

Procedure: Creep Test at SNL

Version Date:

August 7, 2015

Form Completed By:

TDL

1 Test Description

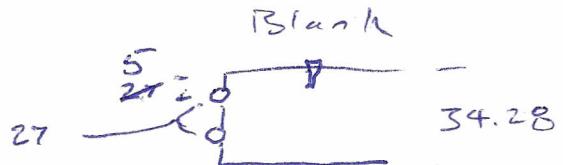
Parameters	Value
Test Name	<u>UNM-WP-HY-175-11</u>
Salt Provenance (Circle One)	Avery Island <input checked="" type="checkbox"/> WIPP
Test Type (Circle One)	<input checked="" type="checkbox"/> Hydrostatic / Shear
Salt Can Label	
Water Added to Salt (Circle One)	yes <input checked="" type="checkbox"/> no
Target/Actual Added Water Content	$w = \frac{m_{water-added}}{m_{salt}} =$
Temperature: [°C / °F]	<u>175°C</u>
Pressure [MPa / psi]	<u>30 MPa conf 2000 psi pore</u>
Jacketing Components (Circle All)	Outer <input checked="" type="checkbox"/> Lead - Outer Viton - Inner Lead - Inner <input checked="" type="checkbox"/> Copper
Tested In (Circle One)	<input checked="" type="checkbox"/> Frame 2 / Frame 3
Test Target (permeability / fractional density / etc)	

Table 1: Description of Test

* UNM-WP-HY-175-11
 Second sample brittle
 too much fibers in first sample of 2000 test

2 Pre-Test Measurements

2.1 Height of components:



Components	Count	Component Label	Recorded Height [mm]
Platens	1	C2	37.07
	2	C7	34.28
Chamfer Discs	1	CP6	8.27
	2	CP2	12.73
Mesh Discs	1	NA	1.1
	2	NA	1.1
Cumulative Height of Components		94.55	mm

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)	225	

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	1 Blank + 1 Alum
Platen O-rings	4	
Platen Screws (0.25 inch 20 rnd)	1	Bolt
Screw-In Nipples	1	HF2 Coated
Nipple O-rings	4	New
Nipple Adapter (HIP HF4 connection)	1	
Nipple Plugs (HIP HF4 plugs)	1	HF2 Plug
Chamfer Discs	2	
Mesh Discs	2	Both on nipple end
Inner Copper Jacket (indicate No. used)	1	Thickness of 1 Sheet of Copper (mm):
Inner Lead Jacket	—	Jacket Thickness (mm): K
Outer Lead Jacket	1	Jacket Thickness (mm): 1.5
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	56.2	mL (burette)	
After Dunk: Water Level Reading on Burette	47.4	mL (burette)	
Volume of Components (No Salt)	974.68	mL	
Mass of Components (No Salt)	4.0436	kg	full HC
Approximate Outside Diameter of Sample		mm	
Dunk Tank Volume Factor: 114.4978 mL/Burette Unit			

Table 5: Measurements of All Components (No Salt)

$$M_{HCT} = 76.0g$$

$$M_c = 3.9676$$

$$V_{HCT} = 10mL$$

8.6
974.68mL
w/HCT

2.3 Measured Mass of Salt

2.3.1 Date:

Parameters	Value	
Salt Can Label	1C	
Before Making Sample: Mass of Salt and Can (with lid)	1930	kg
After Sample is Made: Remaining Mass of Salt and Can (with lid)	136925	kg
Bulk Mass of Salt Used for Sample	51.5618	kg
Cumulative Mass of Components and Salt	5.5303	kg

Table 6: Mass of Salt Before Preconsolidation

1. 5627 - comp - full

No heating

3 Pre-consolidation Measurements

3.0.2 Date:

1330 psi Nitrogen to Seal jacket

3.0.3 Data Sample Rate: N/A

Volume Displayed on GUI	Volume [mL]	Pressure [psi]	Time [hh:mm]
Initial Reading: prior to consolidation	446.19	7	0 leak in
Reading: When at pre-consolidation pressure	71.86	2900	—
Final Reading: after pre consolidation	161.78	20 psi	ISCO

Table 7: Pre-consolidation Details

Parameter	Values	Units
Prior to Dunk: Mass of Specimen (with all components)	5.5327	kg
Prior to Dunk: Water Level Reading on Burette	57.4	mL (burette)
After Dunk: Water Level Reading on Burette	40.8	mL (burette)
Preconsolidated Specimen (all components listed above plus salt)	1902.66	mL
After Dunk: Mass of Specimen (with all components)		kg
Average Height of Specimen	215.36	mm
Average Outside Diameter of Specimen	102.95	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.

$$V_{salt} = 925.98$$

$$\rho_s = 1686.05 \frac{\text{kg}}{\text{m}^3}$$

$$M_{salt} = 1.5618$$

$$FD = 0.78$$

Parameter	Values	Units
Salt Only - Volume: $V_{sample}^{salt} = V_{sample}^{bulk} * (1 - w)$	925.92	mL
Salt Only - Mass: $m_{sample}^{salt} = m_{sample}^{bulk} * (1 - w)$	1.5618	kg
Salt Only - Density: $\rho_{sample}^{salt} = m_{sample}^{salt} / V_{sample}^{salt}$	1626.65	kg/m³
Salt Only - Fractional Density: $\bar{\rho} = \rho_{sample}^{salt} / 2160$	0.78	-

Table 9: Post-Consolidation Density Calculations

4 Application of Heat to Obtain Test Temperature

4.0.4 Data Sample Rate: 1000 sec

Event	Date	Time	Confining Pressure [psi]	Expelled Silicone Oil Volume (mL)
Start Temperature Increase	8/8/16	14:45	~0	
End Temperature Increase	8/9/16	14:00		

Table 10: Dates of Details of Temperature Increase

5 Creep Test

5.0.5 Date (Start Test): 8/9/16 14:15

5.0.6 Data Sample Rate: 10 - 100 - 1000

Event	Value	Comment
ISCO Pump Volume (Pre Pressure Increase)		
ISCO Pump Pressure (Pre Pressure Increase)		
Begin Pressure Increase	Time:	
End Pressure Increase	Time:	
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):

Cooled under 200 MPa P_c 8/17
Removed 8/18

Parameters	Values	Units
Final Mass of Specimen	5.5314	kg
Initial - Dunk Tank Values	61.6	mL (burette)
Final - Dunk Tank Values	46.4	mL (burette)
Volume of Specimen	1740.37	mL
Average Height of Specimen		mm
Average Outside Diameter of Specimen		mm
Density of Salt only		kg/m ³
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 ³
Salt Only - Fractional Density: $\bar{\rho} = \rho_{sample}^{salt} / 2160$		-

Table 13: Post Test Density Calculations

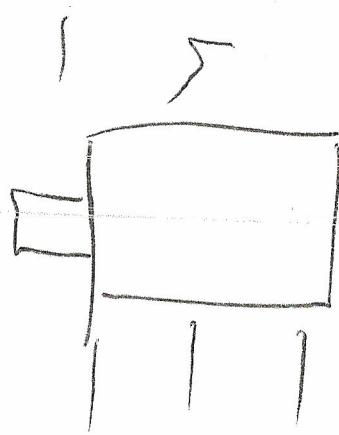
$$V_{salt} = 765.69$$

$$m_{salt} = 1.5618$$

$$\rho = 2039.74 \frac{kg}{m^3}$$

$$FD = 0.944$$

Post Test



D_1

D_2

D_3

$h = 205.48$

$- 205.81$

$- 204.89$

$- 205.32$

$Av 205.49$

D_1

D_2

D_3

$- 94.15$

$- 92.30$

$- 92.72$

$Av 92.41$

$- 94.30$

$- 93.10$

$- 94.66$

$- 92.99$

$- 94.52$

~~94.60~~

$Av 94.57$

$Av 93.22$

$CAv = 97.39$

Font Data

Pre Con

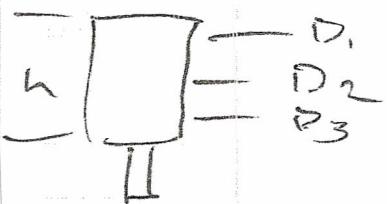
$D = 0.721$

$D = 0.945$

$E_F = 0.721$

$D = 0.941$

As Built Sample



$$\begin{array}{c} h \\ \hline - 199.62 \\ - 199.65 \\ - 199.98 \\ - 199.99 \end{array}$$

$$\begin{array}{c} 225.14 \\ - 227.01 \\ - 225.22 \\ - 225.58 \\ - 225.30 \end{array}$$

D_1

D_2

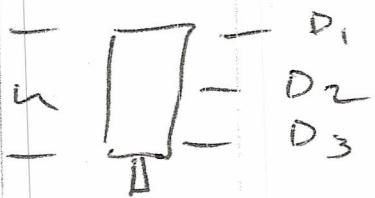
D_3

$$\begin{array}{c} - 107.58 \\ - 108.80 \\ - 107.78 \end{array}$$

$$\begin{array}{c} - 108.38 \\ - 108.11 \\ - 108.62 \end{array}$$

$$\begin{array}{c} - 108.78 \\ - 108.37 \\ - 107.28 \end{array}$$

Pre Consolidated Sample 8/8/16



$$\begin{array}{c} h \text{ (mm)} \\ \hline - 215.42 \\ - 216.12 \\ - 214.82 \\ - 214.84 \end{array}$$

$$Av = 215.36$$

D_1

D_2

D_3

$$\begin{array}{c} - 103.98 \\ - 104.77 \\ - 104.22 \end{array}$$

$$\begin{array}{c} - 100.14 \\ - 100.79 \\ - 100.18 \end{array}$$

$$\begin{array}{c} - 103.90 \\ - 104.52 \\ - 104.13 \end{array}$$

$$Av \ 104.32$$

$$Av \ 100.37$$

$$Av \ 104.18$$

$$OA \ Av \ 102.95$$