

HMA-610 Direct/Residual Shear Data Acquisition Software

NOTE: Please read the equipment requirements, installation, and operation instructions prior to testing. Reliable test results are dependent on the operator's knowledge of both the software and applicable test methods.

INTRODUCTION

Gilson Direct/Residual Shear Data Acquisition Software automatically records and graphs data during direct/residual shear testing of soils. Data points and calculations are determined in accordance with ASTM D3080 and AASHTO T 236 specifications. The data is displayed in real time in a tabular and graphical format. At the conclusion of a test, this data can be used to generate a PDF report or imported into spreadsheet applications such as Excel for further processing.

The Direct/Residual Shear Data Acquisition Software offers a variety of benefits for completing direct and residual shear testing.

- User friendly interface
- Quick and easy installation and updates
- Generates professional testing reports
- Capable of exporting data into spreadsheet applications, such as Excel
- Optimized for both touch-screen and mouse/keyboard operation
- Compatible with Windows 10, 8, 7, Vista, and XP

EQUIPMENT COMPATIBILITY AND TEST SETUP

The following is required to use the Direct/Residual Shear Data Acquisition Software.

Data Readout Box	HM-419
Windows Operating System	Windows 10, 8, 7, Vista, or XP
Computer	Any tablet, PC, or laptop using Windows XP or newer.

Below is a list of compatible equipment with the Direct/Residual Shear Software. Please contact Gilson Technical Support to inquire about compatibility of transducers and load cells not listed below.

Direct Shear Unit	HM-382, HM-380D
Displacement Transducer	HM-739 (Qty. 2)
Load Cell	HM-424D
Shear box	Any Gilson or Karol-Warner manufactured shear box



Figure 1: Example test setup using the HM-382 Pneumatic Digital Direct Residual Shear Machine and a laptop computer.

Figure 1 shows the HM-382 Pneumatic Direct/Residual Shear Machine setup using a laptop. A touchscreen operated tablet or desktop PC can also be used. Two displacement transducers, a load cell and pressure transducer are connected to the data readout box which is then connected to a tablet or PC via a mini-USB to USB cable. These components are included with the HM-382. The HM-380D can also be used but requires vertical load values to be entered manually by the user.

INSTALLATION

1. Two USB devices are included with the software: A Gilson flash drive containing the installation files and a small, black USB security key. Insert the Gilson flash drive into the tablet or PC to be used during testing. Navigate to the USB Drive in File Explorer then double click on the USB Drive to open the installation files. Save or copy these files locally. The software can be downloaded onto other devices to open and edit test data, but data collection is only enabled when the USB security key is attached.

NOTE: If running Windows 7 or below, right click on the application titled **dotNetFx40_Full_x86_x64** and select **Run as administrator**. Doing so will check the current version of the Microsoft .NET framework. If the .NET Framework is not installed or up to date, the most current version will be installed. If the most current version is already installed, the installer will complete with no further action.

NOTE: All software installation files and updates are also available for download on www.globalgilson.com. Log into your "My Gilson Account" to access the "Software Downloads" page.

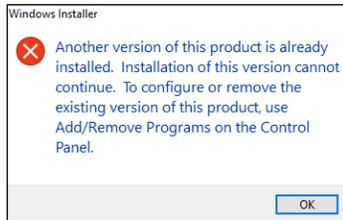


Figure 2: Installation Error Message

2. Run the **DirectShearSetup** file and follow the prompts on the screen. The software should detect any previous versions and uninstall them automatically. If a Windows Installer message appears (Figure 2), follow the prompts and uninstall the previous version of the software. Once installation is complete, close the installer.
3. Eject the USB containing installation files and insert the USB security key. Open the Direct/Residual Shear Data Acquisition Software. Click **Help** along the toolbar (Figure 3) then select **Activation** from the drop-down menu. Enter the provided license number, USB ID, and activation code. The software will run normally for 30 days before this information is required to continue use. Activation information can be entered at any point within the first 30 days after installation.
4. Establish the connection between the data readout box and the software:
 - a. Make sure all connections to the computer and data readout box are secure.
 - b. Navigate to the Connections tab in the software. Select the COM port for the data readout box from the **Serial Port** drop down menu. To determine the correct COM port, navigate to **Control Panel > Device Manager** and view the devices listed under **Ports (COM & LPT)**. The data readout box will appear as a USB serial port. If multiple devices are listed as a USB serial port, the correct serial port can be identified by unplugging the device from the tablet or PC then identifying which serial port disappeared from the listed devices. Once identified, plug the data readout box back into the tablet or PC and click connect.
 - c. Once connected, the travel values will be displayed to the right of the serial port dropdown menu. Gently move one of the LVDTs on the direct shear unit up and down to confirm the connection. The travel value should change.

SETTINGS AND CONTROLS

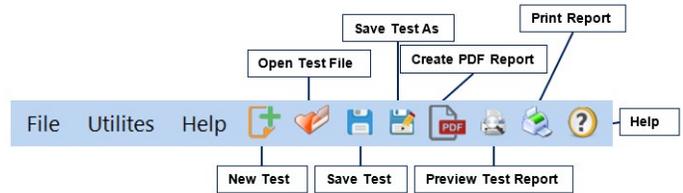


Figure 3: Toolbar

The top toolbar (Figure 3) consists of icons used to start, open, save and create test reports. These commands are also listed under the **File** dropdown menu.

The application settings (Figure 4) can be found under the **Utilities** dropdown menu on the top toolbar. Testing agency and equipment information can be entered here, in addition to selecting testing units and enabling/disabling popup keyboards. Popup keyboards are helpful when using a touch screen operated device. This information will be displayed on the report generated at the completion of a test. These settings remain saved for future testing. There is no need to reenter these settings when opening the program or starting a new test.

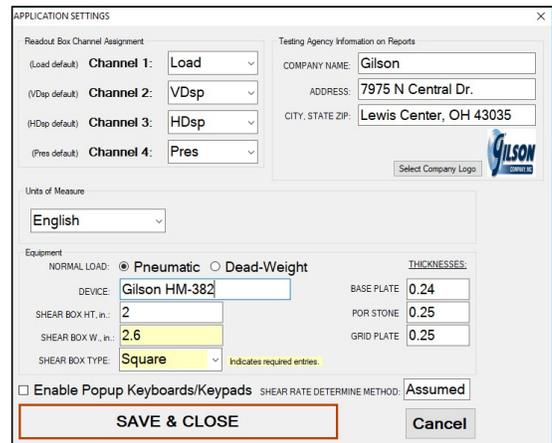


Figure 4: Application Settings

In addition to the application settings, calibration information for pneumatic units (HM-381 and HM-382) can also be entered. Select **Calibration** from the **Utilities** dropdown menu. In the calibration menu (Figure 5) the date of calibration, serial number of the direct shear unit, and calibration data can be entered. Initial calibration values are provided with new units. Enter values for both high and low load. These values should be updated each time the unit is calibrated. It is recommended to use the actual load values and their corresponding low or high pressure values that equate to **1/8tsf** (8.52lbs), **1/4tsf** (17.04lbs), **1/2tsf** (34.09lbs), **1tsf** (68.18lbs), **2tsf** (136.4lbs), **4tsf** (272.7lbs), **8tsf** (545.4lbs), **12tsf** (818.0lbs), **16tsf** (1091.0lbs), and **22tsf** (1500.0lbs) when using a 2.5in diameter sample.

Figure 5: Calibration Menu

RUNNING A TEST

1. Prepare a sample in accordance with the selected test method then seat the shear box with sample in the direct shear unit. Make sure the alignment screws are in place.
2. In the **Setup** tab (Figure 6) enter project and sample information. Yellow boxes indicate required entries to complete testing.

Figure 6: Setup Tab

3. The values in the bottom righthand corner of the **Setup** tab are calculated using the required entries. Select the **Calculate** button to perform these calculations before selecting **Next** in the bottom left hand corner. A dialogue box (Figure 7) will appear. It is recommended that the unit be disconnected from the internet to avoid test interruptions from automatic Windows updates.

Figure 7: Internet Connection Warning

4. In the **Connections** tab (Figure 8), make sure the correct serial port is connected using the serial port dropdown menu. Click **Set File** in the **Connections** tab. Navigate to the desired file location, name the file, then click **Save**. Click the **Next** button to continue to the next tab.

Figure 8: Connection Tab

5. In the **Consolidation** tab (Figure 9), select the graphing format from the dropdown menu. The graph can be displayed in linear time, log time, or the square root of time. The recording frequency defaults to 0.01 minutes for the first 3 minutes of testing but can be adjusted by entering a different value in the recording frequency field.

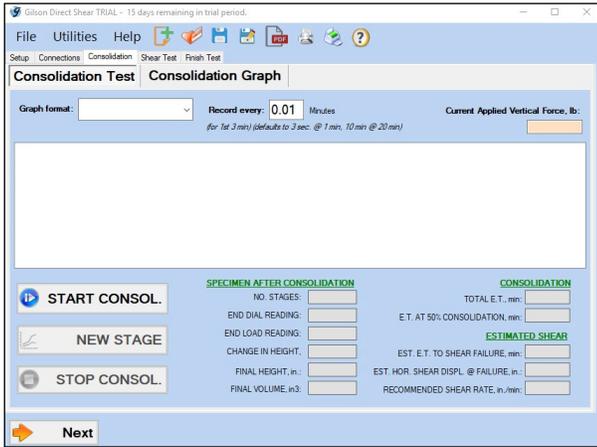


Figure 9: Consolidation Tab

6. Click **Start Consolidation**. If using a pneumatic unit apply the load using the pressure regulator then click **OK, Begin Consolidation** to continue onto the consolidation phase of the test. The software will automatically detect the applied load. For dead-weight units, when prompted, enter the normal load value in pounds (Figure 10). Once the appropriate weights are loaded, click **OK, Begin Consolidation** then release the load arm. The data is displayed in a tabular format and a graphical format. To view the graph, select the **Consolidation Graph** tab. A graph of the current stage will be displayed in real-time.

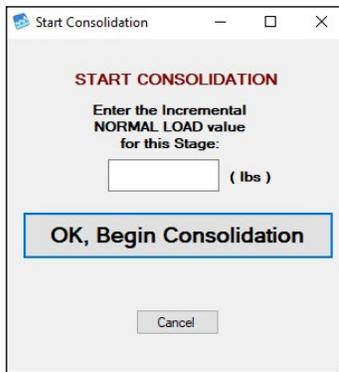


Figure 10: Start Consolidation Dialogue Box

7. To start a new consolidation stage, click **New Stage**, apply the appropriate load then click **OK, New Stage** (Figure 11).



Figure 11: New Consolidation Stage Dialogue Box

8. For dead-weight units, enter the applied load in pounds before continuing. Repeat this step until all stages have been completed. Once completed, click **Stop Consol** and the software will stop collecting consolidation data. When asked “Do you want to stop consolidation?” (Figure 12) click **OK**. Calculations are then performed and will appear in the bottom half of the **Consolidation** tab. Click **Next** to continue to the shear phase.



Figure 12: Stop Consolidation Dialogue Box

9. Remove the alignment screws from the shear box and click **Start Shear** in the **Shear Test** Tab (Figure 13). A dialogue box (Figure 14) will appear with a “Pre-Shear Checklist.” Ensure all items on the checklist have been completed, select **OK** and begin the shear phase.

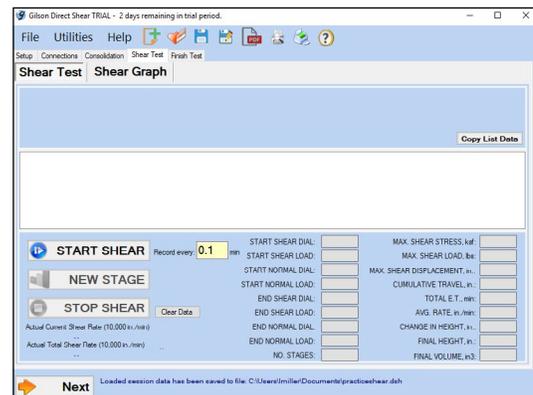


Figure 13: Shear Test Tab

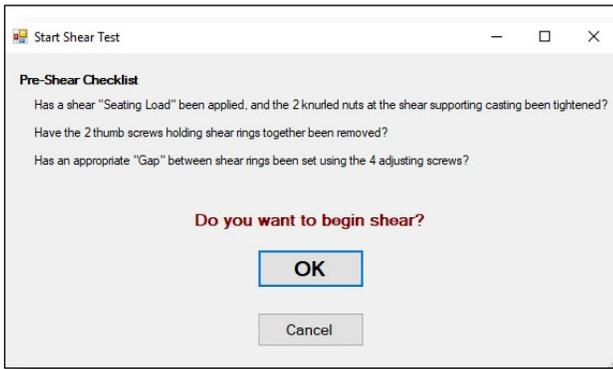


Figure 14: Pre-Shear Checklist

10. To start a new shear stage, click **New Stage**, When the dialogue box (Figure 15) appears, click **OK** and begin the next stage. Repeat this step until all stages have been completed. Once completed, click **Stop Shear** to cease collecting test data. When asked “Do you want to stop shear?” (Figure 16) click **OK** and stop the shear test. Calculations are then performed and will appear in the bottom half of the “Shear Test” tab. Click **Next** to continue to the **Final Test** tab.

NOTE: When running a residual shear test, begin a new stage as stated in Step 9. The software will automatically detect the directional change and identify that stage as a residual.

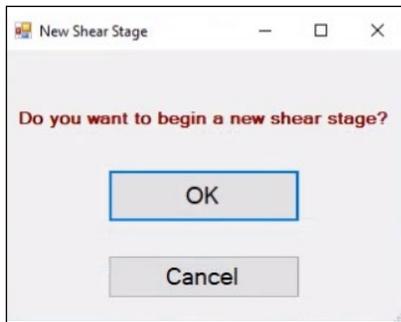


Figure 15: New Shear Stage Dialogue Box



Figure 16: Stop Shear Dialogue Box

11. Enter the final percent moisture in the **Finish Test** tab (Figure 17) then click **Calculate Final Results** to generate the final test calculations. The test data will be saved, and the final values will be displayed in this tab.

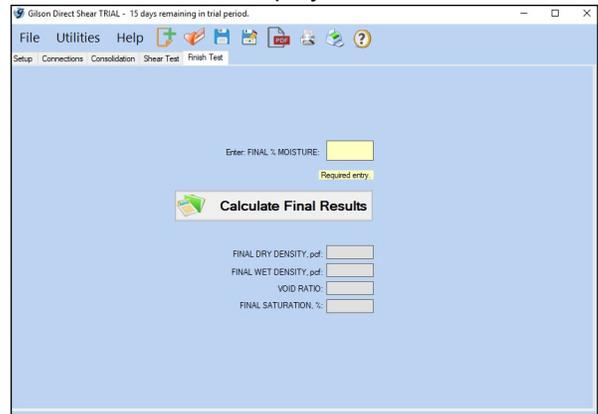


Figure 17: Finish Test Tab

12. The saved file can be reopened, edited and saved using the icons on the top toolbar. The test data is saved in ASCII Comma Delimited format which can be opened for further analysis and processing using spreadsheet applications such as Excel.

FRICITION ANGLE TOOL

To determine the friction angle (Φ) and cohesion intercept (c), navigate to the **Friction Angle** Tab in the software. Select two points from the test data to create a best fit line. Click **Calculate** and the software will calculate Φ and c .

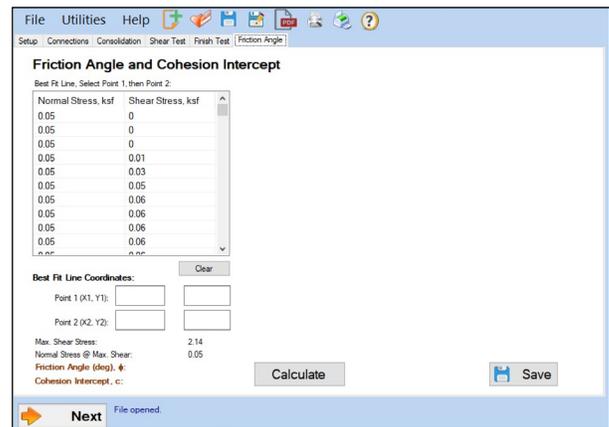


Figure 18: Friction Angle Tool

To export spreadsheet compatible test data:

1. Open spreadsheet application. Select **File > Open > Browse** to locate the test file(s). In the bottom right corner of the file explorer (Figure 18) select **All Files** from the drop-down menu.

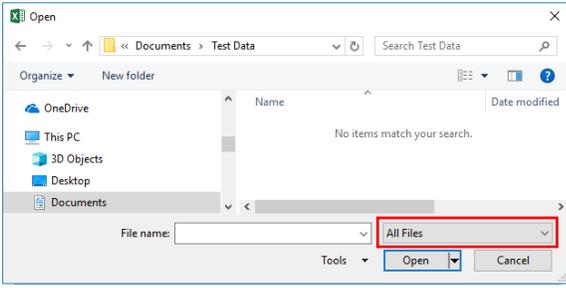


Figure 19: Excel File Explorer

2. Navigate to the test file you are trying to export.
3. Select the file then select **Open**.
4. The **Text Import Wizard** dialog box (Figure 19) will appear. Select **Delimited** then click next.

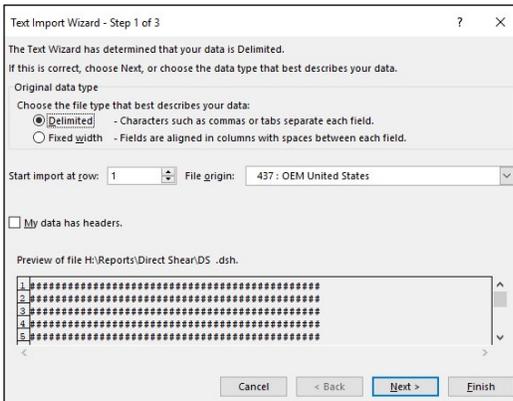


Figure 20: Text Import Wizard Step 1

5. Uncheck the box labeled **Tab** (Figure 20) and select the box labeled **Comma**. Select **Next** then **Finish**.

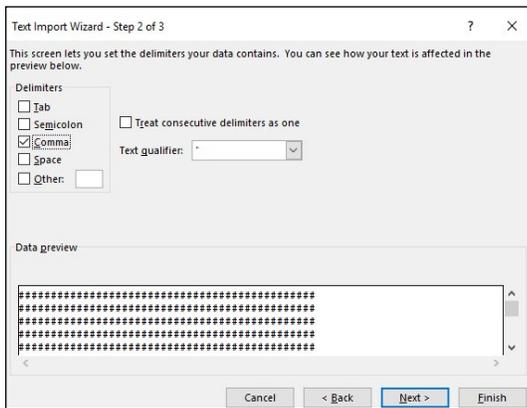


Figure 21: Text Import Wizard Step 2-3

6. The company information, sample information, and test data will be displayed on the spreadsheet.

Software is not identifying serial port connections

Confirm there is power going to the data readout box and that all connections to the box and computer are secure. Make sure all ports and connections are free of dust or debris. Open Windows Device Manager to see if the readout box is listed as a device under **Ports (COM & LPT)**. Instructions for determining the correct serial port can be found in the Installation instructions. Once the readout box appears under **Ports (COM & LPT)**, close then reopen the Software and try reconnecting.

Application License Error Message Appears

This message (Figure 21) will appear when more than the allowed number of test windows is opened. If you would like more than the currently allowed test windows to be opened simultaneously, additional licenses can be purchased. Please contact Please contact Gilson at **1.800.444.1508** or **customerservice@gilsonco.com** to purchase additional licenses.

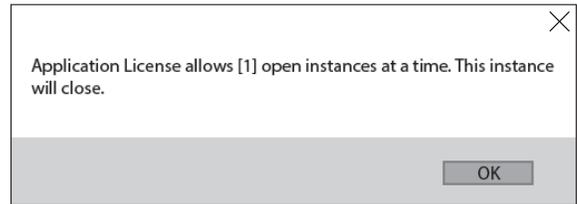


Figure 22: Application License Error Message

If you are not attempting to open more than the allowable windows open Task Manager. If you see **Direct-Residual Shear**, select it from the list then select **End Task**. Try reopening the Software.

Direct Shear Test Report ASTM D3080

Sample ID: 1508
Location: Anytown
Boring No.: 6B
Depth: 12
Description: SLC
Type of Test: Direct Shear
Tested By: LM
Date of Test: 10/19/2018
Specimen Type: Compacted
Prep:
Specific Gravity: 2.65
Plastic Limit: 15
Liquid Limit: 35
Plasticity Index: 20
USCS Class:
AASHTO Class: SLC
Width of Device, in.: 2.6
Type of Device: Square

Before Test

Height, in. 1.48
Water Content, % 15
Area, in² 6.76
Wet Density, pcf 43.666
Dry Density, pcf 33.1
Void Ratio 3.98
Saturation, % 2.62

Consolidation

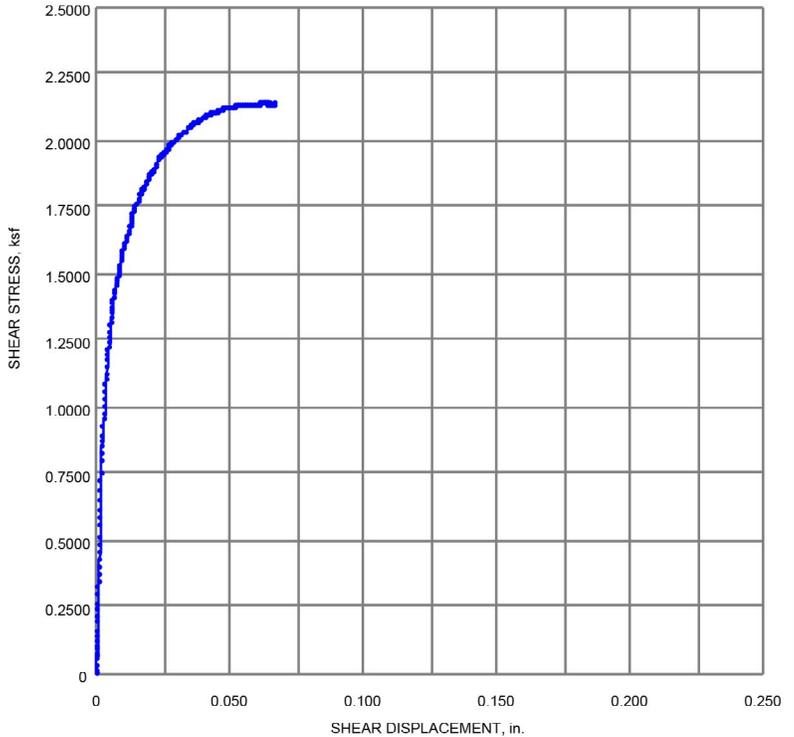
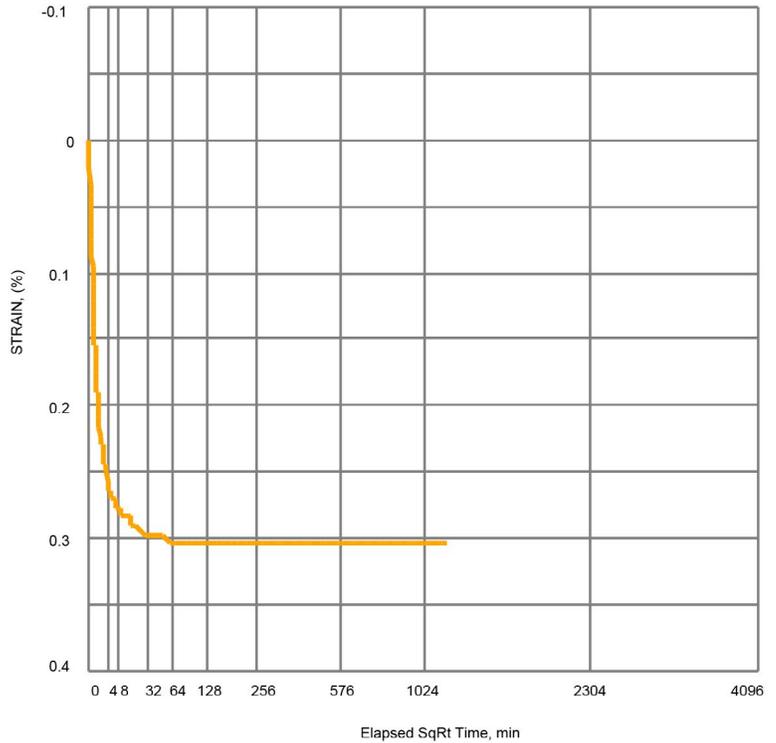
No. Stages 1
Settlement, in. 0.0045

Shear

No. Stages 1
Avg Normal Stress, ksf 0.050
Max Shear Stress, ksf 1.68
Max Shear Force, lbs 78.8
Max Displacement, in. 0.067
Travel, in. 1.697
Avg. Rate, in./min 3.393
Height Change, in. 0.1450
Final Height, in. 1.3350
Final Volume, in³ 9.025

After Test

Water Content, % 19
Dry Density, pcf 36.694
Wet Density, pcf 43.666
Void Ratio 3.66
Saturation, % 1.23



Equipment: Gilson HM-382 HM-419



Gilson Company, Inc.

P.O. Box 200
Lewis Center, OH

Project: Direct Shear

Project No: 7298

Client: Material Testing Lab