

NOTES ON SAFE OUTDOOR "CLAY SCULPTURE" FOR WINTER CLIMATES. (VAL CUSHING)  
2/2/81. ①

THIS "LITTLE" PAPER IS BASED ON SOME RESEARCH DONE BY TED RANDALL OF ALFRED N.Y. WHEN HE NEEDED A SAFE CLAY BODY FOR OUTDOOR CLAY SCULPTURE, WHICH WOULD BE PLACED OUTDOORS IN WINTER CLIMATES AND SUBJECTED TO FREEZING AND THAWING OF WATER. HE CONSULTED WITH DR. BROWNELL AND OTHER CERAMIC ENGINEERS AND SCIENTISTS AT THE CERAMIC COLLEGE AT ALFRED UNIVERSITY. MOST CERAMIC ARTISTS ARE FAMILIAR WITH THE PROBLEM. IF WATER BECOMES TRAPPED IN THE PORES OF A FIRED CLAY BODY THE PIECE WILL CRACK IF OR WHEN THAT WATER FREEZES. EXPANSION TAKES PLACE WHEN WATER FREEZES DUE TO THE FORMATION OF ICE CRYSTALS. THIS EXPANSION EXERTS AN ENORMOUS FORCE AGAINST ANYTHING WHICH TRIES TO CONTAIN IT. NO CLAY PIECE CAN SURVIVE THIS FORCE AND CRACKING RESULTS. CLAY ARTISTS TEND TO ASSUME THAT THESE CRACKS CAN BE AVOIDED IF THE FIRED CLAY BODY HAS UNDER 5% OR 6% ABSORBENCY, OR IS VITREOUS (ZERO ABSORBENCY) OR AT LEAST FAIRLY DENSE AND HARD AND PARTIALLY NON ABSORBENT. THE SOLUTION TO THIS PROBLEM IS RELATED TO POROSITY AND ABSORBENCY, BUT THE EXPLANATION IS BASED ON A SLIGHTLY DIFFERENT PRINCIPLE, AND NEEDS TO BE CLARIFIED. AS FOLLOWS →

→ \* IF WATER WHICH IS TRAPPED IN THE PORES HAS "ESCAPE TUNNELS" WHICH WILL TAKE UP THE EXPANSION, WHEN ICE IS FORMED, THE PIECE WILL NOT CRACK. THE SOLUTION THEN IS TO HAVE A CLAY BODY WITH A PORE STRUCTURE, WITH ENOUGH CAPILLARIES FOR EXPANSION, TO "SQUIRT" OUT INTO THESE VEINS WITHOUT CONFINING THE PRESSURE CAUSED BY FREEZING WATER. IF THE ICE CAN EXPAND AND CONTRACT FREELY THE PIECE WILL NOT CRACK. A PROPER OUTDOOR CLAY SCULPTURE BODY WILL HAVE A C/B RATIO OF .78 (APPROXIMATELY). YOU FIND C/B RATIO BY THE FOLLOWING LAB. TEST.

(LAB. PROCEDURE.)

- ① TAKE A FIRED SAMPLE OF YOUR CLAY BODY AND TAKE THE DRY WGT. (YOU MUST WEIGH CAREFULLY AND ACCURATELY). (RECORD THIS WGT.)
- ② IMMERGE THIS SAMPLE IN WATER FOR 24 HRS. \* DO NOT BOIL THE WATER (JUST IMMERSION, NOT BOILING OR HEATED WATER).
- ③ TAKE THE SATURATED WGT. (AFTER 24 HRS. IN WATER). WIPE OFF THE SURFACE WATER AND WEIGH CAREFULLY. (RECORD THIS WGT.)
- ④ NOW LEAVE SAMPLE IN THE WATER (IMMERSED) AND BOIL THE WATER. LEAVE THE SAMPLE IN BOILING WATER FOR 2 HOURS.
- ⑤ AFTER 2 HOURS OF BOILING, WIPE OFF THE SURFACE WATER AND CAREFULLY WEIGH THE SAMPLE. RECORD THE WGT. AFTER BOILING.
- ⑥ THE DIFFERENCE BETWEEN THE WEIGHT AFTER BOILING & THE WEIGHT AFTER 24 HOURS OF IMMERSION IS THE C/B RATIO, AND SHOULD BE ABOUT .78 \*

(OF 1%).

\* THE .78 REPRESENTS THE ROOM FOR EXPANSION IN THE PORE STRUCTURE. \* . OVER →

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Listed below is one of the clay bodies Ted Randall of Alfred University developed to withstand freezing conditions. This body fires, at C/6 reduction to a warm, deep, cinnamon, orange/brown color.

**TR OUTDOOR SCULPTURE BODY** Cone 6

Color: Orange Brown in Reduction  
Uses: Handbuilding

<b><u>Ingredients:</u></b>	<b><u>Percent</u></b>
Hawthorn	24
Lizella	6
A P Green Missouri Fire Clay	15
Tenn. #9 Ball Clay	10
Fibrous Wollastonite	15
Molochite Porcelain Grog	5
AP Green 20 - 36 Mesh Grog	<u>25</u>

Total 100%

Also add:  
Red Iron Oxide 1.5%

The total shrinkage of any clay body can be lowered a bit more by apportioning the 30% total grog by mesh size follows:

Fine	12%
Medium	3
Coarse	<u>15</u>
Total Grog	30%

Refer to **NOTES ON ZERO SHRINKAGE CLAY BODIES** - Point 1.