directory \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\v4-2\_SS\_input\_gen\_Testing\ u\_plant\_test2:  ../build/input  ../ret/ca\_ss\_boundary\_card.dat  ../ss/SS\_Output\_Control.dat  These files are neededfor the execution of the *SS\_input\_gen.f* tool. | The files are present in the specified directories. | **Pass** |
| 2 | Execute the *runner\_create\_SS\_input\_file.sh*. | Script executes. | **Pass** |
| **Screenshot of the Toolrunner executed for this test.**  Text file present in the testing directory. | | | |
| 3 | Confirm that output file “*input\_SS*” was generated by the *SS\_input\_gen.f* tool in the ../ss directory. | The output file “*input\_SS*” is generated. | **Pass** |
| 4 | Confirm that the following cards are written correctly to the *input\_SS* file and are identical to the information in the *../build/input f*ile:  Simulation Title Card;  Solution Control Card;  Grid Card;  Inactive Nodes Card;  Rock Soil Zonation Card;  Mechanical Properties Card;  Hydraulic Properties Card;  Saturation Function Card;  X-Aqueous Relative Permeability Card;  Y-Aqueous Relative Permeability Card;  Z-Aqueous Relative Permeability Card;  Initial Conditions Card;  Surface Flux Card. | The information in the *input\_SS* file for the specified cards is identical to the information in the source file ‘*input*’ located in the *../build* directory. | **Pass** |
| 5 | Confirm that the *Boundary Conditions Card* information in the *input\_SS* card contains the information from the *../ret/ ca\_ss\_boundary\_card.dat.* There will be an additional boundary condition at the end of the *Boundary Conditions Card* corresponding to the bottom model boundary condition*.* | Information in the *Boundary Conditions Card* generated in the *input\_SS* card contains the information from the *../ret/ ca\_ss\_boundary\_card.dat* and has the addition of the bottom model boundary condition. | **Pass** |
| 6 | Confirm that the Output Control Card information in the *input\_SS* file corresponds to the information in the *ss/ SS\_Output\_Control.dat*. file. | Information in the *Output Control Card* generated in the *input\_SS* card is identical to the information in the *ss/ SS\_Output\_Control.dat*. | **Pass** |