

FORM PB27 8-62

TECHNICAL SPECIFICATIONS

CERTAIN-TEED PRODUCTS CORPORATION ASBESTOS CEMENT PIPE	NUMBER: TM - 7	PAGE 1		
	SUPERSEDES:	DATE OF ISSUE: Sept. 1, 1965		
APPLICABLE TO: RELATIVE STRENGTH TEST - BUCHNER METHOD	CLASSIFICATION: CPC TEST METHOD			
DESCRIPTION: RELATIVE STRENGTH TEST FOR ASBESTOS FIBERS				
SCOPE: To determine the reinforcing value of asbestos fibers in asbestos cement relative to standard 24-Hairpin willowed C&G/3 Fibers. APPARATUS: 1. Mixing Equipment. Patterson-Kelley Model LB-558 laboratory blender complete with two one-quart and one two-quart plastic shells. 2. Vacuum Pump: "Welsh Duo-Vac" Model 1402. 3. Mold Assembly: As detailed in Figure No. 1. 4. Hydraulic Press: 10-ton Carver, laboratory model. 5. Humidity Cabinet: Designed for saturated atmosphere at ambient temperature. 6. Laboratory Autoclave: Capable of maintaining a saturated steam pressure of 120 pounds per square inch gauge. 7. Drying Oven: Standard gravity convection type, capable of maintaining 220 degrees Fahrenheit plus or minus 5 degrees. 8. Flexural Tester: With five inch span and capable of close readings in the zero to 300 pound range. 9. Laboratory Balance: Capable of weighing 500 grams to 0.1 gram. 10. Graduated Cylinder: 1000 ml capacity. 11. Filter Paper: 15 cm circular, Whatman No. 40 and Whatman No. 50. 12. Beaker: 5500 ml, stainless steel. 13. Glass Squares: 7 inches x 1/8 inch thick. 14. Glass Jars: Wide mouth, screw cap, 32 ounce capacity. 15. Spatula: Stainless Steel, with narrow blade. 16. Thermometer: Range minus 4 to plus 220°F in two degrees. 17. Stop Watch.				
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SAMPLE PREPARATION: - For each evaluation, premix 1290 grams of standard cement and 860 grams of standard silica in the two-quart shell by rotating in the blender for 15 minutes. This cement-silica mixture, which will be sufficient for a 15 sample evaluation, should be stored in air-tight containers until needed. - Prepare three cakes each of the following compositions using the standard fiber (weigh to the closest 0.1 gram): 3% Fiber - 4.5 grams fiber, 145.5 grams cement-silica mix 9% Fiber - 13.5 grams fiber, 136.5 grams cement-silica mix 15% Fiber - 22.5 grams fiber, 127.5 grams cement-silica mix Also prepare six cakes of the following composition using the fiber to be evaluated (weigh to the closest 0.1 gram): 15% Fiber - 22.5 grams fiber, 127.5 grams cement-silica mix <u>The order of making should be staggered by preparing one cake each of 3%, 9% and 15% standard fiber followed by two cakes of the unknown, with this order being repeated until a total of 15 samples has been prepared.</u> - Using the one-quart shells, dry mix the materials for each cake by rotating in the blender for five minutes and then add to 600 ml of tap water (at 77°F ± 3°) and wet mix for an additional five minute period. It is found desirable to reserve one of the shells for dry mixing only, using the other for the wet mixing operation. Further, as a matter of convenience, the materials for one sample can be wet mixed while those for the next are being dry mixed.) <u>Be certain that both shells are thoroughly cleaned after each use.</u> - During the mixing operation, fit the Buchner funnel with a sheet of Whatman No. 40 filter paper, wetting the paper to position it firmly. Then level the funnel by eye. - With the stopcock between the filter ^{flask} and vacuum source closed, adjust the vacuum to 16 inches of mercury. - When mixing is complete, swirl the shell vigorously to maintain a uniform slurry concentration and pour the material into the Buchner funnel.		
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7. When all of the slurry has been transferred, apply the vacuum noting the time. 8. Rock the funnel continually during filtration to distribute the fiber. 9. As soon as the water has been drawn off (as indicated by a decrease in vacuum) again note the time. The number of seconds from vacuum application to this point is recorded as the filtering time. 10. Continue vacuum application for 30 seconds to draw off any water remaining in the bottom of the Buchner. 11. Remove the funnel from the flask, place a sheet of Whatman No. 50 filter paper on the cake, invert the funnel and remove the cake onto a tared Plexiglas square. 12. Remove the Whatman No. 40 from the cake bottom and replace it with a sheet of No. 50. 13. Then weigh the cake (to the closest 0.1 gram) on a balance tared for the Plexiglas and the two sheets of No. 50 filter paper. 14. Carefully place the mold over the cake, then invert so that the cake falls into the mold. This places the original bottom of the sample on the bottom of the mold with a sheet of Whatman No. 50 filter paper on each slide. 15. Insert the plug into the mold, invert so that the plug is on the bottom, and place the assembly in the press. Apply pressure at a uniform rate such that a total load of 14,150 pounds is obtained over a 30-second period. 16. Allow the cake to compact for 30 seconds and then release the pressure. 17. Remove the mold from the press. Then remove the plug from the mold and run the spatula around the edge of the cake to free it. 18. Invert the mold on a Plexiglas square to remove the cake, peel off the upper filter paper, place the tared Plexiglas on top, invert, and peel off the bottom filter paper. 19. With the spatula smooth outwards any extruded flash from the pressing operation.		
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20. Then weigh the cake (to the closest 0.1 gram) on a balance tared for the Plexiglas. CURING CYCLE: 1. When the series of cakes is finished, store the stack in the humidity cabinet with a glass square on the bottom and top and between each sample. 2. After 24 hours, remove the cakes from the humidity cabinet and autoclave for 20 hours using saturated steam at 120 lbs. per square inch gauge. (Relative to autoclaving, the system should be purged of air prior to the start of the steaming cycle and the charging and blow-down operations should be performed slowly over approximately 15 minute periods. 3. Finally rack the cakes for free air circulation and dry in the gravity convection oven at 220°F ± 5° for 24 hours. Then obtain the dry weights to the closest 0.1 gram. TESTING PROCEDURE: Test each cake in flexure on a five inch span. After the first break, place the two halves together, rotate the sample 90 degrees, and retest. Tests should be performed as soon as possible after removal from the oven so as to eliminate the effect of excessive moisture absorption. CALCULATIONS: 1. Record the average filtering time in seconds for the fiber being evaluated. 2. Calculate the per cent water remaining after filtration and after pressing for the unknown fiber (to the closest 0.1 per cent) as follows: Per cent water after filtration = (Average filtered weight) - 150.0 (100)/(150.0) Per cent water after pressing = (Average pressed weight - 150.0) (100)/(150.0) 3. Obtain the average breaking load in pounds for the unknown fiber and the 3%, 9% and 15% standard cakes.			
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4. Using a relative strength of 20 for 3%, 60 for 9% and 100 for 15%, calculate the least squares line of breaking load versus relative strength for the standard fiber, as illustrated in the following example: Assume that the average breaking loads for the 3%, 9% and 15% standard cakes are 90.0, 171.0 and 240.0 pounds respectively. The following table is then set up, where X is the relative strength and Y is the corresponding breaking load: <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; border-bottom: 1px solid black;">X</th> <th style="text-align: center; border-bottom: 1px solid black;">Y</th> <th style="text-align: center; border-bottom: 1px solid black;">(X) (Y)</th> <th style="text-align: center; border-bottom: 1px solid black;">(X)²</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">20</td> <td style="text-align: center;">90.0</td> <td style="text-align: center;">1,800.0</td> <td style="text-align: center;">400</td> </tr> <tr> <td style="text-align: center;">60</td> <td style="text-align: center;">171.0</td> <td style="text-align: center;">10,260.0</td> <td style="text-align: center;">3,600</td> </tr> <tr> <td style="text-align: center; border-bottom: 1px solid black;">100</td> <td style="text-align: center; border-bottom: 1px solid black;">240.0</td> <td style="text-align: center; border-bottom: 1px solid black;">24,000.0</td> <td style="text-align: center; border-bottom: 1px solid black;">10,000</td> </tr> <tr> <td style="text-align: center;">Total 180</td> <td style="text-align: center;">501.0</td> <td style="text-align: center;">36,060.0</td> <td style="text-align: center;">14,000</td> </tr> </tbody> </table> The average X and Y values are then calculated as: $M_x = 180/3 = 60$ $M_y = 501.0/3 = 167.0$ The slope of the least squares line is next calculated as: $m = \frac{36,060.0 - (60)(501.0)}{14,000 - (60)(180)} = \frac{36,060 - 30,060}{14,000 - 10,800} = \frac{6000}{3200} = 1.875$ The Y-intercept of the least squares line is finally calculated as: $b = 167.0 - (1.875)(60) = 167.0 - 112.5 = 54.5$ The equation for the least squares line of breaking load versus relative strength for the standard fiber is then: $Y = 1.875x + 54.5$ 5. From the equation for the standard, calculate the relative strength of the unknown fiber (to the closest 0.1) from its average breaking load, as illustrated in the following example: For an unknown fiber having an average breaking load of 210.0 pounds, the relative strength would be: $X = (210.0 - 54.5) / (1.875) = 155.5 / 1.875 = 82.9$			X	Y	(X) (Y)	(X) ²	20	90.0	1,800.0	400	60	171.0	10,260.0	3,600	100	240.0	24,000.0	10,000	Total 180	501.0	36,060.0	14,000
X	Y	(X) (Y)	(X) ²																			
20	90.0	1,800.0	400																			
60	171.0	10,260.0	3,600																			
100	240.0	24,000.0	10,000																			
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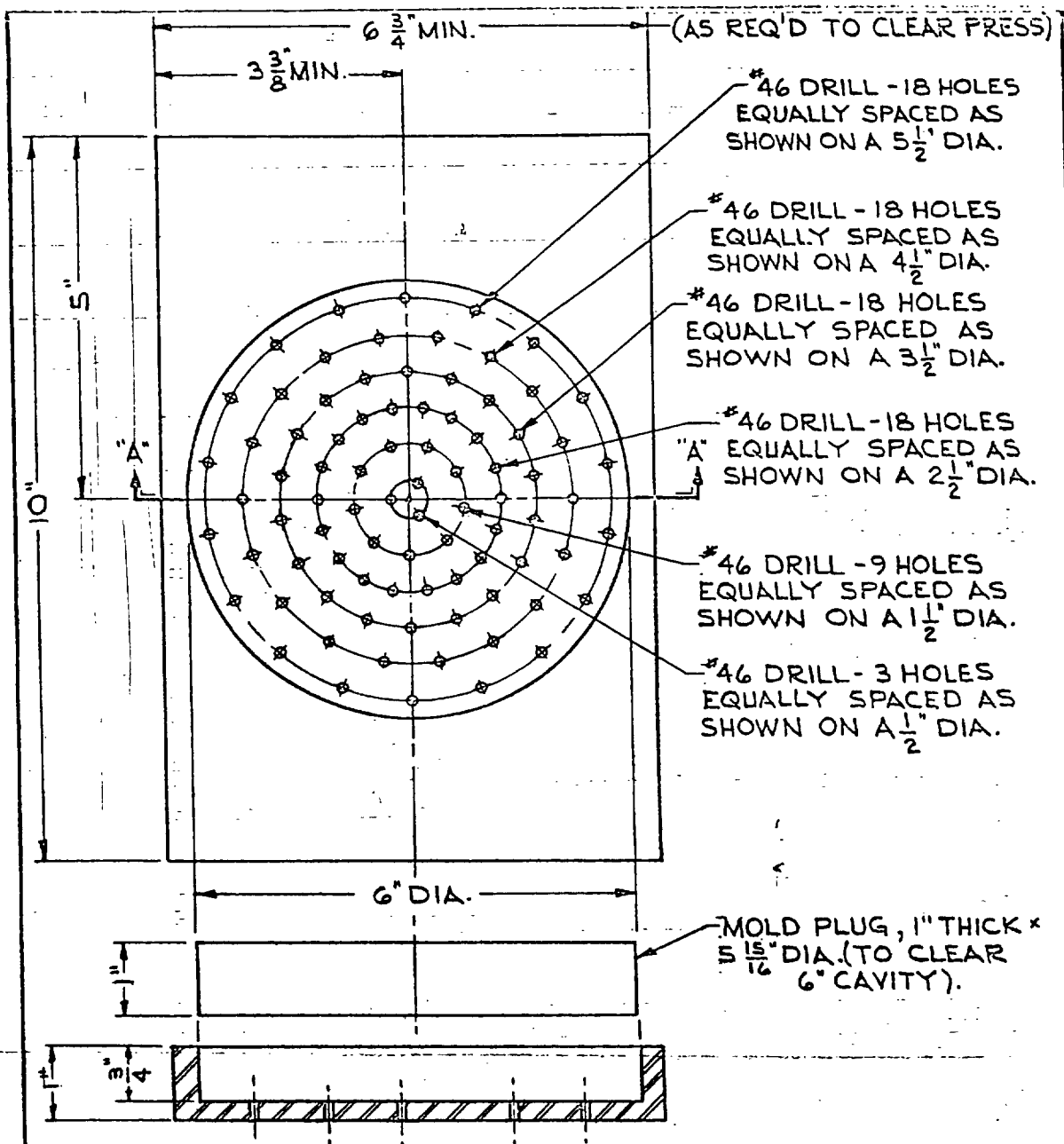
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RESULTS: 1. Filtering Time: This time will vary with both the type of fiber used and the degree to which the fiber has been prepared. Since the end of filtration is taken as the point at which a decrease in vacuum occurs (caused by loss of the water seal around the cake edge), and is not based on the time required to remove a specified amount of water, it is dependent not only on the rate at which water is removed from the A/C slurry, but also on the water retention properties of the fiber used. Consequently, without the per cent water remaining after filtration, the filtering time has no definite meaning. 2. Filtered Weight: The filtered weight, in terms of the per cent water held after filtration, indicates the water retention properties of the fiber used and also varies with the fiber type and the degree of preparation. In conjunction with the filtering time, it has special application in the formulation of wet machine furnishes since, in wet machine operation, the water content of the asbestos-cement film on the felt is controlled by passing the film over a vacuum box. 3. Pressed Weight: The pressed weight, in terms of the per cent water held after pressing, is an indication of the resistance to water removal under pressure. The value is a guide as to the moisture content of the rolled product in wet machine operation and as to the moisture content of pressed sheets. 4. Relative Strength: The relative strength, which expresses the reinforcing characteristics of the fiber relative to the standard fiber as 100, is used in effectiveness of furnish calculations to control the strength of asbestos-cement products.		
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SECTION "A-A"

CONSTRUCTION NOTES:

- 1-MOLD MAY BE MADE CIRCULAR (6 3/4" O.D) INSTEAD OF RECTANGULAR.
- 2-DRILL & TAP CENTER OF PLUG TO DEPTH OF 1/2" FOR 1/2"-13 BOLT.
- 3-MATERIAL - COLD ROLLED STEEL.

PRESS MOLD

FIGURE 1