WEIGHTS & MEASURES TESTING FOR MULCH

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MEASURES ISSUES

- Compression Test
- Single vs multiple drop
- Filtering Tests

COMPRESSION TEST

- Measured one cubic foot of product
- Placed a barrier into the box
- Measured another one cubic foot of product
- Measured in 26-inch tall box (9x16)

Substate	1st cubic foot	2nd cubic foot	1st foot after 2nd added	1st compressed
Cedar Chips	11.50	22.88	11.00	0.50
	11.75	23.38	11.50	0.25
	12.38	24.38	12.13	0.25
	11.63	23.50	11.38	0.25
	12.25	24.25	11.88	0.38
Mean	**11.9**	**23.7**	**11.6**	**0.3**
	0.4	**0.6**	**0.4**	**0.1**

COMPRESSION TEST

- Measured one cubic foot of product
- Placed a barrier into the box
- Measured another one cubic foot of product
- Measured in 26-inch tall box (9x16)

Substate	1st cubic foot	2nd cubic foot	1st foot after 2nd added	1st compressed
Pine Bark Nuggets	12.38	25.25	12.25	0.13
	12.50	24.88	12.25	0.25
	12.25	24.75	12.13	0.13
	12.68	25.13	12.68	0.00
	12.50	24.63	12.38	0.13
Mean	**12.5**	**24.9**	**12.3**	**0.1**
	0.2	**0.3**	**0.2**	**0.1**

COMPRESSION TEST

- Measured one cubic foot of product
- Placed a barrier into the box
- Measured another one cubic foot of product
- Measured in 26-inch tall box (9x16)

Substate	1st cubic foot	2nd cubic foot	1st foot after 2nd added	1st compressed
Hardwood Mulch	11.50	22.63	11.00	0.50
	10.88	21.75	10.38	0.50
	11.25	22.00	10.88	0.38
	11.25	22.25	10.63	0.63
	11.38	22.50	10.88	0.50
Mean	**11.3**	**22.2**	**10.8**	**0.5**
	0.2	**0.4**	**0.3**	**0.1**

COMPRESSION TEST

- Measured one cubic foot of product
- Placed a barrier into the box
- Measured another one cubic foot of product
- Measured in 26-inch tall box (9x16)

Substate	1st cubic foot	2nd cubic foot	1st foot after 2nd added	1st compressed
Red Mulch	11.38	24.25	11.00	0.38
	12.13	24.38	12.13	0.00
	12.38	24.50	11.50	0.88
	12.88	25.00	12.13	0.75
	12.38	24.38	12.00	0.38
Mean	**12.2**	**24.5**	**11.8**	**0.5**
	0.5	**0.3**	**0.5**	**0.3**

COMPRESSION TEST

- Measured one cubic foot of product
- Placed a barrier into the box
- Measured another one cubic foot of product
- Measured in 26-inch tall box (9x16)

Substate	1st cubic foot	2nd cubic foot	1st foot after 2nd added	1st compressed
Cypress Blend	11.38	22.63	11.00	0.38
	11.50	22.13	11.13	0.38
	11.63	23.13	11.38	0.25
	11.50	22.50	11.13	0.38
	11.88	23.13	11.25	0.63
Mean	**11.6**	**22.7**	**11.2**	**0.4**
	0.2	**0.4**	**0.1**	**0.1**

COMPRESSION TEST CONCLUSIONS

- METHOD
- Measured one cubic foot of product
- Placed a barrier into the box
- Measured another one cubic foot of product
- Measured in 26-inch tall box (9x16)

- RESULTS
- All tests showed 24 inches of product measured less in the 26 inch measure
- The column height of the measure compresses the volume of the product
- Compression loss varies with products as much as .75 inches and an average of .4 inches

3, 1-FT^3 DUMPS VS 1, 3-FT^3 DUMP

- Filled 3, 1-cubic foot boxes
- Dumped into measuring box one at a time
- Measured in 38-inch tall box (9x16)

- Filled 3, 1-cubic foot boxes
- Placed in a standard 3 cubic foot mulch bag
- Measured in 38-inch tall box (9x16)

Substate	3, 1 cubic foot dumps	1, 3 cubic foot dump	Difference
Cedar Chips	34.25	37.00	2.75
	35.25	37.00	1.75
	36.75	36.50	-0.25
	35.5	36.75	1.25
	36.5	37.50	1.00
Mean	**35.7**	**37.0**	**1.3**
	1.0	**0.4**	**1.1**

3, 1-FT^3 DUMPS VS 1, 3-FT^3 DUMP CONCLUSIONS

- METHODS
- Filled 3, 1-cubic foot boxes
- Dumped into measuring box one at a time
- Measured in 38-inch tall box (9x16)

- Filled 3, 1-cubic foot boxes
- Placed in a standard 3 cubic foot mulch bag
- Measured in 38-inch tall box (9x16)

- RESULTS
- 3, 1-ft dumps measured less than 1, 3-ft dump

HAND SIFTING

- No Filtering- quick measure with no impedance of flow
- Stiff Filter- Holding a hand stationary under the product as it is finger-sifted into box
- Moving Filter- Moving hands while active finger-sifting of product as it flowed into box

Product (2 cu ft bags)	No Filtering	Stiff Finger Filtering	Moving Finger Filtering
	Inches		
Shredded Natural Mulch	24.8	24.5	23.5
	24.5	23.8	22.0
	24.0	23.5	22.5
Mean	**24.4**	**23.9**	**22.7**
Difference with Filtering		***-0.5***	***-1.7***
Pine Bark Nuggets	24.0	22.5	21.5
	23.5	22.0	20.8
	23.5	21.8	20.8
Mean	**23.7**	**22.1**	**21.0**
Difference with Filtering		**-1.6**	**-2.7**
Brown Mulch (Fine)	22.0	22.0	21.0
	21.5	21.5	20.5
	21.5	21.0	20.5
Mean	**21.7**	**21.5**	**20.7**
Difference with Filtering		**-0.2**	**-1.0**

HAND SIFTING CONCLUSIONS

- METHODS
- No Filtering- quick measure with no impedance of flow
- Stiff Filter- Holding a hand stationary under the product as it flowed into box
- Moving Filter- Moving hands while active finger sifting of product as it flowed into box

- RESULTS
- Impeding flow during measurement reduced volumes in all products tested
- Active hand sifting reduced volumes from 1 to 2.7 inches

OVERALL MSC/NIST RECOMMENDATIONS*

- Test measure must accommodate the entire package
- Recommending new specs for test measures
- Steps to make product free-flowing
- Steps for placing and releasing contents into test measure in continuous flow
- Do not touch the product during the test procedure
- Reading of results

*For details, refer to NCWM L&R Committee proposal.