

# Procedure: Creep Test at SNL

Version Date:

August 7, 2015

Form Completed By: TDL (7/22/16)

## 1 Test Description

Parameters	Value
Test Name	UNM-WP-HY-175-10
Salt Provenance (Circle One)	Avery Island / <u>WIPP</u>
Test Type (Circle One)	<u>Hydrostatic</u> / Shear
Salt Can Label	
Water Added to Salt (Circle One)	yes / <u>no</u>
Target/Actual Added Water Content	$w = \frac{m_{water-added}}{m_{salt}} =$ _____
Temperature: [°C / °F]	175°C
Pressure [MPa / psi]	30 MPa conf      10 MPa Dose
Jacketing Components (Circle All)	Outer <u>Lead</u> Outer Viton - Inner Lead - Inner <u>Copper</u>
Tested In (Circle One)	Frame 2 / <u>Frame 3</u>
Test Target (permeability / fractional density / etc)	

Table 1: Description of Test

## 2 Pre-Test Measurements

### 2.1 Height of components:

Components	Count	Component Label	Recorded Height [mm]
Platens	1	Blank	34.33
	2		
Chamfer Discs	1	240.39	
	2	CPZ	12.73
Mesh Discs	1	NA	1.15
	2	NA	1.15
Cumulative Height of Components		94.75	mm

) Supply side assembly

) Z Mesh discs on g assembly side

Table 2: Itemized List of Components for Height Measurements (No Salt).

### 2.2 Jacket Dimensions

#### 2.2.1 Height of Outer Jacket

This value will vary depending on which platens (steel or aluminium) and chamfer pieces are used, in general:

1. Outer Jacket: 10.125 inches (257.17 mm) to 10.5 inches (266.7 mm);
2. INNER SHELL: 12.0 INCHES (304.8 MM) -> THIS IS FOR BOTH A1 AND A2;
3. Specimen Clearance: 1.875 inches (47.62 mm) to 1.5 inches (38.1 mm);

**NOTE: the maximum height inside Frame 2 and 3 is 12 inches (304.8 mm)**

If the upper internal port of the shell is plugged, the available height is decreased to 11.75 inches (298.45 mm)

Jacket Description	Height	No. of Jackets Used
Outer Lead Jacket (mm)	225	1
Outer Viton Jacket (mm)		
Inner Lead Jacket (mm)		
Inner Copper Jacket (mm)	145	2
Height of Total Sample (mm)	-	

330 x 14

Table 3: Height of Jacketing Components (if jacket not used, write "NA")

### 2.2.2 Checklist of Jacketing Materials:

Components	Count	Verification Checkmark (and Component Label is Applicable)
Platens	2	Blank / Platen Chucks Not Dipped
Platen O-rings	4	
Platen Screws (0.25 inch 20 rnd)	1	
Screw-In Nipples	1	
Nipple O-rings	4	New
Nipple Adapter (HIP HF4 connection)	1	
Nipple Plugs (HIP HF4 plugs)	1	
Chamfer Discs	2	COPZ + ?
Mesh Discs	2	Both on Nipple side
Inner Copper Jacket (indicate No. used)	2	Thickness of 1 Sheet of Copper (mm):
Inner Lead Jacket	—	Jacket Thickness (mm):
Outer Lead Jacket	1	Jacket Thickness (mm): 1.45
External Hose Clamps	4	

Table 4: Itemized List of Components for Mass and Volume Measurements (No Salt).

### 2.2.3 Volume and Mass of Components (No Salt)

Measured Value	Values	Units	Comments
Prior to Dunk: Water Level Reading on Burette	57.9	mL (burette)	→ 8.6
After Dunk: Water Level Reading on Burette	49.3	mL (burette)	484.68
Volume of Components (No Salt)	474.68	mL	w/ HC tails
Mass of Components (No Salt)	3.9900	kg	full HC tails 3.91674
Approximate Outside Diameter of Sample		mm	
Dunk Tank Volume Factor: 114.4978 mL/Burette Unit			

Table 5: Measurements of All Components (No Salt)

HC tails

m 75.265

V 10 mL

## 2.3 Measured Mass of Salt

### 2.3.1 Date:

Parameters	Value
Salt Can Label	35
Before Making Sample: Mass of Salt and Can (with lid)	<u>1.9743</u>
After Sample is Made: Remaining Mass of Salt and Can (with lid)	0.4365
Bulk Mass of Salt Used for Sample	1.5352
Cumulative Mass of Components and Salt	5.4527

Table 6: Mass of Salt Before Preconsolidation

## 3 Pre-consolidation Measurements

Sealed Jacket 1080psi He



3.0.2 Date: 7/22/16

3.0.3 Data Sample Rate:

Volume Displayed on GUI	Volume [mL]	Pressure [psi]	Time [hh:mm]
Initial Reading: prior to consolidation	578.0	28 psi	0
Reading: When at pre-consolidation pressure	265.77	2,900	5:00
Final Reading: after pre consolidation	382.12	241	~

Table 7: Pre-consolidation Details

Parameter	Values	Units
Prior to Dunk: Mass of Specimen (with all components)	5.45570	kg
Prior to Dunk: Water Level Reading on Burette	58.3	mL (burette)
After Dunk: Water Level Reading on Burette	41.9	mL (burette)
Preconsolidated Specimen (all components listed above plus salt)	1877.76	mL
After Dunk: Mass of Specimen (with all components)		kg
Average Height of Specimen		mm
Average Outside Diameter of Specimen		mm
Bulk Salt Volume (Salt and added water):		mL
Dunk Tank Volume Factor: 114.4978 mL/Burette Unit		

Table 8: Measurements Made After Preconsolidation of Specimen.

903.03 A = 1699.96

FD = 0.787

Parameter	Values	Units
Salt Only - Volume: $V_{sample}^{salt} = V_{sample}^{bulk} * (1 - w)$		mL
Salt Only - Mass: $m_{sample}^{salt} = m_{sample}^{bulk} * (1 - w)$		kg
Salt Only - Density: $\rho_{sample}^{salt} = m_{sample}^{salt} / V_{sample}^{salt}$		kg/m <sup>3</sup>
Salt Only - Fractional Density: $\bar{\rho} = \rho_{sample}^{salt} / 2160$		-

Table 9: Post-Consolidation Density Calculations

## 4 Application of Heat to Obtain Test Temperature

4.0.4 Data Sample Rate: 1000 sec

heater set to 190°C

Event	Date	Time	Confining Pressure [psi]	Expelled Silicone Oil Volume (mL)
Start Temperature Increase	7/26	12:15	—	0
End Temperature Increase	7/27	10:08	0	490

Table 10: Dates of Details of Temperature Increase

$$\approx 465 \text{ ml}$$

$$@ 1:45 - T = 143.4$$

## 5 Creep Test ; Loading in to stages

5.0.5 Date (Start Test): 7/27/2016

5.0.6 Data Sample Rate: 10 sec during loading

Event	Value	Comment
ISCO Pump Volume (Pre Pressure Increase)	507.53	high Vol. Isco
ISCO Pump Pressure (Pre Pressure Increase)	28 psi	End at 2900 psi
Begin Pressure Increase	Time: 10:11	
End Pressure Increase	Time: 10:19	
ISCO Pump Volume (Post to Pressure Increase)		
ISCO Pump Pressure (Post Pressure Increase)		
ISCO Pump Flow Rate (Post Pressure Increase)		

Table 11: Details of Test Initiation

5.0.7 Date (End Test):

Parameters	Values	Units
Final Mass of Specimen	5.4546	kg
Initial - Dunk Tank Values	55.4	mL (burette)
Final - Dunk Tank Values	40.4	mL (burette)
Volume of Specimen	1717.47	mL
Average Height of Specimen		mm
Average Outside Diameter of Specimen		mm
Density of Salt only		kg/m <sup>3</sup>
Dunk Tank Volume Factor: 114.4978 mL/Burette Unit		

Table 12: Post Test Measurements

Parameter	Values	Units
Salt Only - Volume: $V_{sample}^{salt} = V_{sample}^{bulk} * (1 - w)$		mL
Salt Only - Mass: $m_{sample}^{salt} = m_{sample}^{bulk} * (1 - w)$		kg
Salt Only - Density: $\rho_{sample}^{salt} = m_{sample}^{salt} / V_{sample}^{salt}$		kg/m <sup>3</sup>
Salt Only - Fractional Density: $\bar{\rho} = \rho_{sample}^{salt} / 2160$		-

Table 13: Post Test Density Calculations

$$V_s = 742.787 \text{ mL}$$

$$\Delta = 2066.81 \quad FD = 0.957$$

Redank 8/4/16

I 56.0

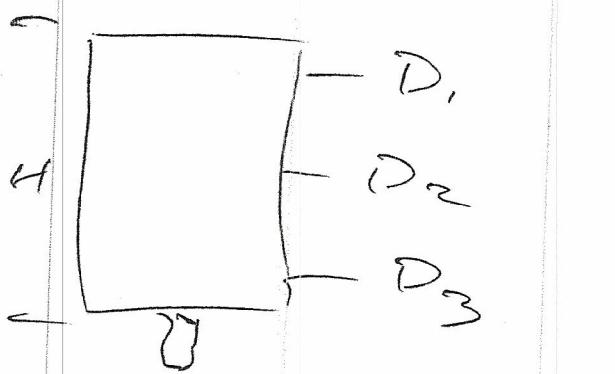
F 40.94 - 41

754.25 mL

P 2035.44

FD = 0.942

# As Built Sample Dimensions



41

224.58  
224.57  
224.15  
224.70

$D_1$

- 107.94  
- 107.65  
- 108.17

$D_3$

- 107.63  
- 108.03

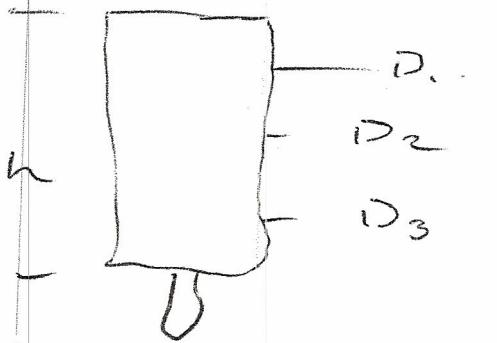
$D_2$

- 108.46  
- 108.20  
- 107.52

- 108.33

# Pre Con Sample

Dimensions



h

- 213.11
- 212.22
- 212.75
- 213.94

D<sub>1</sub>

101.30

102.74

102.30

D<sub>2</sub>

100.33

99.95

99.49

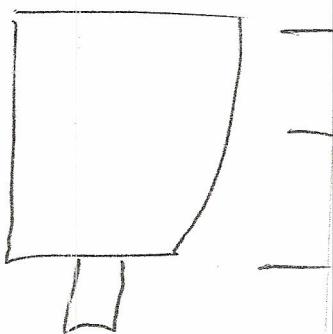
D<sub>3</sub>

102.49

102.36

103.05

# Post Test Measurements



$D_1$

$D_2$

$D_3$

$h$

- 204.98
- 204.19
- 205.21
- 204.77

204.788

$D_1$

$D_2$

$D_3$

— 99.10

— 94.76

— 99.63

— 99.11

— 95.49

— 98.54

— 98.59

— 95.08

— 99.22

$A_V = 98.93$

$A_V = 95.11$

$A_V = 99.13$

$$OA_{AV} = 97.72$$

$$FD \quad \sum_{mid} = 0.972$$

$$\sum OA_{AV} = 0.925$$

RD

$$Schürze = 0.92$$

180 Vol

Voltage

Low Vol Isco

~~2.47~~

~~Vol~~

382.13  
111.45

~~2.46872~~

~~0.0~~

7.805

1814  
9.99

270.68

5.337

68.04 0.0061

$$Vol = \frac{Vol}{Vol} (Vol) +$$

$$n = 50,7176 \frac{mL}{Vol}$$

507.54

High Vol Isco

4,350 fluid

1,450 gas