

Follow The Proven Success

Artimax[®]

America's #1 Selling Dental Articulating Tray System

Proudly Made in the U.S.A.

Measurement of Stone Setting Expansion

B&D Dental has researched and measured many of the leading brands of stone to effectively study the effects of these stones on the final prosthesis

Instrument: SAM[®] Expansion Measuring Instrument
(Dental diagnostic instrument system, Germany)



- capable of reading 0.01mm (=10 micron)
- can be eye measured to 0.001mm (1 micron)

Measurement of Stone Setting Expansion

(The rules we followed)



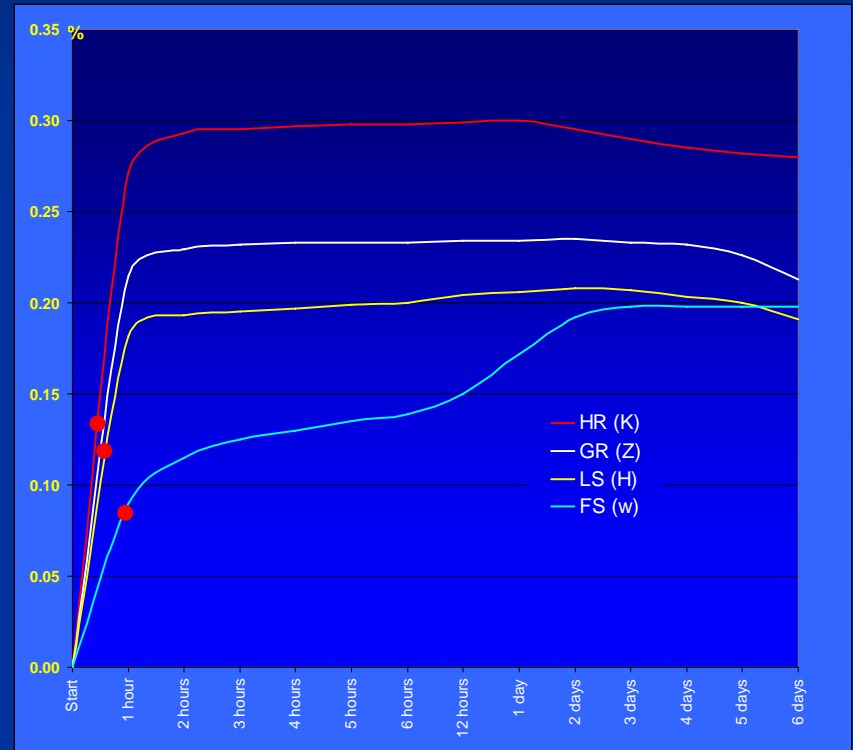
- Manufacturers recommendation
- Exact water/powder ratio (i.e., 20cc/100g)
- Normal lab setting (room temp. $68F \pm 3$, humidity: 35 – 45%)



Base Stone Linear Expansion

- Major brands in the U.S. market -

Base Stone (Lab Stone)	Label	Actual Maximum
HR (K)	0.13 %	0.30 %
GB (Z)	8,500 psi 00.12%	0.23 %
LS (H)	0.12 %	0.21 %
FS (W)	0.08 %	0.20 %



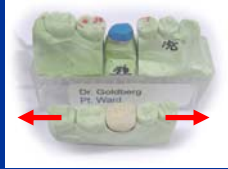



- Nearly all base stones expand significantly for the first day while setting
- As with die stones, base stones continue to expand beyond what manufacturers measure

Stated Die Stone and Base Stone Linear Expansion Rates

- For acceptable restorations to be produced, the cast, die, and base must be dimensionally accurate and stable, and they should exhibit accuracy over an extended period of time.
- Most often, clinicians and laboratory technicians will trust the maximum expansion of dental stones to be that value stated by the manufacturer which is measured 1 - 2 hours from the beginning of the mix.

Expansion Rate 0.3 % (interpreting the real numbers)

Stone Size	Linear Expansion	Stone Size
10 cm	0.30 mm ↑	 <p>10 cm stone block in the measurement tool</p>
6 cm	0.18 mm ↑	 <p>Typical quadrant stone base</p>
3 cm	0.09 mm ↑	 <p>3 cm solid model</p>
1 cm	0.03 mm ↑	 <p># 19 molar</p>

Proportionate Linear Expansion

Before
stone pour



After 2 days



- (0.3% Expansion)
100 mm : 0.3 mm
= 10 mm : 0.03 mm
= 30 mm : 0.09 mm
- The bigger the block the more expansion (in absolute terms)
- How does this effect a long span bridge?

Stone Expansion

How Significant is 0.1 mm of Growth?

Before



After



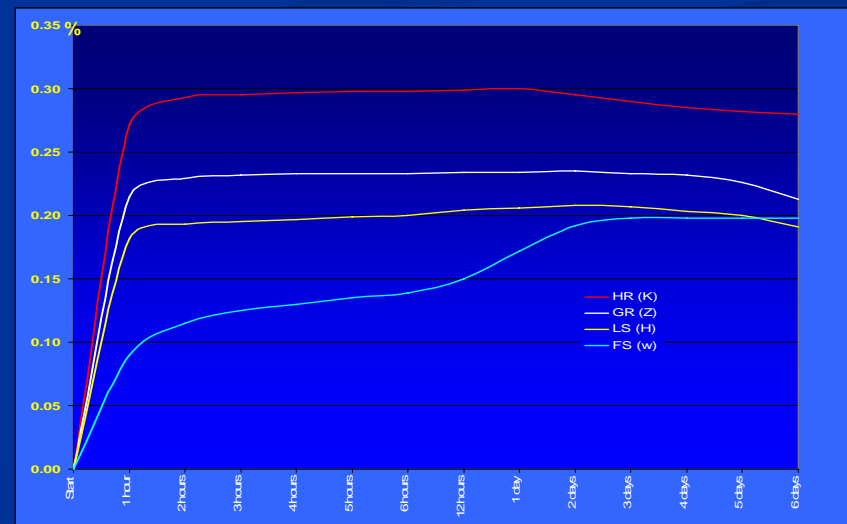
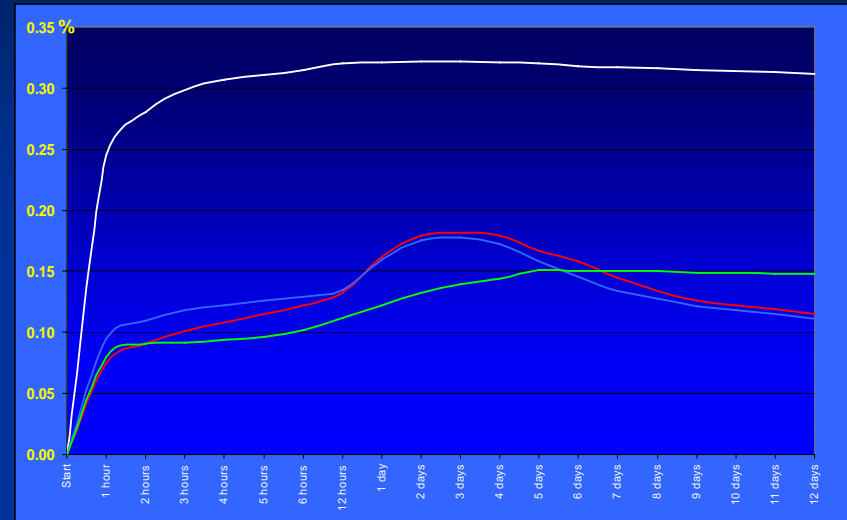
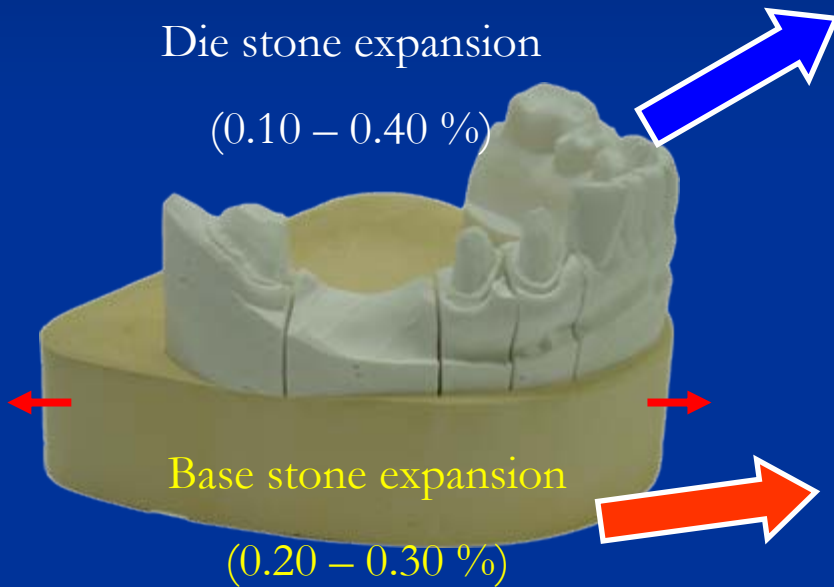
0.3 mm expansion



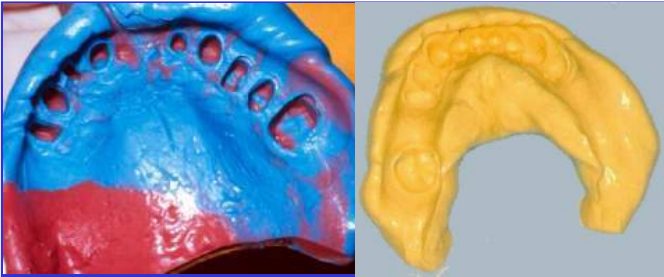
0.1mm is the same thickness as plain copy paper

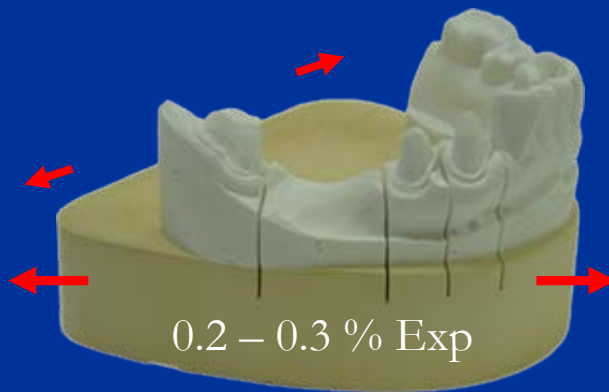
The Problem With the Current Stone-Base Systems (1)

- Double Expansion of Stone Basing -



Double Expansion of Stone Basing

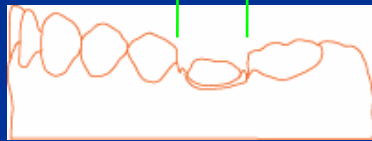
<p>Die Stone</p>	<p>0.1 – 0.4 % ↑</p>	<p>Compensates for the shrinkage of impression material</p>	
<p>Base Stone</p>	<p>0.2 – 0.3 % ↑</p>	<p>Additional expansion only adds another variable to the process</p>	<ul style="list-style-type: none"> - The less expansion, the better - 0 % expansion is ideal



Proximal Contact Problem (Tight Contact)

Patient's mouth

After prep 10.00 mm

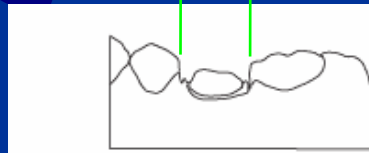


Finished crown



10.10 mm

10.10 mm



Working model

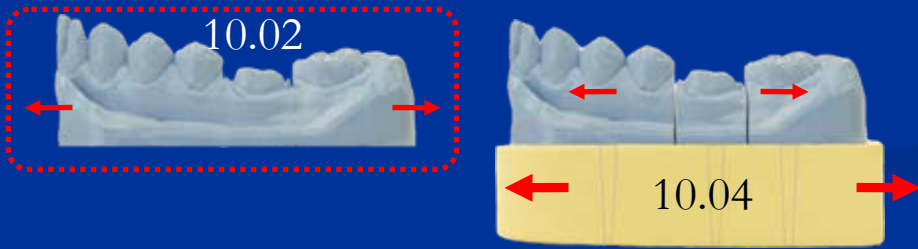

10.20 mm



Solid model check

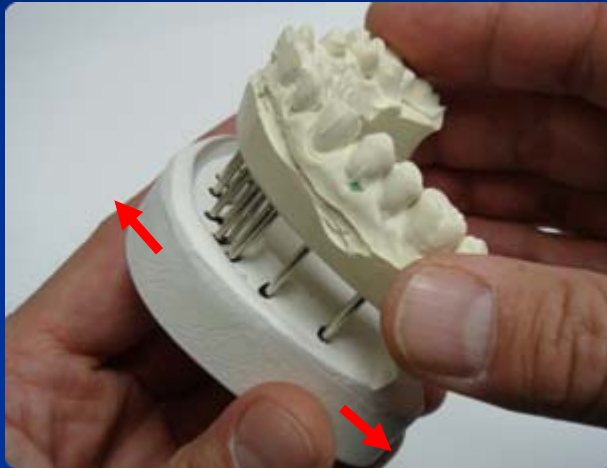
Simple numbers were used to explain the concept

Excess Expansion from Stone Basing

	Model Expansion			Total
	Model & Die Process	Working Model	Base Exp.	
<p>Stone basing</p> <p>Pour → Dry model → Separate from impression → Wet grind → Dry model → Pinning → Wet stone basing</p> 	10.02	10.04	10.06	
<p>Polymer basing</p> <p>Pin insertion → Pour → Dry (or wet) grind</p> 	10.02	-	10.02	

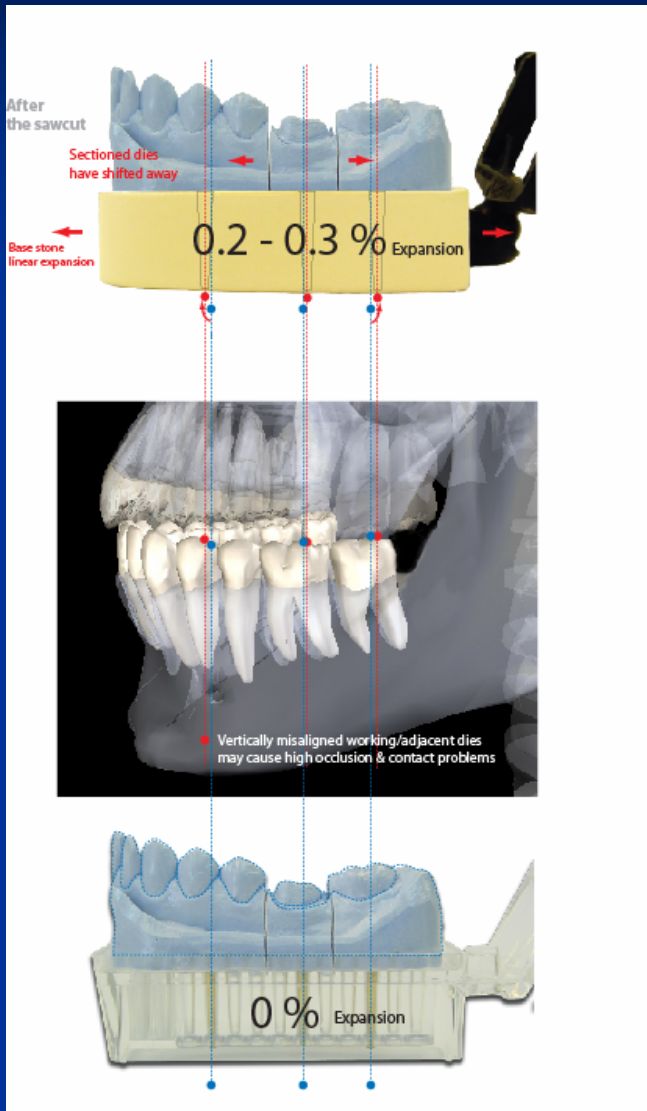
The Problem With the Current Stone-Base Systems (2)

- Dies Become Vertically Shifted & Misaligned -



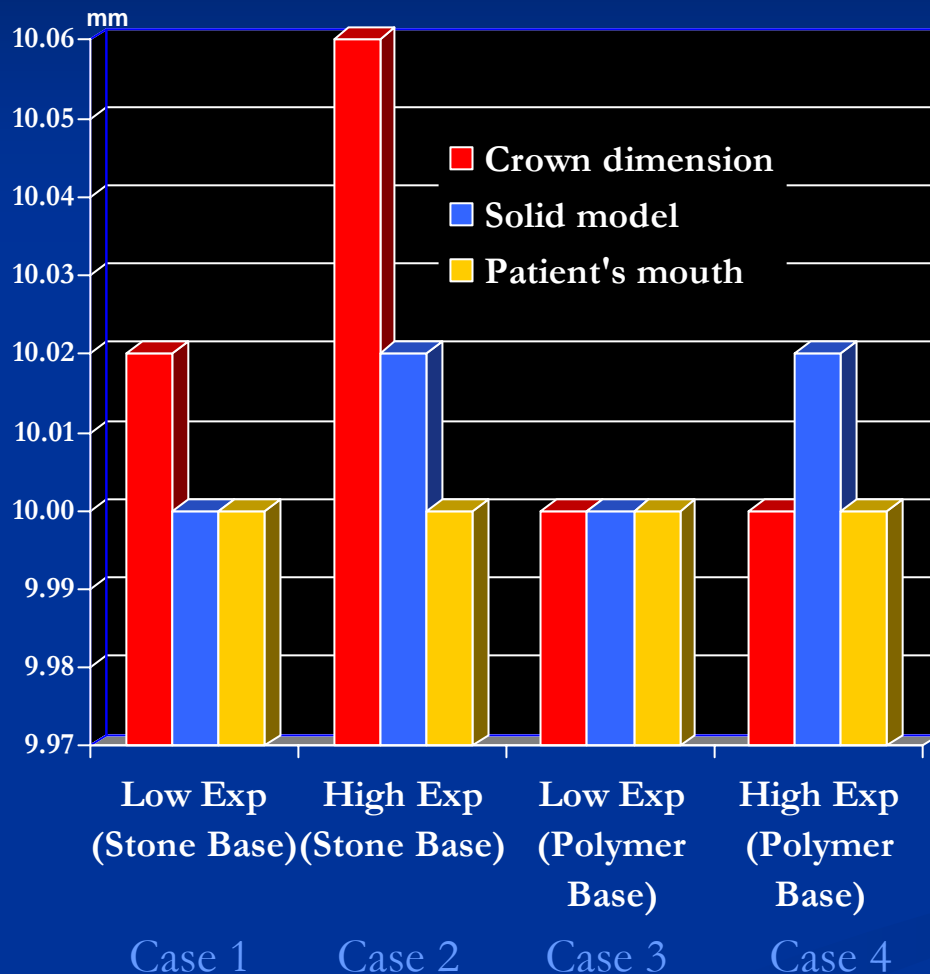
- Sectioned dies have been “shifted away” from their original position and vertically misaligned

Vertically Misaligned Dies



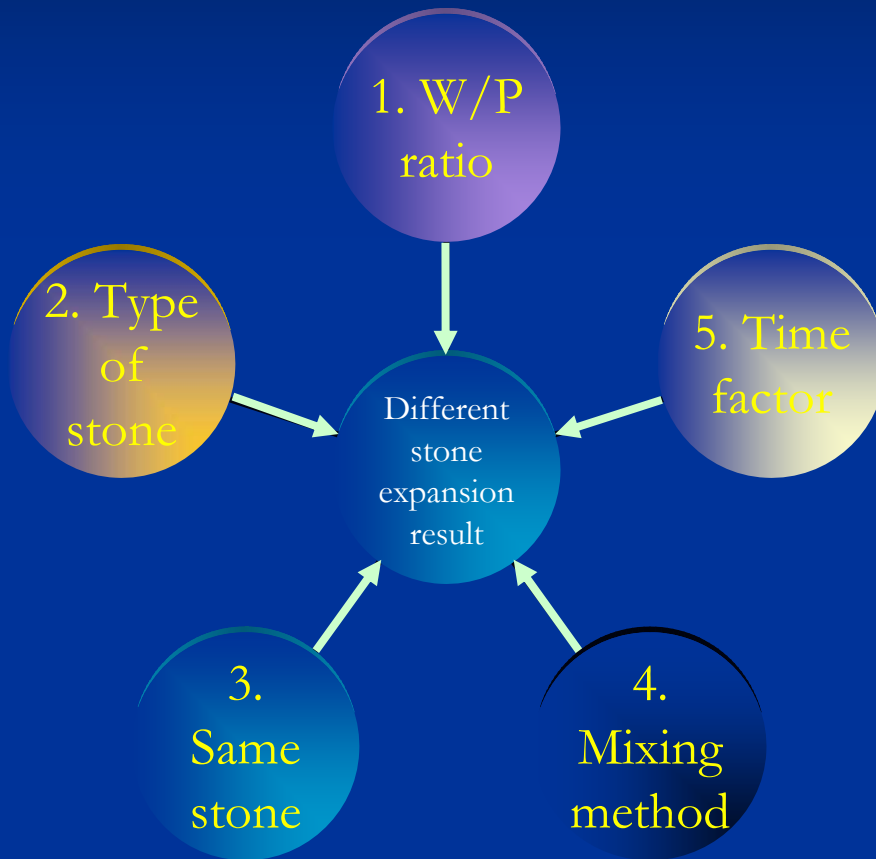
- Vertically misaligned working/adjacent dies may cause high occlusion & contact problems
- This can be extremely apparent with multiple units and bridge cases

Dimensional Comparison (Stone Base vs. Polymer Base)



- High exp. die stone with high exp. stone base produces the largest crown
- Crowns produced on the polymer base are the same size on the solid model
- The base stone expansion variable can be completely eliminated with a 0% expansion plastic polymer base.

What Factors Are Causing Inconsistent Stone Results?



Check these factors one by one when you have consistent (or inconsistent) open/tight contact on the solid model in your lab

1. **Water/Powder ratio**

Stone expands more with less water

2. **Type of stone**

High expansion stone or a stone with a wide variance in linear expansion is more likely to create contact discrepancies

3. **Same stone**

Make sure you use the same stone for both the working model & solid model in order to ensure that each model experienced the same amount of expansion growth

4. **Mixing method**

Hand mixing produces a slightly larger model than machine mixing – be consistent

5. **Time factor**

A master cast/working model prepared 7 days ago, for example, is dimensionally different than a solid model which was poured just last night since it is still expanding

The Moral of the Story is...

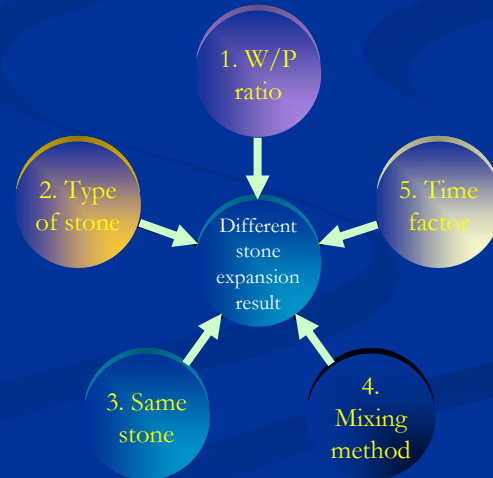
■ Understand



■ Reduce



■ Control



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