TABLE 6

Lab test result	Trial Board 3 (Formulation B plus HYONIC soap blend 65/35) (n = 12)	Trial Board 4 (Formulation B plus HYONIC soap blend 70/30) (n = 34)*
Board weight (lb/MSF)	1106	1013
Nail pull resistance[a] (lb)	85.5	80.3
Core hardness[b] (lb)	>15	12.4
Flexural strength, average[c] (MD) (lb)	55.6	60.3[1]
Flexural strength, average[d] (XMD) (lb)	140.1	142.3[1]

*Except as marked.
[1]n = 4
MD: machine direction
XMD: across machine direction
[a]ASTM standard: 77 lb
[b]ASTM standard: 11 lb
[c]ASTM standard: 36 lb
[d]ASTM standard: 107 lb

As illustrated in Table 6, strength characteristics as measured by nail pull and core hardness were above the ASTM standard. Flexural strength was also measured to be above the ASTM standard. Again, in this example of an embodiment of the invention, the new formulation (such as, for example, Trial Boards 3 and 4) can provide increased trimetaphosphate and starch formulated in a usable, flowable slurry, while maintaining adequate strength.

The use of the terms "a" and "an" and "the" and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention. It should be understood that the illustrated embodiments are exemplary only, and should not be taken as limiting the scope of the invention.

What is claimed is:

1. A light weight gypsum board comprising:

a set gypsum composition disposed between two cover sheets, the set gypsum composition formed from at least water, stucco, pregelatinized starch, and a naphthalenesulfonate dispersant;

the pregelatinized starch is in an amount from about 0.5% to about 10% by weight based on the weight of the stucco, and the naphthalenesulfonate dispersant is in an amount from about 0.2% to about 3.0% by weight based on the weight of the stucco;

the board has a density of about 34 lb/ft^3 or less; and

at a board thickness of about ½ inch, the board has a nail pull resistance of at least about 65 lb, a core hardness of at least about 11 lb, and a flexural strength of at least about 36 lb in a machine direction and/or about 107 lb in a cross-machine direction, the nail pull resistance, the core hardness and the flexural strength determined according to ASTM standard C473.

2. The light weight gypsum board of claim **1**, wherein the naphthalenesulfonate dispersant is in an amount from about 0.25% to about 3.0% by weight based on the weight of the stucco.

3. The light weight gypsum board of claim **1**, wherein the pregelatinized starch is in an amount from about 0.5% to about 6% by weight based on the weight of the stucco.

4. The light weight gypsum board of claim **3**, wherein the pregelatinized starch is in an amount from about 0.5% to about 3% by weight based on the weight of the stucco.

5. The light weight gypsum board of claim **1**, wherein the set gypsum composition is further formed from a polyphosphate present in an amount from about 0.12% to about 0.4% by weight based on the weight of the stucco.

6. The light weight gypsum board of claim **1**, wherein at a board thickness of about ½ inch, the board has a dry weight from about 1000 lb/MSF to about 1400 lb/MSF.

7. The light weight gypsum board of claim **1**, wherein the board has a density from about 24 lb/ft^3 to about 34 lb/ft^3.

8. The light weight gypsum board of claim **7**, wherein at a board thickness of about ½ inch, the board has a nail pull resistance of at least about 72 lb, as determined according to ASTM standard C473.

9. The light weight gypsum board of claim **7**, wherein at a board thickness of about ½ inch, the board has a nail pull resistance of at least about 77 lb, as determined according to ASTM standard C473.

10. The light weight gypsum board of claim **7**, wherein the pregelatinized starch is in an amount from about 0.5% to about 3% by weight based on the weight of the stucco.

11. The light weight gypsum board of claim **10**, having a water to stucco weight ratio from about 0.7 to about 1.2.

12. A light weight gypsum board comprising:

a set gypsum composition disposed between two cover sheets, the set gypsum composition formed from at least water, stucco, starch, and foam;

the starch is in an amount from about 0.5% to about 10% by weight based on the weight of the stucco and effective to increase the core hardness of the gypsum composition relative to the gypsum composition without the starch; and

the board has a board density from about 24 lb/ft^3 to about 34 lb/ft^3, and at a board thickness of about ½ inch, the board has a core hardness of at least about 11 lb, and at least one of: a nail pull resistance of at least about 65 lb, a flexural strength of at least about 36 lb in a machine direction, and a flexural strength of at least about 107 lb in a cross-machine direction, the core hardness, the nail pull resistance, and the flexural strength determined according to ASTM standard C473.

13. The light weight gypsum board of claim **12**, wherein the set gypsum composition is further formed from naphthalene dispersant in an amount from about 0.1% to about 3.0% by weight based on the weight of the stucco.

14. The light weight gypsum board of claim **13**, wherein the starch is in an amount from about 0.5% to about 6% by weight based on the weight of the stucco.