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Atlas Breached Waste Package and Drip Shield Experiments: Breached Drip Shield Tests

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EXECUTIVE SUMMARY

The Engineered Barrier System (EBS) represents one system in the performance of the Yucca Mountain high-level radioactive waste (HLW) repository to isolate and prevent the transport of radionuclides from the site to the accessible environment. Breached Waste Package and Drip Shield Experiments (BWPDSE) were performed at the Department of Energy's National Nuclear Security Administration Nevada Support Facility in North Las Vegas, NV in the A-1 lowbay between May 2, 2002 and July 25, 2002. Data collected from the BWPDSE will be used to support the flux splitting model used in Analysis and Modeling Report ANL-WIS-PA-000001 REV 00 ICN 03 *EBS Radionuclide Transport Abstraction* (BSC 2001a). Tests were conducted by dripping water from heights representing the drift crown or wall on a full-scale section of a drip shield with both smooth and rough surfaces. The drip shields had machined square breaches that represent the general corrosion breaches or nodes in the *WAPDEG Analysis of Waste Package and Drip Shield Degradation* AMR (CRWMS M&O 2000d). Tests conducted during the BWPDSE included: initial tests to determine the splash radius distances and spread factor from the line of drip impact, single patch tests to determine the amount of water collected in target breaches from splashing or rivulet flow, multiple patch tests to determine the amount of water collected in several breaches from both splashing and rivulet flow, and bounding flow rate tests. Supplemental data were collected to provide additional information for rivulet spread, pan evaporation in the test chamber, and water temperatures of the input water and drip shield surface water. The primary flow mechanism observed on both smooth and rough surfaces was rivulet flow, not film flow. Lateral rivulet spread distances were, in general, wider on the smooth drip shield surface than on the rough drip shield surface. There were substantial differences between the mechanisms of rivulet formation and movement on smooth and rough drip shield surfaces. Water collected in breaches was a function of the location of drip impact upstream from the target breach, i.e., impact breaches must be directly above or slightly to the side of the breaches in order for a substantial volume of water to collect in breaches. Splash droplets contributed a small portion of the water collected in breaches. Mass balances showed that evaporation from the drip shield was a large component of water loss. This was particularly manifested during low flow runs of the bounding flow rate tests where test duration was around five hours.

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ACRONYMS

AMR	analysis model report
AP	administrative procedure
BWPDSE	Breached Waste Package and Drip Shield Experiments
CRWMS	Civilian Radioactive Waste Management System
DOE	Department of Energy
DI	deionized
DS	drip shield
DTN	data tracking number
EBS	Engineered Barrier System
HLW	high-level radioactive waste
HMP	humidity moisture probe
M&TE	measuring and test equipment
QA	quality assurance
QARD	quality assurance requirements and description
RH	relative humidity
RTD	resistance temperature device
TCO	YMP Test Coordination Office
TDMS	Technical Data Management System
WP	waste package

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1. INTRODUCTION

1.1 PURPOSE AND SCOPE

Data collected from the Breached Waste Package and Drip Shield Experiments (BWPDSE) will be used to support the flux splitting model used in future revisions of the Analysis and Modeling Report (AMR) ANL-WIS-PA-000001, *EBS Radionuclide Transport Abstraction* (BSC 2001a). The purpose of the BWPDSE was to collect information on water flow paths and penetration through breaches on drip shield surfaces so that the flux splitting model can be both validated and made more complete with respect to water mass losses caused by splashing and evaporation.

The scope of this report is to document the BWPDSE by:

- Presenting test configurations and operating conditions
- Summarizing test data and providing data submittal tracking numbers
- Presenting test results

Both waste package (WP) and drip shield (DS) geometries are applicable to the flux splitting model and data generated in these tests will be used to describe seepage flux entering breaches through both DSs and WPs. A DS surface was used in these tests for simplification, and future testing to support the EBS radionuclide transport abstraction may include tests performed on WP surfaces if it is determined that such data are required.

1.2 BACKGROUND

The Engineered Barrier System (EBS) represents one system in the performance of the Yucca Mountain high-level radioactive waste (HLW) repository to isolate and prevent the transport of radionuclides from the site to the accessible environment. The primary transport mechanism for radionuclides is liquid water that may penetrate the EBS through breaches in the drip shields (DS) and waste packages (WP), which make up the components of the EBS. Water flux (represented by the letter "q") can enter the breaches via three different mechanisms: q(direct), a droplet falls directly through the patch (hole); q(film) liquid enters a breach by film or rivulet flow and; q(splash) liquid enters a breach as a result of liquid being pushed or lofted from a point of drip impact on the DS. A patch is a modeling term for a breach in the DS or WP. The flux splitting model (BSC 2001a) is conservatively based on the following assumptions:

1. Drip impact occurs without a loss of water mass from splattering and evaporation.

2. Dripping flux falls exactly at the crown of the DS. This limits the zone of impact to the horizontal surface across the DS crown and does not include the curved surface that would cause droplets to be deflected from the DS.

3. The flux passing through a DS patch is proportional to the ratio of the length of the penetration in the axial direction to the total axial length of the DS. In this assumption

all fluid that drips and flows from the DS crown toward a penetration will be collected if the axial locations of the source and patch coincide (BSC 2001a).

The current model does not consider drop mass loss and splash radius following impact. The water droplets projected during impact, in reality, may land on the DS surface in another location or be completely thrown off of the DS. Because natural processes were in effect, these experiments represented effects not considered in the current models, which were not capable of incorporating the random processes inherent in water dripping onto both dry and wetted surfaces.

Test controls included the drip seepage rate, drip impact location, breach location, and breach size. General corrosion breaches were the only breaches considered in these tests and were based on the nodes or square patches of area 0.072144 m^2 (0.2685963-m square) from the *WAPDEG Analysis of Waste Package and Drip Shield Degradation* AMR (CRWMS M&O 2000d). For testing purposes the patch size in the BWPDSE was rounded to 0.270-m square in place of the patch size (0.2685963-m square) used in CRWMS M&O 2000d. The drip shield length was constructed to 10 patch lengths, or 2.7 m. In CRWMS M&O 2000d, general corrosion patches did not appear on DSs before 10,000 years after placement, while manufacturing defects were predicted to appear after 1000 years.

Environmental conditions of interest in the BWPDSE were temperature and relative humidity (RH). The test was performed in an enclosed insulated chamber where the RH was elevated above 80%. It is important to note that these tests did not consider the effects of elevated temperature. It was not the intent to maintain test environment conditions, i.e., temperature and RH, at the expected repository environment, but conditions were maintained to provide accurate water collection.

1.3 QUALITY ASSURANCE

This technical report was prepared in accordance with Administrative Procedure (AP)-3.11Q, *Technical Reports.* The technical work plan (TWP) that governed the work for the BWPDSE was TWP-MGR-MD-000015 Rev. 2, *Technical Work Plan For: Engineered Barrier System Department Modeling and Testing FY 02 Work Activities* (BSC 2002a), which was prepared in accordance with AP-2.27Q, Rev. 0, *Quality Determination and Planning for Scientific, Engineering, and Regulatory Compliance Activities*. Specific activities for the BWPDSE, including the writing of this report, are described in *The Test Plan for: Atlas Breached Waste Package and Drip Shield Experiments,* SITP-02-EBS-005 (BSC 2002b). This activity was subject to the Quality Assurance Requirements and Description (DOE 2003) requirements.

Other quality assurance features of this testing program include:

The Field Work Package (FWP)-EBS –02-001, Engineered Barrier Systems – *Breached Waste Package and Drip Shield Testing* (YMP 2002) which defines the execution plan, facility requirements, and health and safety guidelines of the BWPDSE.

Details of the test configuration and records of the test execution were documented in scientific notebook numbers SN-M&O-SCI-043-V1, SN-M&O-SCI-043-V2, and SN-M&O-SCI-043-V3, per AP-SIII.1Q, *Scientific Notebooks* (Howard 2002a, Howard 2002b, and Howard 2002c).

All instruments were calibrated in the Bechtel Nevada calibration laboratory and calibrations were documented in scientific notebook SN-M&O-SCI-043-V1 (Howard 2002a, pp. 24-34) and SN-M&O-043-V2 (Howard 2002b, pp. 223-240).

All data were entered manually into the scientific notebook, and then entered manually into MS Word documents for submittal to the TDMS. Data were reviewed and verified in accordance with AP-2.14Q prior to being submitted to the TDMS. Because the data were entered manually into the scientific notebook and then submitted to the TDMS via MS Word documents, the only AP-SV.1Q controls listed in the TWP that applied were those outlining personal computer security and a regular back up of test files. These controls were in place during the BWPDSE.

The only software utilized during the BWPDSE was MS Excel '97 for performing calculations and making data plots. All formulas, inputs and outputs are documented and this software is, therefore, exempt from the requirements of AP-SI.1Q per AP-3.11Q Sec. 5.1.3e.

During the BWPDSE, BSC QA conducted a surveillance (Krisha 2002) and found the testing to be programmatically compliant. No conditions adverse to quality were identified.

1.4 EBS BREACHED DRIP SHIELD TEST DESCRIPTION

The BWPDSE was conducted at the Department of Energy's National Nuclear Security Administration Nevada Support Facility in North Las Vegas, NV in the A-1 lowbay between May 2, 2002 and July 25, 2002. Testing was performed by dripping water on smooth and rough DS surfaces with cut square breaches (0.270-m square). Water was dripped on the DS surfaces at nominal rates of 2 m^3/yr (3.8 g/min), 0.2 m^3/yr (0.38 g/min), and 20 m^3/yr (38 g/min) and allowed to collect in breaches or gutters placed on the DS boundaries. Following each test, the collected water was weighed at each station and a mass balance performed. Before tests were conducted, initial tests were performed to determine splash distances after drop impact and lateral rivulet spread from the line of impact. In some of the initial tests Blue #1 food coloring was used in the drip water in order to make rivulets and splashes more visible on the drip shield surface. This practice was used sparingly during the initial tests and was not used during the formal testing because the food coloring stained the DS surface, making it necessary to thoroughly clean the DS surface before the next test run. The measurements taken during the initial tests were used to select drip impact locations for formal tests. All tests were performed at full-scale with respect to drop distance and DS curvature.

2. TEST CONFIGURATION

2.1 TEST DESIGN CRITERIA

The following criteria applied to the test design:

1. DS breaches represent square general corrosion patches of area 0.072144 m^2 (0.2685963 by 0.2685963 m), based on the AMR ANL-EBS-PA-000001 REV 00 ICN 01 WAPDEG *Analysis of Waste Package and Drip Shield Degradation* (CRWMS M&O 2000d). Actual breaches used in the BWPDSE were machined (or cut) into the DS with dimensions of 0.270 by 0.270 m.

2. The WP diameter (1.564 m) used in the BWPDSE represents those of the 21 PWR WP (CRWMS M&O 2000b). The WP diameter is the WP footprint beneath the DS and represents the seepage area over the DS as illustrated in Figure 1.

3. The dripping distance was based on AMR design parameters, and thus drip velocity was represented on a full scale. The EBS/repository design parameters and values used in the BWPDSE, including reference to full DS dimensions, are listed in Table 1. Based on the values listed in Table 1, the distance from the top of the drift to the crown of the DS is 2.173 m. Drip impact locations were positioned along lateral lines at the crown, 33^o along the DS curvature, and 16.5^o along the DS curvature (see Figure 1).

4. The nominal seepage drip rate was based on an average of the seepage flux rates expected in the repository (BSC 2001b). It is assumed that the DS will intercept all seepage flux entering the drift and for the purposes of these tests, seepage flux was represented as drips per unit time per unit area of DS above the waste package (WP) footprint. A nominal seepage rate of 2 m^3/yr was used in the q(splash) and q(film) tests, while bounding rates of 0.2m^3/yr and 20m^3/yr were used during the bounding flow rate tests.

5. The condition of DS surfaces during the time they are not expected to fail (i.e., 1000 years for manufacturing defects and 10,000 years for general corrosion) was difficult to predict and replicate. Two different surfaces were tested: a standard machined stainless steel surface (the most conservative condition), and a rough surface that only approximated DS conditions expected to exist during DS failure. Both surface conditioning processes can be replicated.

6. The tests were conducted in an environment that would minimize evaporation, but not necessarily simulate repository conditions. This was achieved by conducting the tests in an insulated test chamber. During formal testing (not including all initial tests), the relative humidity (RH) in the chamber was maintained above 80%. The test chamber temperature was not directly controlled during testing, but was monitored.

2.2 DRIP SHIELD MATERIALS AND SURFACE CONDITIONS

The DS was constructed of ¼ inch stainless steel and supported by an aluminum frame. For purposes of the BWPDSE, a full-scale section of DS was used in place of a complete DS. The DS section design was based on the full DS dimensions outlined in Table 1. The DS was 2.7-m long, 1.27-m wide, and 1.62-m high. A diagram of the drip shield with dimensions and patch (breach) locations is shown in Figure 2 and a picture of the DS and frame can be viewed in Figure 3 (Howard 2002a, p. 14 and p. 16). The smooth DS surface was formed by polishing the stock stainless steel with 60-grit sandpaper on a circular sander. A close-up photograph of the stainless steal DS surface is shown in Figure 4. The rough surface was formed by covering the stainless steel DS surface with a silica anti-slip coating (Howard 2002b, p. 70). A picture of the rough DS can be viewed in Figure 5 and a picture of the texture can be viewed in Figure 6.

2.3 TEST CHAMBER DESIGN AND INSTRUMENTATION

The test chamber was constructed from standard metal framing material and plywood. The chamber was insulated with R-5.7 rated insulation all sides and ceiling (Howard 2002c, p. 113). The test chamber dimensions were 3.66-m long, 2.74-m wide, and 2.44-m high (Figure 7). Water vapor was introduced into the chamber with the use of commercial humidifiers. Initially two humidifiers were used. A third humidifier was added before the q(film) tests (see Section 2.1.6) on the smooth DS for the purpose of increasing the RH at a faster rate and maintaining a higher RH in the chamber. During testing the RH was maintained at 80% or higher. A ventilation fan was used during testing to circulate air around the test chamber. Figure 7 shows a diagram of the test chamber with locations of humidifiers, the ventilation fan, and monitoring instrumentation. Test chamber instrumentation is listed with all testing M&TE in Appendix A. The test chamber ceiling had three slots positioned along the length of the chamber ceiling to allow water drips to fall on the DS crown, the 16.5^{o} line, and the 33^{o} line. The slots were covered during testing with a 1.5-in styrofoam sheet, except for one of the many pre-cut access holes where the drip tower (see Section 2.4.1) was located. The test chamber environment data were collected before and after each test and recorded by hand on data collection sheets that were entered into the scientific notebook.

2.4 WATER INJECTION AND COLLECTION SYSTEMS

2.4.1 Water Injection

Water drips were introduced into the test environment by injecting water through an aquarium diffuser using a metering pump. The aquarium diffuser is a porous medium that allows water drops to collect slowly and fall after enough mass has collected to break the surface tension. A test performed to measure the droplet mass from an aquarium diffuser resulted in a mean mass of 0.141 grams (Howard 2002b, pp. 4-6). This method was used because it is similar to the processes that occur when water droplets collect and fall from the drift crown. The diffuser was mounted in a clear PVC tube (drip tower) and was adjusted to three different heights during the tests, which represent the drip distances between the DS surface at the crown, 16.5^{o}, and 33^{o} and

the corresponding position on the drift wall (see Figure 1). Figure 8 presents a photograph of the drip tower showing the three possible drip positions at 2.17-m (crown), 2.22-m (16.5°), and 2.31-m (33°) (Howard 2002a, p. 36). The drip tower was movable and was positioned over the designated impact location through the one of the three slots in the test chamber ceiling.

The input water rate was measured by weighing the initial and final water masses over the test time duration. Test duration times were measured with a stopwatch from the time the first drop impacted the drip shield to the time when the metering pump was shut off.

2.4.2 Water Collection System

Water that was dripped over the DS surface was collected at various stations that constituted water passing through breaches, water passing around breaches and running off the DS, water splashing over the edge of the DS boundary, and residual water that adhered to the DS surface. Water that ran into breaches was collected in pans that were mounted on the inside of the DS. Paper towels were placed inside the collection pans to prevent water from splashing out of the pan and to direct water into the pan from the breach inside edges. Water that passed by breaches and off the DS surface collected in gutters mounted to the front and back of the DS. Water that splashed off the front, back, and sides of the DS was caught and directed into the same collection gutters used to collect runoff. Residual water that remained on the DS surface was wiped up with pre-weighed lint-less paper towels. Diagrams of the gutters and splash shields mounted on the DS are shown in Figure 9. Six breaches and four gutters were used during the tests. The numbering system for the breaches is shown in Figure 4 and the numbering system for the gutters and splash shields is shown in Figure 9.

Water was collected from the gutters and splash shields in the same manner as it was collected from the DS surface. Water was wiped up with pre-weighed lint-less paper towels from gutters and splash shields, then weighed to determine the net moisture picked up by the towels. Water mass collected through breaches was determined by pre-weighing the collection pans then weighing them again following each test. The water masses collected at each station (i.e., breaches 1-6, gutters 1-4, and splash shields 1-4) were recorded by hand on data sheets then attached in the scientific notebook.

In the course of the testing it became evident that exposed towels could exchange moisture mass with the test chamber air for a net mass gain or loss. In order to provide data on the possible mass change for exposed towels, a reference towel was used in tests starting with the single patch tests for the rough DS surface. These data were applied only to the towels used to prevent splashing in the breach collection pans because the towels used to swab water from the DS, gutters, and splash shields were either weighed shortly before use or placed in pre-weighed sealed containers before and after use.

2.5 SUPPORTING MEASUREMENTS

Supporting measurements were those additional measurements that did not contribute directly to the collection of water, but provided additional data to add to the understanding of water pathways, in the form of rivulet flow and evaporation from the DS surface. These additional

measurements include pan evaporation, water temperature, and rivulet spread. These measurements were not taken during every test, but enough measurements were taken to provide sufficient data to understand these processes.

2.5.1 Pan Evaporation Measurements

Evaporation in the test chamber was measured during tests with a 20.3-cm by 20.3-cm square plastic pan. The procedure used was to fill the pan with enough water to just cover the bottom then weigh the pan and water before and after the test. The pan was weighed without water to get a tare weight of 67.7 grams (Howard 2002a, p. 70). The evaporation pan data is not a direct representation of evaporation from the DS surface because of the differences between the exposed water surface area on the DS surface and the pan. The evaporation pan data is used as a general reference for the evaporation potential inherent under chamber conditions.

2.5.2 Rivulet Spread Measurements

Rivulet spread measurements were taken as a part of the initial tests on the smooth and rough DS surfaces to provide data for determining the impact locations for the formal testing. The practice of measuring the maximum and minimum rivulet spread was made a part of the data collection routine during the single patch q(film) tests on the smooth DS surface. Measurements were performed with a commercial ruler or tape measure from the axial line of drip impact down the face of the DS. The convention for measurement direction was positive to the DS right and negative to the DS left when facing the DS front. Measurements were recorded to the nearest 0.5-cm.

2.5.3 Water Temperature Measurements

Water temperature measurements were taken during the final week of bounding flow rate tests on the rough DS. The four types of temperature measurements taken were input water, DS beaker water, DS surface water, and air temperature. Descriptions of these measurements are provided in Table 3. The primary objective of these measurements was to collect water temperature data to aid in the understanding of water evaporation from the DS surface.

2.6 INSTRUMENT ACCURACY AND ERROR

Instrument accuracies for the BWPDSE are listed in Table 2 and are stated in the initial entry of the scientific notebook SN-M&O-SCI-043-V1 (Howard 2002a, p. 5). Instrument unique identifiers and their calibration status can be found in the scientific notebook and in Appendix A of this report.

There were two different analytical balance models used during the tests, each model having a different specification for accuracy. The model used to weigh input water was the same or less accurate than the balance used to weigh collection water. In this scenario, the mass balances test

data (see Appendix B) are limited in accuracy by the less accurate model (or input mass). Because of this limitation, the accuracy for the less accurate model was used as the standard for water masses during the test and the mass balance data reported in Appendix B of this report has been truncated to reflect this.

3. TEST MATRIX

The tests conducted during the BWPDSE on both smooth and rough DS surfaces include initial (or preliminary) splash radius (drip splash) and spread factor, single patch q(splash), single patch q(film), and multiple patch tests. The test descriptions and geometries are presented in the following sections. A list of the tests conducted for the BWPDSE is provided in Table 4.

3.1 INITIAL TESTS

3.1.1 Initial Splash Radius Tests on the Smooth DS Surface

The objective of the splash radius tests was to determine the splash distance from the point of drip impact. The two measurements of interest from the splash radius tests are: 1) the radius of the bulk or cluster of splash droplets that accumulate around the impact point, and 2) the farthest drip splash thrown from the impact point which is referred to as the fringe. The data in these tests were used to set the impact point distance from the patch (breach) center in the single patch q(splash) tests. Two splash radius tests were conducted on the smooth DS surface.

3.1.1.1 Splash Radius Test #1 – Smooth DS

Splash radius test #1 was performed by dripping deionized (DI) water on the DS crown at a location of 27 cm from the DS centerline as illustrated in Figure 10 (The DS centerline is centered on Patch 6). The drops were counted and the drip radius measurements were taken at regular intervals during the test. Drip measurements were taken along three axes at 0°, 90°, and 180° (see Figure 10). The distance from the drip injection point to the impact point was 2.17 m. The patch located at the crown was covered to prevent water from entering. Relative humidity, temperature, and barometric pressure were measured inside and outside of the test chamber before and after the test.

3.1.1.2 Splash Radius Test #2 – Smooth DS

Splash radius test #2 was performed by dripping DI water with Blue #1 food coloring on the DS centerline at 33° from the crown as illustrated in Figure 11. The drops were counted and the drip radius measurements were taken at regular intervals during the test. Measurements were reported to the nearest whole cm. Drip measurements were taken along three axes at 0, 180, and 270 degrees (see Figure 11). The distance from the drip injection point to the impact point was 2.31 m. Patch #2 was covered to prevent water from entering. Relative humidity, temperature, and barometric pressure were measured inside and outside of the test chamber before and after the test.

3.1.2 Initial Spread Factor Tests on the Smooth DS Surface

The objective of the spread factor tests was to determine the lateral rivulet spread distance from the drip impact point. The data collected in these tests was used to set the impact point distance from the patch (breach) center in the single patch q(film) tests.

3.1.2.1 Spread Factor Test #1 – Smooth DS

Spread factor test #1 was performed by dripping DI water on the DS Crown at a location of 27 cm from the DS centerline as illustrated in Figure 12. The drops were counted and rivulet spread measurements were taken at regular intervals during the test. The pump was stopped to take measurements. The distances from the line of impact on the DS surface to the rivulets were measured at 33^{o}, the transition between the vertical and curved sections, and at the top of the patches on the vertical section. The distance from the drip injection point to the impact point was 2.17 m. The breaches located at the crown (breach 6) and at the vertical center position (breach 2) were covered to prevent water from entering (see Figure 12). Relative humidity, temperature, and barometric pressure were measured inside and outside of the test chamber before and after the test.

3.1.2.2 Spread Factor Test #2 – Smooth DS

Spread factor test #2 was performed by dripping DI water with Blue #1 food coloring on the DS crown at a location of 27 cm from the DS centerline. The test geometry and method used to measure rivulet spread was the same as spread factor test #1 (see Figure 12).

3.1.2.3 Spread Factor Test #3 – Smooth DS

Spread factor test #3 was performed by dripping DI water with Blue #1 food coloring on the DS crown at a location of 27 cm from the DS centerline. The drops were allowed to accumulate on the DS surface and form rivulets without stopping the pump. After a period of time when several rivulets had formed, the pump was shut off and the rivulet spread was measured for each rivulet that remained on the DS. The measurement convention was positive for rivulets to the right of the drip impact center and negative for rivulets to the left. The distances from the line of impact to the rivulets were measured at 33^{o}, the transition between the vertical and curved sections, and at the top of the patches on the vertical section. The distance from the drip injection point to the impact point was 2.17 m. The breaches located at the crown (breach 6) and at the vertical center position (breach 2) were covered to prevent water from entering. The geometry was the same as that used in spread factor test #1 (see Figure 12). Relative humidity, temperature, and barometric pressure were measured inside and outside of the test chamber before and after the test.

3.1.2.4 Spread Factor Test #4 – Smooth DS

Spread Factor Test #4 was performed by dripping DI water with blue #1 food coloring on the DS centerline at 33^{o} as illustrated in Figure 13. The method used to collect measurements was the

same as spread factor test #3. The distance from the drip injection point to the impact point was 2.31 m. The breaches located at the crown (breach 6) and at the vertical center position (breach 2) were covered to prevent water from entering (see Figure 13). Relative humidity, temperature, and barometric pressure were measured inside and outside of the test chamber before and after the test.

3.1.3 Initial Splash Radius Tests on the Rough DS Surface

Splash radius tests were conducted on the rough DS surface with the same method as those conducted on the smooth DS surface, however, the test matrix was modified to provide more data that represents characteristics of the rough surface. Three test drip impact locations were tested on the rough DS surface at the crown, 16.5°, and 33°. Because the rough DS surface reacted differently than the smooth surface, three replicate tests were performed at the crown drip impact location. The data in these tests were used to set the impact point distance from the patch (breach) center in the single patch q(splash) tests.

3.1.3.1 Splash Radius Tests #1 - #3 – Rough DS

Splash radius tests #1 through #3 on the rough DS surface were performed in the same manner as splash radius test #1 conducted on the smooth DS surface. DI water was dripped on the DS crown at a location of 27 cm left of the DS centerline as illustrated. The methods and geometry were the same as splash radius test #1 on the smooth DS surface, with the exception that the drip impact location was located to the left of DS center instead of the right as illustrated in Figure 9.

3.1.3.2 Splash Radius Tests #4 and #5 – Rough DS

Splash radius tests #4 and #5 on the rough DS surface were performed by dripping DI water at a location of 27 cm from the DS centerline at 33° and 16.5°, respectively. The method was the same as that used in splash radius tests #1 - #3. The geometry for tests #4 and #5 differ with drip impact points located at 33° (2.31-m drop distance) and 16.5° (2.22-m drop distance).

3.1.4 Initial Spread Factor Tests on the Rough DS Surface

Spread factor tests were conducted on the rough DS surface with the same method as those conducted on the smooth DS surface. Three drip impact locations were tested on the rough DS surface at the crown, 16.5°, and 33°. Spread factor tests #1, #2, and #3 on the rough DS surface were performed by dripping DI water at a location of 27 cm left of the DS centerline at 16.5°, 33°, and the crown, respectively. The drops were allowed to accumulate on the DS surface and form rivulets without stopping the pump. After a period of time when several rivulets had formed, the pump was shut off and the rivulet spread was measured for each rivulet that remained on the DS. The measurement convention was positive for rivulets to the right of the drip impact center and negative for rivulets to the left. The distances from the line of impact to the rivulets were measured at 33°, the transition between the vertical and curved sections, and at the top of the patches on the vertical section.

3.2 SINGLE PATCH q(SPLASH) TESTS

The objective of the single patch q(splash) tests was to collect splash droplets only (excluding rivulets flow) that entered target breaches 4, 5, and 6 while water was dripped onto the DS section at a impact point within the bulk radius of splash determined in the splash radius tests. The single patch q(splash) tests were performed by dripping DI water on the DS at a locations determined during the initial splash radius tests for a period long enough to allow a sufficient collection of water in the breaches of interest. Breach 2 was covered to prevent water entry (see Figures 14 and 15). Relative humidity, temperature, and barometric pressure were measured inside and outside of the test chamber before and after the tests.

3.2.1 Single Patch q(splash)Tests on the Smooth DS Surface

The drip impact locations for the single patch q(splash) tests conducted on the smooth DS surface are listed in Table 5 and test geometry is illustrated in Figure 14.

3.2.2 Single Patch q(splash) Tests on the Rough DS Surface

The drip impact locations for the single patch q(splash) tests conducted on the rough DS surface are listed in Table 6 and test geometry is illustrated in Figure 15. It was evident during q(splash) tests on the smooth surface that the splash area patterns resulting from some drip locations did not meet the test objective to allow only splashes (excluding rivulet flow) to enter target breaches 4, 5, and 6 (see Section 3.2). For this reason, the number of drip locations was reduced for the single patch q(splash) tests on the rough DS based on observation and test results from the q(splash) tests on the smooth DS.

3.3 SINGLE PATCH q(FILM) TESTS

The objective of the Single Patch q(film) tests was to collect rivulet flows that entered patches 2, 4, and 5 while water was dripped onto the DS section at an impact point within the rivulet spread range determined in the spread factor tests. The single patch q(film) tests were performed by dripping DI water on the DS at locations determined during the initial spread factor tests for a period long enough to allow a sufficient collection of water in the patches of interest. Breaches 1, 3, and 6 were covered to prevent water entry during the smooth DS tests (see Figure 16). No breaches were covered during tests performed on the rough DS surface because the collection of water in the additional breaches did not interfere with target breach collection and additional splash data could be obtained in breach 6 (see Figure 17). Relative humidity, temperature, and barometric pressure were measured inside and outside of the test chamber before and after the test. The single patch q(film) tests were also referred to as rivulet flow tests.

3.3.1 Single Patch q(film) Tests on the Smooth DS Surface

The drip impact locations for the single patch q(film) tests conducted on the smooth DS surface are listed in Table 7 and test geometry is illustrated in Figure 16.

3.3.1 Single Patch q(film) Tests on the Rough DS Surface

The drip impact locations for the single patch q(film) tests conducted on the rough DS surface are listed in Table 8 and test geometry is illustrated in Figure 17.

3.4 MULTIPLE PATCH TESTS

The objective of the multiple patch tests was to collect both splash and rivulet flows that entered all affected patches while water was dripped onto the DS section at regular impact points along the DS axis. Multiple patch tests on the smooth and rough DS surfaces were performed by dripping DI water on the DS at locations shown listed in Table 9 and shown in Figure 18. The drip impact locations in Table 9 and Figure 18 apply to tests on the smooth and rough DS surfaces.

3.5 BOUNDING FLOW RATE TESTS

The objective of these tests was to provide data for the extreme drift seepage conditions to compare with test data performed at the nominal 2.0 m^3/yr rate during the single and multiple patch tests. The bounding flow rate tests were carried out at seepage rates of 0.2 m^3/yr and 20 m^3/yr. The bounding flow rate tests on the smooth and rough DS surfaces were performed by dripping DI water on the DS at locations listed in Table 10, which represent nine of the drip impact locations used in the multiple patch tests (see Figure 18). The low flow rate (0.2 m^3/yr – nominal) tests were performed for approximately five hours for each location, while the high flow rate (20 m^3/yr – nominal) were performed for approximately10 minutes. The drip impact locations in Table 10 apply to tests on the smooth and rough DS surfaces.

4. TEST DATA

4.1 BWPDSE TEST DATA TRACKING NUMBERS

Data submittals outlined in this section represent data generated during the BWPDSE and logged in the scientific notebooks (Howard 2002a and Howard 2002b). Test data tracking numbers (DTNs) and titles for the BWPDSE are listed below:

Atlas Breached Waste Package and Drip Shield Experiments: Initial Tests for Rough Drip Shield Surface, DTN: MO0207EBSATBWP.021
Period: 6/26/2002 to 6/28/2002

Atlas Breached Waste Package and Drip Shield Experiments: Initial Tests for Smooth Drip Shield Surface, DTN: MO0207EBSATBWP.022
Period: 5/13/2002 to 5/15/2002

Atlas Breached Waste Package and Drip Shield Experiments: Single Patch q(splash) and q(film) Tests on the Smooth Drip Shield Surface, DTN: MO0207EBSATBWP.023
Period: 5/16/2002 to 6/1/2002

Atlas Breached Waste Package and Drip Shield Experiments: Multiple Patch Tests for Smooth Drip Shield Surface, DTN: MO0207EBSATBWP.024
Period: 6/3/2002 to 6/14/2002

Atlas Breached Waste Package and Drip Shield Experiments: Bounding Flow Rate Tests on the Smooth Drip Shield Surface, DTN: MO0207EBSATBWP.025
Period: 6/14/2002 to 6/24/2002

Atlas Breached Waste Package and Drip Shield Experiments: Single Patch q(splash) and q(film) Tests on the Rough Drip Shield Surface, DTN: MO0208EBSATBWP.026
Period: 7/11/2002 to 7/16/2002

Atlas Breached Waste Package and Drip Shield Experiments: Multiple Patch Tests on the Rough Drip Shield Surface, DTN: MO0208EBSATBWP.027
Period: 6/28/2002 to 7/25/2002

Atlas Breached Waste Package and Drip Shield Experiments: Bounding Flow Rate Tests on the Rough Drip Shield Surface, DTN: MO0208EBSATBWP.028
Period: 7/16/2002

4.2 BWPDSE TEST OBSERVATIONS AND DATA ANALYSIS

4.2.1 Initial Test Observations

The purpose of this section is to summarize the observations of the initial tests performed on the smooth and rough DS surfaces. Observations were particularly made with respect to droplet formation and rivulet spread in the splash radius and spread factor tests. Droplet formation for the smooth and rough DS surfaces was documented in photos for some of the initial tests. (Howard 2002a and Howard 2002b).

4.2.1.1 Observations during Initial Tests Performed on the Smooth DS Surface

An example of water droplet formation is presented in a photograph from splash radius test #1 in Figure 19. Beads formed and increased in size around the center of impact with each successive drop. After a time, the beads closest to the downhill curvature would reach a critical mass and roll down the face of the drip shield in the form of a rivulet. Droplet splashing was observed on the crown as well as the curved drip shield surface within the tested seepage area (above the 33^{o} line). No film flow was observed during tests on the smooth DS surface.

The maximum lateral splash radius observed in splash radius test #1 was 72.5 cm after 60 drops. As a comparison, the longest lateral splash distance observed in spread factor test #2 was 71.0 cm after 478 drops. To determine the distance to be used in the q(splash) tests, a value of 70.0 cm was multiplied by 0.25 for a final distance of 17.5 cm, which falls within the cluster values observed in the splash test observations after sufficient mass had been deposited on the DS surface to allow regular splashing from impact on water droplets.

When water was dripped at the crown, the rivulet flow area spreads out in a delta formation, meaning maximum spread was located on the vertical section of the DS and the minimum spread was located at the point of impact. The delta formation spread was less for drip impact locations on the 33^{o} line. Spread distances, distance from the patch/breach center, used during the single patch q(film) tests for breaches 2, 4, and 5 were based on spread distances measured during impact on the crown. The spread distances used for the single patch tests on the smooth DS surface were: breach 2, 15 cm from patch center; breach 4, 8.0 cm from patch center; and breach 5, 4.0 cm from patch center.

4.2.1.2 Observations during Initial Tests Performed on the Rough DS Surface

On the rough DS surface water beads formed from splashing would lead to the formation of small pools with constant dripping. A large pool would form around the drip impact center and spread. A photograph showing water pooling around the impact center is provided in Figure 20. Rivulet flow began much later on the rough DS surface after the pools grew large enough to reach the DS slope, causing the pools to drain down the DS face. As observed on the smooth drip shield surface, droplet splashing occurred on the curved section within the tested seepage area (above the 33^{o} line). Film flow was not observed during the tests on the rough DS surface.

The maximum lateral (0^o or right) bulk splash radius was observed in splash test #1 at 48.0 cm after 203 drops. The distance used in the q(splash) tests was determined by multiplying a value of 40.0 cm by 0.5 for a final distance of 20 cm. This final distance falls within the cluster values observed in the splash test observations after sufficient mass had been deposited on the DS surface to allow regular splashing from impact on water droplets. The splash radius on the rough DS was less than on the smooth DS surface. The outer splashes on the fringe tended to be smaller and less frequent than the fringe splashes on the smooth DS surface.

The spread factor distances used in the q(film) flow tests were designed to allow either all or a portion of the rivulets formed up gradient to enter at breaches 2, 4, and 5. The rivulet spread distances from the drip centerline were much less on the rough DS surface than on the smooth DS. In many cases, rivulets flowed straight down the face of the drip shield with little lateral deviation. In addition, established flow paths were maintained, meaning there was a continuous flow of water in some rivulets. The impact points for the rough DS tests were set at 13.5 cm from the patch centers, or along the edge, for Patches 2, 3, and 4.

4.2.2 Test Data Analysis

Data from the single patch tests, multiple patch tests, and bounding flow rate tests were analyzed by performing a mass balance. As a part of the analysis the percentages were determined for water collected in each station as a function of the total input. Seepage rate, pan evaporation, and reference towel data were included as references. These data are listed in Appendix B with the test chamber environment conditions. A complete representation of the data is found in the TDMS submittals (see Section 4.1). The values listed in Appendix B have been truncated to the number of significant figures representing the instrument error of the weighing balance (see Section 2.6). Losses determined in the mass balances ranged from around 7% to the mid 50% range. The highest losses were observed during the low flow runs of the bounding flow rate tests. Most of the losses ranged from around 10% to 30%. Losses in the mass balance can be attributed mainly to evaporation of water droplets from the DS surface and other collection surfaces (gutters and splash shields) with some loss attributed to the limitation of the collection procedure, i.e., collecting water by swabbing the DS and collection surfaces. In general, more losses were observed on the rough DS surface over the smooth DS surface. The water collection process, i.e., swabbing water from the DS surface, may have had a greater impact on experimental error than the weighing process. The greater losses observed on the rough DS surface can most likely be attributed to the added difficulty of swabbing water from the roughened texture.

4.2.3 Rivulet Spread Data

The rivulet spread from the impact centerline was measured for a number of tests (see Section 2.5.2). These data are listed in Appendix C. Rivulet spread ranged from 0 to around 45 cm from the drip impact line. In general the smooth DS surface produced a wider spread over the rough DS surface. In many cases on the rough DS, surface rivulet flow would start in a few main rivulets then maintain flow through those rivulets through the duration of the test. The smooth DS surface produced several variable flow paths during the single test.

4.2.4 Water Temperature Data

Water temperature data were collected for the input water and the DS surface water during the last week of testing (see Section 2.5.3). These data are listed in Appendix D. The primary objective of these data was to aid in the understanding of evaporation from the DS surface. The DS surface water temperatures matched the air temperature (within tenths of a ^{o}C) and the DS beaker and input waters were generally lower than the air and DS surface water temperatures.

5. CONCLUSIONS

The purpose of the BWPDSE was to provide data to support the validation and further development of the flux splitting model used in the *EBS Radionuclide Transport Abstraction* (BSC 2001a). The data gathered in these tests represent the possible flow paths that affect the entry of water through corrosion breaches on both smooth and rough DS surfaces. These data were limited by the instrument error information provided in Section 2.6. Uncertainties in the data were based primarily on limitations of the collection process, which was performed by swabbing up water from the DS surfaces, gutters, and splash shields. The differences in the water mass collection and seepage input (see Appendix B) can be attributed primarily to evaporation from the DS and other collection surfaces. The evaporation process from beaded water droplets on flat surfaces was much greater than the measured pan evaporation. It was evident from the bounding flow rate data that evaporation losses were greater when the test time was lengthened. Evaporation processes played a substantial role in water losses during the BWPDSE and should be investigated further. The following items summarize the conclusions of the BWPDSE:

- The primary flow mechanism on both smooth and rough surfaces was rivulet flow, not film flow.

- Lateral rivulet spread distances were, in general, wider on the smooth DS surface than on the rough DS surface.

- There were substantial differences between the mechanisms of rivulet formation and movement on smooth and rough DS surfaces.

- Water collected in breaches was a function of the location of drip impact upstream from the target breach, i.e., impact location must be directly above or slightly to the side of the breach in order for a substantial volume of water to collect in breach.

- Splash droplets contribute a small portion of the water collected in breaches.

- Mass balances showed that evaporation from the DS was a large component of water loss. This was particularly manifested during low flow runs of the bounding flow rate tests where test duration was around 5 hours.

- Mass balances were affected to some degree by the water collection process. This was manifested in the losses observed between tests conducted on the smooth and rough DS surfaces.

6. AKNOWLEDGMENTS

The Breached Waste Package and Drip Shield Experiments were performed with help from the Engineered Barrier Systems test team. Cliff Howard was the responsible manager. Norm Kramer managed procurements, data submittals, and quality issues. Hemendra Kalia coordinated use of the North Las Vegas facility and construction support. Roy Johnston managed the day-to-day construction and test operations. John Del Mar performed many of tests and provided data analysis support. Neva Mason provided reference and technical reviews. Sandra Dalvit Dunn provided procedural guidance and technical reviews. Linda Croom assisted in the assembly and review of the document. Fred Homuth and Troy Williams of the TCO provided technical advice and instrumentation.

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7.2 CODES, STANDARDS, REGULATIONS, AND PROCEDURES

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AP-SV.1Q, Rev. 0, ICN 3. *Control of the Electronic Management of Information*. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.20020917.0133

7.3 OUTPUT DATA

MO0207EBSATBWP.021. *Atlas Breached Waste Package and Drip Shield Experiments: Initial Tests for Rough Drip Shield Surface.* Submittal date: July 31, 2002.

MO0207EBSATBWP.022. *Atlas Breached Waste Package and Drip Shield Experiments: Initial Tests for Smooth Drip Shield Surface*. Submittal data: July 31, 2002

MO0207EBSATBWP.023. *Atlas Breached Waste Package and Drip Shield Experiments: Single Patch q(splash) and q(film) Tests on the Smooth Drip Shield Surface*. Submittal data: July 31, 2002.

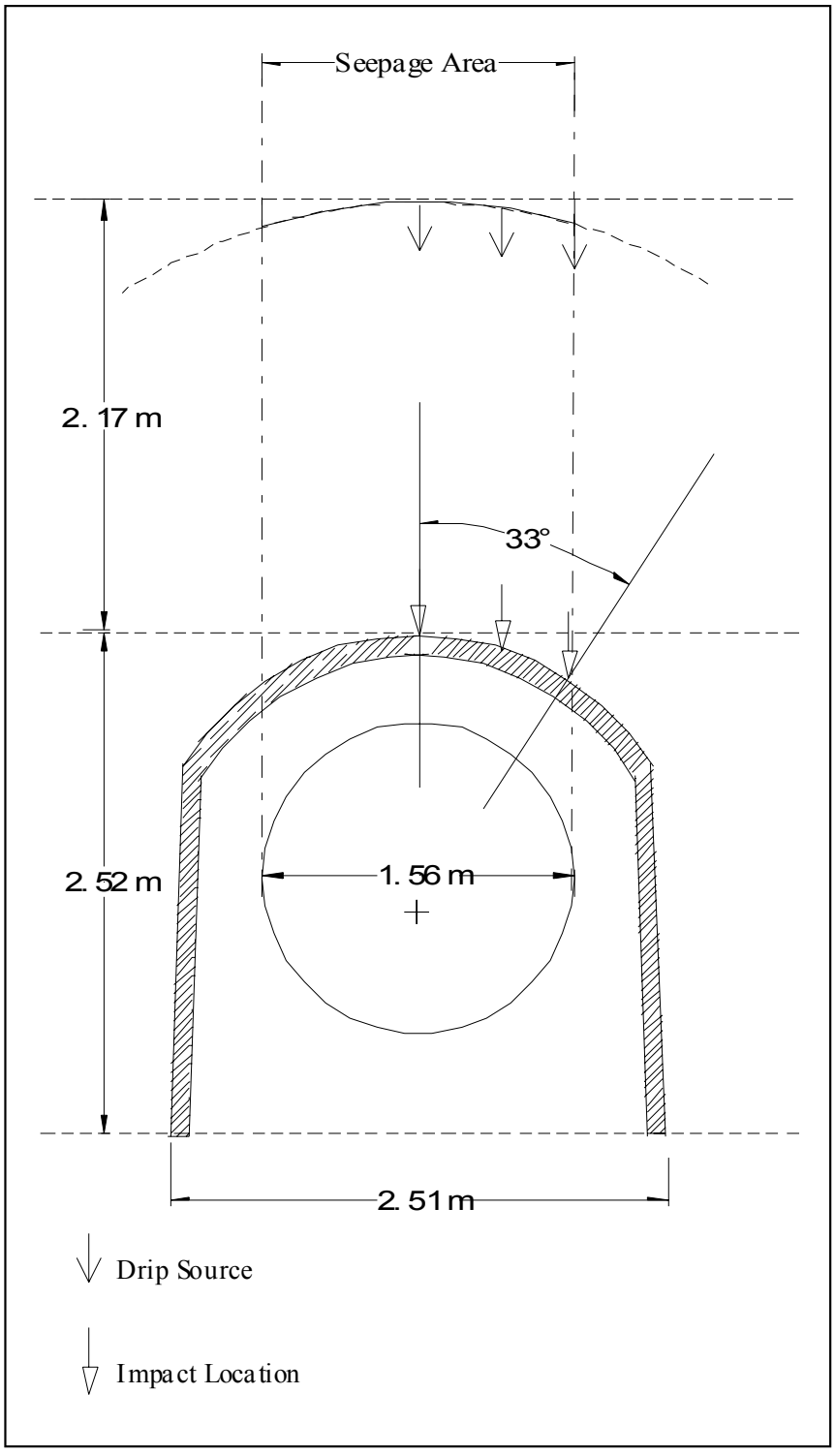
MO0207EBSATBWP.024. *Atlas Breached Waste Package and Drip Shield Experiments: Multiple Patch Tests for Smooth Drip Shield Surface*. Submittal data: July 31, 2002.

MO0207EBSATBWP.025. *Atlas Breached Waste Package and Drip Shield Experiments: Bounding Flow Rate Tests on the Smooth Drip Shield Surface*. Submittal data: July 31, 2002.

MO0208EBSATBWP.026. *Atlas Breached Waste Package and Drip Shield Experiments: Single Patch q(splash) and q(film) Tests on the Rough Drip Shield Surface*. Submittal data: August 13, 2002.

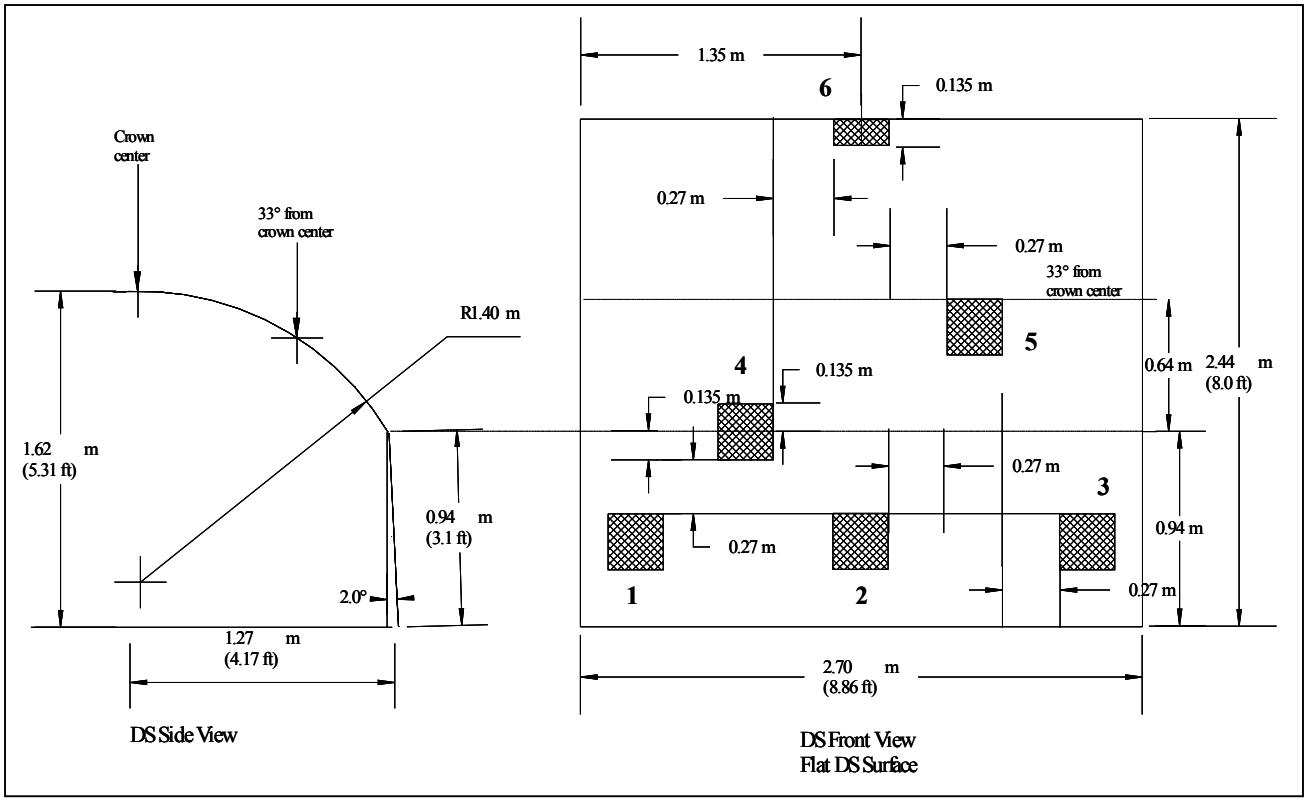
MO0208EBSATBWP.027. *Atlas Breached Waste Package and Drip Shield Experiments: Multiple Patch Tests on the Rough Drip Shield Surface*. Submittal data: August 13, 2002.

MO0208EBSATBWP.028. *Atlas Breached Waste Package and Drip Shield Experiments: Bounding Flow Rate Tests on the Rough Drip Shield Surface*. Submittal data: August 13, 2002.



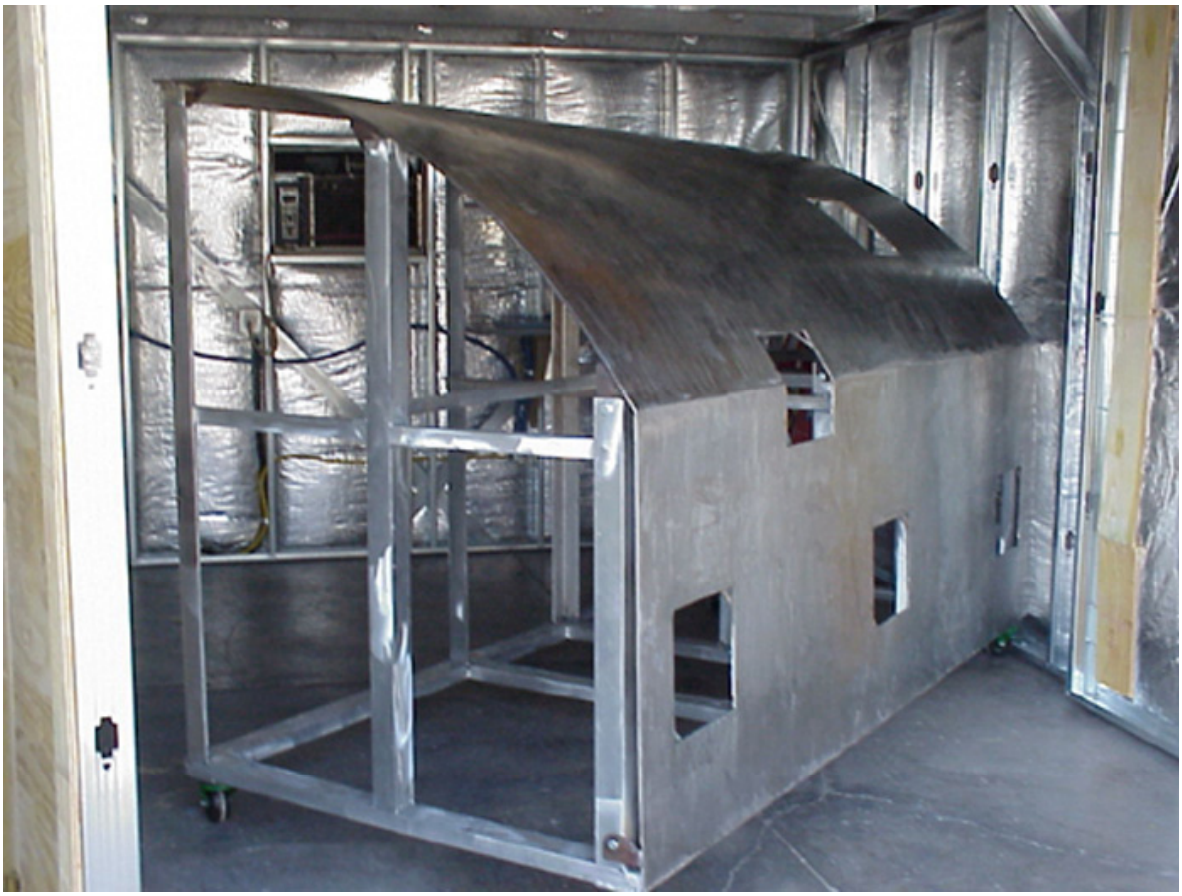
Source: Howard 2002c, p. 111.

Figure 1. Seepage Area Represented in the BWPDSE



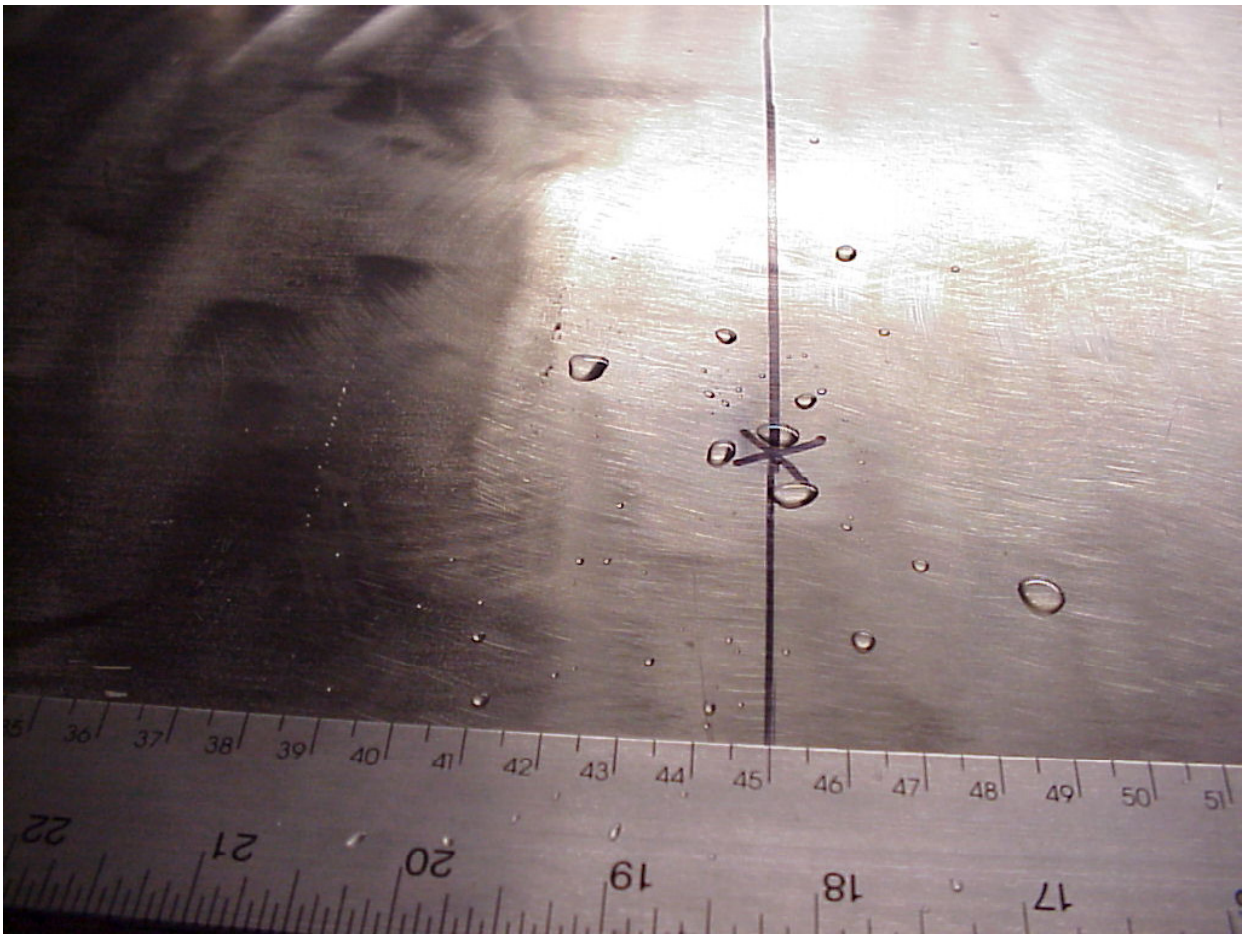
Source: Howard 2002a, p. 14.

Figure 2. BWPDSE Drip Shield Dimensions and Patch Locations



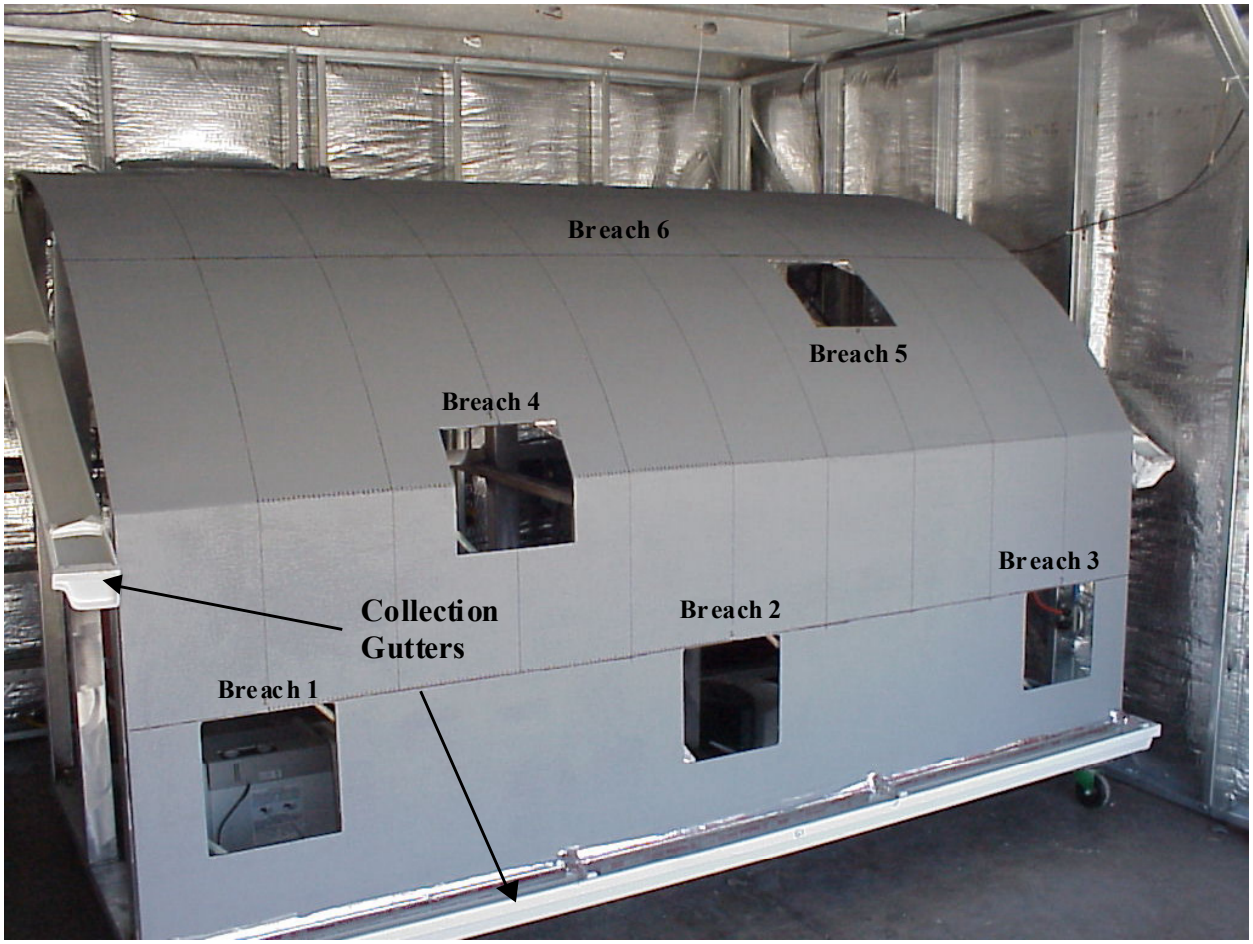
Source: Howard 2002a, p. 16.

Figure 3. Stainless Steel Drip Shield Section



Source: Howard 2002a, p. 42.

Figure 4. Polished Stainless Steel Drip Shield Surface (Splash Radius Test #1 - 2 Drops)

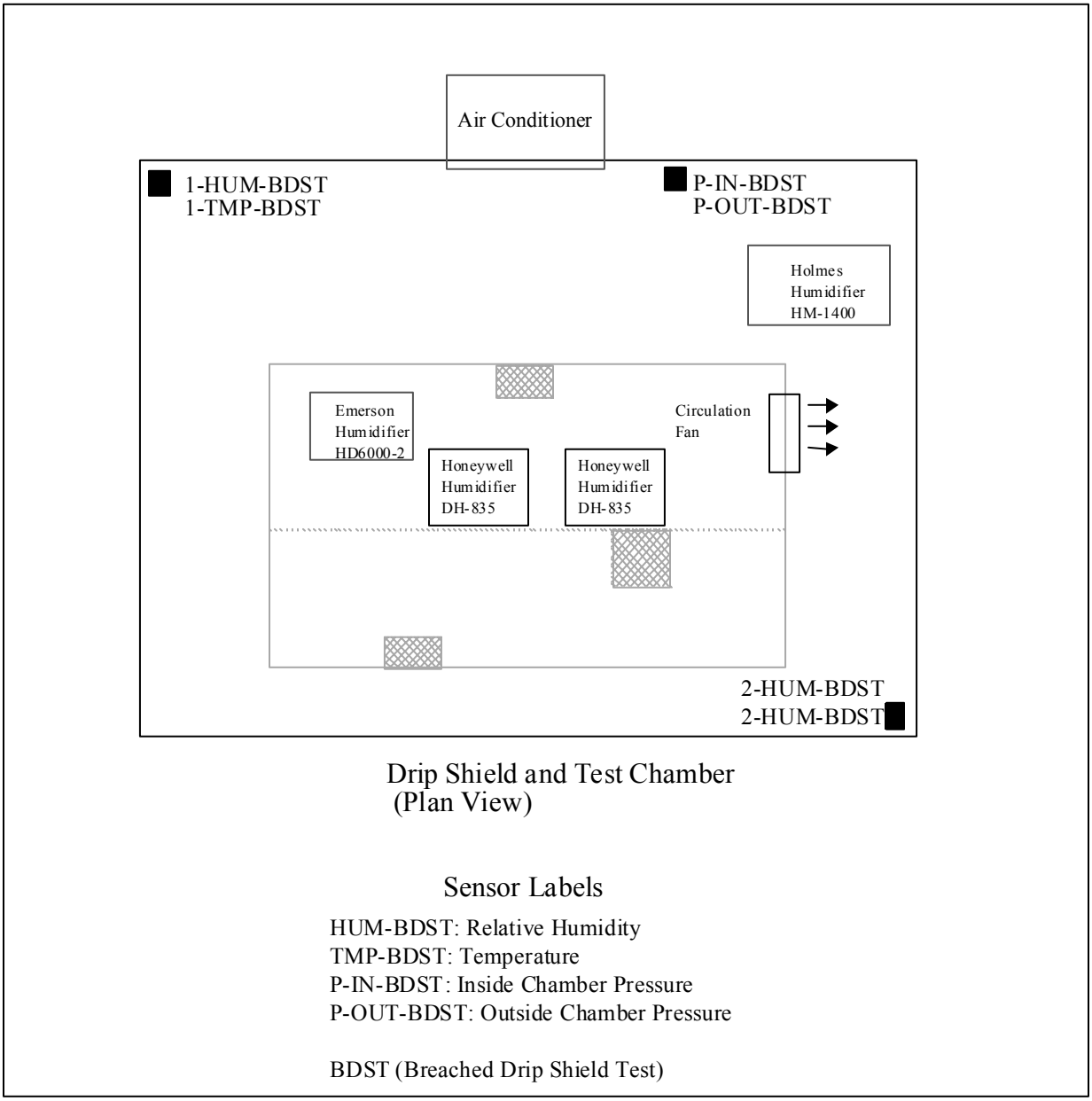


Source: Howard 2002c, p. 112.

Figure 5. Rough Drip Shield Surface with Collection Gutters

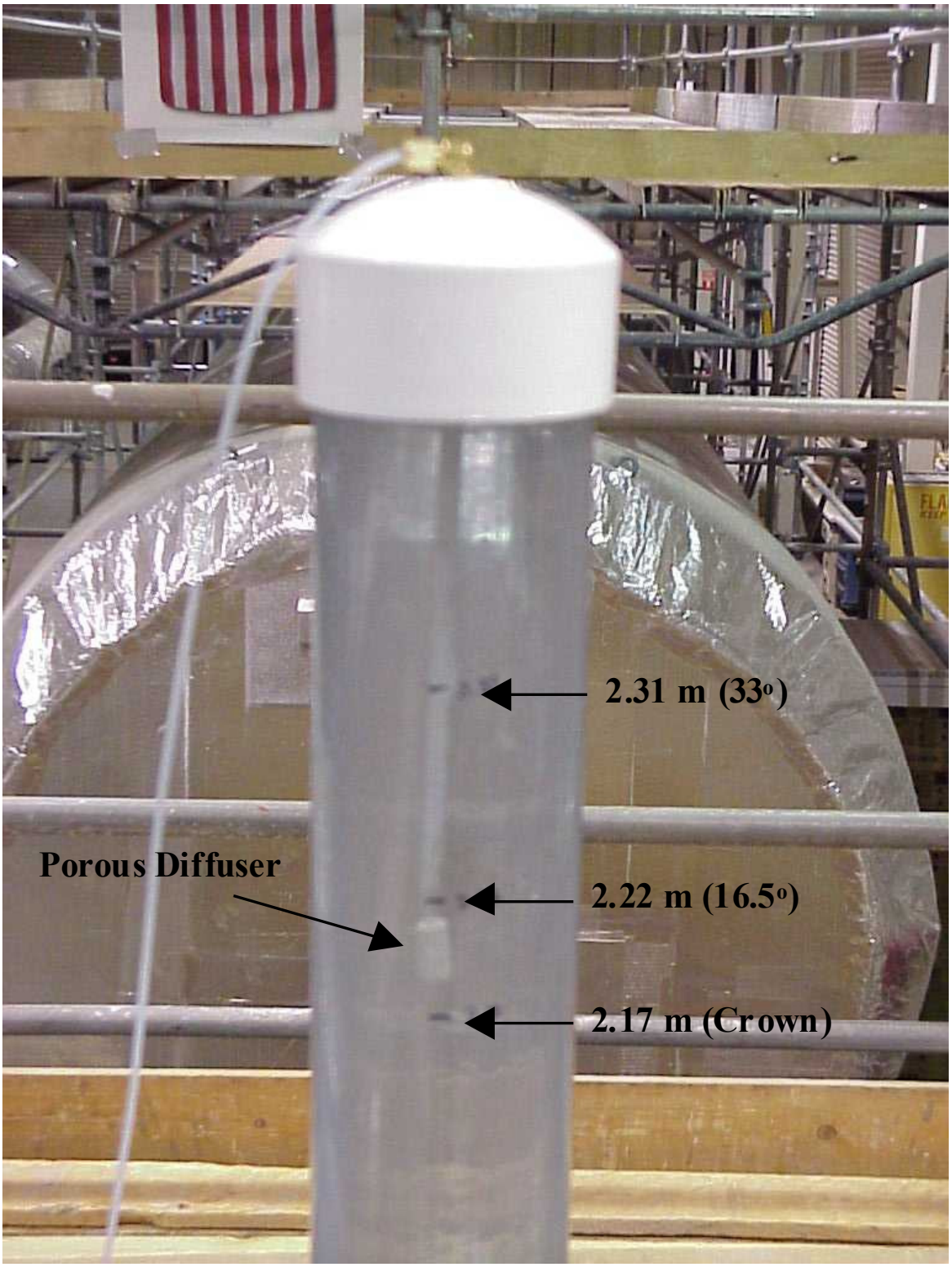
Source: Howard 2002b, p. 70.

Figure 6. Rough Drip Shield Texture



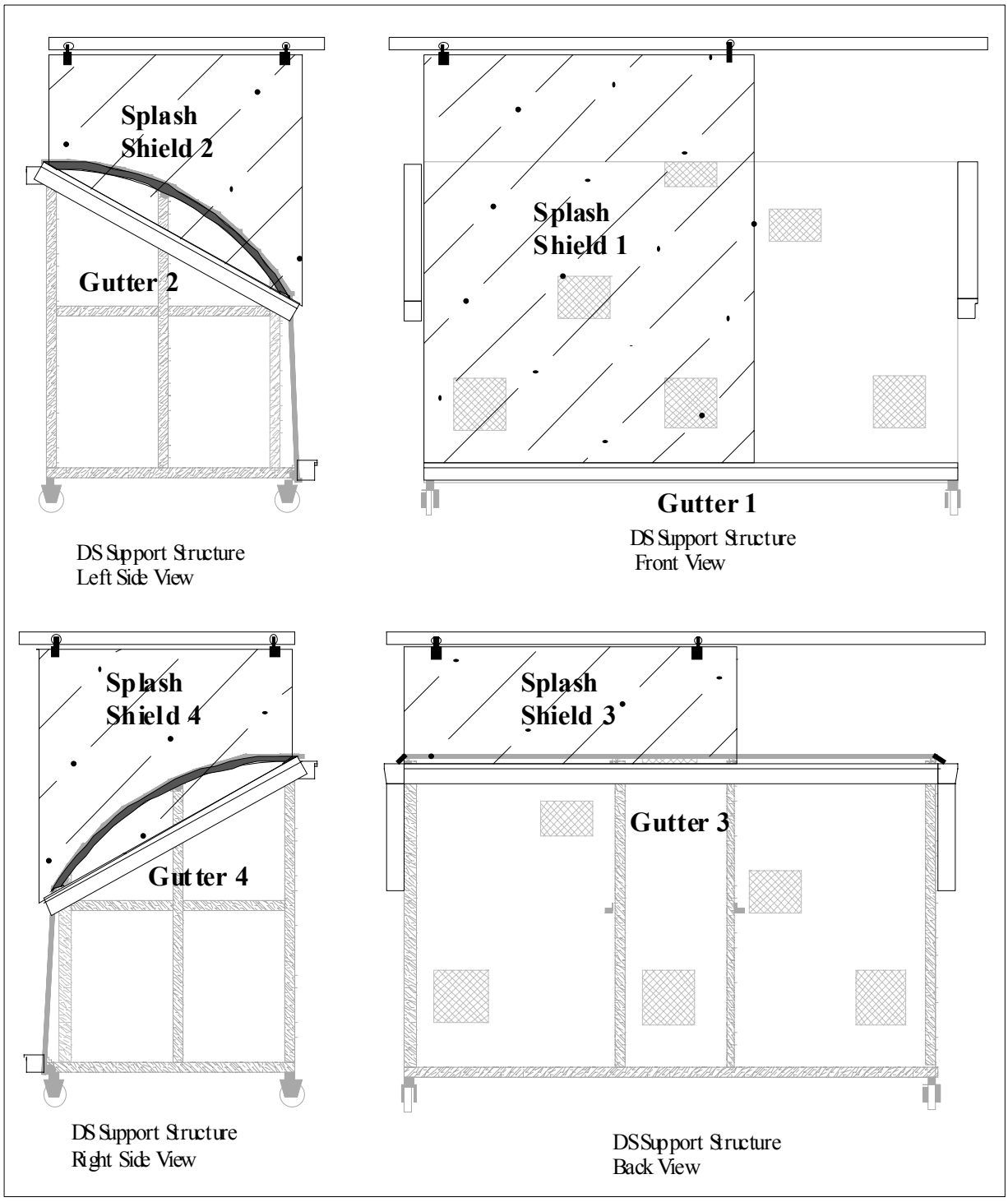
Source: Howard 2002a, p. 108

Figure 7. Test Chamber Environment Control and Instrumentation



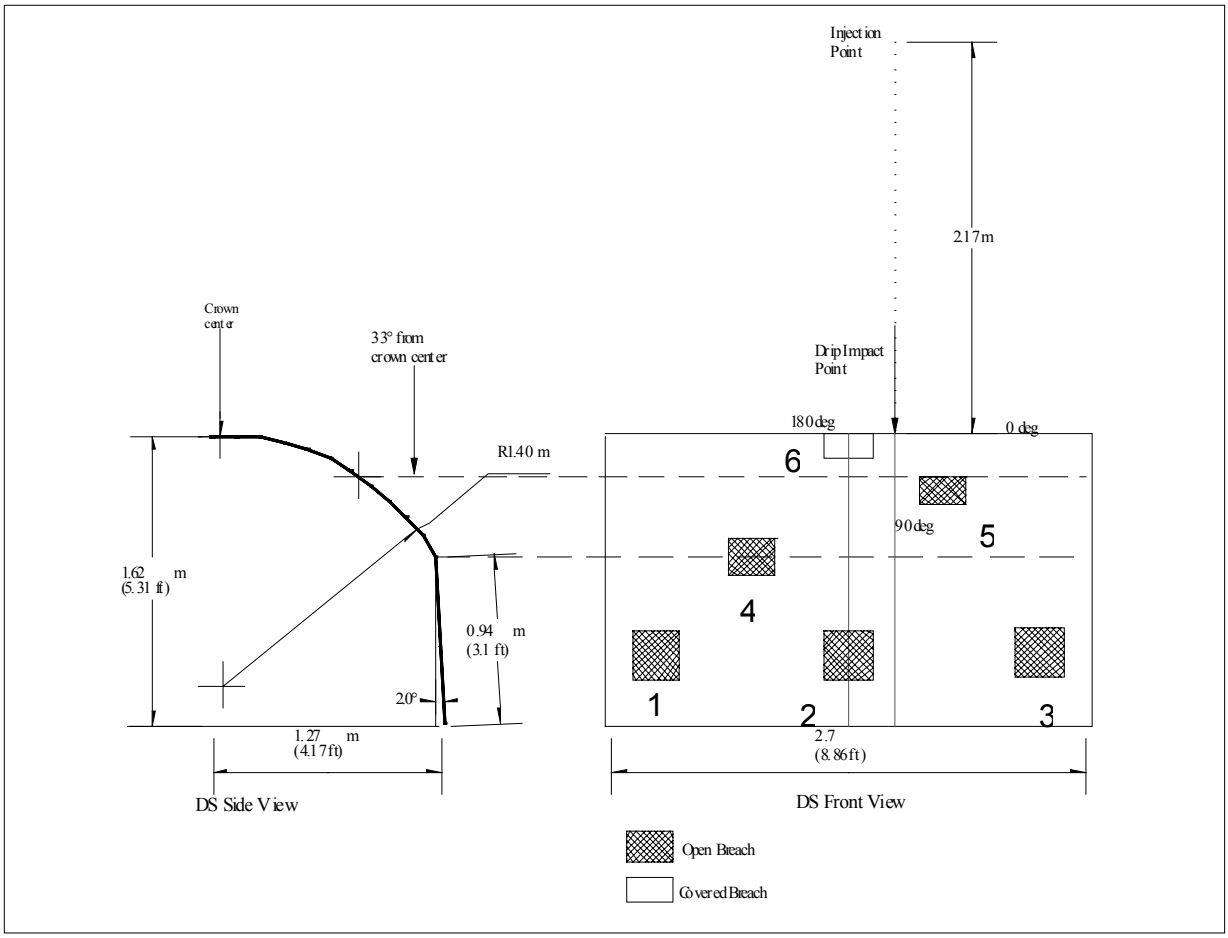
Source: Howard 2002a, p. 22.

Figure 8. Drip Tower



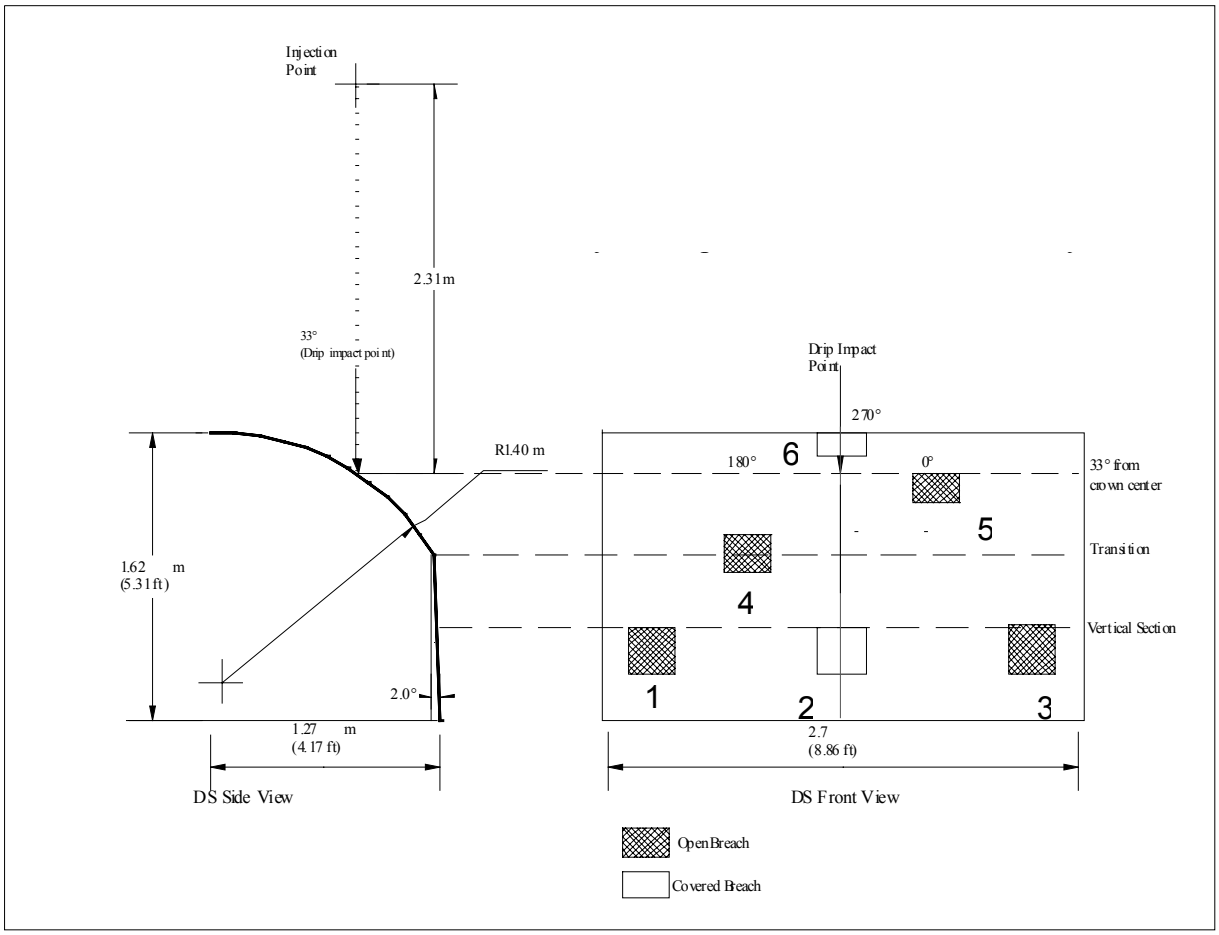
Source: Howard 2002a, pp. 18-19.

Figure 9. Collection System Gutters and Splash Shields



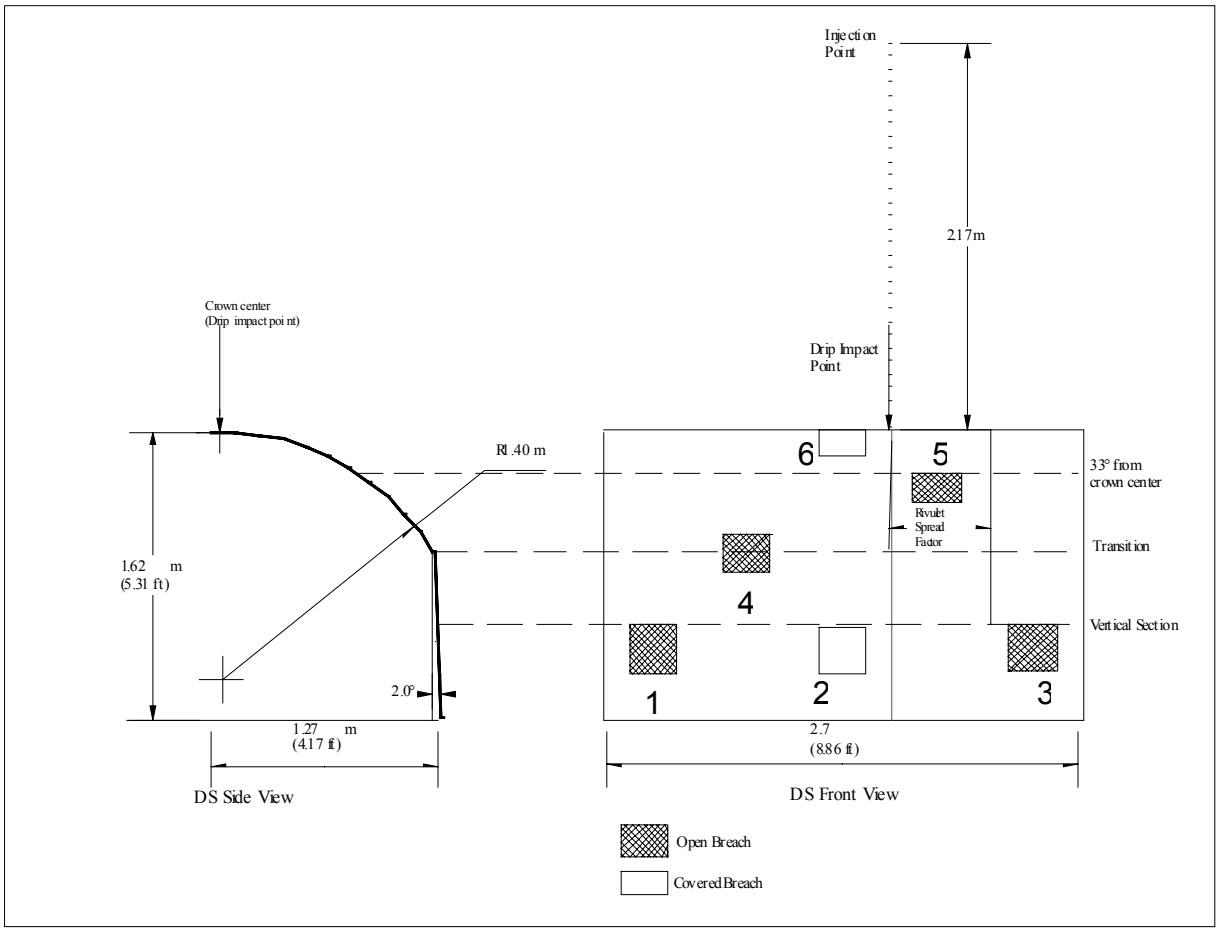
Source: Howard 2002a, p. 40.

Figure 10. Splash Radius Test #1 Geometry on Smooth DS Surface



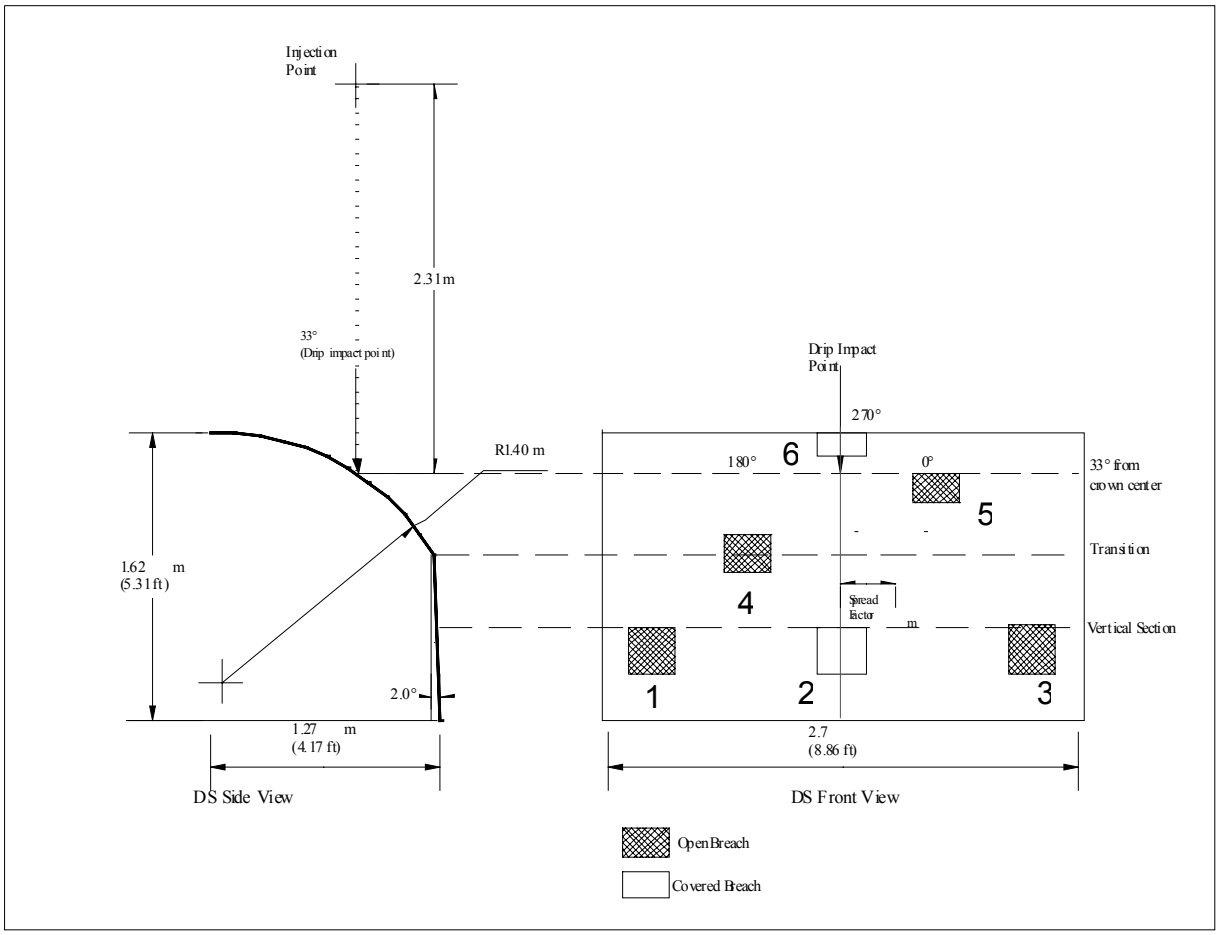
Source: Howard 2002a, p. 58.

Figure 11. Splash Radius Test #2 Geometry on Smooth DS Surface



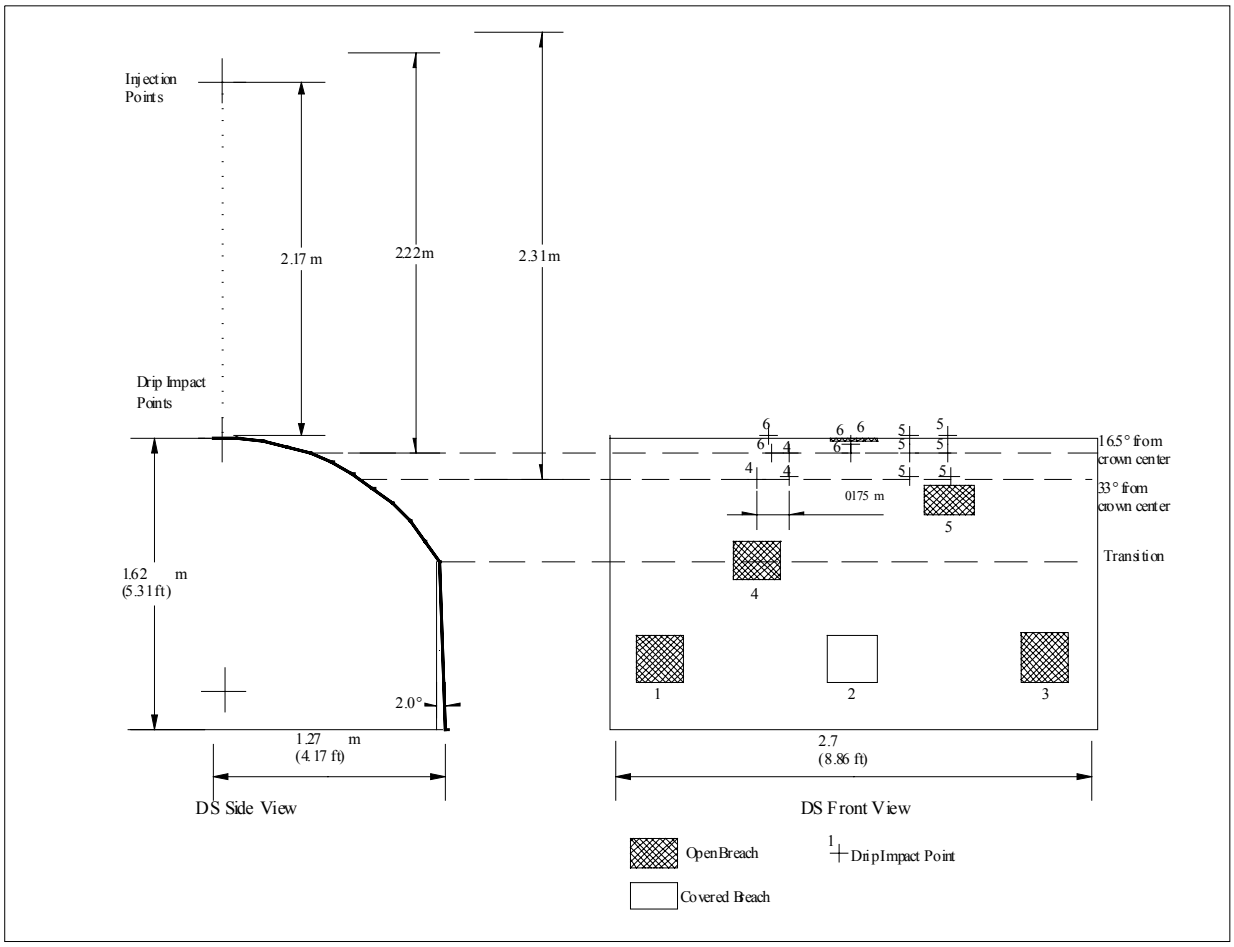
Source: Howard 2002a, p. 46.

Figure 12. Spread Factor Test #1 Geometry on Smooth DS Surface



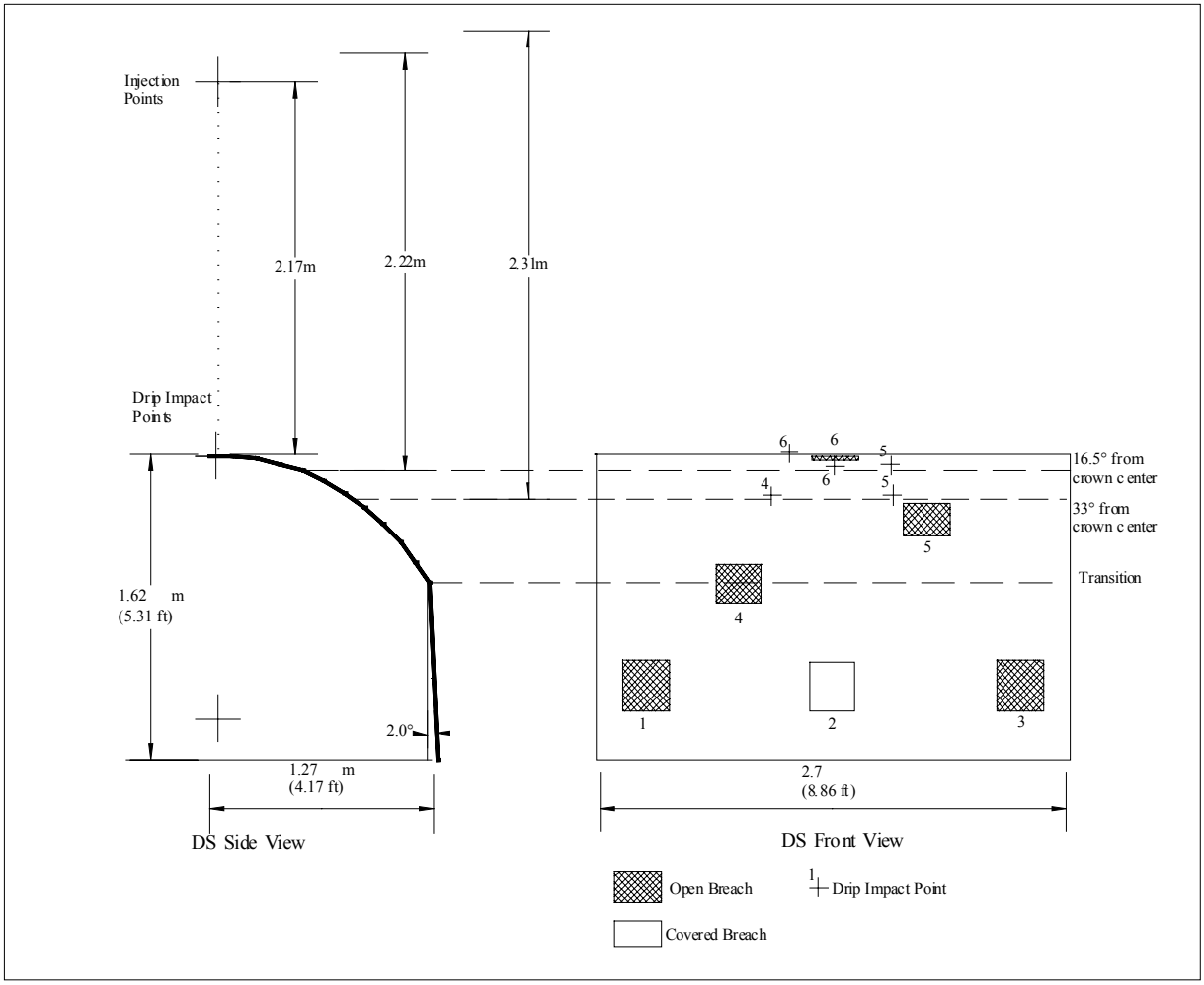
Source: Howard 2002a, p. 62.

Figure 13. Spread Factor Test #4 Geometry on Smooth DS Surface



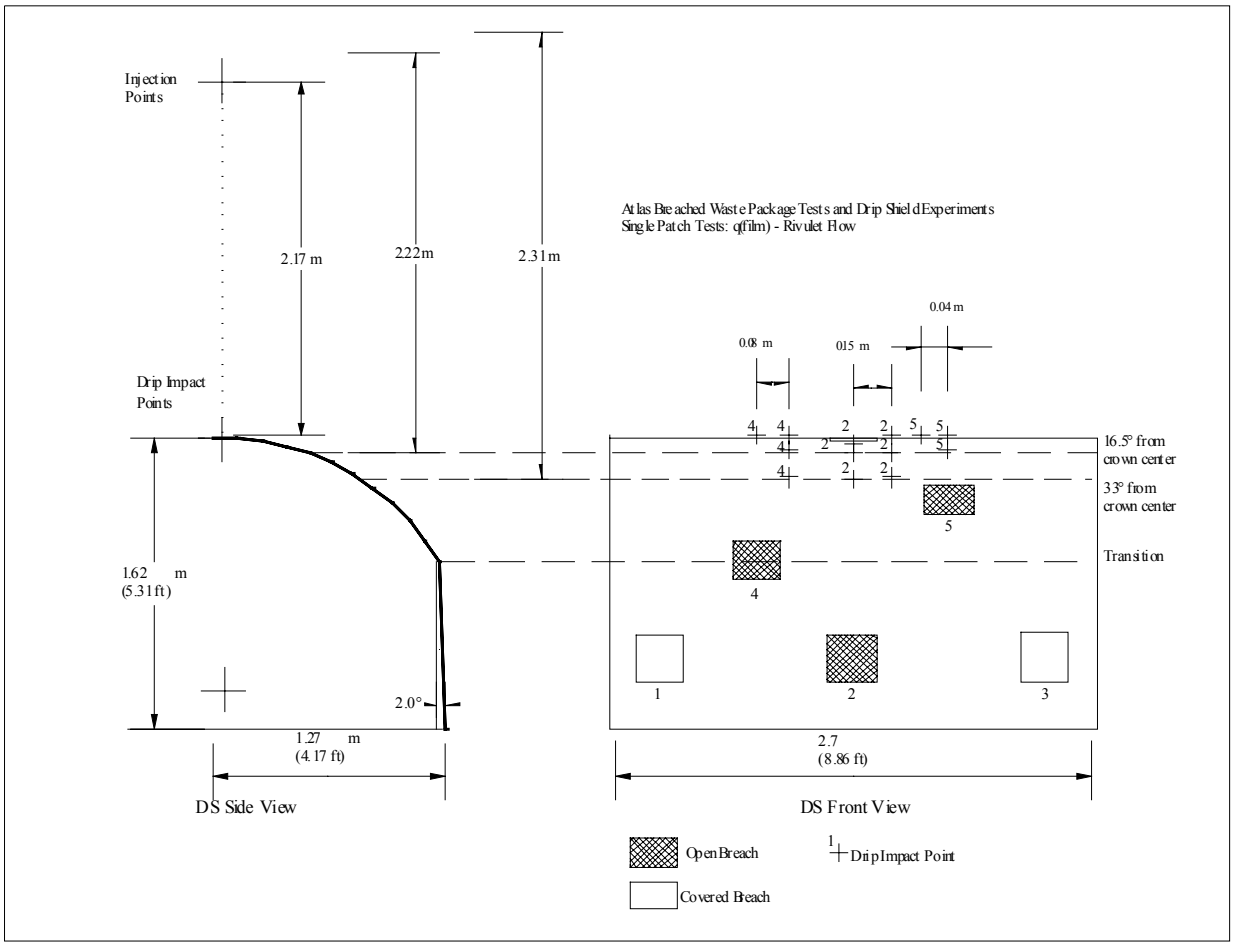
Source: Howard 2002a, p. 68

Figure 14. Single Patch q(splash) Tests on Smooth DS Surface



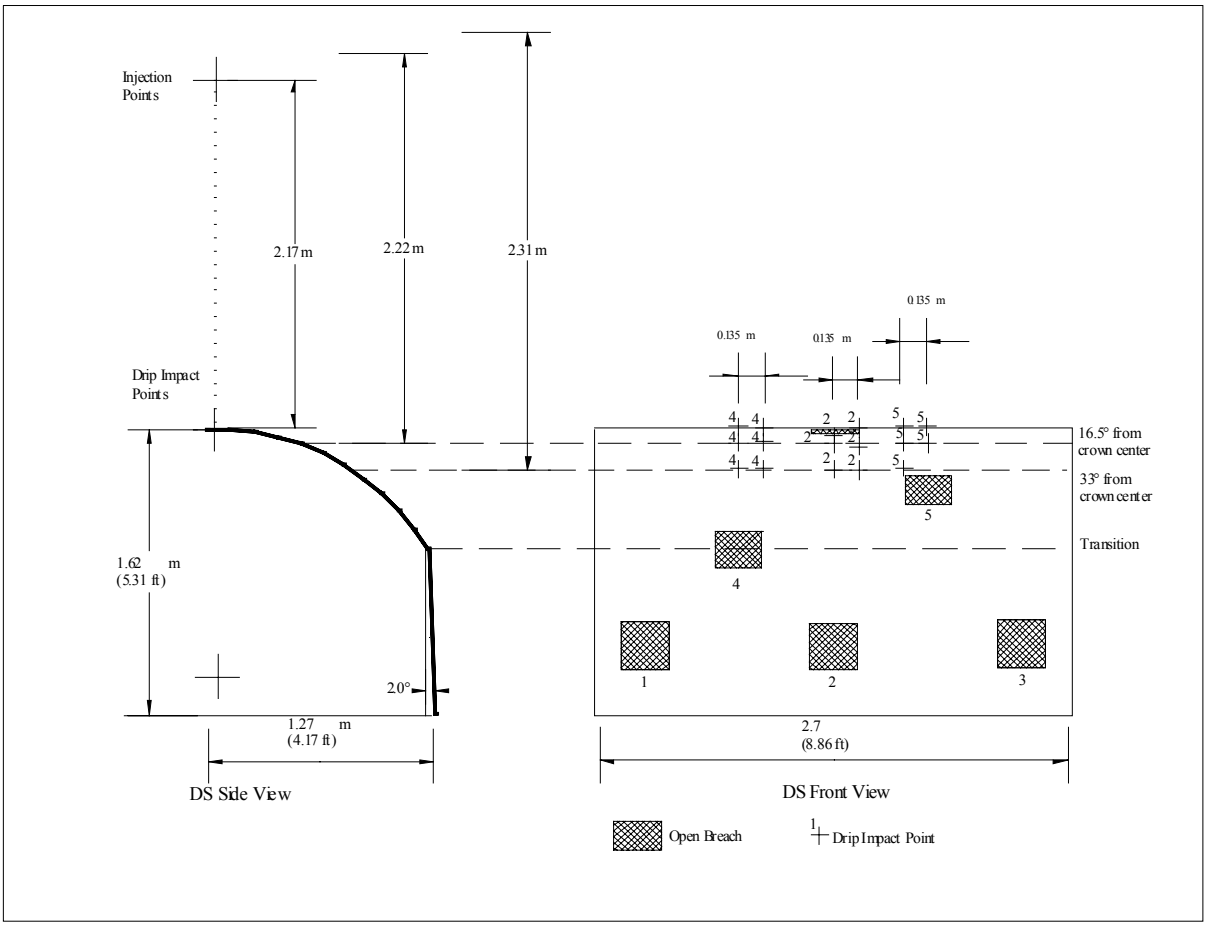
Source: Howard 2002b, p. 92.

Figure 15. Single Patch q(splash) Tests on Rough DS Surface



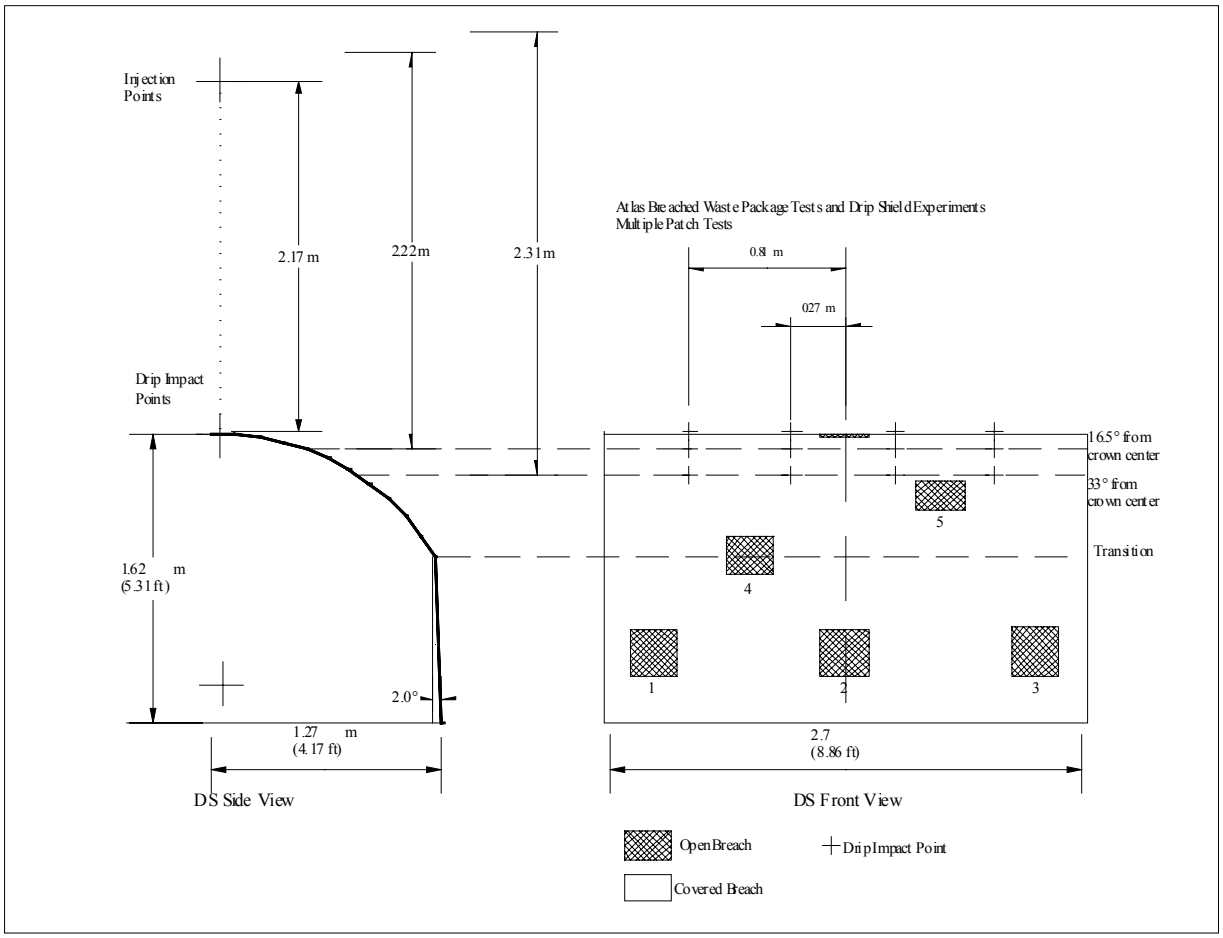
Source: Howard 2002a, p. 110.

Figure 16. Single Patch q (film) Tests on Smooth DS Surface



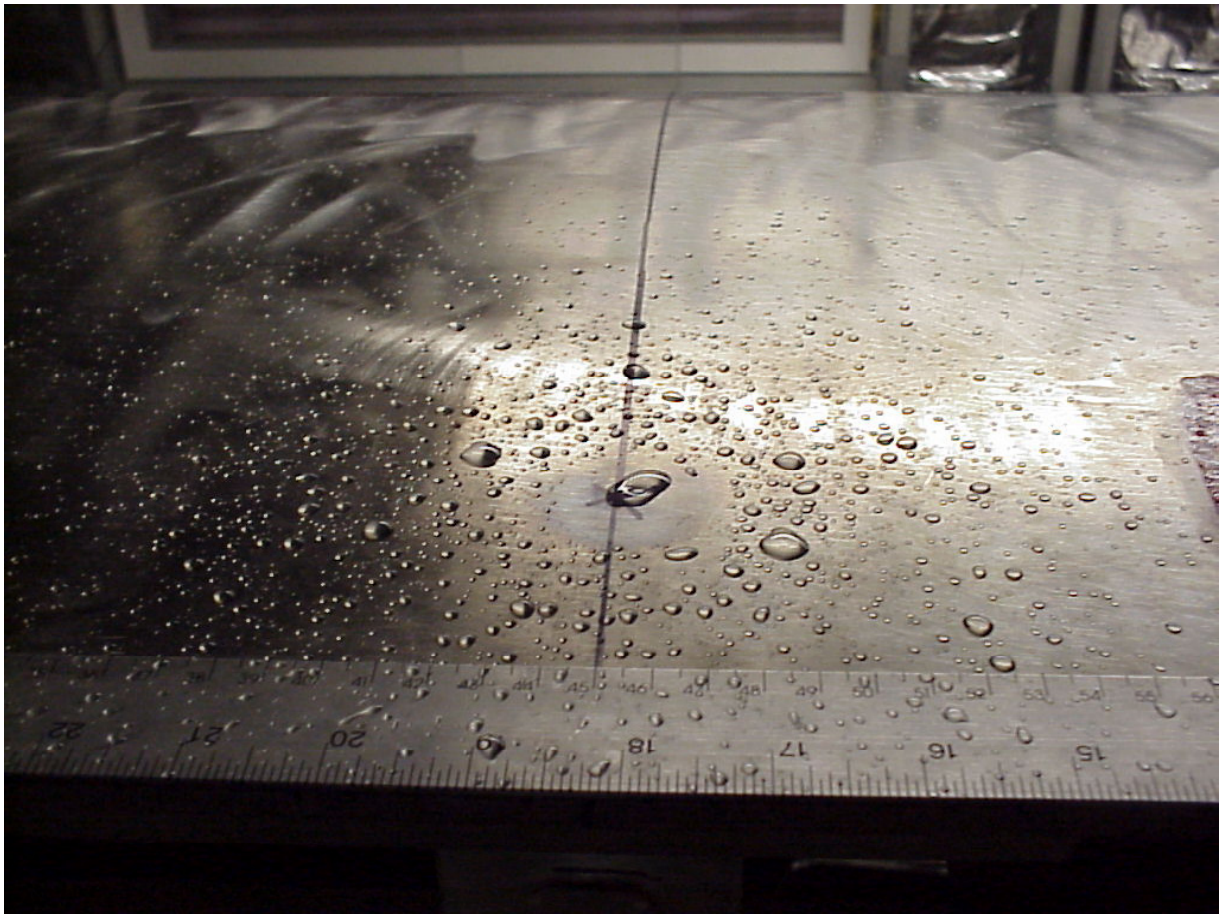
Source: Howard 2002b, p. 107.

Figure 17. Single Patch q(film) Tests on Rough DS Surface



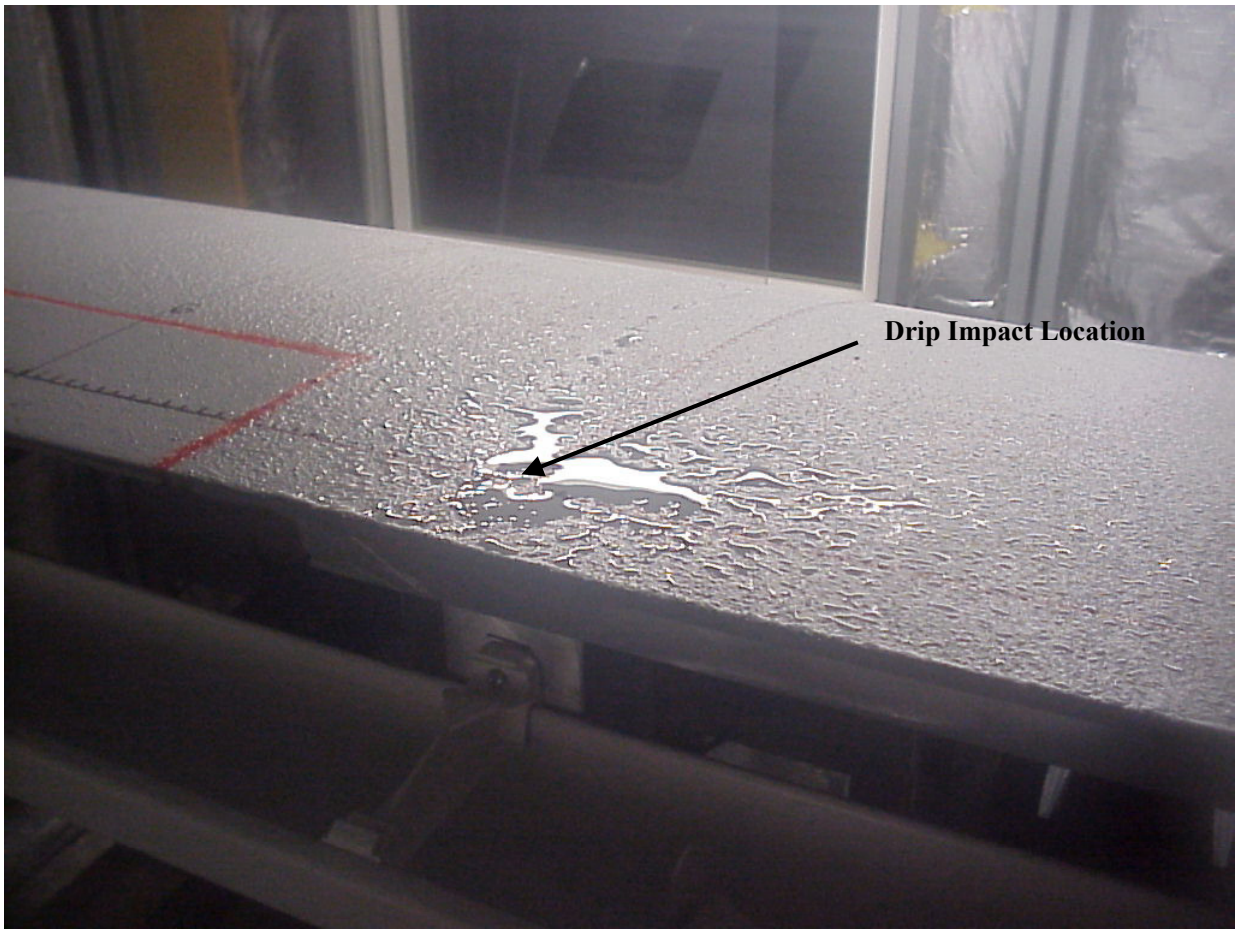
Source: Howard 2002a, p. 140.

Figure 18. Multiple Patch Tests on Smooth and Rough DS Surfaces



Source: Howard 2002a, p. 44.

Figure 19. Water Droplet Formation on the Smooth DS Surface



Source: Howard 2002b, p. 76.

Figure 20. Water Pooling on Rough DS Surface

Table 1 EBS/Repository Design Parameters

Parameter	Parameter Value	Source
Drip Shield Height	2521 mm	CRWMS M&O 2000a
Drip Shield Width	2512 mm	CRWMS M&O 2000a
Drip Shield Radius of Curvature	1.3 m	CRWMS M&O 2000a
Invert Depth	0.806 m	CRWMS M&O 2000c
Drift Diameter	5.5 m	CRWMS M&O 1999
WP Diameter	1.564 m	CRWMS M&O 2000b
Fall Distance From Drift Crown to DS Crown (see Figure 1)	2173 mm	Drift Diameter – (DS Height + Invert Depth)

Source: BSC (Bechtel SAIC Company) 2002, p. 8.

Table 2. BWPDSE Instrument Accuracy

Instrument	Range	Accuracy
Temperature/Humidity Probe (Vaisala HMP 235A)	10-100% RH 0-100 ^{o}C	± 2% RH @ 10-90% RH, ± 3.0% RH above 90% RH; Temperature ± 2.0 ^{o}C
Pressure Transducer (Setra 270)	800-1100 mbar	± 0.05% Full Scale
Analytical Balance (Mettler PM4000)	0-4000 g	Minimum Accuracy ± 0.06 g
Analytical Balance (Mettler PJ360)	0-300 g	Minimum Accuracy ± 0.06 g
RTD (Omega RTD-809)	Calibrated Range: 15, 45, and 100 ^{o}C	± 0.3 ^{o}C

Source: Howard 2002a, pp. 25-34; Howard 2002c, pp. 223-240.

Table 3. Water Measurement Descriptions

Measurement Type	Measurement Description
Input Water	Injection source water in beaker located on Analytical Balance PM4000 (Howard 2002b, p. 3) inside the test chamber. RTD probe submerged in water and reading was taken after 30 sec.
DS Beaker Water	Water in glass beaker placed in contact with the DS surface throughout the test. RTD probe is placed below water surface in beaker and reading was taken after 30 sec.
DS Surface Water	Water film remaining on the DS following a test. RTD probe is placed in contact with the DS. The probe is not submerged in water, and in most cases only a thin film is present. Reading is taken after 30 sec.
Air Temperature	RTD probe is mounted so that it is not in contact with DS any other surface. Reading is taken after 30 sec.

Source: Howard 2002b, pp. 220-222.

Table 4. BWPDSE Test Matrix

Tests Conducted on Smooth DS Surface	Tests Conducted on Rough DS Surface
Initial/Preliminary Tests: Splash Radius (Drip Splash) Test #1 Splash Radius (Drip Splash) Test #2 Spread Factor Test #1 Spread Factor Test #2 Spread Factor Test #3 Spread Factor Test #4	Initial/Preliminary Tests: Splash Radius (Drip Splash) Test #1 Splash Radius (Drip Splash) Test #2 Splash Radius (Drip Splash) Test #3 Splash Radius (Drip Splash) Test #4 Splash Radius (Drip Splash) Test #5 Spread Factor Test #1 Spread Factor Test #2 Spread Factor Test #3
Single Patch q(splash) Tests	Single Patch q(splash) Tests
Single Patch q(film) – Rivulet Flow Tests	Single Patch q(film) – Rivulet Flow Tests
Multiple Patch Tests	Multiple Patch Tests

Source: Howard 2002a, pp. 39-151; Howard 2002b, pp. 9-219.

Table 5. Single Patch q(splash) Drip Location on Smooth DS Surface

Patch/Breach	Drip Location	Drop Distance (m)
Patch 4	Patch center, 33°	2.31
	17.5 cm right of center, 33°	2.31
	17.5 cm right of center, 16.5°	2.22
	Patch center, 16.5°	2.22
Patch 5	Patch center, crown	2.17
	17.5 cm left of center, crown	2.17
	Patch center, 16.5°	2.22
	17.5 cm left of center, 16.5°	2.22
	Patch center, 33°	2.31
	17.5 cm left of center, 33°	2.31
Patch 6	37 cm left of center, crown	2.17
	36.5 cm left of center, between patch edge and 16.5°	2.17
	Patch center, between crown and 16.5°	2.17
	35.5 cm left of center, 16.5°	2.22
	Patch center, 16.5°	2.22

Source: Howard 2002a, p. 67.

Table 6. Single Patch Drip Locations on Rough DS Surface

Patch/Breach	Drip Location	Drop Distance (m)
Patch 4	27 cm right of Patch 4 center, 33°	2.31
Patch 5	20 cm left of Patch 5 center, 33°	2.31
	20 cm left of Patch 5 center, 16.5°	2.22
Patch 6	20 cm left of Patch 6 center, Crown	2.17
	Center of Patch 6, 15 cm forward from crown along DS center.	2.17
	Center of Patch 6, 16.5°	2.22

Source: Howard 2002b, p. 90.

Table 7. Single Patch q(film) Drip Locations on Smooth DS Surface

Patch/Breach	Drip Location	Drop Distance (m)
Patch 2	15 cm right of patch center, crown	2.17
	Patch center, 10.5 cm forward from crown	2.17
	Patch center, 33°	2.31
	15 cm right of patch center, 16.5°	2.22
	Patch center, 16.5°	2.22
	15 cm right of patch center, 33°	2.31
Patch 4	8 cm right of patch center, 33°	2.31
	8 cm right of patch center, crown	2.17
	Patch center, crown	2.17
	8 cm right of patch center, 16.5°	2.22
Patch 5	Patch center, crown	2.17
	4 cm left of center, crown	2.17
	4 cm left of center, 16.5°	2.22

Source: Howard 2002a, p. 109.

Table 8. Single Patch q(film) Drip Locations on Rough DS Surface

Patch/Breach	Drip Location	Drop Distance (m)
Patch 2	13.5 cm right of patch center, 10.5 cm forward from crown	2.17
	Patch center, 10.5 cm forward from crown	2.17
	Patch center, 33°	2.31
	13.5 cm right of patch center, 16.5°	2.22
	Patch center, 16.5°	2.22
	13.5 cm right of patch center, 33°	2.31
Patch 4	13.5 cm right of patch center, 33°	2.31
	13.5 cm right of patch center, 16.5°	2.22
	13.5 cm right of patch center, crown	2.17
	Patch center, 33°	2.31
	Patch center, 16.5°	2.22
	Patch center, crown	2.17
Patch 5	Patch center, crown	2.17
	Patch center, 16.5°	2.22
	13.5 cm left of patch center, crown	2.17
	13.5 cm left of patch center, 16.5°	2.22
	13.5 cm left of patch center, 33°	2.31

Source: Howard 2002 b, p. 105.

Table 9. Multiple Patch Drip Locations for Smooth and Rough DS Surface Tests

Crown	0.81 m left of DS centerline	0.27 m left of DS centerline	0.27 m right of DS centerline	0.81 m right of DS centerline	Drip distance: 2.17 m
16.5° Line	0.81 m left of DS centerline	0.27 m left of DS centerline	0.27 m right of DS centerline	0.81 m right of DS centerline	Drip distance: 2.22 m
33° Line	0.81 m left of DS centerline	0.27 m left of DS centerline	0.27 m right of DS centerline	0.81 m right of DS centerline	Drip distance: 2.31 m

Source: Howard 2002a, p. 139.

Table 10. Bounding Flow Rate Drip Locations for Smooth and Rough DS Surface Tests

Crown	0.54 m left of DS centerline	0.27 m left of DS centerline	0.27 m right of DS centerline	Drip distance: 2.17 m
16.5° Line	0.54 m left of DS centerline	0.27 m left of DS centerline	0.27 m right of DS centerline	Drip distance: 2.22 m
33° Line	0.54 m left of DS centerline	0.27 m left of DS centerline	0.27 m right of DS centerline	Drip distance: 2.31 m

Source: Howard 2002b, p. 27.

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APPENDIX A:
M&TE Used in the BWPDSE

Data System Identifier	Description	Sensor Serial Number	Sensor Model	Calibration Dates	Conversion	Basis
1-HUM-BDST	Relative Humidity	T2310004	Vaisala HMP235A	Pre-test Cal Date: 05/07/02 Due: 05/07/03 Post-test Cal Date: 09/11/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 998256
1-TMP-BDST	Air Temperature	T2310004	Vaisala HMP235A	Pre-test Cal Date: 05/07/02 Due: 05/07/03 Post-test Cal Date: 09/11/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 998256
2-HUM-BDST	Relative Humidity	T4510008	Vaisala HMP235A	Pre-test Cal Date: 05/07/02 Due: 05/07/03 Post-test Cal Date: 09/13/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 998236
2-TMP-BDST	Air Temperature	T4510008	Vaisala HMP235A	Pre-test Cal Date: 05/07/02 Due: 05/07/03 Post-test Cal Date: 09/13/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 998236
P-IN-BDST	Test chamber pressure	416325	Setra 270	Pre-test Cal Date: 05/07/02 Due: 05/07/03 Post-test Cal Date: 08/29/2002	Y=0.1X+600 X = mVolt	Bechtel Nevada Calibration Lab Cal ID 007763
P-OUT-BDST	Ambient pressure	416325	Setra 270	Pre-test Cal Date: 05/07/02 Due: 05/07/03 Post-test Cal Date: 08/29/2002	Y=0.1X+600 X = mVolt	Bechtel Nevada Calibration Lab Cal ID 007763
Ambient RH (EBS-0429)	Ambient Relative Humidity	W2320024	Vaisala HMP235A	Pre-test Cal Date: 05/07/02 Due: 05/07/03 Post-test Cal Date: 09/11/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 315820
Ambient Temp. (EBS-0429)	Ambient Temperature	W2320024	Vaisala HMP235A	Pre-test Cal Date: 05/07/02 Due: 05/07/03 Post-test Cal Date: 09/11/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 315820

Source: Howard 2002a, pp. 24-34; Howard 2002c, pp. 83-110.

M&TE Used in the BWPDSE, Continued

Data System Identifier	Description	Sensor Serial Number	Sensor Model	Calibration Dates	Conversion	Basis
Fluke Mulitmeter	Voltage (Pressure) Resistance (RTD Temp.)	6700202	Fluke 702	Pre-test Cal Date: 06/11/01 Due: 06/11/02 Post-test Cal Date: 06/14/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 007462
Fluke Mulitmeter	Voltage (Pressure) Resistance (RTD Temp.)	6695202	Fluke 702	Pre-test Cal Date: 01/16/02 Due: 01/16/03 Post-test Cal Date: 08/28/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 007463
Analytical Balance PM4000	Water mass Input/ Collection	J48850	Mettler PM4000	Pre-test Cal Date: 12/27/01 Due: 06/27/02 Post-test Cal Date: 07/29/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 307277
Analytical Balance PM4000	Water mass Input/Collection	J48849	Mettler PM4000	Pre-testCal Date: 02/06/02 Due: 08/06/02 Post-test Cal Date: 08/19/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 307232
Analytical Balance PJ360	Water mass Collection	H78850	Mettler PJ360	Cal Date: 02/06/02 Pre-test Due: 08/06/03 Post-test Cal Date: 08/19/2002	Use display panel	Bechtel Nevada Calibration Lab Cal ID 301293
DS-RTD-01	Temperature Probe RTD-809	343	Omega RTD-809	Pre-test Cal Date: 03/27/02 Due: 03/27/03 Post-test Cal Date: 09/05/2002	Use Fluke 702 in RTD mode	Bechtel Nevada Calibration Lab Cal ID 992993

Source: Howard 2002a, pp. 24-34; Howard 2002c, pp. 83-110.

APPENDIX B:
Collection Station Percentage Data

Description of Collection Station Identifiers
Collection station identifiers are represented in the first column of the data sheets contained in Appendix B, and represents the stations where water was collected and weighed during the BDSWPE. The following provides an explanation of the symbols used to identify collection stations. Gutters are shown and labeled in Figure 9 and breach numbering is shown in Figure 4. Designators for test chamber instrumentation are explained in Figure 7.

G – Gutters
The gutters were identified with the letter G, which is followed by two numbers - the first represents the specific gutter (see Figure 9) and the second the swabbing towel or group of towels used during the collection and weighing process on that particular gutter.

SS – Splash Shields
The splash shields were identified with the letters SS, which is followed by a numbers that represents the specific splash shield (see Figure 9). All towels used to swab the splash shields were grouped into one container for weighing.

B – Breach
The breaches were identified with the letter B, which is followed by a numbers that represents the specific breach (see Figure 4).

DS in – Drip Shield Inside Surface
The drip shield inside surface represents under side of the drip shield where water some times formed rivulets after running around the edges of breaches and by passing the breach collection pans during rare instances.

DS out – Drip Shield Outside Surface
The drip shield outer surface represents the outer surface of the drip shield where water was dripped during the BWPDSE. Some portion of the water dripped during the tests collected and remained on the DS surface and this collection station represents the water collected from the DS surface following the tests.

Other
This collection station represented some instances where a collection deviated from the normal routine or collection stations. In such instances, an explanation is provided on the data sheet attachments in the scientific notebooks.

Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 4, Centerline, 16.5 **Test Date:** 5/21/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	669.7	529.8	139.9	100%
Evap	158.3	158.3	0	
G1-1	7.2	11.5	4.3	
G1-2	7.2	12.8	5.6	
G1-3			0	
G1-4			0	
SS-1	7.4	7.8	0.4	7.4%
G2-1	7.4	7.8	0.4	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.3%
G3-1	7.3	7.4	0.1	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.7	106.9	0.2	0.1%
B2			0	0.0%
B3			0	0.0%
B4	106.9	191.3	84.4	60.3%
B5	7.2	7.4	0.2	0.1%
B6			0	0.0%
DS in-1	7.4	7.6	0.2	
DS in-2			0	0.1%
DS out-1	7.2	21.8	14.6	
DS out-2	7.3	23.2	15.9	
DS out-3	7.3	11.0	3.7	
DS out-4			0	24.4%
Other			0	0.0%
		Total Collected	130	92.9%

Total Input (g)	139.9
Total Collected (g)	130
Difference (g)	**-9.9**
	-7%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0
% Evaporation	**0.00%**

Mass Flow Rate	
Test Duration (min)	30.01667
Flow Rate (g/min)	4.66

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.8	18.9	P-IN-BDST	880
2-HUM/TMP-BDST	91.3	18.7		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	96.2	19.7	P-IN-BDST	887
2-HUM/TMP-BDST	94.5	19.5		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 4 Centerline, 33 **Test Date:** 5/20/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	685.4	548.2	137.2	100%
Evap	142.8	142.5	0.3	
G1-1	7.2	10.7	3.5	
G1-2	7.1	10.9	3.8	
G1-3			0	
G1-4			0	
SS-1	7.1	7.6	0.5	5.7%
G2-1	7.2	7.5	0.3	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.2%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.7	106.7	0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	106.8	216.7	109.9	80.1%
B5			0	0.0%
B6			0	0.0%
DS in-1	7.2	7.3	0.1	
DS in-2			0	0.1%
DS out-1	7.3	9.7	2.4	
DS out-2			0	
DS out-3			0	
DS out-4			0	1.7%
Other			0	0.0%
		Total Collected	120.5	87.8%

Total Input (g)	137.2
Total Collected (g)	120.5
Difference (g)	**-16.7**
	-12%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.3
% Evaporation	**0.40%**

Mass Flow Rate	
Test Duration (min)	30
Flow Rate (g/min)	4.57

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.5	21.2	P-IN-BDST	868
2-HUM/TMP-BDST	89.5	20.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.2	21.3	P-IN-BDST	869
2-HUM/TMP-BDST	87.5	21		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 4, 17.5 cm right of centerline, 16.5 **Test Date:** 5/21/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	667.1	516.3	150.8	100%
Evap	158.3	158.3	0	
G1-1	7.2	34.4	27.2	
G1-2	7.2	53.0	45.8	
G1-3	7.3	40.2	32.9	
G1-4	7.3	9.2	1.9	
SS-1	7.2	7.4	0.2	71.6%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.2	7.7	0.5	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.3%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	106.8	108.5	1.7	1.1%
B5	108.7	109.3	0.6	0.4%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.6	20.4	12.8	
DS out-2	7.3	9.9	2.6	
DS out-3	7.3	10.9	3.6	
DS out-4			0	12.6%
Other			0	0.0%
		Total Collected	129.8	86.1%

Total Input (g)	150.8
Total Collected (g)	129.8
Difference (g)	**-21**
	-14%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0
% Evaporation	**0.00%**

Mass Flow Rate	
Test Duration (min)	30
Flow Rate (g/min)	5.03

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	95.9	20.3	P-IN-BDST	890
2-HUM/TMP-BDST	94.3	19.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93	20.9	P-IN-BDST	889
2-HUM/TMP-BDST	91.6	20.5		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 4, 17.5 cm right of centerline, 33 **Test Date:** 5/20/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	670.3	538.8	131.5	100%
Evap	143.6	143.3	0.3	
G1-1	7.5	44.2	36.7	
G1-2	7.1	57.9	50.8	
G1-3	7.2	20.0	12.8	
G1-4	7.2	8.7	1.5	
SS-1	7.2	10.4	3.2	79.8%
G2-1	7.1	7.4	0.3	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.2%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.2	106.7	0.5	0.4%
B2			0	0.0%
B3			0	0.0%
B4	106.7	115.7	9	6.8%
B5			0	0.0%
B6			0	0.0%
DS in-1	7.2	7.3	0.1	
DS in-2			0	0.1%
DS out-1	7.3	12.7	5.4	
DS out-2	7.1	7.6	0.5	
DS out-3			0	
DS out-4			0	4.5%
Other			0	0.0%
		Total Collected	120.8	91.9%

Total Input (g)	131.5
Total Collected (g)	120.8
Difference (g)	**-10.7**
	-8%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.3
% Evaporation	**0.40%**

Mass Flow Rate	
Test Duration (min)	30
Flow Rate (g/min)	4.38

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.9	19.7	P-IN-BDST	868
2-HUM/TMP-BDST	89.3	19.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.1	20.7	P-IN-BDST	869
2-HUM/TMP-BDST	87.2	20.8		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 4, centerline, 16.5 *using the 33 degree drip tip. **Test Date:** 5/20/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	652.2	517.1	135.1	100%
Evap	141.1	140.8	0.3	
G1-1	7.3	9.3	2	
G1-2	7.3	7.9	0.6	
G1-3			0	
G1-4			0	
SS-1			0	1.9%
G2-1	7.4	7.4	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1	7.4	7.8	0.4	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.3%
B1	106.4	106.7	0.3	0.2%
B2			0	0.0%
B3			0	0.0%
B4	106.9	182.0	75.1	55.6%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.4	19.8	12.4	
DS out-2	7.4	17.4	10	
DS out-3	7.3	8.2	0.9	
DS out-4			0	17.2%
Other			0	0.0%
		Total Collected	101.7	75.3%

Total Input (g)	135.1
Total Collected (g)	101.7
Difference (g)	**-33.4**
	-25%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.3
% Evaporation	**0.41%**

Mass Flow Rate	
Test Duration (min)	30
Flow Rate (g/min)	4.50

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.7	21.5	P-IN-BDST	869
2-HUM/TMP-BDST	83.3	21.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91	21.6	P-IN-BDST	869
2-HUM/TMP-BDST	86.6	21.8		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 5, Centerline, 33, 1 hour **Test Date:** 5/16/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	761.0	533.8	227.2	100%
Evap	350.3	349.7	0.6	
G1-1	7.2	25.0	17.8	
G1-2	7.3	46.6	39.3	
G1-3	7.1	10.6	3.5	
G1-4	7.0	12.5	5.5	
SS-1			0	29.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3	105.5	106.1	0.6	0.3%
B4	107.0	107.0	0	0.0%
B5	108.8	209.6	100.8	44.4%
B6			0	0.0%
DS in-1	7.3	8.6	1.3	
DS in-2			0	0.6%
DS out-1	7.0	12.1	5.1	
DS out-2	6.8	7.3	0.5	
DS out-3			0	
DS out-4			0	2.5%
Other			0	0.0%
		Total Collected	174.4	76.8%

Total Input (g)	227.2
Total Collected (g)	174.4
Difference (g)	**-52.8**
	-23%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.6
% Evaporation	**0.21%**

Mass Flow Rate	
Test Duration (min)	60.55
Flow Rate (g/min)	3.75

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	82	22.2	P-IN-BDST	865
2-HUM/TMP-BDST	84.5	21.7		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	73.9	23.9	P-IN-BDST	861
2-HUM/TMP-BDST	68.5	24		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 5, Centerline, 33, 30 min **Test Date:** 5/16/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	621.7	477.7	144	63%
Evap	143.0	142.6	0.4	
G1-1	7.1	16.1	9	
G1-2	7.2	11.4	4.2	
G1-3	7.2	10.2	3	
G1-4			0	
SS-1			0	7.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	108.8	195.3	86.5	38.1%
B6			0	0.0%
DS in-1	7.3	8.0	0.7	
DS in-2			0	0.3%
DS out-1	7.2	10.6	3.4	
DS out-2	7.4	7.6	0.2	
DS out-3			0	
DS out-4			0	1.6%
Other			0	0.0%
		Total Collected	107	47.1%

Total Input (g)	144.0
Total Collected (g)	107
Difference (g)	**-37**
	-26%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.4
% Evaporation	**0.53%**

Mass Flow Rate	
Test Duration (min)	30.00
Flow Rate (g/min)	4.80

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	85.1	24.1	P-IN-BDST	854
2-HUM/TMP-BDST	83.5	24		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.5	24.1	P-IN-BDST	871
2-HUM/TMP-BDST	86.6	23.8		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 5, Centerline, 16.5 **Test Date:** 5/22/02

	Initial	Final	Difference	% of Input
Water Input	676.1	551.3	124.8	100%
Evap	149.6	149.5	0.1	
G1-1	7.2	9.9	2.7	
G1-2	7.1	7.8	0.7	
G1-3			0	
G1-4			0	
SS-1			0	2.7%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.3	7.6	0.3	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.2%
G4-1	7.2	7.7	0.5	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.4%
B1			0	0.0%
B2			0	0.0%
B3	105.8	106.1	0.3	0.2%
B4			0	0.0%
B5	108.6	199.1	90.5	72.5%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.2	14.4	7.2	
DS out-2	7.0	10.0	3	
DS out-3			0	
DS out-4			0	8.2%
Other	7.3	7.7	0.4	0.3%
		Total Collected	105.6	84.6%

Total Input	124.8
Total Collected	105.6
Difference	**-19.2**
	-15%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.1
% Evaporation	**0.12%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.16

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.3	18.8	P-IN-BDST	881
2-HUM/TMP-BDST	89.4	18.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.4	18.8	P-IN-BDST	881
2-HUM/TMP-BDST	89.8	18.7		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 5, Centerline, Crown **Test Date:** 5/22/02

	Initial	Final	Difference	% of Input
Water Input	672.9	535.5	137.4	100%
Evap	149.3	149.0	0.3	
G1-1	7.3	8.4	1.1	
G1-2	7.3	11.0	3.7	
G1-3			0	
G1-4			0	
SS-1			0	3.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	34.6	27.2	
G3-2	7.2	27.0	19.8	
G3-3	7.5	8.0	0.5	
G3-4			0	
SS-3	7.4	9.2	1.8	35.9%
G4-1	7.3	7.7	0.4	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.3%
B1			0	0.0%
B2			0	0.0%
B3	105.5	106.0	0.5	0.4%
B4			0	0.0%
B5	108.7	124.2	15.5	11.3%
B6	108.0	108.6	0.6	0.4%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.1	43.0	35.9	
DS out-2	7.4	16.1	8.7	
DS out-3	7.4	10.0	2.6	
DS out-4			0	34.4%
Other			0	0.0%
		Total Collected	118.3	86.1%

Total Input	137.4
Total Collected	118.3
Difference	**-19.1**
	-14%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**0.36%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.58

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.4	20.3	P-IN-BDST	877
2-HUM/TMP-BDST	89.4	20.2		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.8	20.1	P-IN-BDST	882
2-HUM/TMP-BDST	84.4	20.2		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 5, 17.5 cm leftt of patch centerline, 16.5 **Test Date:** 5/21/02

	Initial	Final	Difference	% of Input
Water Input	661.5	474	187.5	100%
Evap	155.6	155.5	0.1	
G1-1	7.4	51.9	44.5	
G1-2	7.5	55	47.5	
G1-3	7.6	18.6	11	
G1-4			0	
SS-1	7.5	13.5	6	58.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	7.7	0.3	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.2%
G4-1	7.4	7.7	0.3	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.2%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.1	111.7	2.6	1.4%
B6	108.4	108.7	0.3	0.2%
DS in-1	7.5	30.7	23.2	
DS in-2	7.4	13.3	5.9	15.5%
DS out-1			0	
DS out-2			0	
DS out-3			0	
DS out-4			0	0.0%
Other			0	0.0%
		Total Collected	141.6	75.5%

Total Input	187.5
Total Collected	141.6
Difference	**-45.9**
	-24%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.1
% Evaporation	**0.11%**

Mass Flow Rate	
Test Duration, min	30.01667
Flow Rate, g/min	6.25

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90	21.3	P-IN-BDST	882
2-HUM/TMP-BDST	87.3	21.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.3	20.7	P-IN-BDST	895
2-HUM/TMP-BDST	88.2	20.8		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 5, 17.5 cm left of patch centerline, Crown **Test Date:** 5/22/02

	Initial	Final	Difference	% of Input
Water Input	667.8	523.0	144.8	100%
Evap	148.0	147.8	0.2	
G1-1	7.5	26.1	18.6	
G1-2	7.2	8.1	0.9	
G1-3			0	
G1-4			0	
SS-1			0	13.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	25.4	18	
G3-2	7.4	25.4	18	
G3-3	7.5	20.7	13.2	
G3-4			0	
SS-3	7.4	10.5	3.1	36.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.2	112.2	3	2.1%
B6	108.4	110.7	2.3	1.6%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.4	43.9	36.5	
DS out-2	7.4	18.6	11.2	
DS out-3	7.4	12.1	4.7	
DS out-4			0	36.2%
Other			0	0.0%
		Total Collected	129.5	89.4%

Total Input	144.8
Total Collected	129.5
Difference	**-15.3**
	-11%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.25%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.83

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.5	20.8	P-IN-BDST	875
2-HUM/TMP-BDST	86.8	20.7		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	91.9	20.8	P-IN-BDST	875
2-HUM/TMP-BDST	90	20.8		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 5, 17.5 cm left of patch centerline, 33 **Test Date:** 5/17/02

	Initial	Final	Difference	% of Input
Water Input	529.4	439.6	89.8	100%
Evap	122.2	121.7	0.5	
G1-1	14.1	65.4	51.3	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	57.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	108.5	108.8	0.3	0.3%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.1	19.8	12.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	14.1%
Other (floor)	7.2	22.4	15.2	16.9%
		Total Collected	79.5	88.5%

Total Input	89.8
Total Collected	79.5
Difference	**-10.3**
	-11%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.5
% Evaporation	**0.90%**

Mass Flow Rate	
Test Duration, min	30.183333
Flow Rate, g/min	2.98

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	79.6	23.3	P-IN-BDST	871
2-HUM/TMP-BDST	80.1	22.7		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	84.6	23.4	P-IN-BDST	867
2-HUM/TMP-BDST	82.9	22.9		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 6, Centerline, 16.5 **Test Date** 5/21/02

	Initial	Final	Difference	% of Input
Water Input	664.0	516.3	147.7	100%
Evap	156.8	156.3	0.5	
G1-1	7.4	52.8	45.4	
G1-2	7.4	46.3	38.9	
G1-3	7.6	45.9	38.3	
G1-4	7.4	11.5	4.1	
SS-1			0	85.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	7.6	0.2	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.1	107.3	0.2	0.1%
B5	109.2	109.4	0.2	0.1%
B6	108.3	108.6	0.3	0.2%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.4	16.1	8.7	
DS out-2	7.4	8.9	1.5	
DS out-3			0	
DS out-4			0	6.9%
Other			0	0.0%
		Total Collected	137.8	93.3%

Total Input	147.7
Total Collected	137.8
Difference	**-9.9**
	-7%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.5
% Evaporation	**0.55%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.92

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.3	21.4	P-IN-BDST	884
2-HUM/TMP-BDST	87.6	21.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.6	21.4	P-IN-BDST	892
2-HUM/TMP-BDST	88.2	21.4		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 6, Centerline, Between crown and 16.5 **Test Date** 5/23/02

	Initial	Final	Difference	% of Input
Water Input	667.8	525.6	142.2	100%
Evap	141.6	141.4	0.2	
G1-1	7.3	40.4	33.1	
G1-2	7.4	45.9	38.5	
G1-3	7.3	8.2	0.9	
G1-4			0	
SS-1	7.2	7.4	0.2	51.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	8.0	0.6	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.1	107.5	0.4	0.3%
B5	109.0	109.7	0.7	0.5%
B6	108.4	108.9	0.5	0.4%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.2	34.3	27.1	
DS out-2	7.4	12.4	5	
DS out-3	7.2	19.4	12.2	
DS out-4	7.3	10.6	3.3	33.5%
Other			0	0.0%
		Total Collected	122.5	86.1%

Total Input	142.2
Total Collected	122.5
Difference	**-19.7**
	-14%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.27%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.74

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.9	20	P-IN-BDST	880
2-HUM/TMP-BDST	88.4	19.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.2	20.4	P-IN-BDST	888
2-HUM/TMP-BDST	89.2	20.2		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 6, 36.5 cm left of patch centerline, 16.5 **Test Date** 5/21/02

	Initial	Final	Difference	% of Input
Water Input	661.8	519.5	142.3	100%
Evap	157.9	157.8	0.1	
G1-1	7.4	57.6	50.2	
G1-2	7.4	48.8	41.4	
G1-3	7.4	10.1	2.7	
G1-4			0	
SS-1	7.3	8.6	1.3	67.2%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	7.8	0.4	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.3%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.3	108.9	1.6	1.1%
B5	109.3	109.3	0	0.0%
B6	108.6	108.7	0.1	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.5	18.2	10.7	
DS out-2	7.4	10.3	2.9	
DS out-3	7.3	7.4	0.1	
DS out-4			0	9.6%
Other			0	0.0%
		Total Collected	111.4	78.3%

Total Input	142.3
Total Collected	111.4
Difference	**-30.9**
	-22%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.1
% Evaporation	**0.11%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.74

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.7	22	P-IN-BDST	884
2-HUM/TMP-BDST	90.8	21.6		
Final Conditions	**RH (%)**	**Temperature (^{o}C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	86.5	22.7	P-IN-BDST	886
2-HUM/TMP-BDST	80.5	22.8		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 6, 36.5 cm left of patch centerline, Crown **Test Date** 5/22/02

	Initial	Final	Difference	% of Input
Water Input	654.5	515.4	139.1	100%
Evap	147.3	146.9	0.4	
G1-1	7.4	24.2	16.8	
G1-2	7.3	10.2	2.9	
G1-3			0	
G1-4			0	
SS-1			0	14.2%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	37.8	30.4	
G3-2	7.3	21.4	14.1	
G3-3	7.4	17.1	9.7	
G3-4			0	
SS-3	7.5	8.4	0.9	39.6%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.2	108.0	0.8	0.6%
B5			0	0.0%
B6	108.4	111.3	2.9	2.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.5	14.9	7.4	
DS out-2	7.6	8.4	0.8	
DS out-3	7.4	37.2	29.8	
DS out-4			0	27.3%
Other			0	0.0%
		Total Collected	116.5	83.8%

Total Input	139.1
Total Collected	116.5
Difference	**-22.6**
	-16%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**0.50%**

Mass Flow Rate	
Test Duration, min	30.016667
Flow Rate, g/min	4.63

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.4	21.6	P-IN-BDST	872
2-HUM/TMP-BDST	87.3	21.4		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.6	21.1	P-IN-BDST	877
2-HUM/TMP-BDST	90.8	21		

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Single Patch q(splash) Test Summary and Mass Balance-Smooth DS Surface

Test: Patch 6, 36.5 cm left of cntrln, between Crown and 16.5 **Test Date** 5/23/02

	Initial	Final	Difference	% of Input
Water Input	660.4	531.1	129.3	100%
Evap	122.7	122.5	0.2	
G1-1	7.3	53.9	46.6	
G1-2	7.3	23.2	15.9	
G1-3	7.3	18.0	10.7	
G1-4	7.0	7.5	0.5	
SS-1			0	57.0%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.3	7.9	0.6	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.5%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.0	113.6	6.6	5.1%
B5			0	0.0%
B6	108.3	108.8	0.5	0.4%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.4	26.1	18.7	
DS out-2	7.2	20.3	13.1	
DS out-3	7.2	10.2	3	
DS out-4			0	26.9%
Other			0	0.0%
		Total Collected	116.2	89.9%

Total Input	129.3
Total Collected	116.2
Difference	**-13.1**
	-10%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.36%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.31

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.2	19.1	P-IN-BDST	881
2-HUM/TMP-BDST	88.7	18.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.6	19.6	P-IN-BDST	878
2-HUM/TMP-BDST	89.2	19.5		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 2, 15 cm right of center, Crown **Test Date** 5/29/02

	Initial	Final	Difference	% of Input
Water Input	-23.6	-137.7	114.1	100%
Evap	96.6	95.3	1.3	
G1-1	7.4	28.0	20.6	
G1-2	7.6	10.8	3.2	
G1-3			0	
G1-4			0	
SS-1			0	20.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.3	14.4	7.1	
G3-2	7.3	11.7	4.4	
G3-3			0	
G3-4			0	
SS-3	7.2	8.2	1	11.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.8	112.9	6.1	5.3%
B3			0	0.0%
B4			0	0.0%
B5	109.6	109.5	-0.1	-0.1%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.3	8.3	1	
DS out-2	7.4	14.5	7.1	
DS out-3	7.3	37.6	30.3	
DS out-4			0	33.7%
Other			0	0.0%
		Total Collected	80.7	70.7%

Total Input	114.1
Total Collected	80.7
Difference	**-33.4**
	-29%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.3
% Evaporation	**4.35%**

Mass Flow Rate	
Test Duration, min	34.4
Flow Rate, g/min	3.32

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.8	25.7	P-IN-BDST	857
2-HUM/TMP-BDST	84.5	25.7		
Final Conditions	**RH (%)**	**Temperature (^{o}C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	90.1	25.8	P-IN-BDST	870
2-HUM/TMP-BDST	85.9	26.3		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 2, Centerline, 10.5 cm forward from crown **Test Date** 5/31/02

	Initial	Final	Difference	% of Input
Water Input	538.1	468.9	69.2	100%
Evap	90.3	89.3	1	
G1-1	7.4	13.7	6.3	
G1-2	7.4	7.9	0.5	
G1-3			0	
G1-4			0	
SS-1			0	9.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.3	7.9	0.6	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	7.3	8.9	1.6	3.2%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.5	117.2	10.7	15.5%
B3			0	0.0%
B4	107.5	107.6	0.1	0.1%
B5	109.5	109.5	0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.4	11.8	4.4	
DS out-2	7.3	28.0	20.7	
DS out-3	7.5	11.1	3.6	
DS out-4			0	41.5%
Other G1-5			0	0.0%
		Total Collected	48.5	70.1%

Total Input	69.2
Total Collected	48.5
Difference	**-20.7**
	-30%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1
% Evaporation	**4.24%**

Mass Flow Rate	
Test Duration, min	30.016667
Flow Rate, g/min	2.31

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88	24.6	P-IN-BDST	865
2-HUM/TMP-BDST	84.9	24.7		
Final Conditions	**RH (%)**	**Temperature (^{o}C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	89.7	25.3	P-IN-BDST	862
2-HUM/TMP-BDST	87.1	25.5		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 2, 15 cm right of center, 16.5 **Test Date** 5/21/02

	Initial	Final	Difference	% of Input
Water Input	36.1	-141.1	177.2	100%
Evap	96.3	96.2	0.1	
G1-1	7.6	54.3	46.7	
G1-2	7.5	50.9	43.4	
G1-3	7.4	36.7	29.3	
G1-4			0	
SS-1	7.5	8.6	1.1	68.0%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	7.6	7.6	0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.1	112.0	4.9	2.8%
B3			0	0.0%
B4	107.2	107.5	0.3	0.2%
B5	109.4	109.7	0.3	0.2%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.5	7.9	0.4	
DS out-2	7.5	9.1	1.6	
DS out-3	7.6	17.4	9.8	
DS out-4	7.5	15.3	7.8	11.1%
Other	7.5	8.8	1.3	0.7%
		Total Collected	146.9	82.9%

Total Input	177.2
Total Collected	146.9
Difference	**-30.3**
	-17%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.1
% Evaporation	**0.34%**

Mass Flow Rate	
Test Duration, min	60.06667
Flow Rate, g/min	2.95

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.2	23	P-IN-BDST	863
2-HUM/TMP-BDST	89.6	27.7		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93	24.3	P-IN-BDST	869
2-HUM/TMP-BDST	92.9	24.1		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 2, centerline, 16.5 **Test Date** 5/31/02

	Initial	Final	Difference	% of Input
Water Input	28.7	-213.7	242.4	100%
Evap	96.0	95.6	0.4	
G1-1	7.5	8.5	1	
G1-2	7.5	11.5	4	
G1-3	7.6	11.9	4.3	
G1-4			0	
SS-1			0	3.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.6	7.6	0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.1	107.5	0.4	0.2%
B3			0	0.0%
B4	107.4	259.1	151.7	62.6%
B5	109.6	109.7	0.1	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.5	8.8	1.3	
DS out-2	7.5	19.5	12	
DS out-3	7.6	18.0	10.4	
DS out-4	7.5	11.4	3.9	11.4%
Other floor	7.4	8.7	1.3	0.5%
		Total Collected	190.4	78.5%

Total Input	242.4
Total Collected	190.4
Difference	**-52**
	-21%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.37%**

Mass Flow Rate	
Test Duration, min	66.15
Flow Rate, g/min	3.66

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.1	24.6	P-IN-BDST	865
2-HUM/TMP-BDST	92.2	24.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.3	25.3	P-IN-BDST	865
2-HUM/TMP-BDST	89.1	25		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 2, 15 cm right of center, 33 **Test Date** 5/31/02

	Initial	Final	Difference	% of Input
Water Input	51.9	-84.8	136.7	100%
Evap	92.4	91.1	1.3	
G1-1	7.6	61.2	53.6	
G1-2	6.7	37.0	30.3	
G1-3	7.4	9.7	2.3	
G1-4	7.4	8.5	1.1	
SS-1			0	63.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.3	7.9	0.6	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	114.7	137.2	22.5	16.5%
B3			0	0.0%
B4			0	0.0%
B5	109.4	109.5	0.1	0.1%
B6			0	0.0%
DS in-1	7.4	7.9	0.5	
DS in-2			0	0.4%
DS out-1	7.4	10.5	3.1	
DS out-2	7.4	7.7	0.3	
DS out-3			0	
DS out-4			0	2.5%
Other (floor)	7.2	9.7	2.5	1.8%
		Total Collected	116.9	85.5%

Total Input	136.7
Total Collected	116.9
Difference	**-19.8**
	-14%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.3
% Evaporation	**5.06%**

Mass Flow Rate	
Test Duration, min	30.05
Flow Rate, g/min	4.55

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.3	26.1	P-IN-BDST	865
2-HUM/TMP-BDST	91.3	25.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.8	26.2	P-IN-BDST	865
2-HUM/TMP-BDST	93.3	25.7		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 2, Centerline, 33 **Test Date** 5/31/02

	Initial	Final	Difference	% of Input
Water Input	97.3	-106.6	203.9	100%
Evap	92.1	92.6	-0.5	
G1-1	7.5	11.6	4.1	
G1-2	7.6	8.0	0.4	
G1-3	7.6	8.1	0.5	
G1-4			0	
SS-1			0	2.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	114.4	278.2	163.8	80.3%
B3			0	0.0%
B4			0	0.0%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.5	7.8	0.3	
DS out-2	7.7	7.7	0	
DS out-3	7.5	9.8	2.3	
DS out-4			0	1.3%
Other			0	0.0%
		Total Collected	171.4	84.1%

Total Input	203.9
Total Collected	171.4
Difference	**-32.5**
	-16%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	-0.5
% Evaporation	**-1.97%**

Mass Flow Rate	
Test Duration, min	42.016667
Flow Rate, g/min	4.85

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	84.4	25.3	P-IN-BDST	866
2-HUM/TMP-BDST	83	25.1		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.8	25.9	P-IN-BDST	863
2-HUM/TMP-BDST	92.2	25.3		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 4, 8cm right of centerline, 33 **Test Date:** 6/1/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	53.7	-83.7	137.4	100%
Evap	106.7	106.4	0.3	
G1-1	7.4	13.0	5.6	
G1-2	7.2	8.6	1.4	
G1-3	7.4	7.7	0.3	
G1-4			0	
SS-1			0	5.3%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.7	107.0	0.3	0.2%
B3			0	0.0%
B4	114.8	222.2	107.4	78.2%
B5			0	0.0%
B6			0	0.0%
DS in-1	7.4	7.9	0.5	
DS in-2			0	0.4%
DS out-1	7.3	10.3	3	
DS out-2	7.3	7.7	0.4	
DS out-3			0	
DS out-4			0	2.5%
Other			0	0.0%
		Total Collected	118.9	86.5%

Total Input (g)	137.4
Total Collected (g)	118.9
Difference (g)	**-18.5**
	-13%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.3
% Evaporation	**0.77%**

Mass Flow Rate	
Test Duration (min)	30.53
Flow Rate (g/min)	4.50

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	85	23.1	P-IN-BDST	869
2-HUM/TMP-BDST	88.4	22.7		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.4	23.7	P-IN-BDST	871
2-HUM/TMP-BDST	93.1	23.3		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 4, 8cm right of centerline, Crown **Test Date:** 5/30/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	-50.3	-228.5	178.2	100%
Evap	98.6	98.0	0.6	
G1-1	7.6	16.4	8.8	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	4.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.6	8.6	1	
G3-2	7.6	23.2	15.6	
G3-3	7.6	8.8	1.2	
G3-4	7.5	17.1	9.6	
SS-3			0	15.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.0	109.0	2	1.1%
B3			0	0.0%
B4	107.6	129.6	22	12.3%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.6	8.7	1.1	
DS out-2	7.5	19.6	12.1	
DS out-3	7.5	34.4	26.9	
DS out-4	7.7	40.3	32.6	40.8%
Other			0	0.0%
		Total Collected	132.9	74.6%

Total Input (g)	178.2
Total Collected (g)	132.9
Difference (g)	**-45.3**
	-25%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.6
% Evaporation	**1.94%**

Mass Flow Rate	
Test Duration (min)	60.38
Flow Rate (g/min)	2.95

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.4	25.6	P-IN-BDST	854
2-HUM/TMP-BDST	83.8	25.7		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.9	26.5	P-IN-BDST	865
2-HUM/TMP-BDST	91.3	26.2		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 4, 8 cm right of centerline, 16.5 **Test Date:** 5/31/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	-0.9	-173.2	172.3	100%
Evap	96.7	96.4	0.3	
G1-1	7.6	9.5	1.9	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1	7.5	8.7	1.2	1.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2	7.6	7.6	0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.9	107.9	1	0.6%
B3			0	0.0%
B4	107.1	199.6	92.5	53.7%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.5	22.3	14.8	
DS out-2	7.6	14.4	6.8	
DS out-3	7.4	9.3	1.9	
DS out-4			0	13.6%
Other			0	0.0%
		Total Collected	120.1	69.7%

Total Input (g)	172.3
Total Collected (g)	120.1
Difference (g)	**-52.2**
	-30%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.3
% Evaporation	**1.03%**

Mass Flow Rate	
Test Duration (min)	61.47
Flow Rate (g/min)	2.80

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.1	21.3	P-IN-BDST	873
2-HUM/TMP-BDST	87.5	21		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.3	22.6	P-IN-BDST	871
2-HUM/TMP-BDST	92.1	22.2		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 5, Centerline, Crown **Test Date:** 5/30/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	-12.6	-176.4	163.8	100%
Evap	77.0	76.5	0.5	
G1-1	7.5	8.2	0.7	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	0.4%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	13.5	6.1	
G3-2	7.4	25.7	18.3	
G3-3	7.5	31.3	23.8	
G3-4			0	
SS-3	7.3	11.6	4.3	32.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.5	109.0	2.5	1.5%
B3			0	0.0%
B4			0	0.0%
B5	109.4	130.5	21.1	12.9%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.4	27.1	19.7	
DS out-2	7.4	41.4	34	
DS out-3	7.8	17.1	9.3	
DS out-4	7.7	8.9	1.2	39.2%
Other			0	0.0%
		Total Collected	141	86.1%

Total Input (g)	163.8
Total Collected (g)	141
Difference (g)	**-22.8**
	-14%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.5
% Evaporation	**5.38%**

Mass Flow Rate	
Test Duration (min)	64.07
Flow Rate (g/min)	2.56

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.4	22.4	P-IN-BDST	866
2-HUM/TMP-BDST	87.8	22.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.2	24	P-IN-BDST	868
2-HUM/TMP-BDST	90	23.9		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 5, 4 cm left of centerline, Crown **Test Date:** 5/16/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	-210.4	-344.2	133.8	100%
Evap	87.7	87.0	0.7	
G1-1	7.6	15.0	7.4	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	5.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	15.5	8.1	
G3-2	7.4	8.1	0.7	
G3-3	7.4	9.3	1.9	
G3-4			0	
SS-3	7.4	35.9	28.5	29.3%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.7	107.1	0.4	0.3%
B3			0	0.0%
B4			0	0.0%
B5	109.1	118.2	9.1	6.8%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.4	38.8	31.4	
DS out-2	7.4	33.7	26.3	
DS out-3	7.4	17.5	10.1	
DS out-4	7.5	8.6	1.1	51.5%
Other			0	0.0%
		Total Collected	125	93.4%

Total Input (g)	133.8
Total Collected (g)	125
Difference (g)	**-8.8**
	-7%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.7
% Evaporation	**3.50%**

Mass Flow Rate	
Test Duration (min)	51.28
Flow Rate (g/min)	2.61

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.8	24.5	P-IN-BDST	863
2-HUM/TMP-BDST	89	24.5		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.7	25.6	P-IN-BDST	850
2-HUM/TMP-BDST	85.6	25.6		

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Single Patch q(film) Test Summary and Mass Balance - Smooth DS Surface

Test: Patch 5, 4 cm left of centerline, 16.5 **Test Date:** 5/31/02

	Initial	Final	Difference	% of Input
Water Input	-37.2	-210.3	173.1	100%
Evap	94.3	93.6	0.7	
G1-1	7.6	7.8	0.2	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1	7.5	11.3	3.8	2.3%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	7.6	7.7	0.1	0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4	7.7	7.7	0	0.0%
B1			0	0.0%
B2	107.0	107.1	0.1	0.1%
B3			0	0.0%
B4	107.4	107.5	0.1	0.1%
B5	117.4	301.9	184.5	106.6%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.6	20.0	12.4	
DS out-2	7.6	13.0	5.4	
DS out-3	7.5	8.6	1.1	
DS out-4			0	10.9%
Other			0	0.0%
		Total Collected	207.7	120.0%

Total Input (g)	173.1
Total Collected (g)	207.7
Difference (g)	**34.6**
	20%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.7
% Evaporation	**2.54%**

Mass Flow Rate	
Test Duration, min	60.05
Flow Rate, g/min	2.88

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.2	25.7	P-IN-BDST	870
2-HUM/TMP-BDST	87	25.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.9	25.9	P-IN-BDST	859
2-HUM/TMP-BDST	92.1	25.3		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 81 cm left of DS center, Crown **Test Date** 6/13/02

	Initial	Final	Difference	% of Input
Water Input	755.5	529.3	226.2	100%
Evap	112.7	111.9	0.8	
G1-1	7.4	14.1	6.7	
G1-2	7.4	43.7	36.3	
G1-3			0.0	
G1-4			0.0	
SS-1			0.0	19.0%
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2	7.4	7.5	0.1	0.0%
G3-1	7.3	17.1	9.8	
G3-2	7.3	22.2	14.9	
G3-3			0.0	
G3-4			0.0	
SS-3			0.0	10.9%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1	107.3	110.0	2.7	1.2%
B2			0.0	0.0%
B3			0.0	0.0%
B4	107.1	110.6	3.5	1.5%
B5			0.0	0.0%
B6	109.7	109.9	0.2	0.1%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	7.3	40.5	33.2	
DS out-2	7.3	15.7	8.4	
DS out-3	7.3	26.9	19.6	
DS out-4	7.4	36.2	28.8	39.8%
Other			0.0	0.0%
		Total Collected	164.2	72.6%

Total Input	226.2
Total Collected	164.2
Difference	**-62.0**
	-27.4%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.8
% Evaporation	**1.74%**

Mass Flow Rate	
Test Duration, min	62.8
Flow Rate, g/min	3.60

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	82.3	22.7	P-IN-BDST	866
2-HUM/TMP-BDST	81.3	23		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	85.7	25.1	P-IN-BDST	856
2-HUM/TMP-BDST	86	25		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 27 cm left of DS center, Crown **Test Date** 6/13/02

	Initial	Final	Difference	% of Input
Water Input	710.1	433.2	276.9	100%
Evap	114.9	113.6	1.3	
G1-1	7.5	27.9	20.4	
G1-2	7.5	9.6	2.1	
G1-3			0.0	
G1-4			0.0	
SS-1			0.0	8.1%
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2			0.0	0.0%
G3-1	7.4	46.8	39.4	
G3-2	7.4	23.5	16.1	
G3-3	7.4	21.9	14.5	
G3-4			0.0	
SS-3			0.0	25.3%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1			0.0	0.0%
B2	106.5	108.3	1.8	0.7%
B3			0.0	0.0%
B4	107.7	110.4	2.7	1.0%
B5	109.0	109.1	0.1	0.0%
B6	109.5	117.0	7.5	2.7%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	7.4	30.4	23.0	
DS out-2	7.4	43.8	36.4	
DS out-3	7.5	39.8	32.3	
DS out-4	7.5	12.0	4.5	34.7%
Other			0.0	0.0%
		Total Collected	200.8	72.5%

Total Input	276.9
Total Collected	200.8
Difference	**-76.1**
	-27.5%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.3
% Evaporation	**2.70%**

Mass Flow Rate	
Test Duration, min	60.117
Flow Rate, g/min	4.61

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	81.8	21.4	P-IN-BDST	870
2-HUM/TMP-BDST	84.4	21.2		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.8	23.2	P-IN-BDST	868
2-HUM/TMP-BDST	85.1	23.3		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 27 cm right of DS center, Crown **Test Date** 6/12/02

	Initial	Final	Difference	% of Input
Water Input	85.8	-187.3	273.1	100%
Evap	87.1	85.4	1.7	
G1-1	7.4	22.7	15.3	
G1-2	7.4	17.9	10.5	
G1-3	7.5	7.9	0.4	
G1-4			0	
SS-1			0	9.6%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	7.4	17.1	9.7	
G3-2	7.3	41	33.7	
G3-3			0	
G3-4 (SS)	7	8.6	1.6	
SS-3	7.4	15.5	8.1	19.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.7	110.8	4.1	1.5%
B3			0	0.0%
B4	107.1	109.2	2.1	0.8%
B5	109	109.3	0.3	0.1%
B6	109.6	114.4	4.8	1.8%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.4	34.5	27.1	
DS out-2	7.5	15.1	7.6	
DS out-3	7.5	7.9	0.4	
DS out-4	7.6	34.2	26.6	22.6%
Other			0	0.0%
		Total Collected	152.3	55.8%

Total Input	273.1
Total Collected	152.3
Difference	**-120.8**
	-44.2%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.7
% Evaporation	**8.33%**

Mass Flow Rate	
Test Duration, min	65.68
Flow Rate, g/min	4.16

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	81.6	25.4	P-IN-BDST	861
2-HUM/TMP-BDST	81.3	25.4		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	87.5	25.3	P-IN-BDST	865
2-HUM/TMP-BDST	86.6	25.4		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 81 cm right of DS center, Crown **Test Date** 6/12/02

	Initial	Final	Difference	% of Input
Water Input	-0.5	-276.6	276.1	100%
Evap	89.4	88.1	1.3	
G1-1	7.3	12.5	5.2	
G1-2	7.3	33.5	26.2	
G1-3	7.4	23.8	16.4	
G1-4			0.0	
SS-1			0.0	17.3%
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2			0.0	0.0%
G3-1	7.5	25.3	17.8	
G3-2	7.3	27.5	20.2	
G3-3 (SS)	7.5	8.5	1.0	
G3-4	7.5	8.2	0.7	
SS-3	7.7	18.9	11.2	18.4%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1			0.0	0.0%
B2	106.5	106.8	0.3	0.1%
B3			0.0	0.0%
B4	107.0	107.1	0.1	0.0%
B5	109.1	113.5	4.4	1.6%
B6	109.6	115.6	6.0	2.2%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	8.5	9.9	1.4	
DS out-2	7.4	23.4	16.0	
DS out-3	7.3	38.2	30.9	
DS out-4	7.6	41.9	34.3	29.9%
Other			0.0	0.0%
		Total Collected	192.1	69.6%

Total Input	276.1
Total Collected	192.1
Difference	**-84**
	-30.4%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.3
% Evaporation	**5.73%**

Mass Flow Rate	
Test Duration, min	72.38
Flow Rate, g/min	3.81

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	82.6	22.4	P-IN-BDST	858
2-HUM/TMP-BDST	81.9	22.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	82.1	24.7	P-IN-BDST	857
2-HUM/TMP-BDST	80.5	24.8		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 81 cm left of DS center, 16.5 **Test Date** 6/13/02

	Initial	Final	Difference	% of Input
Water Input	838.9	589.8	249.1	100%
Evap	109.3	107.2	2.1	
G1-1	7.6	52.3	44.7	
G1-2	7.5	44.5	37.0	
G1-3	7.6	62.1	54.5	
G1-4	7.5	55.6	48.1	
G1-5	7.6	8.6	1.0	74.4%
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2	7.6	7.6	0.0	0.0%
G3-1			0.0	
G3-2			0.0	
G3-3			0.0	
G3-4			0.0	
SS-3	7.5	7.5	0.0	0.0%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1	107.6	107.7	0.1	0.0%
B2			0.0	0.0%
B3			0.0	0.0%
B4	107.3	107.3	0.0	0.0%
B5			0.0	0.0%
B6	109.9	109.9	0.0	0.0%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	7.5	7.6	0.1	
DS out-2	7.5	9.6	2.1	
DS out-3	7.6	10.8	3.2	
DS out-4			0.0	2.2%
Other G1-5			0.0	0.0%
		Total Collected	190.8	76.6%

Total Input	249.1
Total Collected	190.8
Difference	**-58.3**
	-23%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	2.1
% Evaporation	**4.93%**

Mass Flow Rate	
Test Duration, min	66.02
Flow Rate, g/min	3.77

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	85	25.4	P-IN-BDST	856
2-HUM/TMP-BDST	81.7	25.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	80.2	26.2	P-IN-BDST	863
2-HUM/TMP-BDST	80.1	26.3		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 27 cm left of DS center, 16.5 **Test Date** 6/13/02

	Initial	Final	Difference	% of Input
Water Input	824.7	589.0	235.7	100%
Evap	106.6	106.2	0.4	
G1-1	7.6	30.9	23.3	
G1-2	7.5	42.9	35.4	
G1-3	7.5	53.9	46.4	
G1-4	7.4	52.9	45.5	
SS-1			0.0	63.9%
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2			0.0	0.0%
G3-1			0.0	
G3-2			0.0	
G3-3			0.0	
G3-4			0.0	
SS-3	7.5	7.6	0.1	0.0%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1			0.0	0.0%
B2	106.8	108.2	1.4	0.6%
B3			0.0	0.0%
B4	107.4	107.8	0.4	0.2%
B5			0.0	0.0%
B6	110.0	110.5	0.5	0.2%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	7.5	11.7	4.2	
DS out-2	7.5	23.2	15.7	
DS out-3	7.5	22.4	14.9	
DS out-4			0.0	14.8%
Other			0.0	0.0%
		Total Collected	187.8	79.7%

Total Input	235.7
Total Collected	187.8
Difference	**-47.9**
	-20%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.00%**

Mass Flow Rate	
Test Duration, min	63.88
Flow Rate, g/min	3.69

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	83.7	26.8	P-IN-BDST	862
2-HUM/TMP-BDST	85.4	26.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.7	28	P-IN-BDST	871
2-HUM/TMP-BDST	92	27.8		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 27 cm right of DS center, 16.5 **Test Date** 6/14/02

	Initial	Final	Difference	% of Input
Water Input	790.3	543.2	247.1	100%
Evap	89.6	89.2	0.4	
G1-1	65.1	233.2	168.1	
G1-2			0.0	
G1-3			0.0	
G1-4			0.0	
SS-1			0.0	68.0%
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2			0.0	0.0%
G3-1	41.6	41.9	0.3	
G3-2			0.0	
G3-3			0.0	
G3-4			0.0	
SS-3			0.0	0.1%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1			0.0	0.0%
B2	107.0	108.5	1.5	0.6%
B3			0.0	0.0%
B4	107.5	107.7	0.2	0.1%
B5	109.4	110.8	1.4	0.6%
B6	110.2	110.5	0.3	0.1%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	57.1	100.6	43.5	
DS out-2	7.8	8.1	0.3	
DS out-3			0.0	
DS out-4			0.0	17.7%
Other			0.0	0.0%
		Total Collected	215.6	87.3%

Total Input	247.1
Total Collected	215.6
Difference	**-31.5**
	-13%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.75%**

Mass Flow Rate	
Test Duration, min	67.63
Flow Rate, g/min	3.65

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	85.2	23	P-IN-BDST	882
2-HUM/TMP-BDST	87.8	23.1		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	95.7	25	P-IN-BDST	873
2-HUM/TMP-BDST	93.9	25		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 81 cm right of DS center, 16.5 **Test Date** 6/3/02

	Initial	Final	Difference	% of Input
Water Input	811.4	590.6	220.8	100%
Evap	152.3	151.4	0.9	
G1-1	7.4	57	49.6	
G1-2	7.4	61.7	54.3	
G1-3	7.8	43.8	36	
G1-4	7.3	38.7	31.4	
SS-1 (G1-5)	7.5	11	3.5	79.2%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1	7.6	8.2	0.6	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.3%
B1			0	0.0%
B2			0	0.0%
B3	105.8	107.9	2.1	1.0%
B4			0	0.0%
B5	108.5	110.4	1.9	0.9%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	7.3	22.7	15.4	
DS out-2	7.6	15.1	7.5	
DS out-3	7.6	9.1	1.5	
DS out-4			0	11.1%
Other			0	0.0%
		Total Collected	203.8	92.3%

Total Input	220.8
Total Collected	203.8
Difference	**-17**
	-8%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.9
% Evaporation	**1.05%**

Mass Flow Rate	
Test Duration, min	60
Flow Rate, g/min	3.68

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.9	25.9	P-IN-BDST	865
2-HUM/TMP-BDST	90.8	25.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.5	25.8	P-IN-BDST	875
2-HUM/TMP-BDST	92.3	25.5		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 81 cm right of DS center, 33 **Test Date** 6/3/02

	Initial	Final	Difference	% of Input
Water Input	693.1	569.4	123.7	1.000
Evap	153.2	152.7	0.5	
G1-1	7.4	57.1	49.7	
G1-2	7.4	52.2	44.8	
G1-3	7.4	9.2	1.8	
G1-4	7.4	18.9	11.5	
SS-1			0.0	0.871
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2			0.0	0.000
G3-1			0.0	
G3-2			0.0	
G3-3			0.0	
G3-4			0.0	
SS-3			0.0	0.000
G4-1	7.6	7.6	0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.000
B1			0.0	0.000
B2			0.0	0.000
B3	105.7	106.3	0.6	0.005
B4			0.0	0.000
B5	108.9	109.4	0.5	0.004
B6			0.0	0.000
DS in-1			0.0	
DS in-2			0.0	0.000
DS out-1	7.4	9.4	2.0	
DS out-2	7.4	7.9	0.5	
DS out-3			0.0	
DS out-4			0.0	0.020
Other			0.0	0.000
		Total Collected	111.4	0.901

Total Input	123.7
Total Collected	111.4
Difference	**-12.3**
	-10%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.5
% Evaporation	**0.58%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.12

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.3	25.6	P-IN-BDST	861
2-HUM/TMP-BDST	86.5	25.6		
Final Conditions	**RH (%)**	**Temperature (^{o}C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	90.7	25.8	P-IN-BDST	864
2-HUM/TMP-BDST	90.6	25.8		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 27 cm right of DS center, 33 **Test Date** 6/3/02

	Initial	Final	Difference	% of Input
Water Input	722.6	582.3	140.3	100%
Evap	154.4	153.6	0.8	
G1-1	7.4	58.4	51.0	
G1-2	7.2	61.0	53.8	
G1-3	7.2	20.6	13.4	
G1-4	7.2	10.1	2.9	
SS-1			0.0	86.3%
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2			0.0	0.0%
G3-1			0.0	
G3-2			0.0	
G3-3			0.0	
G3-4			0.0	
SS-3			0.0	0.0%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1			0.0	0.0%
B2	106.7	106.8	0.1	0.1%
B3			0.0	0.0%
B4			0.0	0.0%
B5	109.2	109.3	0.1	0.1%
B6			0.0	0.0%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	7.5	9.2	1.7	
DS out-2	7.3	8.0	0.7	
DS out-3			0.0	
DS out-4			0.0	1.7%
Other			0.0	0.0%
		Total Collected	123.7	88.2%

Total Input	140.3
Total Collected	123.7
Difference	**-16.6**
	-12%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.8
% Evaporation	**0.91%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.68

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.2	24.6	P-IN-BDST	860
2-HUM/TMP-BDST	86.1	24.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.9	25.7	P-IN-BDST	863
2-HUM/TMP-BDST	85.6	25.2		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 27 cm left of DS center, 33 **Test Date** 6/3/02

	Initial	Final	Difference	% of Input
Water Input	661.0	527.9	133.1	100%
Evap	131.8	131.8	0.0	
G1-1	7.3	57.3	50.0	
G1-2	7.2	58.9	51.7	
G1-3	7.4	27.0	19.6	
G1-4	7.3	7.6	0.3	
SS-1			0.0	91.4%
G2-1			0.0	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2			0.0	0.0%
G3-1			0.0	
G3-2			0.0	
G3-3			0.0	
G3-4			0.0	
SS-3			0.0	0.0%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1			0.0	0.0%
B2	107.0	107.3	0.3	0.2%
B3			0.0	0.0%
B4	106.9	107.4	0.5	0.4%
B5			0.0	0.0%
B6			0.0	0.0%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	7.2	11.7	4.5	
DS out-2	7.2	9.2	2.0	
DS out-3			0.0	
DS out-4			0.0	4.9%
Other			0.0	0.0%
		Total Collected	128.9	96.8%

Total Input	133.1
Total Collected	128.9
Difference	**-4.2**
	-3%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0
% Evaporation	**0.00%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.44

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.5	22.7	P-IN-BDST	868
2-HUM/TMP-BDST	88.8	22.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.1	23.5	P-IN-BDST	865
2-HUM/TMP-BDST	90.7	23.6		

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Multiple Patch Test Summary and Mass Balance-Smooth DS Surface

Test: 81 cm left of DS center, 33 **Test Date** 6/3/02

	Initial	Final	Difference	% of Input
Water Input	718.1	585.7	132.4	100%
Evap	136.8	136.6	0.2	
G1-1	7.1	53.0	45.9	
G1-2	7.4	60.4	53.0	
G1-3	7.5	20.4	12.9	
G1-4	7.4	7.7	0.3	
SS-1			0.0	84.7%
G2-1	7.3	7.7	0.4	
G2-2			0.0	
G2-3			0.0	
G2-4			0.0	
SS-2			0.0	0.3%
G3-1			0.0	
G3-2			0.0	
G3-3			0.0	
G3-4			0.0	
SS-3			0.0	0.0%
G4-1			0.0	
G4-2			0.0	
G4-3			0.0	
G4-4			0.0	
SS-4			0.0	0.0%
B1	107.1	107.7	0.6	0.5%
B2			0.0	0.0%
B3			0.0	0.0%
B4	106.7	107.4	0.7	0.5%
B5			0.0	0.0%
B6			0.0	0.0%
DS in-1			0.0	
DS in-2			0.0	0.0%
DS out-1	7.3	12.6	5.3	
DS out-2	7.3	8.3	1.0	
DS out-3			0.0	
DS out-4			0.0	4.8%
Other			0.0	0.0%
		Total Collected	120.1	90.7%

Total Input	132.4
Total Collected	120.1
Difference	**-12.3**
	-9%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.29%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	4.41

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.6	21.4	P-IN-BDST	864
2-HUM/TMP-BDST	88.4	21.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.5	22.2	P-IN-BDST	862
2-HUM/TMP-BDST	92.3	22.1		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 54 cm left of DS center, Crown

Test Date 6/18/02

	Initial	Final	Difference	% of Input
Water Input	853.8	516.1	337.7	100%
Evap	92.9	92.6	0.3	
G1-1	64.3	85.7	21.4	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	6.3%
G2-1	48.5	48.9	0.4	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.1%
G3-1	56.3	152.0	95.7	
G3-2	49.0	62.0	13	
G3-3			0	
G3-4			0	
SS-3			0	32.2%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	107.6	108.0	0.4	0.1%
B2	107.2	108.2	1	0.3%
B3			0	0.0%
B4	107.3	153.7	46.4	13.7%
B5			0	0.0%
B6	110.2	112.7	2.5	0.7%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.7	146.1	89.4	
DS out-2	55.5	81.0	25.5	
DS out-3			0	
DS out-4			0	34.0%
Other			0	0.0%
		Total Collected	295.7	87.6%

Total Input	337.7
Total Collected	295.7
Difference	**-42**
	-12%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**1.15%**

Mass Flow Rate	
Test Duration, min	10.02
Flow Rate, g/min	33.71

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	97.6	30.6	P-IN-BDST	861
2-HUM/TMP-BDST	89.7	30.4		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	99.4	30.9	P-IN-BDST	860
2-HUM/TMP-BDST	94.2	30.4		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: Low flow rate, 54 cm left of DS Center, Crown

Test Date 6/18/02

	Initial	Final	Difference	% of Input
Water Input	769.2	680.3	88.9	100%
Evap	94.5	93.3	1.2	
G1-1	57.0	58.5	1.5	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	1.7%
G2-1	41.0	41.0	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	63.5	73.5	10	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	11.2%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	8.1	8.7	0.6	0.7%
B3			0	0.0%
B4	107.7	115.6	7.9	8.9%
B5			0	0.0%
B6	110.2	110.4	0.2	0.2%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.9	105.1	41.2	
DS out-2			0	
DS out-3			0	
DS out-4			0	46.3%
Other	8.2	14.1	5.9	6.6%
		Total Collected	67.3	75.7%

Total Input	88.9
Total Collected	67.3
Difference	**-21.6**
	-24%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.2
% Evaporation	**4.32%**

Mass Flow Rate	
Test Duration, min	300.03
Flow Rate, g/min	0.30

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.1	26.4	P-IN-BDST	864
2-HUM/TMP-BDST	94.8	26.1		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	107.2	30.4	P-IN-BDST	861
2-HUM/TMP-BDST	93.2	30.3		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 27 cm left of DS center, Crown **Test Date** 6/18/02

	Initial	Final	Difference	% of Input
Water Input	857.5	524.8	332.7	100%
Evap	94.9	94.5	0.4	
G1-1	56.7	82.8	26.1	
G1-2	48.1	51.1	3	
G1-3			0	
G1-4			0	
SS-1			0	8.7%
G2-1	40.9	41.0	0.1	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	55.9	157.5	101.6	
G3-2	56.1	82.1	26	
G3-3			0	
G3-4			0	
SS-3			0	38.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.7	121.1	14.4	4.3%
B3			0	0.0%
B4	107.2	110.5	3.3	1.0%
B5	7.6	7.9	0.3	0.1%
B6	109.8	121.7	11.9	3.6%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.3	147.2	90.9	
DS out-2	55.1	76.9	21.8	
DS out-3			0	
DS out-4			0	33.9%
Other			0	0.0%
		Total Collected	299.4	90.0%

Total Input	332.7
Total Collected	299.4
Difference	**-33.3**
	-10%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.42%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	33.27

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.1	24.9	P-IN-BDST	858
2-HUM/TMP-BDST	91.8	24.6		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93	26.1	P-IN-BDST	860
2-HUM/TMP-BDST	94.7	25.7		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: Low flow rate, 27 cm left of DS Center, Crown **Test Date** 6/17/02

	Initial	Final	Difference	% of Input
Water Input	872.2	771.2	101	100%
Evap	93.2	91.8	1.4	
G1-1	42.6	48.1	5.5	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	5.4%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	57.6	69.3	11.7	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	11.6%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.4	107.3	0.9	0.9%
B3			0	0.0%
B4	107.0	107.6	0.6	0.6%
B5			0	0.0%
B6	109.6	110.7	1.1	1.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.0	99.8	35.8	
DS out-2			0	
DS out-3			0	
DS out-4			0	35.4%
Other			0	0.0%
		Total Collected	55.6	55.0%

Total Input	101.0
Total Collected	55.6
Difference	**-45.4**
	-45%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.4
% Evaporation	**5.28%**

Mass Flow Rate	
Test Duration, min	300
Flow Rate, g/min	0.34

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	95.1	28.5	P-IN-BDST	863
2-HUM/TMP-BDST	91.5	28.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.4	30.3	P-IN-BDST	874
2-HUM/TMP-BDST	94.8	29.7		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 27 cm right of DS center, Crown **Test Date** 6/17/02

	Initial	Final	Difference	% of Input
Water Input	907.3	529.1	378.2	100%
Evap	93.5	93.5	0	
G1-1	64.4	124.4	60	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	15.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	55.6	103.3	47.7	
G3-2	57.5	146.2	88.7	
G3-3			0	
G3-4			0	
SS-3			0	36.1%
G4-1	41.8	42.5	0.7	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.2%
B1			0	0.0%
B2	8.4	10.8	2.4	0.6%
B3	106.7	106.8	0.1	0.0%
B4			0	0.0%
B5	109.8	112.2	2.4	0.6%
B6	110.3	124.3	14	3.7%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.5	175.9	112.4	
DS out-2	48.0	70.1	22.1	
DS out-3			0	
DS out-4			0	35.6%
Other			0	0.0%
		Total Collected	350.5	92.7%

Total Input	378.2
Total Collected	350.5
Difference	**-27.7**
	-7%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0
% Evaporation	**0.00%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	37.82

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.4	27.1	P-IN-BDST	858
2-HUM/TMP-BDST	92.7	27.1		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	96	28.2	P-IN-BDST	863
2-HUM/TMP-BDST	94.5	28		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: low flow, 27 cm right of DS center, Crown **Test Date** 6/14/02

	Initial	Final	Difference	% of Input
Water Input	782.2	644.5	137.7	100%
Evap	87.0	85.0	2	
G1-1	63.9	78.4	14.5	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	10.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	48.4	62.5	14.1	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	10.2%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.1	108.5	1.4	1.0%
B3			0	0.0%
B4	107.6	107.8	0.2	0.1%
B5	109.5	114.0	4.5	3.3%
B6	110.2	111.8	1.6	1.2%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.1	113.3	49.2	
DS out-2			0	
DS out-3			0	
DS out-4			0	35.7%
Other			0	0.0%
		Total Collected	85.5	62.1%

Total Input	137.7
Total Collected	85.5
Difference	**-52.2**
	-38%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	2
% Evaporation	**9.85%**

Mass Flow Rate	
Test Duration, min	321.37
Flow Rate, g/min	0.43

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.3	24.4	P-IN-BDST	875
2-HUM/TMP-BDST	91.8	24.1		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	99.3	28.9	P-IN-BDST	873
2-HUM/TMP-BDST	93.1	28.8		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 54 cm left of DS center, 16.5 **Test Date** 6/18/02

	Initial	Final	Difference	% of Input
Water Input	850.0	496.6	353.4	100%
Evap	92.1	91.8	0.3	
G1-1	57.2	74.6	17.4	
G1-2	7.4	21.5	14.1	
G1-3			0	
G1-4			0	
SS-1			0	8.9%
G2-1	48.5	49.8	1.3	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.4%
G3-1	49.1	50.0	0.9	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.3%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	107.9	108.3	0.4	0.1%
B2	108.0	108.4	0.4	0.1%
B3			0	0.0%
B4	107.4	277.2	169.8	48.0%
B5			0	0.0%
B6	109.7	110.1	0.4	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.2	134.7	70.5	
DS out-2	48.3	84.5	36.2	
DS out-3	7.6	9.0	1.4	
DS out-4			0	30.6%
Other			0	0.0%
		Total Collected	312.8	88.5%

Total Input	353.4
Total Collected	312.8
Difference	**-40.6**
	-11%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**1.18%**

Mass Flow Rate	
Test Duration, min	10.15
Flow Rate, g/min	34.82

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	96.2	30.8	P-IN-BDST	859
2-HUM/TMP-BDST	91.8	30.4		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	99	31	P-IN-BDST	864
2-HUM/TMP-BDST	94.3	30.6		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: Low flow rate, 54 cm left of DS Center, 16.5 **Test Date** 6/19/02

	Initial	Final	Difference	% of Input
Water Input	822.7	715.7	107	100%
Evap	109.1	109.8	-0.7	
G1-1	57.1	58.1	1	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	0.9%
G2-1	41.0	41.0	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.5	41.6	0.1	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.6	107.5	0.9	0.8%
B2	107.4	108.6	1.2	1.1%
B3			0	0.0%
B4	107.7	192.2	84.5	79.0%
B5			0	0.0%
B6	109.7	110.6	0.9	0.8%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.4	72.1	7.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	7.2%
Other			0	0.0%
		Total Collected	96.3	90.0%

Total Input	107.0
Total Collected	96.3
Difference	**-10.7**
	-10%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	-0.7
% Evaporation	**-1.65%**

Mass Flow Rate	
Test Duration, min	300
Flow Rate, g/min	0.36

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89	25.7	P-IN-BDST	867
2-HUM/TMP-BDST	92.4	25.4		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	103.5	29.8	P-IN-BDST	862
2-HUM/TMP-BDST	94.4	29.7		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 27 cm left of DS Center, 16.5 **Test Date** 6/20/02

	Initial	Final	Difference	% of Input
Water Input	868.5	498.1	370.4	100%
Evap	108.8	108.6	0.2	
G1-1	65	273.5	208.5	
G1-2	56.4	61.9	5.5	
G1-3			0	
G1-4			0	
SS-1			0	57.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.7	42.1	0.4	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.5	113.1	5.6	1.5%
B3			0	0.0%
B4	107.2	110.6	3.4	0.9%
B5	109	110.2	1.2	0.3%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.7	149	84.3	
DS out-2	55.9	84.3	28.4	
DS out-3			0	
DS out-4			0	30.4%
Other			0	0.0%
		Total Collected	337.3	91.1%

Total Input	370.4
Total Collected	337.3
Difference	**-33.1**
	-9%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.48%**

Mass Flow Rate	
Test Duration, min	10.05
Flow Rate, g/min	36.86

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	82.6	26.6	P-IN-BDST	864
2-HUM/TMP-BDST	88.4	26.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92	27.4	P-IN-BDST	866
2-HUM/TMP-BDST	94.2	27.2		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: Low flow rate, 27 cm left of DS Center, 16.5 **Test Date** 6/20/02

	Initial	Final	Difference	% of Input
Water Input	768.0	646.2	121.8	100%
Evap	109.7	108.3	1.4	
G1-1	65.4	163.0	97.6	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	80.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	42.2	42.1	-0.1	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	-0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	108.5	108.5	0	0.0%
B3			0	0.0%
B4	107.8	107.8	0	0.0%
B5	109.2	109.7	0.5	0.4%
B6	110.5	110.4	-0.1	-0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	58.2	61.5	3.3	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.7%
Other			0	0.0%
		Total Collected	101.2	83.1%

Total Input	121.8
Total Collected	101.2
Difference	**-20.6**
	-17%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.4
% Evaporation	**3.26%**

Mass Flow Rate	
Test Duration, min	300.03
Flow Rate, g/min	0.41

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	103.1	30	P-IN-BDST	863
2-HUM/TMP-BDST	93.8	29.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	100.9	31	P-IN-BDST	877
2-HUM/TMP-BDST	93.8	30.7		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 27 cm right of DS center, 16.5 **Test Date** 6/20/02

	Initial	Final	Difference	% of Input
Water Input	862.0	522.3	339.7	100%
Evap	108.0	107.9	0.1	
G1-1	64.9	240.9	176	
G1-2	56.3	63.0	6.7	
G1-3			0	
G1-4			0	
SS-1			0	53.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.7	43.2	1.5	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.4%
G4-1	41.2	41.5	0.3	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.1%
B1			0	0.0%
B2	107.7	110.6	2.9	0.9%
B3			0	0.0%
B4	107.4	107.9	0.5	0.1%
B5	109.3	113.5	4.2	1.2%
B6	110.0	111.0	1	0.3%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.8	167.8	103	
DS out-2	56.2	79.4	23.2	
DS out-3			0	
DS out-4			0	37.2%
Other			0	0.0%
		Total Collected	319.3	94.0%

Total Input	339.7
Total Collected	319.3
Difference	**-20.4**
	-6%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.1
% Evaporation	**0.24%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	33.97

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.8	26.3	P-IN-BDST	864
2-HUM/TMP-BDST	88.7	26.1		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.6	27.7	P-IN-BDST	863
2-HUM/TMP-BDST	94.6	27.5		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: Low flow rate, 27 cm right of DS Center, 16.5 **Test Date** 6/20/02

	Initial	Final	Difference	% of Input
Water Input	808.9	713.5	95.4	100%
Evap	107.4	107.5	-0.1	
G1-1	64.6	118.3	53.7	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	56.3%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.8	41.9	0.1	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1	41.1	41.1	0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	108.5	108.6	0.1	0.1%
B3			0	0.0%
B4			0	0.0%
B5	109.3	110.4	1.1	1.2%
B6	110.0	110.7	0.7	0.7%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.7	78.4	14.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	15.4%
Other			0	0.0%
		Total Collected	70.4	73.8%

Total Input	95.4
Total Collected	70.4
Difference	**-25**
	-26%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	-0.1
% Evaporation	**-0.25%**

Mass Flow Rate	
Test Duration, min	300
Flow Rate, g/min	0.32

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.6	26.3	P-IN-BDST	857
2-HUM/TMP-BDST	87.1	26.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	95.8	29.9	P-IN-BDST	860
2-HUM/TMP-BDST	93.4	29.8		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 54 cm left of DS center, 33 **Test Date** 6/20/02

	Initial	Final	Difference	% of Input
Water Inpu	890.3	561.5	328.8	100%
Evap	102.0	101.8	0.2	
G1-1	65.1	137.9	72.8	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	22.1%
G2-1	41.3	41.8	0.5	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.2%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.9	107.3	0.4	0.1%
B2	107.5	108.1	0.6	0.2%
B3			0	0.0%
B4	107.2	294.1	186.9	56.8%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.2	97.7	33.5	
DS out-2			0	
DS out-3			0	
DS out-4			0	10.2%
Other			0	0.0%
		Total Collected	294.7	89.6%

Total Input	328.8
Total Collected	294.7
Difference	**-34.1**
	-10%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.57%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	32.88

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	81.8	27.7	P-IN-BDST	858
2-HUM/TMP-BDST	85.3	27.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.5	28.7	P-IN-BDST	870
2-HUM/TMP-BDST	92.9	28.2		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: Low flow rate, 54 cm left of DS center, 33 **Test Date** 6/21/02

	Initial	Final	Difference	% of Input
Water Input	685.3	584.2	101.1	100%
Evap	103.7	104.0	-0.3	
G1-1	50.1	50.7	0.6	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	0.6%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.6	107.5	0.9	0.9%
B2	107.5	108.4	0.9	0.9%
B3			0	0.0%
B4	107.3	190.4	83.1	82.2%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	58.0	60.9	2.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.9%
Other			0	0.0%
		Total Collected	88.4	87.4%

Total Input	101.1
Total Collected	88.4
Difference	**-12.7**
	-13%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	-0.3
% Evaporation	**-0.81%**

Mass Flow Rate	
Test Duration, min	300
Flow Rate, g/min	0.34

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	81.2	25.3	P-IN-BDST	865
2-HUM/TMP-BDST	83.1	25.4		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	107.4	27.3	P-IN-BDST	874
2-HUM/TMP-BDST	95.9	27.2		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 27 cm left of DS center, 33 **Test Date** 6/20/02

	Initial	Final	Difference	% of Input
Water Input	907.8	540.7	367.1	100%
Evap	102.5	102.5	0	
G1-1	65.2	287.1	221.9	
G1-2	63.4	104.0	40.6	
G1-3			0	
G1-4			0	
SS-1			0	71.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.7	110.6	2.9	0.8%
B3			0	0.0%
B4	107.1	108.1	1	0.3%
B5	109.8	110.9	1.1	0.3%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	72.2	118.7	46.5	
DS out-2			0	
DS out-3			0	
DS out-4			0	12.7%
Other			0	0.0%
		Total Collected	314	85.5%

Total Input	367.1
Total Collected	314
Difference	**-53.1**
	-14%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0
% Evaporation	**0.00%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	36.71

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.3	28.2	P-IN-BDST	857
2-HUM/TMP-BDST	89.7	27.6		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.9	29	P-IN-BDST	867
2-HUM/TMP-BDST	93.9	28.6		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: Low flow rate, 27 cm left of DS center, 33 **Test Date** 6/24/02

	Initial	Final	Difference	% of Input
Water Input	-1.9	-98.2	96.3	100%
Evap	103.4	102.8	0.6	
G1-1	64.6	142.8	78.2	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	81.2%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.7	107.6	0.9	0.9%
B3			0	0.0%
B4	109.8	111.0	1.2	1.2%
B5	107.2	107.9	0.7	0.7%
B6	109.0	109.8	0.8	0.8%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.9	61.4	4.5	
DS out-2			0	
DS out-3			0	
DS out-4			0	4.7%
Other			0	0.0%
		Total Collected	86.3	89.6%

Total Input	96.3
Total Collected	86.3
Difference	**-10**
	-10%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.6
% Evaporation	**1.63%**

Mass Flow Rate	
Test Duration, min	304.95
Flow Rate, g/min	0.32

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	83.5	23.9	P-IN-BDST	863
2-HUM/TMP-BDST	83.9	23.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	96.9	28.4	P-IN-BDST	861
2-HUM/TMP-BDST	95	27.8		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: High flow rate, 27 cm right of DS center, 33 **Test Date** 6/20/02

	Initial	Final	Difference	% of Input
Water Input	835.6	518.0	317.6	100%
Evap	103.6	103.5	0.1	
G1-1	64.6	303.9	239.3	
G1-2	55.9	85.6	29.7	
G1-3			0	
G1-4			0	
SS-1			0	84.7%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.9	41.9	0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.6	108.4	0.8	0.3%
B3			0	0.0%
B4	107.3	107.9	0.6	0.2%
B5	109.9	113.5	3.6	1.1%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	72.0	111.6	39.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	12.5%
Other			0	0.0%
		Total Collected	313.6	98.7%

Total Input	317.6
Total Collected	313.6
Difference	**-4**
	-1%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.1
% Evaporation	**0.27%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	31.76

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.8	28.4	P-IN-BDST	862
2-HUM/TMP-BDST	85.1	28.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.5	29.2	P-IN-BDST	854
2-HUM/TMP-BDST	93	29		

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Bounding Flow Test Summary and Mass Balance-Smooth DS Surface

Test: Low flow rate, 27 cm right of DS center, 33 **Test Date** 6/24/02

	Initial	Final	Difference	% of Input
Water Input	-121.6	-217.4	95.8	100%
Evap	102.5	100.5	2	
G1-1	64.9	137.8	72.9	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	76.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.5	107.6	0.1	0.1%
B3			0	0.0%
B4			0	0.0%
B5	110.8	110.9	0.1	0.1%
B6	109.7	109.9	0.2	0.2%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	49.6	51.9	2.3	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.4%
Other			0	0.0%
		Total Collected	75.6	78.9%

Total Input	95.8
Total Collected	75.6
Difference	**-20.2**
	-21%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	2
% Evaporation	**5.59%**

Mass Flow Rate	
Test Duration, min	304.02
Flow Rate, g/min	0.32

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.9	28.6	P-IN-BDST	856
2-HUM/TMP-BDST	92.6	28.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	96.9	29.6	P-IN-BDST	892
2-HUM/TMP-BDST	93.5	29.3		

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Single Patch q(splash) Test Summary and Mass Balance - Rough Surface

Test: Patch 4, 27 cm right of patch center, 33 **Test Date:** 7/2/02

	Initial	Final	Difference	% of Input
Water Input	842.2	300.2	542	100%
Evap	100.9	100.0	0.9	
G1-1	64.4	289.2	224.8	
G1-2	69.5	306.4	236.9	
G1-3			0	
G1-4			0	
SS-1			0	85.2%
G2-1	41.5	41.5	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.5	107.8	0.3	0.1%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.4	75.0	10.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.0%
Other			0	0.0%
		Total Collected	472.6	87.2%

Total Input	542.0
Total Collected	472.6
Difference	**-69.4**
	-13%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.9
% Evaporation	**2.63%**

Mass Flow Rate	
Test Duration, min	120
Flow Rate, g/min	4.52

Reference Towel Mass	
Initial Mass (g)	7.989
Final Mass (g)	8.332
Difference (g)	0.34

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	85.3	27.4	P-IN-BDST	869
2-HUM/TMP-BDST	85.6	27.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.2	29.2	P-IN-BDST	866
2-HUM/TMP-BDST	92.4	29.1		

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Single Patch q(splash) Test Summary and Mass Balance - Rough Surface

Test: Patch 5, 20 cm left of patch center, 33 **Test Date:** 7/2/02

	Initial	Final	Difference	% of Input
Water Input	880.2	349.2	531	100%
Evap	116.9	116.1	0.8	
G1-1	64.8	302.5	237.7	
G1-2	70.6	276.7	206.1	
G1-3			0	
G1-4			0	
SS-1			0	83.6%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1	41.5	41.5	0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3	107.1	107.8	0.7	0.1%
B4			0	0.0%
B5	109.6	111.3	1.7	0.3%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	65.1	79.7	14.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.7%
Other			0	0.0%
		Total Collected	460.8	86.8%

Total Input	531.0
Total Collected	460.8
Difference	**-70.2**
	-13%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.8
% Evaporation	**1.59%**

Mass Flow Rate	
Test Duration, min	120.02
Flow Rate, g/min	4.42

Reference Towel Mass	
Initial Mass (g)	8.267
Final Mass (g)	8.498
Difference (g)	0.23

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.3	27.5	P-IN-BDST	860
2-HUM/TMP-BDST	88.8	27.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.5	29.1	P-IN-BDST	870
2-HUM/TMP-BDST	93.7	28.7		

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Single Patch q(splash) Test Summary and Mass Balance - Rough Surface

Test: Patch 5, 20 cm left of patch center, 16.5 **Test Date:** 7/1/02

	Initial	Final	Difference	% of Input
Water Input	815.1	279.1	536	100%
Evap	98.1	97.6	0.5	
G1-1	66.4	286.1	219.7	
G1-2	64.6	241.1	176.5	
G1-3			0	
G1-4			0	
SS-1			0	73.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	49.8	50.7	0.9	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.2%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.5	118.5	9	1.7%
B6	110.0	110.7	0.7	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	73.4	123.1	49.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	9.3%
Other			0	0.0%
		Total Collected	456.5	85.2%

Total Input	536.0
Total Collected	456.5
Difference	**-79.5**
	-15%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.5
% Evaporation	**1.59%**

Mass Flow Rate	
Test Duration, min	113.42
Flow Rate, g/min	4.73

Reference Towel Mass	
Initial Mass (g)	7.758
Final Mass (g)	8.425
Difference (g)	0.67

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	84.5	27.9	P-IN-BDST	850
2-HUM/TMP-BDST	88.8	27.3		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.9	30.5	P-IN-BDST	873
2-HUM/TMP-BDST	93.4	30		

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Single Patch q(splash) Test Summary and Mass Balance - Rough Surface

Test: Patch 6, 20 cm left of patch center, Crown **Test Date:** 6/28/02

	Initial	Final	Difference	% of Input
Water Input	-43.8	-341.7	297.9	100%
Evap	81.6	81.0	0.6	
G1-1	72.9	222.3	149.4	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	50.2%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	49.4	119.7	70.3	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	64.5	79.7	15.2	28.7%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.7	107.9	0.2	0.1%
B5	109.5	110.0	0.5	0.2%
B6	110.2	114.4	4.2	1.4%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.9	97.7	32.8	
DS out-2			0	
DS out-3			0	
DS out-4			0	11.0%
Other			0	0.0%
		Total Collected	272.6	91.5%

Total Input	297.9
Total Collected	272.6
Difference	**-25.3**
	-8%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.6
% Evaporation	**4.03%**

Mass Flow Rate	
Test Duration, min	69.1
Flow Rate, g/min	4.31

Reference Towel Mass	
Initial Mass (g)	7.994
Final Mass (g)	8.517
Difference (g)	0.52

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91	25.3	P-IN-BDST	864
2-HUM/TMP-BDST	92.7	25		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.6	27.8	P-IN-BDST	853
2-HUM/TMP-BDST	94.3	27.3		

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Single Patch q(splash) Test Summary and Mass Balance - Rough Surface

Test: Patch 6, Patch center, 15 cm below crown **Test Date:** 7/1/02

	Initial	Final	Difference	% of Input
Water Input	666.8	368.0	298.8	100%
Evap	100.9	100.5	0.4	
G1-1	74.1	255.8	181.7	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	60.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	58.1	79.1	21	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	7.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.6	107.9	0.3	0.1%
B5	109.5	110.0	0.5	0.2%
B6	110.0	111.0	1	0.3%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	57.4	91.5	34.1	
DS out-2	8.1	14.5	6.4	
DS out-3			0	
DS out-4			0	13.6%
Other			0	0.0%
		Total Collected	245	82.0%

Total Input	298.8
Total Collected	245.0
Difference	**-53.8**
	-18%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.17%**

Mass Flow Rate	
Test Duration, min	60
Flow Rate, g/min	4.98

Reference Towel Mass	
Initial Mass (g)	8.323
Final Mass (g)	8.426
Difference (g)	0.10

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.6	26.5	P-IN-BDST	854
2-HUM/TMP-BDST	90.7	26.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.4	27.9	P-IN-BDST	856
2-HUM/TMP-BDST	93.2	27.6		

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Single Patch q(splash) Test Summary and Mass Balance - Rough Surface

Test: Patch 6, Patch center, 16.5 **Test Date:** 7/1/02

	Initial	Final	Difference	% of Input
Water Input	788.3	266.5	521.8	100%
Evap	99.6	99.2	0.4	
G1-1	66.3	292.9	226.6	
G1-2	58.2	230.1	171.9	
G1-3			0	
G1-4			0	
SS-1			0	76.4%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	49.6	50.6	1	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.2%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.5	108.1	0.6	0.1%
B5	109.3	110.7	1.4	0.3%
B6	109.8	110.6	0.8	0.2%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	65.6	110.7	45.1	
DS out-2	8.4	12.0	3.6	
DS out-3			0	
DS out-4			0	9.3%
Other			0	0.0%
		Total Collected	451	86.4%

Total Input	521.8
Total Collected	451
Difference	**-70.8**
	-14%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.22%**

Mass Flow Rate	
Test Duration, min	108
Flow Rate, g/min	4.83

Reference Towel Mass	
Initial Mass (g)	8.118
Final Mass (g)	8.757
Difference (g)	0.64

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	85.3	26.4	P-IN-BDST	862
2-HUM/TMP-BDST	85.5	26.2		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	97.3	29.7	P-IN-BDST	862
2-HUM/TMP-BDST	94.5	29.4		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 2, centerline, 16.5°

Test Date: 7/8/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	28.7	-279.3	308	100%
Evap	117.5	117.6	-0.1	
G1-1	64.4	66.0	1.6	
G1-2	48.8	51.4	2.6	
G1-3			0	
G1-4			0	
SS-1			0	1.4%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2	41.5	42.3	0.8	
G3-3			0	
G3-4			0	
SS-3			0	0.3%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.9	343.1	235.2	76.4%
B3			0	0.0%
B4	107.6	107.8	0.2	0.1%
B5	109.7	110.3	0.6	0.2%
B6	110.7	111.7	1	0.3%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.9	90.5	26.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	8.6%
Other			0	0.0%
		Total Collected	268.6	87.2%

Total Input (g)	308.0
Total Collected (g)	268.6
Difference (g)	**-39.4**
	-13%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	-0.1
% Evaporation	**-0.20%**

Mass Flow Rate	
Test Duration (min)	60.03
Flow Rate (g/min)	5.13

Reference Towel Mass	
Initial Mass (g)	8.164
Final Mass (g)	8.49
Difference (g)	0.33

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	95.3	27.9	P-IN-BDST	869
2-HUM/TMP-BDST	91.4	28.2		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	97.5	29.6	P-IN-BDST	865
2-HUM/TMP-BDST	93.8	29.5		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 2, centerline 10.5 cm forward from crown, Patch 6 covered **Test Date:** 7/10/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	72.4	-214.8	287.2	100%
Evap	96.7	96.2	0.5	
G1-1	42.7	44.1	1.4	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	0.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	48.9	55.8	6.9	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	49.1	58.3	9.2	5.6%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.7	257.9	150.2	52.3%
B3			0	0.0%
B4	106.0	106.1	0.1	0.0%
B5	109.3	109.4	0.1	0.0%
B6			0	0.0%
DS in-1	48.5	61.1	12.6	
DS in-2			0	4.4%
DS out-1	64.6	101.3	36.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	12.8%
Other			0	0.0%
		Total Collected	217.2	75.6%

Total Input (g)	287.2
Total Collected (g)	217.2
Difference (g)	**-70**
	-24%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.5
% Evaporation	**1.72%**

Mass Flow Rate	
Test Duration (min)	60.72
Flow Rate (g/min)	4.73

Reference Towel Mass	
Initial Mass (g)	7.776
Final Mass (g)	7.786
Difference (g)	0.01

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.1	20.4	P-IN-BDST	860
2-HUM/TMP-BDST	90.5	20.5		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.2	21.6	P-IN-BDST	859
2-HUM/TMP-BDST	85.1	22.1		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 2, 13.5 cm right of patch center 10.5 cm forward from crow **Test Date:** 7/10/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	53.5	-234.9	288.4	100%
Evap	96.2	95.1	1.1	
G1-1	57.5	131.3	73.8	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	25.6%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	49.3	55.9	6.6	
G3-2	49.3	58.7	9.4	
G3-3			0	
G3-4			0	
SS-3			0	5.5%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	108.2	172.2	64	22.2%
B3			0	0.0%
B4			0	0.0%
B5	109.5	109.5	0	0.0%
B6			0	0.0%
DS in-1	41.2	45.6	4.4	
DS in-2			0	1.5%
DS out-1	64.9	114.6	49.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	17.2%
Other			0	0.0%
		Total Collected	207.9	72.1%

Total Input (g)	288.4
Total Collected (g)	207.9
Difference (g)	**-80.5**
	-28%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	1.1
% Evaporation	**3.86%**

Mass Flow Rate	
Test Duration (min)	60.05
Flow Rate (g/min)	4.80

Reference Towel Mass	
Initial Mass (g)	7.932
Final Mass (g)	7.867
Difference (g)	-0.07

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.1	23	P-IN-BDST	853
2-HUM/TMP-BDST	90.4	22.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.2	23.9	P-IN-BDST	847
2-HUM/TMP-BDST	85.4	24.3		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 2, 13.5 cn right of center, 33 **Test Date:** 7/3/02

	Initial	Final	Difference	% of Input
Water Input	740.3	432.3	308	100%
Evap	101.2	101.0	0.2	
G1-1	56.6	78.3	21.7	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	7.0%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.7	287.2	179.5	58.3%
B2-2	48.3	99.0	50.7	16.5%
B4			0	0.0%
B5	109.2	110.1	0.9	0.3%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.8	68.4	11.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	3.8%
Other			0	0.0%
		Total Collected	264.4	85.8%

Total Input	308.0
Total Collected	264.4
Difference	**-43.6**
	-14%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.58%**

Mass Flow Rate	
Test Duration, min	60
Flow Rate, g/min	5.13

Reference Towel Mass	
Initial Mass (g)	7.808
Final Mass (g)	8.066
Difference (g)	0.26

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.4	26.3	P-IN-BDST	858
2-HUM/TMP-BDST	90.7	25.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.5	27.9	P-IN-BDST	867
2-HUM/TMP-BDST	94.6	27.6		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 2, Centerline, 33 7/3/02

	Initial	Final	Difference	% of Input
Water Input	705.7	398.3	307.4	100%
Evap	103.0	102.7	0.3	
G1-1	64.1	80.5	16.4	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	5.3%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.4	350.9	243.5	79.2%
B3			0	0.0%
B4	107.3	107.6	0.3	0.1%
B5	109.2	109.8	0.6	0.2%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.8	75.1	10.3	
DS out-2			0	
DS out-3			0	
DS out-4			0	3.4%
Other			0	0.0%
		Total Collected	271.1	88.2%

Total Input	307.4
Total Collected	271.1
Difference	**-36.3**
	-12%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**0.83%**

Mass Flow Rate	
Test Duration, min	60
Flow Rate, g/min	5.12

Reference Towel Mass	
Initial Mass (g)	7.648
Final Mass (g)	8.239
Difference (g)	0.59

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.8	26.3	P-IN-BDST	862
2-HUM/TMP-BDST	89.3	26.2		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.1	27.5	P-IN-BDST	873
2-HUM/TMP-BDST	94.2	27.2		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch2, 13.5 cm right of centerline, 16.5 7/3/02

	Initial	Final	Difference	% of Input
Water Input	767.1	460.6	306.5	100%
Evap	99.5	99.4	0.1	
G1-1	64.2	144.0	79.8	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	26.0%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	42.1	42.3	0.2	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.6	232.4	124.8	40.7%
B3			0	0.0%
B4	99.7	99.7	0	0.0%
B5	109.2	111.1	1.9	0.6%
B6	109.8	110.4	0.6	0.2%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.8	105.6	41.8	
DS out-2			0	
DS out-3			0	
DS out-4			0	13.6%
Other			0	0.0%
		Total Collected	249.1	81.3%

Total Input	306.5
Total Collected	249.1
Difference	**-57.4**
	-19%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.1
% Evaporation	**0.30%**

Mass Flow Rate	
Test Duration, min	60
Flow Rate, g/min	5.11

Reference Towel Mass	
Initial Mass (g)	7.631
Final Mass (g)	7.839
Difference (g)	0.21

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.4	27.4	P-IN-BDST	860
2-HUM/TMP-BDST	90.4	27.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.2	29	P-IN-BDST	861
2-HUM/TMP-BDST	94.1	28.5		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 4, 13.5 cm right of patch center, 16.5°

Test Date: 7/8/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	28.4	-275.6	304	100%
Evap	113.9	113.8	0.1	
G1-1	64.4	147.6	83.2	
G1-2	41.7	45.4	3.7	
G1-3			0	
G1-4			0	
SS-1			0	28.6%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.8	42.5	0.7	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.2%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.6	108.2	0.6	0.2%
B3			0	0.0%
B4	107.2	239.3	132.1	43.5%
B5	109.1	109.8	0.7	0.2%
B6	109.8	110.8	1	0.3%
DS in-1	40.9	42.1	1.2	
DS in-2			0	0.4%
DS out-1	63.6	99.1	35.5	
DS out-2			0	
DS out-3			0	
DS out-4			0	11.7%
Other			0	0.0%
		Total Collected	258.7	85.1%

Total Input (g)	304.0
Total Collected (g)	258.7
Difference (g)	**-45.3**
	-15%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.1
% Evaporation	**0.22%**

Mass Flow Rate	
Test Duration (min)	60.38
Flow Rate (g/min)	5.03

Reference Towel Mass	
Initial Mass (g)	7.719
Final Mass (g)	8.28
Difference (g)	0.56

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	82.6	23.9	P-IN-BDST	855
2-HUM/TMP-BDST	87.6	23.7		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.8	28.4	P-IN-BDST	852
2-HUM/TMP-BDST	93.5	28.3		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 4,centerline, 16.5°

Test Date: 7/9/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	-18.3	-320.0	301.7	100%
Evap	88.5	88.0	0.5	
G1-1	42.5	42.6	0.1	
G1-2	41.5	45.8	4.3	
G1-3			0	
G1-4			0	
SS-1			0	1.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	41.7	42.1	0.4	0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	105.9	106.2	0.3	0.1%
B2	107.6	107.9	0.3	0.1%
B3			0	0.0%
B4	107.4	307.3	199.9	66.3%
B5	109.1	109.4	0.3	0.1%
B6	109.8	110.2	0.4	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.5	92.1	27.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	9.1%
Other			0	0.0%
		Total Collected	233.6	77.4%

Total Input (g)	301.7
Total Collected (g)	233.6
Difference (g)	**-68.1**
	-23%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.5
% Evaporation	**2.40%**

Mass Flow Rate	
Test Duration (min)	60
Flow Rate (g/min)	5.03

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.1	20.5	P-IN-BDST	853
2-HUM/TMP-BDST	89.2	20.3		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.9	24.1	P-IN-BDST	856
2-HUM/TMP-BDST	92.8	23.8		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 4,centerline, crown **Test Date:** 7/9/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	87.8	-213.6	301.4	100%
Evap	86.8	86.0	0.8	
G1-1	50.2	50.3	0.1	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	0.0%
G2-1	41.2	41.2	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	49.1	70.2	21.1	
G3-2	48.0	61.4	13.4	
G3-3			0	
G3-4			0	
SS-3			0	11.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.0	106.1	0.1	0.0%
B2	107.7	107.9	0.2	0.1%
B3			0	0.0%
B4	107.4	279.1	171.7	57.0%
B5			0	0.0%
B6	109.9	110.1	0.2	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.3	84.2	19.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	6.6%
Other			0	0.0%
		Total Collected	226.7	75.2%

Total Input (g)	301.4
Total Collected (g)	226.7
Difference (g)	**-74.7**
	-25%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.8
% Evaporation	**4.19%**

Mass Flow Rate	
Test Duration (min)	61.58
Flow Rate (g/min)	4.89

Reference Towel Mass	
Initial Mass (g)	7.721
Final Mass (g)	7.87
Difference (g)	0.15

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.2	23.3	P-IN-BDST	849
2-HUM/TMP-BDST	89.8	23.1		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.1	25.4	P-IN-BDST	853
2-HUM/TMP-BDST	91.2	25.3		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 4, 13.5 cm right of patch center, crown - Test#1 **Test Date:** 7/9/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	16.7	-275.5	292.2	100%
Evap	85.8	85.4	0.4	
G1-1	85.8	85.4	-0.4	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	-0.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.8	108.0	0.2	0.1%
B3			0	0.0%
B4	107.4	149.8	42.4	14.5%
B5			0	0.0%
B6	110.1	111.8	1.7	0.6%
DS in-1	48.8	132.4	83.6	
DS in-2	48.2	50.8	2.6	29.5%
DS out-1			0	
DS out-2			0	
DS out-3			0	
DS out-4			0	0.0%
Other			0	0.0%
		Total Collected	130.1	44.5%

Total Input (g)	292.2
Total Collected (g)	130.1
Difference (g)	**-162.1**
	-55%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.4
% Evaporation	**2.21%**

Mass Flow Rate	
Test Duration (min)	60.22
Flow Rate (g/min)	4.85

Reference Towel Mass	
Initial Mass (g)	7.842
Final Mass (g)	8.11
Difference (g)	0.27

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.1	25.6	P-IN-BDST	
2-HUM/TMP-BDST	87.9	25.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.8	28.1	P-IN-BDST	
2-HUM/TMP-BDST	91.5	28.1		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 4,13.5 cm right of patch center, crown - Test#2 **Test Date:** 7/9/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	47.1	-242.3	289.4	100%
Evap	85.3	84.7	0.6	
G1-1	49.7	166.2	116.5	
G1-2	49.2	74.0	24.8	
G1-3			0	
G1-4			0	
SS-1			0	48.8%
G2-1	41.3	41.4	0.1	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	49.3	74.7	25.4	
G3-2	56.8	73.2	16.4	
G3-3			0	
G3-4			0	
SS-3			0	14.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.8	108.0	0.2	0.1%
B3			0	0.0%
B4	106.1	106.8	0.7	0.2%
B5			0	0.0%
B6	110.1	111.7	1.6	0.6%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.7	107.5	42.8	
DS out-2			0	
DS out-3			0	
DS out-4			0	14.8%
Other			0	0.0%
		Total Collected	228.5	79.0%

Total Input (g)	289.4
Total Collected (g)	228.5
Difference (g)	**-60.9**
	-21%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.6
% Evaporation	**3.41%**

Mass Flow Rate	
Test Duration (min)	60.02
Flow Rate (g/min)	4.82

Reference Towel Mass	
Initial Mass (g)	7.895
Final Mass (g)	8.090
Difference (g)	0.20

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.2	27.5	P-IN-BDST	854
2-HUM/TMP-BDST	81.1	28		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94	28.9	P-IN-BDST	862
2-HUM/TMP-BDST	91.6	28.9		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 4, 13.5 cm right of patch center 33°

Test Date: 7/11/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	-124.6	-270.8	146.2	100%
Evap	86.9	86.2	0.7	
G1-1	64.3	149.2	84.9	
G1-2	55.5	64.7	9.2	
G1-3			0	
G1-4			0	
SS-1			0	64.4%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	108.0	108.1	0.1	0.1%
B3			0	0.0%
B4	106.2	107.5	1.3	0.9%
B5			0	0.0%
B6			0	0.0%
DS in-1	47.9	61.3	13.4	
DS in-2			0	9.2%
DS out-1	49.3	53.9	4.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	3.1%
Other			0	0.0%
		Total Collected	113.5	77.6%

Total Input (g)	146.2
Total Collected (g)	113.5
Difference (g)	**-32.7**
	-22%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.7
% Evaporation	**3.65%**

Mass Flow Rate	
Test Duration (min)	30.08
Flow Rate (g/min)	4.86

Reference Towel Mass	
Initial Mass (g)	7.897
Final Mass (g)	7.994
Difference (g)	0.10

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.3	21.6	P-IN-BDST	858
2-HUM/TMP-BDST	87	22.5		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.7	23.5	P-IN-BDST	848
2-HUM/TMP-BDST	92.8	23.3		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 4, centerline, 33 **Test Date:** 7/2/02

	Initial	Final	Difference	% of Input
Water Input	863.8	320.9	542.9	100%
Evap	99.1	98.4	0.7	
G1-1	49.5	87.0	37.5	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	6.9%
G2-1	41.5	41.9	0.4	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.1%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.2	510.3	403.1	74.2%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	65.1	80.7	15.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.9%
Other			0	0.0%
		Total Collected	456.6	84.1%

Total Input	542.9
Total Collected	456.6
Difference	**-86.3**
	-16%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.7
% Evaporation	**2.16%**

Mass Flow Rate	
Test Duration, min	120
Flow Rate, g/min	4.52

Reference Towel Mass	
Initial Mass (g)	7.492
Final Mass (g)	7.934
Difference (g)	0.44

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	83	27.4	P-IN-BDST	857
2-HUM/TMP-BDST	83.2	27.4		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.8	29.8	P-IN-BDST	874
2-HUM/TMP-BDST	91.8	29.5		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 5, 13.5 cm left of patch center, 16.5°

Test Date: 7/8/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	-1.3	-342.2	340.9	100%
Evap	117.6	117.7	-0.1	
G1-1	71.3	313.9	242.6	
G1-2	48.6	58.0	9.4	
G1-3			0	
G1-4			0	
SS-1			0	73.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1 (SS)	48.6	50.3	1.7	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.5%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.5	108.1	0.6	0.2%
B3			0	0.0%
B4			0	0.0%
B5	109.2	111.7	2.5	0.7%
B6	109.7	111.0	1.3	0.4%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.3	83.3	27	
DS out-2			0	
DS out-3			0	
DS out-4			0	7.9%
Other			0	0.0%
		Total Collected	285.1	83.6%

Total Input (g)	340.9
Total Collected (g)	285.1
Difference (g)	**-55.8**
	-16%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	-0.1
% Evaporation	**-0.20%**

Mass Flow Rate	
Test Duration (min)	65.20
Flow Rate (g/min)	5.23

Reference Towel Mass	
Initial Mass (g)	7.639
Final Mass (g)	8.13
Difference (g)	0.49

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.3	26.3	P-IN-BDST	864
2-HUM/TMP-BDST	93.4	26.1		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	95.7	28.3	P-IN-BDST	869
2-HUM/TMP-BDST	94.6	28.2		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 5, 13.5 cm left of patch center, crown **Test Date:** 7/10/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	67.9	-231.2	299.1	100%
Evap	94.7	94.2	0.5	
G1-1	63.8	200.6	136.8	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	45.7%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	49.6	96.5	46.9	
G3-2	48.1	62.5	14.4	
G3-3			0	
G3-4			0	
SS-3			0	20.5%
G4-1	41.0	41.2	0.2	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.1%
B1			0	0.0%
B2	108.3	108.4	0.1	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.5	115.4	5.9	2.0%
B6	110.6	112.3	1.7	0.6%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	65.5	109.0	43.5	
DS out-2			0	
DS out-3			0	
DS out-4			0	14.5%
Other			0	0.0%
		Total Collected	249.5	83.4%

Total Input (g)	299.1
Total Collected (g)	249.5
Difference (g)	**-49.6**
	-17%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.5
% Evaporation	**1.85%**

Mass Flow Rate	
Test Duration (min)	61.88
Flow Rate (g/min)	4.83

Reference Towel Mass	
Initial Mass (g)	7.92
Final Mass (g)	8.25
Difference (g)	0.33

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.4	24.7	P-IN-BDST	856
2-HUM/TMP-BDST	88.9	24.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.1	26.6	P-IN-BDST	846
2-HUM/TMP-BDST	90.1	26.9		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 5, centerline, crown **Test Date:** 7/10/02

	Initial	Final	Difference	% of Input
Water Input	42.2	-245.5	287.7	100%
Evap	92.2	91.8	0.4	
G1-1	49.6	66.3	16.7	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	5.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	48.3	111.9	63.6	
G3-2	48.4	67.6	19.2	
G3-3			0	
G3-4			0	
SS-3			0	28.8%
G4-1	40.9	42.0	1.1	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.4%
B1			0	0.0%
B2	107.7	108.3	0.6	0.2%
B3	105.9	106.5	0.6	0.2%
B4			0	0.0%
B5			0	0.0%
B6	110.3	111.4	1.1	0.4%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.3	117.7	54.4	
DS out-2			0	
DS out-3			0	
DS out-4			0	18.9%
Other			0	0.0%
		Total Collected	157.3	54.7%

Total Input	287.70
Total Collected	157.3
Difference	**-130.4**
	-45%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.57%**

Mass Flow Rate	
Test Duration, min	60
Flow Rate, g/min	4.80

Reference Towel Mass	
Initial Mass (g)	7.568
Final Mass (g)	8.22
Difference (g)	0.65

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	83	24	P-IN-BDST	855
2-HUM/TMP-BDST	83.2	24		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.2	26.9	P-IN-BDST	854
2-HUM/TMP-BDST	92.3	26.9		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 5, 13.5 cm right of patch center, 33°

Test Date: 7/11/02

	Initial	Final	Difference	% of Input
Water Input	58.4	-108.2	166.6	100%
Evap	87.8	87.3	0.5	
G1-1	63.7	179.1	115.4	
G1-2	55.4	67.0	11.6	
G1-3			0	
G1-4			0	
SS-1			0	76.2%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	108.0	108.0	0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	112.2	113.8	1.6	1.0%
B6			0	0.0%
DS in-1	41.2	41.8	0.6	
DS in-2			0	0.4%
DS out-1	63.7	68.6	4.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.9%
Other			0	0.0%
		Total Collected	134.1	80.5%

Total Input	166.6
Total Collected	134.1
Difference	**-32.5**
	-20%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.5
% Evaporation	**2.37%**

Mass Flow Rate	
Test Duration, min	34.03
Flow Rate, g/min	4.90

Reference Towel Mass	
Initial Mass (g)	7.956
Final Mass (g)	7.97
Difference (g)	0.01

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.5	21.3	P-IN-BDST	848
2-HUM/TMP-BDST	93.9	21		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	92.9	22.4	P-IN-BDST	859
2-HUM/TMP-BDST	92.9	22.3		

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Single Patch q(film) Test Summary and Mass Balance - Rough Surface

Test: Patch 5, Centerline, 16.5 **Test Date:** 7/3/02

	Initial	Final	Difference	% of Input
Water Input	739.2	434.0	305.2	100%
Evap	100.5	100.3	0.2	
G1-1	50.1	60.5	10.4	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	3.4%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.2	41.4	0.2	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1	42.1	42.6	0.5	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.2%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.4	320.1	210.7	69.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.9	101.6	37.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	12.4%
Other			0	0.0%
		Total Collected	259.5	85.0%

Total Input	305.2
Total Collected	259.5
Difference	**-45.7**
	-15%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.59%**

Mass Flow Rate	
Test Duration, min	60
Flow Rate, g/min	5.09

Reference Towel Mass	
Initial Mass (g)	7.595
Final Mass (g)	7.858
Difference (g)	0.26

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.1	27	P-IN-BDST	863
2-HUM/TMP-BDST	88.9	26.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.3	28.6	P-IN-BDST	864
2-HUM/TMP-BDST	94.4	28.2		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 81 cm left of DS center, crown **Test Date:** 7/11/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	29.4	-262.8	292.2	100%
Evap	85.9	85.2	0.7	
G1-1	57.1	131.8	74.7	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	25.6%
G2-1	41.0	41.9	0.9	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.3%
G3-1	49.0	82.6	33.6	
G3-2	56.0	70.4	14.4	
G3-3			0	
G3-4			0	
SS-3			0	16.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.2	164.8	58.6	20.1%
B2			0	0.0%
B3			0	0.0%
B4	106.4	106.7	0.3	0.1%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.9	101.9	38	
DS out-2			0	
DS out-3			0	
DS out-4			0	13.0%
Other			0	0.0%
		Total Collected	220.5	75.5%

Total Input (g)	292.2
Total Collected (g)	220.5
Difference (g)	**-71.7**
	-25%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.7
% Evaporation	**3.85%**

Mass Flow Rate	
Test Duration (min)	61.07
Flow Rate (g/min)	4.78

Reference Towel Mass	
Initial Mass (g)	7.9
Final Mass (g)	7.8
Difference (g)	-0.1

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.6	23.9	P-IN-BDST	856
2-HUM/TMP-BDST	92.3	24		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.4	24.4	P-IN-BDST	855
2-HUM/TMP-BDST	89.6	24.4		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 27 cm left of DS center, crown **Test Date:** 7/11/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	68.5	-220.0	288.5	100%
Evap	85.1	84.4	0.7	
G1-1	64.2	130.2	66	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	22.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	48.9	115.2	66.3	
G3-2	56.0	76.6	20.6	
G3-3			0	
G3-4			0	
SS-3			0	30.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.9	112.2	4.3	1.5%
B3			0	0.0%
B4	106.6	111.9	5.3	1.8%
B5			0	0.0%
B6	110.1	113.5	3.4	1.2%
DS in-1	41.0	45.1	4.1	
DS in-2			0	1.4%
DS out-1	64.2	115.0	50.8	
DS out-2			0	
DS out-3			0	
DS out-4			0	17.6%
Other			0	0.0%
		Total Collected	220.8	76.5%

Total Input (g)	288.5
Total Collected (g)	220.8
Difference (g)	**-67.7**
	-23%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.7
% Evaporation	**4.02%**

Mass Flow Rate	
Test Duration (min)	60.22
Flow Rate (g/min)	4.79

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	7.8
Difference (g)	0.0

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.3	24.2	P-IN-BDST	854
2-HUM/TMP-BDST	86.8	24.6		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.6	24.9	P-IN-BDST	848
2-HUM/TMP-BDST	86.3	25.5		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 27 cm right of DS center, crown **Test Date:** 7/12/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	41.5	-252.6	294.1	100%
Evap	107.0	106.7	0.3	
G1-1	72.1	206.8	134.7	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	45.8%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	56.2	100.9	44.7	
G3-2	48.9	67.6	18.7	
G3-3			0	
G3-4			0	
SS-3			0	21.6%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	108.0	108.3	0.3	0.1%
B3			0	0.0%
B4			0	0.0%
B5	109.5	109.7	0.2	0.1%
B6	110.1	113.3	3.2	1.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.6	110.6	47	
DS out-2			0	
DS out-3			0	
DS out-4			0	16.0%
Other			0	0.0%
		Total Collected	248.8	84.6%

Total Input (g)	294.1
Total Collected (g)	248.8
Difference (g)	**-45.3**
	-15%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.3
% Evaporation	**0.76%**

Mass Flow Rate	
Test Duration (min)	60.95
Flow Rate (g/min)	4.83

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	8.0
Difference (g)	0.2

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.9	19.8	P-IN-BDST	861
2-HUM/TMP-BDST	92	19.6		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.4	21.4	P-IN-BDST	858
2-HUM/TMP-BDST	89.9	22.7		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 81 cm right of DS center, crown **Test Date:** 7/12/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	78.7	-211.3	290	100%
Evap	106.3	105.5	0.8	
G1-1	71.8	220.8	149	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	51.4%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	56.2	98.2	42	
G3-2	56.5	71.4	14.9	
G3-3			0	
G3-4			0	
SS-3			0	19.6%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4	41.0	46.7	5.7	2.0%
B1			0	0.0%
B2			0	0.0%
B3	107.0	107.2	0.2	0.1%
B4			0	0.0%
B5	109.6	110.6	1	0.3%
B6	110.3	110.2	-0.1	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.3	103.2	38.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	13.4%
Other			0	0.0%
		Total Collected	251.6	86.8%

Total Input (g)	290.0
Total Collected (g)	251.6
Difference (g)	**-38.4**
	-13%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.8
% Evaporation	**2.07%**

Mass Flow Rate	
Test Duration (min)	60.65
Flow Rate (g/min)	4.78

Reference Towel Mass	
Initial Mass (g)	8.0
Final Mass (g)	7.9
Difference (g)	-0.1

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.3	22.3	P-IN-BDST	863
2-HUM/TMP-BDST	88.5	22.8		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.3	24.1	P-IN-BDST	858
2-HUM/TMP-BDST	89.5	24.4		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 81 cm right of DS center, 16.5°

Test Date: 7/12/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	16.9	-265.9	282.8	100%
Evap	105.3	104.7	0.6	
G1-1	64.9	257.3	192.4	
G1-2	41.1	45.9	4.8	
G1-3			0	
G1-4			0	
SS-1			0	69.7%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1(SS)	41.6	42.2	0.6	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.2%
G4-1(SS)	41.2	45.6	4.4	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	1.6%
B1			0	0.0%
B2			0	0.0%
B3	108.1	108.9	0.8	0.3%
B4			0	0.0%
B5	109.4	110.2	0.8	0.3%
B6	110.1	110.3	0.2	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.3	91.0	26.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	9.4%
Other			0	0.0%
		Total Collected	230.7	81.6%

Total Input (g)	282.8
Total Collected (g)	230.7
Difference (g)	**-52.1**
	-18%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.6
% Evaporation	**1.60%**

Mass Flow Rate	
Test Duration (min)	60.03
Flow Rate (g/min)	4.71

Reference Towel Mass	
Initial Mass (g)	7.9
Final Mass (g)	8.1
Difference (g)	0.2

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89	24.9	P-IN-BDST	858
2-HUM/TMP-BDST	89.2	24.7		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	93.9	26.9	P-IN-BDST	867
2-HUM/TMP-BDST	93.1	26.7		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 27 cm right of DS center, 16.5 **Test Date:** 7/15/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	824.2	507.4	316.8	100%
Evap	107.0	105.6		
G1-1	65.0	259.2	194.2	
G1-2	56.3	72.5	16.2	
G1-3			0	
G1-4			0	
SS-1			0	66.4%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	49.3	49.7	0.4	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1	41.4	41.4	0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.8	106.8	0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.0	109.4	0.4	0.1%
B6	109.8	109.5	-0.3	-0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.3	82.1	17.8	
DS out-2			0	
DS out-3			0	
DS out-4			0	5.6%
Other			0	0.0%
		Total Collected	228.7	72.2%

Total Input (g)	316.8
Total Collected (g)	228.7
Difference (g)	**-88.1**
	-28%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0
% Evaporation	**0.00%**

Mass Flow Rate	
Test Duration (min)	60
Flow Rate (g/min)	5.28

Reference Towel Mass	
Initial Mass (g)	7.9
Final Mass (g)	7.9
Difference (g)	0.0

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.7	26	P-IN-BDST	854
2-HUM/TMP-BDST	90.9	25.7		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	91.9	26.8	P-IN-BDST	865
2-HUM/TMP-BDST	92.8	26.6		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 27 cm left of DS center, 16.5 **Test Date:** 7/15/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	769.6	460.0	309.6	100%
Evap	104.8	104.5	0.3	
G1-1	64.5	241.8	177.3	
G1-2	56.1	100.2	44.1	
G1-3			0	
G1-4			0	
SS-1			0	71.5%
G2-1	41.4	41.5	0.1	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.7	42.1	0.4	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.6	107.1	0.5	0.2%
B3			0	0.0%
B4	105.8	106.3	0.5	0.2%
B5	109.0	109.5	0.5	0.2%
B6	109.8	110.5	0.7	0.2%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.8	88.4	23.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	7.6%
Other			0	0.0%
		Total Collected	247.7	80.0%

Total Input (g)	309.6
Total Collected (g)	247.7
Difference (g)	**-61.9**
	-20%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.3
% Evaporation	**0.81%**

Mass Flow Rate	
Test Duration (min)	60
Flow Rate (g/min)	5.16

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	8.0
Difference (g)	0.3

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.9	26.1	P-IN-BDST	859
2-HUM/TMP-BDST	87.4	25.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.9	27.6	P-IN-BDST	864
2-HUM/TMP-BDST	92.8	27.2		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 81 cm left of DS center, 16.5 **Test Date:** 7/15/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	731.1	488.5	242.6	100%
Evap	103.5	103.4	0.1	
G1-1	64.8	230.7	165.9	
G1-2	8.0	8.5	0.5	
G1-3			0	
G1-4			0	
SS-1			0	68.6%
G2-1	41.2	44.4	3.2	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	1.3%
G3-1	41.5	42.8	1.3	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.5%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	107.6	108.3	0.7	0.3%
B2			0	0.0%
B3			0	0.0%
B4	105.9	106.8	0.9	0.4%
B5			0	0.0%
B6	7.6	7.6	0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.8	99.6	34.8	
DS out-2			0	
DS out-3			0	
DS out-4			0	14.3%
Other			0	0.0%
		Total Collected	207.3	85.4%

Total Input (g)	242.6
Total Collected (g)	207.3
Difference (g)	**-35.3**
	-15%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.1
% Evaporation	**0.28%**

Mass Flow Rate	
Test Duration (min)	60
Flow Rate (g/min)	4.04

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	8.5
Difference (g)	0.8

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	85.2	25.7	P-IN-BDST	860
2-HUM/TMP-BDST	86.6	25.5		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	94.7	28.3	P-IN-BDST	866
2-HUM/TMP-BDST	94.6	27.9		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 81 cm left of DS center, 33 **Test Date:** 7/16/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	636.9	530.1	106.8	100%
Evap	102.0	101.4	0.6	
G1-1	64.3	145.2	80.9	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	75.7%
G2-1	41.3	41.3	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	106.0	106.0	0	0.0%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	49.9	51.8	1.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	1.8%
Other			0	0.0%
		Total Collected	82.8	77.5%

Total Input (g)	106.8
Total Collected (g)	82.8
Difference (g)	**-24**
	-22%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.6
% Evaporation	**1.75%**

Mass Flow Rate	
Test Duration (min)	30
Flow Rate (g/min)	3.56

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	7.8
Difference (g)	0.0

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	83.1	25.7	P-IN-BDST	854
2-HUM/TMP-BDST	84.6	25.6		
Final Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	83.4	26.1	P-IN-BDST	847
2-HUM/TMP-BDST	83.8	26		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 27 cm left of DS center, 33 **Test Date:** 7/16/02

	Initial (g)	Final (g)	Difference (g)	% of Input
Water Input	676.1	568.8	107.3	100%
Evap	103.0	102.9	0.1	
G1-1	64.1	152.9	88.8	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	83.1%
G2-1	41.1	41.1	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	106.1	106.4	0.3	0.3%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	49.8	52.5	2.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.5%
Other			0	0.0%
		Total Collected	91.8	86.0%

Total Input (g)	107.3
Total Collected (g)	91.8
Difference (g)	**-15.5**
	-14%

Evaporation	
Evap Pan Tare Wt (g)	67.7
Evaporation (g)	0.1
% Evaporation	**0.28%**

Mass Flow Rate	
Test Duration (min)	30
Flow Rate (g/min)	3.58

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	8.2
Difference (g)	0.5

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	84.2	25.3	P-IN-BDST	857
2-HUM/TMP-BDST	86	25.2		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	92.8	27.4	P-IN-BDST	853
2-HUM/TMP-BDST	93.3	27.1		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 27 cm right of DS center, 33 **Test Date:** 7/16/02

	Initial	Final	Difference	% of Input
Water Input	690.9	582.5	108.4	100%
Evap	104.0	103.5	0.5	
G1-1	65.1	152.0	86.9	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	80.2%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1	41.1	41.1	0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.4	109.7	0.3	0.3%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	50.6	52.1	1.5	
DS out-2			0	
DS out-3			0	
DS out-4			0	1.4%
Other			0	0.0%
		Total Collected	88.7	81.8%

Total Input	108.4
Total Collected	88.7
Difference	**-19.7**
	-18%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.5
% Evaporation	**1.34%**

Mass Flow Rate	
Test Duration, min	30
Flow Rate, g/min	3.61

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	8.0
Difference (g)	0.3

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.7	25.1	P-IN-BDST	854
2-HUM/TMP-BDST	86.1	25.1		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	92.1	26.4	P-IN-BDST	864
2-HUM/TMP-BDST	91.5	26.4		

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Multiple Patch Test Summary and Mass Balance - Rough Surface

Test: 81 cm right of DS center, 33 **Test Date:** 7/16/02

	Initial	Final	Difference	% of Input
Water Input	652.0	542.6	109.4	100%
Evap	105.9	105.0	0.9	
G1-1	65.1	149.7	84.6	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	77.3%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1	41.3	41.6	0.3	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.3%
B1			0	0.0%
B2			0	0.0%
B3	107.7	107.8	0.1	0.1%
B4			0	0.0%
B5	109.3	109.5	0.2	0.2%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.9	58.3	1.4	
DS out-2			0	
DS out-3			0	
DS out-4			0	1.3%
Other			0	0.0%
		Total Collected	86.6	79.2%

Total Input	109.4
Total Collected	86.6
Difference	**-22.8**
	-21%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.9
% Evaporation	**2.30%**

Mass Flow Rate	
Test Duration, min	30.03
Flow Rate, g/min	3.64

Reference Towel Mass	
Initial Mass (g)	7.9
Final Mass (g)	7.8
Difference (g)	-0.1

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86	25.1	P-IN-BDST	860
2-HUM/TMP-BDST	85.1	25.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.6	25.9	P-IN-BDST	864
2-HUM/TMP-BDST	88.4	25.4		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 54 cm left of DS center, Crown

Test Date 7/19/02

	Initial	Final	Difference	% of Input
Water Input	813.0	482.3	330.7	100%
Evap	100.4	100.0	0.4	
G1-1	42.5	42.6	0.1	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	0.0%
G2-1	41.2	41.5	0.3	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.1%
G3-1	64.1	113.7	49.6	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	15.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.4	301.3	193.9	58.6%
B5			0	0.0%
B6	102.2	102.9	0.7	0.2%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	71.8	111.1	39.3	
DS out-2			0	
DS out-3			0	
DS out-4			0	11.9%
Other			0	0.0%
		Total Collected	283.9	85.8%

Total Input	330.7
Total Collected	283.9
Difference	**-46.8**
	-14%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.19%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	33.07

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	7.9
Difference (g)	0.1

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	84.4	24.8	P-IN-BDST	863
2-HUM/TMP-BDST	85	25		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	90.3	25.4	P-IN-BDST	861
2-HUM/TMP-BDST	90.8	25.2		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: Low flow rate, 54 cm left of DS Center, Crown **Test Date** 7/23/02

	Initial	Final	Difference	% of Input
Water Input	695.4	577.3	118.1	100%
Evap	88.7	86.3	2.4	
G1-1	66.8	122.4	55.6	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	47.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.9	43.5	1.6	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	49.7	50.9	1.2	2.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1	106.4	106.1	0	0.0%
B2	108.2	107.1	0	0.0%
B3			0	0.0%
B4	108.4	107.5	0	0.0%
B5			0	0.0%
B6	110.4	110.1	0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	66.8	69.0	2.2	
DS out-2			0	
DS out-3			0	
DS out-4			0	1.9%
Other			0	0.0%
		Total Collected	60.6	51.3%

Total Input	118.1
Total Collected	60.6
Difference	**-57.5**
	-49%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	2.4
% Evaporation	**10.91%**

Mass Flow Rate	
Test Duration, min	300.1
Flow Rate, g/min	0.39

Reference Towel Mass	
Initial Mass (g)	8.2
Final Mass (g)	7.8
Difference (g)	-0.4

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	101.7	26.9	P-IN-BDST	854
2-HUM/TMP-BDST	92.7	26.2		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.4	27.2	P-IN-BDST	858
2-HUM/TMP-BDST	91.2	26.6		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 27 cm left of DS center, Crown

Test Date 7/19/02

	Initial	Final	Difference	% of Input
Water Input	788.1	459.5	328.6	100%
Evap	99.8	99.4	0.4	
G1-1	64.7	197.6	132.9	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	40.4%
G2-1	41.5	41.5	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	63.9	144.8	80.9	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	24.6%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	7.6	10.5	2.9	0.9%
B3			0	0.0%
B4	99.7	100.3	0.6	0.2%
B5			0	0.0%
B6	109.9	112.2	2.3	0.7%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	72.0	127.9	55.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	17.0%
Other			0	0.0%
		Total Collected	275.5	83.8%

Total Input	328.6
Total Collected	275.5
Difference	**-53.1**
	-16%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.21%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	32.86

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	8.0
Difference (g)	0.2

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89	24.8	P-IN-BDST	855
2-HUM/TMP-BDST	86.4	25		
Final Conditions	**RH (%)**	**Temperature (^{o}C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	92.2	25.9	P-IN-BDST	857
2-HUM/TMP-BDST	92.2	25.2		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: Low flow rate, 27 cm left of DS Center, Crown

Test Date 7/23/02

	Initial	Final	Difference	% of Input
Water Input	815.2	701.9	113.3	100%
Evap	89.1	88.9	0.2	
G1-1	58.0	71.5	13.5	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	11.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	42.2	53.9	11.7	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	49.6	56.5	6.9	16.4%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.1	108.6	1.5	1.3%
B3			0	0.0%
B4	107.5	108.8	1.3	1.1%
B5			0	0.0%
B6	110.0	111.6	1.6	1.4%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	65.8	91.7	25.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	22.9%
Other			0	0.0%
		Total Collected	62.4	55.1%

Total Input	113.3
Total Collected	62.4
Difference	**-50.9**
	-45%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.89%**

Mass Flow Rate	
Test Duration, min	302.5
Flow Rate, g/min	0.37

Reference Towel Mass	
Initial Mass (g)	7.9
Final Mass (g)	8.5
Difference (g)	0.6

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.3	21	P-IN-BDST	852
2-HUM/TMP-BDST	93.4	20.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	110	28.1	P-IN-BDST	849
2-HUM/TMP-BDST	95.6	27.7		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 27 cm right of DS center, Crown

Test Date 7/19/02

	Initial	Final	Difference	% of Input
Water Input	744.2	437.6	306.6	100%
Evap	99.0	98.5	0.5	
G1-1	64.7	229.9	165.2	
G1-2	49.3	55.4	6.1	
G1-3			0	
G1-4			0	
SS-1			0	55.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	64.0	112.4	48.4	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	15.8%
G4-1	41.0	41.1	0.1	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	99.1	99.2	0.1	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.1	109.4	0.3	0.1%
B6	109.8	112.4	2.6	0.8%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	71.7	110.8	39.1	
DS out-2			0	
DS out-3			0	
DS out-4			0	12.8%
Other			0	0.0%
		Total Collected	261.9	85.4%

Total Input	306.6
Total Collected	261.9
Difference	**-44.7**
	-15%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.5
% Evaporation	**1.55%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	30.66

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	7.8
Difference (g)	0.1

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.5	24	P-IN-BDST	856
2-HUM/TMP-BDST	81.4	25		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91	25.9	P-IN-BDST	852
2-HUM/TMP-BDST	91.3	25.4		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: low flow, 27 cm right of DS center, Crown

Test Date 7/22/02

	Initial	Final	Difference	% of Input
Water Input	744.8	674.0	70.8	100%
Evap	96.2	95.1	1.1	
G1-1	66.0	95.1	29.1	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	41.1%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	50.0	52.6	2.6	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	49.3	51.0	1.7	6.1%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	111.6	110.4	0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.6	109.9	0.3	0.4%
B6	111.5	110.5	0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	65.5	69.4	3.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	5.5%
Other			0	0.0%
		Total Collected	37.6	53.1%

Total Input	70.8
Total Collected	37.6
Difference	**-33.2**
	-47%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1.1
% Evaporation	**3.73%**

Mass Flow Rate	
Test Duration, min	301.1
Flow Rate, g/min	0.24

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	8.2
Difference (g)	0.4

Test Chamber Environment

Initial Conditions	RH (%)	Temperature (°C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.1	27.4	P-IN-BDST	846
2-HUM/TMP-BDST	87.1	27.4		
Final Conditions	**RH (%)**	**Temperature (°C)**		**Atm. P. (mbar)**
1-HUM/TMP-BDST	99	29.9	P-IN-BDST	874
2-HUM/TMP-BDST	94.2	29.5		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 54 cm left of DS center, 16.5 **Test Date** 7/18/02

	Initial	Final	Difference	% of Input
Water Input	756.0	427.8	328.2	100%
Evap	98.7	98.4	0.3	
G1-1	49.7	60.7	11	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	3.4%
G2-1	48.6	49.0	0.4	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.1%
G3-1	41.5	42.6	1.1	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.3%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.7	305.6	197.9	60.3%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	71.6	130.9	59.3	
DS out-2			0	
DS out-3			0	
DS out-4			0	18.1%
Other			0	0.0%
		Total Collected	269.7	82.2%

Total Input	328.2
Total Collected	269.7
Difference	**-58.5**
	-18%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**0.94%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	32.82

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	7.8
Difference (g)	0.1

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	84.8	24	P-IN-BDST	859
2-HUM/TMP-BDST	85	24		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.6	24.4	P-IN-BDST	850
2-HUM/TMP-BDST	89	24.3		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: Low flow rate, 54 cm left of DS Center, 16.5 **Test Date** 7/18/02

	Initial	Final	Difference	% of Input
Water Input	627.0	532.6	94.4	100%
Evap	98.2	97.7	0.5	
G1-1	42.4	42.6	0.2	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	0.2%
G2-1	41.2	41.2	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.6	41.6	0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	107.3	164.5	57.2	60.6%
B5			0	0.0%
B6	102.2	102.3	0.1	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.7	59.1	2.4	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.5%
Other			0	0.0%
		Total Collected	59.9	63.5%

Total Input	94.4
Total Collected	59.9
Difference	**-34.5**
	-37%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.5
% Evaporation	**1.59%**

Mass Flow Rate	
Test Duration, min	300
Flow Rate, g/min	0.31

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	8.7
Difference (g)	1.0

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.7	23.8	P-IN-BDST	858
2-HUM/TMP-BDST	84.3	24.4		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	108.5	27.7	P-IN-BDST	852
2-HUM/TMP-BDST	90.7	28.1		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 27 cm left of DS Center, 16.5 **Test Date** 7/18/02

	Initial	Final	Difference	% of Input
Water Input	790.8	468.7	322.1	100%
Evap	99.7	99.0	0.7	
G1-1	64.5	244.2	179.7	
G1-2	63.0	89.9	26.9	
G1-3			0	
G1-4			0	
SS-1			0	64.1%
G2-1	41.1	41.1	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	41.7	43.7	2	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.6%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.4	108.1	0.7	0.2%
B3			0	0.0%
B4	107.5	108.8	1.3	0.4%
B5	101.6	101.8	0.2	0.1%
B6	110.2	110.5	0.3	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	71.9	124.8	52.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	16.4%
Other			0	0.0%
		Total Collected	264	82.0%

Total Input	322.1
Total Collected	264
Difference	**-58.1**
	-18%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.7
% Evaporation	**2.12%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	32.21

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	7.8
Difference (g)	0.0

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.1	24.2	P-IN-BDST	860
2-HUM/TMP-BDST	85	24.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88.5	24.4	P-IN-BDST	862
2-HUM/TMP-BDST	88.7	24.4		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: Low flow rate, 27 cm left of DS Center, 16.5 **Test Date** 7/24/02

	Initial	Final	Difference	% of Input
Water Input	795.6	679.6	116	100%
Evap	80.8	80.5	0.33	
G1-1	66.4	156.2	89.8	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1	42.0	42.1	0.1	77.5%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	40.5	40.5	0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.0	107.8	0.8	0.7%
B3			0	0.0%
B4	107.5	107.9	0.4	0.3%
B5	109.4	109.9	0.5	0.4%
B6	110.1	110.4	0.3	0.3%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	63.8	66.9	3.1	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.7%
Other			0	0.0%
		Total Collected	95	81.9%

Total Input	116.0
Total Collected	95
Difference	**-21**
	-18%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.33
% Evaporation	**2.34%**

Mass Flow Rate	
Test Duration, min	300.2
Flow Rate, g/min	0.39

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	8.5
Difference (g)	0.8

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.7	20.9	P-IN-BDST	843
2-HUM/TMP-BDST	92.4	20.4		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	96.3	28.1	P-IN-BDST	852
2-HUM/TMP-BDST	95	27.6		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 27 cm right of DS center, 16.5 **Test Date** 7/18/02

	Initial	Final	Difference	% of Input
Water Input	759.3	445.4	313.9	100%
Evap	100.3	99.9	0.4	
G1-1	64.1	236.4	172.3	
G1-2	63.1	97.9	34.8	
G1-3			0	
G1-4			0	
SS-1			0	66.0%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1	48.9	50.3	1.4	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.4%
G4-1	41.0	41.2	0.2	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.1%
B1			0	0.0%
B2	106.8	107.6	0.8	0.3%
B3			0	0.0%
B4			0	0.0%
B5	109.3	110.4	1.1	0.4%
B6	8.4	8.6	0.2	0.1%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	64.0	121.6	57.6	
DS out-2			0	
DS out-3			0	
DS out-4			0	18.3%
Other			0	0.0%
		Total Collected	268.4	85.5%

Total Input	313.9
Total Collected	268.4
Difference	**-45.5**
	-14%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.4
% Evaporation	**1.19%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	31.39

Reference Towel Mass	
Initial Mass (g)	7.6
Final Mass (g)	7.9
Difference (g)	0.3

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	83.6	24.7	P-IN-BDST	875
2-HUM/TMP-BDST	85.7	24.7		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.7	25.5	P-IN-BDST	861
2-HUM/TMP-BDST	92.8	25.5		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: Low flow rate, 27 cm right of DS Center, 16.5 **Test Date** 7/24/02

	Initial	Final	Difference	% of Input
Water Input	667.4	547.7	119.7	100%
Evap	80.4	79.4	1	
G1-1	61.2	158.2	97	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1	40.2	40.2	0	81.0%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3	40.9	40.9	0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.7	107.8	0.1	0.1%
B3			0	0.0%
B4			0	0.0%
B5	109.9	110.0	0.1	0.1%
B6	110.4	110.4	0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	62.8	63.7	0.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	0.8%
Other			0	0.0%
		Total Collected	98.1	82.0%

Total Input	119.7
Total Collected	98.1
Difference	**-21.6**
	-18%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1
% Evaporation	**7.30%**

Mass Flow Rate	
Test Duration, min	301.7
Flow Rate, g/min	0.40

Reference Towel Mass	
Initial Mass (g)	8.1
Final Mass (g)	8.2
Difference (g)	0.1

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	95.2	28.3	P-IN-BDST	862
2-HUM/TMP-BDST	94.5	27.7		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	98	29.7	P-IN-BDST	868
2-HUM/TMP-BDST	94.9	29.2		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 54 cm left of DS center, 33 **Test Date** 7/17/02

	Initial	Final	Difference	% of Input
Water Input	776.1	446.0	330.1	100%
Evap	103.1	102.9	0.2	
G1-1	49.5	85.2	35.7	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	10.8%
G2-1	41.0	41.5	0.5	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.2%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	106.0	311.0	205	62.1%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	49.1	71.6	22.5	
DS out-2			0	
DS out-3			0	
DS out-4			0	6.8%
Other			0	0.0%
		Total Collected	263.7	79.9%

Total Input	330.1
Total Collected	263.7
Difference	**-66.4**
	-20%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.2
% Evaporation	**0.55%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	33.01

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	8.0
Difference (g)	0.3

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.2	24.7	P-IN-BDST	856
2-HUM/TMP-BDST	89.3	24.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89.9	25.1	P-IN-BDST	860
2-HUM/TMP-BDST	90.9	24.9		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: Low flow rate, 54 cm left of DS center, 33 **Test Date** 7/16/02

	Initial	Final	Difference	% of Input
Water Input	682.2	559.1	123.1	100%
Evap	101.3	100.3	1	
G1-1	42.2	42.4	0.2	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	0.2%
G2-1	41.1	41.1	0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4	106.2	159.4	53.2	43.2%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	41.4	42.5	1.1	
DS out-2			0	
DS out-3			0	
DS out-4			0	0.9%
Other			0	0.0%
		Total Collected	54.5	44.3%

Total Input	123.1
Total Collected	54.5
Difference	**-68.6**
	-56%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	1
% Evaporation	**2.89%**

Mass Flow Rate	
Test Duration, min	300
Flow Rate, g/min	0.41

Reference Towel Mass	
Initial Mass (g)	8.0
Final Mass (g)	8.3
Difference (g)	0.3

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	89	27.2	P-IN-BDST	852
2-HUM/TMP-BDST	89.9	26.9		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	97	27.7	P-IN-BDST	875
2-HUM/TMP-BDST	86.5	28.7		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 27 cm left of DS center, 33 **Test Date** 7/17/02

	Initial	Final	Difference	% of Input
Water Input	798.7	459.5	339.2	100%
Evap	102.5	102.2	0.3	
G1-1	63.9	256.2	192.3	
G1-2	62.5	104.3	41.8	
G1-3			0	
G1-4			0	
SS-1			0	69.0%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.0	107.0	0	0.0%
B3			0	0.0%
B4	107.5	107.6	0.1	0.0%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.4	74.3	17.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	5.3%
Other			0	0.0%
		Total Collected	252.1	74.3%

Total Input	339.2
Total Collected	252.1
Difference	**-87.1**
	-26%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**0.84%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	33.92

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	7.8
Difference (g)	0.0

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	82	24.7	P-IN-BDST	849
2-HUM/TMP-BDST	83.3	25.4		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	84.8	24.6	P-IN-BDST	848
2-HUM/TMP-BDST	85.7	24.5		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: Low flow rate, 27 cm left of DS center, 33 **Test Date** 7/25/02

	Initial	Final	Difference	% of Input
Water Input	798.5	682.7	115.8	100%
Evap	84.0	83.7	0.3	
G1-1	74.3	169.1	94.8	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1	40.2	41.0	0.8	82.6%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	107.0	108.0	1	0.9%
B3			0	0.0%
B4	107.6	108.0	0.4	0.3%
B5			0	0.0%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	69.4	71.3	1.9	
DS out-2			0	
DS out-3			0	
DS out-4			0	1.6%
Other			0	0.0%
		Total Collected	98.9	85.4%

Total Input	115.8
Total Collected	98.9
Difference	**-16.9**
	-15%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**1.73%**

Mass Flow Rate	
Test Duration, min	303.85
Flow Rate, g/min	0.38

Reference Towel Mass	
Initial Mass (g)	7.8
Final Mass (g)	8.6
Difference (g)	0.8

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	87.9	20.4	P-IN-BDST	850
2-HUM/TMP-BDST	92.7	20		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	99.8	27.9	P-IN-BDST	850
2-HUM/TMP-BDST	95.2	27.5		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: High flow rate, 27 cm right of DS center, 33 **Test Date** 7/17/02

	Initial	Final	Difference	% of Input
Water Input	803.2	472.9	330.3	100%
Evap	102.0	101.7	0.3	
G1-1	63.8	248.3	184.5	
G1-2	62.7	111.6	48.9	
G1-3			0	
G1-4			0	
SS-1			0	70.7%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2	106.9	107.0	0.1	0.0%
B3			0	0.0%
B4	107.5	107.6	0.1	0.0%
B5	109.3	110.5	1.2	0.4%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	56.5	73.2	16.7	
DS out-2			0	
DS out-3			0	
DS out-4			0	5.1%
Other			0	0.0%
		Total Collected	251.5	76.1%

Total Input	330.3
Total Collected	251.5
Difference	**-78.8**
	-24%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**0.85%**

Mass Flow Rate	
Test Duration, min	10
Flow Rate, g/min	33.03

Reference Towel Mass	
Initial Mass (g)	7.7
Final Mass (g)	7.8
Difference (g)	0.1

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	86.1	24.3	P-IN-BDST	854
2-HUM/TMP-BDST	86.1	24.6		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	88	24.8	P-IN-BDST	853
2-HUM/TMP-BDST	89.3	24.8		

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Bounding Flow Test Summary and Mass Balance - Rough DS Surface

Test: Low flow rate, 27 cm right of DS center, 33 **Test Date** 7/17/02

	Initial	Final	Difference	% of Input
Water Input	661.7	549.4	112.3	100%
Evap	101.7	101.4	0.3	
G1-1	64.3	140.5	76.2	
G1-2			0	
G1-3			0	
G1-4			0	
SS-1			0	67.9%
G2-1			0	
G2-2			0	
G2-3			0	
G2-4			0	
SS-2			0	0.0%
G3-1			0	
G3-2			0	
G3-3			0	
G3-4			0	
SS-3			0	0.0%
G4-1			0	
G4-2			0	
G4-3			0	
G4-4			0	
SS-4			0	0.0%
B1			0	0.0%
B2			0	0.0%
B3			0	0.0%
B4			0	0.0%
B5	109.7	110.5	0.8	0.7%
B6			0	0.0%
DS in-1			0	
DS in-2			0	0.0%
DS out-1	49.2	52.2	3	
DS out-2			0	
DS out-3			0	
DS out-4			0	2.7%
Other			0	0.0%
		Total Collected	80	71.2%

Total Input	112.3
Total Collected	80
Difference	**-32.3**
	-29%

Evaporation	
Evap Pan Tare Wt, g	66.7
Evaporation, g	0.3
% Evaporation	**0.86%**

Mass Flow Rate	
Test Duration, min	304
Flow Rate, g/min	0.37

Reference Towel Mass	
Initial Mass (g)	8.0
Final Mass (g)	8.4
Difference (g)	0.4

Test Chamber Environment				
Initial Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	91.6	25.9	P-IN-BDST	857
2-HUM/TMP-BDST	92.8	25.5		
Final Conditions	RH (%)	Temperature (^{o}C)		Atm. P. (mbar)
1-HUM/TMP-BDST	109.6	28.6	P-IN-BDST	863
2-HUM/TMP-BDST	95.1	28.4		

SN-M&O-SCI-043-V2, pages 184-185

APPENDIX C:
Rivulet Spread Data

Test Description: Q (film) – Rivulet Flow
Patch 5, center, crown
Pages 116 and 117 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical**
Maximum (cm)	-28.0	-45.5	-54.0
Minimum (cm)	0	0	0

Test Description: Q (film) – Rivulet Flow
Patch 5, 4 cm left of center, crown
Pages 118 and 119 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical**
Maximum (cm)	21	Not Recorded	Not Recorded
Minimum (cm)	Not Recorded	Not Recorded	Not Recorded

Test Description: Q (film) – Rivulet Flow
Patch 4, center, crown
Pages 120 and 121 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical**
Right (cm)	26.5	19.0	Not Visible at Test End
Left (cm)	11.0	14.0	47.0

Test Description: Q (film) – Rivulet Flow
Patch 4, 8 cm right of center, crown
Pages 122 and 123 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** Top of Patch 40.5 cm from Trans
Right (cm)	28.5	36.5	45
Left (cm)	15.0	24	19

Test Description: Q (film) – Rivulet Flow
Patch 4, 8 cm right of center, 16.5º
Pages 124 and 125 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	5.5	13.5	15
Left (West) (cm)	3.5	N/A	N/A

Test Description: Q (film) – Rivulet Flow
Patch 2, center, 16.5º
Pages 126 and 127 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	7.5	19.5	19.0
Left (West) (cm)	4.5	22.0	27.0

Test Description: Q (film) – Rivulet Flow
Patch 2, 15 cm right of center, 16.5º
Pages 128 and 129 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	11.5	18.0	18.0
Left (West) (cm)	9.0	15.0	18.0

Test Description: Q (film) – Rivulet Flow
Patch 5, 4 cm left of center, 16.5º
Pages 131 and 132 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	8.5	N/A enter breach	N/A enter breach
Left (West) (cm)	8.5	N/A enter breach	N/A enter breach

Test Description: Q (film) – Rivulet Flow
Patch 2, 15 cm right of center, 33º
Pages 133 and 134 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	13.0	14.5
Left (West) (cm)	N/A	11.5	12.0

Test Description: Q (film) – Rivulet Flow
Patch 2, center, 33º
Pages 135 and 136 of SN-M&O-SCI-043-V1

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	N/A	9.0	6.0
Left (West) (cm)	N/A	10.5	18.0

Test Description: Q (film) – Rivulet Flow
Patch 4, 8 cm right of center, 33º
Pages 137 and 138 of SN-M&O-SCI-043-V1

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	N/A	14.5 top of patch 4	N/A enter breach
Left (West) (cm)	N/A	9.5 top of patch 4	N/A enter breach

Test Description: Multiple Patch Tests, Smooth DS Surface
81 cm left of DS center, 33º
Pages 142 and 143 of SN-M&O-SCI-043-V1

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	N/A	14 cm	15 cm
Left (West) (cm)	N/A	12 cm	18 cm

Test Description: Multiple Patch Tests, Smooth DS Surface
27 cm left of DS center, 33º
Pages 144 and 145 of SN-M&O-SCI-043-V1

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	N/A	11 cm	16 cm
Left (West) (cm)	N/A	9cm	14 cm

Test Description: Multiple Patch Tests, Smooth DS Surface
27 cm right of DS center, 33º
Pages 146 and 147 of SN-M&O-SCI-043-V1

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	N/A	10 cm	8 cm
Left (West) (cm)	N/A	13 cm	15 cm

Test Description: Multiple Patch Tests, Smooth DS Surface
81 cm right of DS center, 33º
Pages 148 and 149 of SN-M&O-SCI-043-V1

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	N/A	10 cm	22 cm
Left (West) (cm)	N/A	10 cm	10 cm

Test Description: Multiple Patch Tests, Smooth DS Surface
27 cm right of drip shield center (Patch 6 center), crown
Pages 9 and 10 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	29.0	Enter B5	Enter B5
Left (West) (cm)	13.0	19.0	23.0

Test Description: Multiple Patch Tests, Smooth DS Surface
27 cm left of drip shield center, crown
Pages 15 and 16 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	21.5	29.0	30.0
Left (West) (cm)	21.0	Enter B4	Enter B4

Test Description: Multiple Patch Tests, Smooth DS Surface
81 cm left of drip shield center, crown
Pages 17 and 18 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	23.5	Enter B4	Enter B4
Left (West) (cm)	17.0	11.5	35.5

Test Description: Multiple Patch Tests, Smooth DS Surface
81 cm left of drip shield center, 16.5°
Pages 19 and 20 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	4.5	Enter B4	Enter B4
Left (West) (cm)	6.5	14.0	Not Visible, Dry

Test Description: Multiple Patch Tests, Smooth DS Surface
27 cm left of drip shield center, 16.5°
Pages 21 and 22 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	7.0	13.0	20.0
Left (West) (cm)	5.5	15.0	14.5

Test Description: Multiple Patch Tests, Smooth DS Surface
27 cm right of drip shield center, 16.5°
Pages 25 and 26 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	6.0	15.5	24.0
Left (West) (cm)	11.0	27.5	31.0

Test Description: Multiple Patch Tests, Smooth DS Surface
81 cm right of drip shield center, crown
Pages 200 and 201 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	18.0	17.0	29.0
Left (West) (cm)	20.0	21.0	32.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
7 cm right of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 32-33

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	13.5	8.5	25.5
Left (West) (cm)	20.0	28.0	36.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
27 cm right of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 36-37

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	16.5	29.0	45.0
Left (West) (cm)	24.0	37.0	39.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
27 cm left of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 38-39

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	8.0	13.0	20.0
Left (West) (cm)	10.0	23.0	24.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
27 cm left of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 40-41

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	19	27	34
Left (West) (cm)	24	32	21

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
54 cm left of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 42-43

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	30.0	54.0	63.0
Left (West) (cm)	10.5	15.0	15.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
54 cm left of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 44-45

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	32.0	44.0	56.0
Left (West) (cm)	22.0	30.0	35.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
54 cm left of drip shield center, 16.5º
Scientific Notebook SN-M&O-SCI-043-V2, pp. 46-47

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	31.0	35.0	35.0
Left (West) (cm)	46.0	46.0	45.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
54 cm left of drip shield center, 16.5º
Scientific Notebook SN-M&O-SCI-043-V2, pp. 48-49

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	8.5	19.0	24.0
Left (West) (cm)	10.0	27.0	30.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
27 cm left of drip shield center, 16.5°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 50-51

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	6.0	17.0	24.0
Left (West) (cm)	8.0	16.0	20.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
27 cm left of drip shield center, 16.5°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 52-53

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	18.0	22.0	25.0
Left (West) (cm)	24.0	19.0	21.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
27 cm right of drip shield center, 16.5°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 54-55

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	13.0	14.0	19.0
Left (West) (cm)	27.0	23.0	24.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
27 cm right of drip shield center, 16.5°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 56-57

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	12.0	16.0	20.0
Left (West) (cm)	17.0	19.0	28.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
27 cm left of drip shield center, 33°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 58-59

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	4.0	11.0	26.0
Left (West) (cm)	3.0	17.0	18.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
27 cm right of drip shield center, 33°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 60-61

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	5.0	15.0	28.0
Left (West) (cm)	5.0	17.0	17.0

Test Description: High Flow Rate (20.0 m^3/yr nominal), Smooth DS Surface
54 cm left of drip shield center, 33°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 62-63

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	4.0	17.0	18.0
Left (West) (cm)	4.0	17.0	20.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
54 cm left of drip shield center, 33°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 64-65

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	NA	NA	NA
Left (West) (cm)	NA	NA	NA

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
27 cm left of drip shield center, 33°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 66-67

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	NA	9.0	Enter B4
Left (West) (cm)	NA	9.5	8.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Smooth DS Surface
27 cm right of drip shield center, 33°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 68-69

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	NA	8.5	12.0
Left (West) (cm)	NA	10.0	8.0

Test Description: Single Patch q(splash) Tests, Rough DS Surface
Patch 6, 20 cm left of patch center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 93-94

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	16.0	9.5	19.0
Left (West) (cm)	14.0	12.5	12.5

Test Description: Single Patch q(splash) Tests, Rough DS Surface
Patch 6 center, 15 cm below crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 95-96

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	6.0	9.0	11.0
Left (West) (cm)	10.0	9.5	10.5

Test Description: Single Patch q(splash) Tests, Rough DS Surface
Patch 6, patch center, 16.5°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 97-98

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	13.0	43.0	39.0
Left (West) (cm)	8.0	39.0	38.0

Test Description: Single Patch q(splash) Tests, Rough DS Surface
Patch 5, 20 cm left of patch center, 16.5°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 99-100

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	29.0	2.0	4.0
Left (West) (cm)	27.0	40.0	34.0

Test Description: Single Patch q(splash) Tests, Rough DS Surface
Patch 5, 20 cm left of patch center, 33°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 101-102

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	3.0	3.0	3.0
Left (West) (cm)	1.0	16.0	18.0

Test Description: Single Patch q(splash) Tests, Rough DS Surface
Patch 4, 27 cm right of patch center, 33°
Scientific Notebook SN-M&O-SCI-043-V2, pp. 103-104

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	3.0	17.0	16.0
Left (West) (cm)	3.0	11.5	10.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 4, centerline, 33°
Pages 110 and 111 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	3.0	23.0	18.0
Left (West) (cm)	2.0	20.0	22.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 2, center, 33°
Pages 112 and 113 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	2.0	2.0	4.0
Left (West) (cm)	2.0	9.0	8.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 2, 13.5 cm right of center, 33°
Pages 114 and 115 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	2.0	10.0	10.0
Left (West) (cm)	2.0	1.0	3.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 5, centerline, 16.5°
Pages 116 and 117 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	16.5	18.0	19.0
Left (West) (cm)	27.0	22.0	22.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 2, 13.5 cm right of centerline, 16.5°
Pages 118 and 119 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	14.0	25.0	20.0
Left (West) (cm)	12.0	14.0	12.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 5, 13.5 cm left of patch center, 16.5°
Pages 120 and 121 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	20.5	N/A	N/A
Left (West) (cm)	15.0	15.0	15.5

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 2, centerline, 16.5°
Pages 122 and 123 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	32.0	32.0	41.0
Left (West) (cm)	20.0	20.0	18.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 4, centerline, 16.5°
Pages 126 and 127 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	11.0	N/A	N/A
Left (West) (cm)	23.5	25.0	26.5

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 4, centerline, crown
Pages 128 and 129 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	1.0	N/A	N/A
Left (West) (cm)	26.0	27.0	26.5

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 4, 13.5 cm right of patch center, crown
Pages 132 and 133 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	21.0	22.0	23.0
Left (West) (cm)	11.5	N/A	N/A

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 2, centerline 10.5 cm forward from crown, Patch 6 covered
Pages 134 and 135 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	20.0 ends	12.0	13.5
Left (West) (cm)	11.5	11.5	12.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 2, 13.5 cm left of center, 10.5 cm forward from crown
Pages 136 and 137 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	25.0	22.0	23.0
Left (West) (cm)	20.0	19.0	Not visible beyond transition

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 5, 13.5 cm left of patch center, crown
Pages 138 and 139 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	22.0	N/A	N/A
Left (West) (cm)	8.0	11.5	11.5

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 5, 13.5 cm left of patch center, 33°
Pages 142 and 143 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	N/A	N/A
Left (West) (cm)	N/A	9.0	9.0

Test Description: Single Patch q(film) Rivulet Flow Tests: Rough DS Surface
Patch 4, 13.5 cm right of patch center, 33°
Pages 144 and 145 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	9.0	11.0
Left (West) (cm)	N/A	N/A	N/A

Test Description: Multiple Patch Tests, Rough DS Surface
81 cm left of drip shield center, Crown
Pages 149 and 150 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	17.5	Enter Breach	Enter Breach
Left (West) (cm)	32.5	30.0	32.0

Test Description: Multiple Patch Tests, Rough DS Surface
27 cm left of drip shield center, Crown
Pages 151 and 152 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	18.0	18.0	18.5
Left (West) (cm)	21.5	Enter B4	Enter B4

Test Description: Multiple Patch Tests, Rough DS Surface
27 cm right of drip shield center, Crown
Pages 153 and 154 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	10.0	7.5	9.5
Left (West) (cm)	10.0	10.0	Rivulet ends, 4.0 next

Test Description: Multiple Patch Tests, Rough DS Surface
27 cm right of drip shield center, Crown
Pages 155 and 156 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	None	None	None
Left (West) (cm)	1.0	1.0	0.5

Test Description: Multiple Patch Tests, Rough DS Surface
81 cm right of drip shield center, Crown
Pages 157 and 158 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	*34.0	*32.0	25.0
Left (West) (cm)	17.0	Enter B5	Enter B5

Test Description: Multiple Patch Tests, Rough DS Surface
27 cm right of drip shield center, 16.5°
Pages 161 and 162 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	12.0	8.0	7.0
Left (West) (cm)	8.0	6.0	6.0

Test Description: Multiple Patch Tests, Rough DS Surface
27 cm left of drip shield center, 16.5°
Pages 163 and 164 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	19.0	13.0	13.0
Left (West) (cm)	21.0	12.0	10.0

Test Description: Multiple Patch Tests, Rough DS Surface
81 cm left of drip shield center, 16.5°
Pages 165 and 166 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	22.0	12.0	13.0
Left (West) (cm)	16.0	14.0	9.0

Test Description: Multiple Patch Tests, Rough DS Surface
81 cm right of drip shield center, 33°
Pages 167 and 168 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	2.0	1.5
Left (West) (cm)	N/A	2.0	2.0

Test Description: Multiple Patch Tests, Rough DS Surface
27 cm right of drip shield center, 33°
Pages 169 and 170 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	1.0	1.0
Left (West) (cm)	N/A	3.0	2.5

Test Description: Multiple Patch Tests, Rough DS Surface
27 cm left of drip shield center, 33°
Pages 171 and 172 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	1.0	1.5
Left (West) (cm)	N/A	2.0	4.0

Test Description: Multiple Patch Tests, Rough DS Surface
81 cm left of drip shield center, 33°
Pages 173 and 174 of Scientific Notebook SN-M&O-SCI-043-V2

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	4.0	2.0
Left (West) (cm)	N/A	3.0	1.0

Test Description: High Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm left of drip shield center, 33^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 180-181

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	9	14	10
Left (West) (cm)	6	8	2.5

Test Description: High Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm right of drip shield center, 33^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 182-183

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	3	11	11
Left (West) (cm)	5	12	13

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm right of drip shield center, 33^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 184-185

Position relative to drip impact	**33°**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	2.5	3
Left (West) (cm)	N/A	2.5	5

Test Description: High Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm right of drip shield center, 16.5^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 186-187

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	15	10	10
Left (West) (cm)	16	17	20

Test Description: High Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm left of drip shield center, 16.5^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 188-189

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	32	34	23
Left (West) (cm)	26	13	12

Test Description: High Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
54 cm left of drip shield center, 16.5^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 190-191

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	20	19	21
Left (West) (cm)	25	26	26

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
54 cm left of drip shield center, 16.5^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 192-193

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	6	N/A	N/A
Left (West) (cm)	3	N/A	N/A

Test Description: High Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
54 cm left of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 194-195

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	None	N/A	N/A
Left (West) (cm)	2	N/A	N/A

Test Description: High Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm left of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 196-197

Position relative to drip impact	33º	Transition (Curved to vertical)	Vertical (Top of patch on vertical)
Right (East) (cm)	15	15	15
Left (West) (cm)	15	14	10

Test Description: High Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm right of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 198-199

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	6	3	4
Left (West) (cm)	6	3	2

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm right of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 204-205

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	16.0	Enter B5	Enter B5
Left (West) (cm)	50.0	53.0	52.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm right of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 206-207

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	1.0	N/A	N/A
Left (West) (cm)	N/A	4.0	3.5

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm left of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 208-209

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	12.0	16.0	18.0
Left (West) (cm)	25.5	Enter B4	Enter B4

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
54 cm left of drip shield center, crown
Scientific Notebook SN-M&O-SCI-043-V2, pp. 210-211

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	0	4.5	5.0
Left (West) (cm)	0	N/A	N/A

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm left of drip shield center, 16.5^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 212-213

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	2.0	0	2.5
Left (West) (cm)	3.0	1.0	1.0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm right of drip shield center, 16.5^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 214-215

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	0	0	0
Left (West) (cm)	0	0	0

Test Description: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
27 cm left of drip shield center, 33^0
Scientific Notebook SN-M&O-SCI-043-V2, pp. 216-217

Position relative to drip impact	**33º**	**Transition** (Curved to vertical)	**Vertical** (Top of patch on vertical)
Right (East) (cm)	N/A	4.5	4.5
Left (West) (cm)	N/A	6.0	9.5

APPENDIX D:
Water Temperature Data

Date: 7/22/02
Test: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
Scientific Notebook SN-M&O-SCI-043-V2, pp. 204-205

RTD Used: DS-RTD-01with Fluke 702 multimeter in RTD temperature mode (See Page 203 of SN-M&0-SCI-043-V2)			
Measurement	Temperature (^{o}C)	Ohms	Time
Input Water	28.5	111.1	9:11
Input Water	33.4	113.0	13:52
DS Beaker Water	32.1	112.4	13:56

Date: 7/22/02
Test: Low Flow Rate (0.2 m3/yr nominal), Rough DS Surface
Scientific Notebook SN-M&O-SCI-043-V2, pp. 206-207

RTD Used: DS-RTD-01with Fluke 702 multimeter in RTD temperature mode (See Page 203 of SN-M&0-SCI-043-V2)			
Measurement	Temperature (^{o}C)	Ohms	Time
Input Water	31.2	112.1	14:47
DS Beaker Water	30.5	111.3	14:58
DS Surface Water	31.9	112.4	20:01
DS Beaker Water	31.6	112.4	20:06
Input Water	33.9	113.2	20:04

Date: 7/23/02
Test: Low Flow Rate (0.2 m3/yr nominal), Rough DS Surface
Scientific Notebook SN-M&O-SCI-043-V2, pp. 208-209

RTD Used: DS-RTD-01with Fluke 702 multimeter in RTD temperature mode (See Page 203 of SN-M&0-SCI-043-V2)			
Measurement	Temperature (^{o}C)	Ohms	Time
Input Water	23.9	109.3	7:08
DS Beaker Water	22.1	108.4	7:14
DS Beaker Water	29.4	111.4	12:06
DS Surface Water	30.1	111.7	12:23
Input Water	30.0	111.7	12:27

Date: 7/23/02
Test: Low Flow Rate (0.2 m3/yr nominal), Rough DS Surface
Scientific Notebook SN-M&O-SCI-043-V2, pp. 210-211

RTD Used: DS-RTD-01with Fluke 702 multimeter in RTD temperature mode (See Page 203 of SN-M&0-SCI-043-V2)			
Measurement	Temperature (^{o}C)	Ohms	Time
Input Water	30.4	111.8	12:53
DS Beaker Water	29.8	111.6	12:54
DS Beaker Water	28.3	111.0	18:02
Input Water	31.5	112.3	18:06
DS Surface Water	30.1	111.7	18:12

Date: 7/24/02
Test: Low Flow Rate (0.2 m3/yr nominal), Rough DS Surface
Scientific Notebook SN-M&O-SCI-043-V2, pp. 212-213

RTD Used: DS-RTD-01with Fluke 702 multimeter in RTD temperature mode (See Page 203 of SN-M&0-SCI-043-V2)			
Measurement	Temperature (^{o}C)	Ohms	Time
DS Beaker Water	21.2	108.3	7:04
Input Water	23.1	109.0	7:06
DS Surface Water	30.7	112.0	12:23
DS Beaker Water	29.8	111.6	12:28
Input Water	29.9	111.7	12:36

Date: 7/24/02
Test: Low Flow Rate (0.2 m3/yr nominal), Rough DS Surface
Scientific Notebook SN-M&O-SCI-043-V2, pp. 214-215

RTD Used: DS-RTD-01with Fluke 702 multimeter in RTD temperature mode (See Page 203 of SN-M&0-SCI-043-V2)			
Measurement	Temperature (^{o}C)	Ohms	Time
Input Water	30.2	111.7	12:51
DS Beaker Water	30.0	111.7	12:53
Air Temperature	30.3	111.8	12:59
Air Temperature	31.9	112.4	18:00
DS Beaker Water	31.6	112.3	18:02
DS Surface Water	32.1	112.4	18:06
Input Water	33.5	113.0	18:12

Date: 7/25/02
Test: Low Flow Rate (0.2 m^3/yr nominal), Rough DS Surface
Scientific Notebook SN-M&O-SCI-043-V2, pp. 216-217

RTD Used: DS-RTD-01with Fluke 702 multimeter in RTD temperature mode (See Page 203 of SN-M&0-SCI-043-V2)			
Measurement	Temperature (^oC)	Ohms	Time
Input Water	22.6	108.8	7:28
DS Beaker Water	22.2	108.6	7:36
Air Temperature	23.6	109.1	7:38
Air Temperature	30.2	111.8	12:37
DS Surface Water	30.0	111.7	12:42
DS Beaker Water	29.5	111.5	12:48
Input Water	29.3	111.4	12:50

Description of Measurement Types

Input Water: Injection source water in beaker located on Analytical Balance PM4000 (see page 3 of SN-M&O-SCI-043-V2) inside the test chamber. RTD probe submerged in water and reading was taken after 30 sec.

DS Beaker Water: Water in glass beaker placed in contact with the DS surface throughout the test. RTD probe is placed below water surface in beaker and reading was taken after 30 sec.

DS Surface Water: Water film remaining on the DS following a test. RTD probe is placed in contact with the DS. The probe is not submerged in water, and in most cases only a thin film is present. Reading is taken after 30 sec.

Air Temperature: RTD probe is mounted so that it is not in contact with DS any other surface. Reading is taken after 30 sec.