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Speaking of Fulcanelli



Shell Building Charts (Cylinder Shells)

This page tries to give answers to questions everyone trying to make a successfull canister shell sooner or later will have to ask. Keeping in mind the desired shell diameter such questions are e.g.: "How many wraps of which paper are required to make my shell case?", "How many layers are desirable for pasting the shell?", "How much grain will it take to lift my shell?", "What size stars for which shell size?" etc.

It is plain that one could work out the optimum data for each shell himself, but this would mean having to face a process of trial and error consuming both time and material. As pertinent data is available, this would mean to reinvent the wheel.

Table 1: Paper wraps for shell case (single break shells)

Shell size (inches):	Paper weight (kraft paper):	Number of turns:	Length of paper strips:
3	70lb	3	one 24" strip
4	70lb	4	two 24" strips or one 48" strip
5	70lb	5	three 24" strips or two 36" strips
6	70lb	6	four 24" strips or two 48" strips
8	70lb	8	four 48" strips

The paper used for cylinder shell cases is always #70 virgin kraft paper. The number of turns around the case former in this case equals the diameter of the finished shell in inches. If lighter paper is used to make up the case, the required number of turns is calculated using the following formulas: nominal shell diameter (inches)*0,007= desired case thickness. Divide the desired case thickness by the caliper (in inches) of the paper you want to use to get the required number of turns. The grain of the paper has to be regarded when cutting the strips.

In this chart, the last column represents the length of the strips used to make up the case (this lenght of paper will give us the appropriate number of turns when wrapped around the proper former). The width of the strips is largely determined by the desired filling of the shell. When inserts such as saettines are to be used, the paper has to be cut wider than in the case of cut stars. However, there must be sufficient paper to allow the shell to be properly closed.

Table 2: Paste wraps (single break shells)

Shell size (inches):	Paper weight (kraft paper):	Number of turns:	Length of paper strips:
3	30 or 40lb	3	one 24" strip
4	50, 60 or 70lb	4	two 24" strips
5	60 or 70lb	5	three 24" strips or two 36" strips
6	60 or 70lb	6	four 24" strips or two 48" strips
8	70lb	8	four 48" strips

As you can see the number of turns again equals the nominal diameter and the strip dimensions are the same as above, but lighter paper is employed in most cases. The width again varies with the actual height of the shell.

Table 3: Canulle diameters

Shell size (inches):	Canulle diameter (inches)
3	3/4 to 1
4	1 to 1-1/4
5	1-1/2 to 1-3/4
6	1-3/4 to 2
8	2-1/4 -3

The canulle is the center tube inserted when filling the shell. A larger bore means that the shell will contain less stars but will break harder due to more break charge.

Table 4: Cut star sizes

Shell size (inches):	Color stars (inches):	Tailed stars (inches):
3	1/4 or smaller	1/4 - 3/8
4	1/4 - 3/8	3/8 - 1/2
5	3/8 - 1/2	1/2 - 5/8
6	3/8 - 1/2	1/2 - 3/4
8	1/2 or larger	5/8 or larger

It is important to use the appropriate size of star in shells of a given diameter. If the stars are chosen too large, the burst will look sparse and the stars will burn too long. Larger shells spread their stars wider and thus larger and longer burning stars can be used. Small stars in large shells will burn out before the flower is fully developed. The star size also plays an important role for the integrity of a shell. Can shells gain their structural integrity by means of a properly settled, densely fitting (star) filling. If the stars don´t fit to the shell in size, the shell may collapse under the kick of the lift due to the fact that the filling showed interstices.

Table 5: Lifting charges (single break shells)

Shell size (inches):	Shell type:	commercial 2FA (ounces):
3	color or salute	1
3	color and inserts	1-1/4 to 1-1/2 oz
4	color or salute	2

4	color and inserts	2-1/2
5	color or salute	3 to 3-1/2
5	color and inserts	4 to 5
6	color or salute	4 to 5
6	color and inserts	4-1/2 to 6
8	color	8 - 12

These are general guidelines using commercial powder. Different stars/contents invariable deviate in weight and thus the actual 2FA lift may have to be adjusted. As a rule of thumb a shell is given an ounce of commercial 2FA per pound of weight. Any other grain size than 2FA should be avoided and risks damaging the shell. 2FA gives a soft kick due to the fact that the charge isn´t entirely consumed when the shell leaves the mortar.

Table 6: Time fuse delays and spolette properties (single break shells)

Shell size (inches):	Desired delay time (sec.):	Spolette I.D.:	Spolette O.D.:	Spolette lenght:	Powder charge:
3	3	5/16"	0,55"	2"	1" to 1-1/4"
4	3.5	5/16" to 3/8"	11/16"	3"	1-3/8"
5	4	5/16" to 3/8"	11/16"	3"	1-3/8" to 1-1/2"
6	5	5/16" to 3/8"	11/16"	3"	1-1/2"
8	6	5/16" to 3/8"	11/16"	4"	1-3/4"

For the Spolette we use strong paper tubes that are either hand-charged or pressed in a hydraulic press. The powder charge refers to commercial meal (mealed gunpowder) and its dimensions may have to be adjusted when using weaker homemade material. As a rule of thumb one inch of commercial powder loaded in a spolette gives a delay of three seconds.

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