Appendix D
GCNA Keyboard Standards

The following text is reproduced in its entirety from the GCNA Bulletin, November 1970, incorporating several corrections of errata. The standards described herein were adopted at the 1970 Congress and remain the recognized North American carillon clavier standard, except for modifications to the pedals which were approved in 1981. ***The text in italics has been superceded by revised standards adopted in 1981.*** The 1981 revisions were never published per se, but exist in the form of drawings prepared by Richard Strauss and dated 1981. Only those dimensions pertaining to pedal geometry were adopted. Copies of these drawings are on file at the Brees Library in Lake Wales, Florida. The drawings following these written standards attempt to graphically illustrate the standards adopted in 1970 and 1981.

Over the years since the adoption of these standards, some carillon designers and builders have introduced refinements and improvements in their claviers, in some cases deviating from the standards. The clavier design by Richard Strauss know as K2000, which incorporates European key spacing, has been used as the basis for several new claviers in the U.S. as well as Europe. These trends indicate that clavier design continues to evolve

Carillon Console Standards of the Guild of Carillonneurs in North America July 1970

Text in italics superceded by revised standards adopted in 1981

Purpose:	The purpose of this standard is to specify dimensions and construction details for manual consoles of carillons installed in the United States of America and in Canada.
Scope:	*This standard shall apply in detail to consoles of carillons of four-octave range. For carillons of more or less than four octaves, this standard shall apply as far as practical, consistent with the different range of the instrument.*
1	Range of Manual: The basic compass of the manual clavier shall be four octaves, c3 to c7. A key shall be provided for each bell in the carillon; all semi-tone keys should be provided within the compass of the instrument.1
2	Range of Pedals: The basic compass of the pedal clavier shall be two octaves, C3 to C5 including a pedal corresponding to each manual key present within this compass; where bells lower than the basis keynote (the bell attached to c3 key and pedal) are present, extra pedals to control these bells shall be provided below the basic pedal compass.
3	Lateral relationship of manual to pedal: A “playing axis” has been established in designing the standard keyboard: this axis shall be a vertical line joining the centerlines of the d5 manual key and the B3 pedal; in other words, the B3 pedal is to be located directly beneath the d5 manual key.
4	The vertical distance from the centerline of “white” keys to top of “white” pedal at axis shall be 30 11/16 in. (779 mm.).
5	Horizontal distance from front end of pedal to front end of “white” keys at axis shall be 1 3/8 in. (35 mm.).

6 The vertical distance between centerlines of rows of “white” and “black” keys shall be 3 13/16 in. (97 mm.).

7 Horizontal distance from front end of “white” key to front of “black” key shall be 2 3/4 in. (70 mm.).

8 Horizontal distance between key centers shall be 2 in. (51 mm.).

9 It is recommended that the “white” keys be no shorter than 24 in. (610 mm.), measured from the playing end to the fulcrum.

10 The keys, when at rest, should be inclined upward slightly toward the playing ends; the centerline of each key should form an angle of 2° to a horizontal line drawn through the center of the key at the fulcrum.

11 The distance from the front end of the “white” keys to the front surface of the key “spreader” should be not less than 7 ¼ in. (184 mm.).

12 That untapered portion of the key which lies on the player’s side of the “spreader” shall have a cross-section of 1 in. x 1 in. (25 mm. x 25 mm.).

13 The tapered playing-end of the key shall have a length of 3 3/8” in. (86 mm.).

14 Shape of key playing end: The playing end of the key shall be nearly cylindrical, (actually, a truncated cone), being tapered in such a way as to have a diameter of 5/8 in. (16 mm.) at a point 1 ½ in. (38 mm.) from the end; it is suggested that this be produced by giving this portion of the key a diameter of approximately ¾ in. (19 mm.) at the end toward the untapered (square cross-section) portion and 9/16 in. (14 mm.) at the end toward the player. (This requirement, together with the key spacing detailed above, insures that there will be a clear space of 3 3/8 in. (86 mm.) at the measuring point for the hand to descend between the keys on either side of the one being played)

15 The transition from the square to circular cross-sectional portions of the key shall be smoothed, to present no sharp corners.

16 The end of the key shall terminate in a portion of a sphere whose diameter is no less than the diameter of the key at that point and no more that 1 ½ times this diameter.

17 The depth of stroke of the key, measured at the front edge of the key “spreader” shall be 2 in ± 1/8 in. (51 mm. ± 3 mm.)

18 It is recommended that the length of the “white” pedal at axis be not less than 22 5/8 in. (575 mm.) measured from the front end to the fulcrum.

19 The top surface of the pedal, when at rest, shall make an angle of 2° with a horizontal line drawn through the top center of the fulcrum.

20 The vertical distance from the top of the “black” pedal to the top of the adjacent “white” pedal shall be 3 in. (76 mm.). But note, that in the case of the pedals in the range where concavity is used, this distance shall be measured from the top of the “black” pedal to a point half way between the top surfaces of the adjacent “white” pedals.

21 The horizontal distance between centerlines of adjacent “white” pedals shall be 3 ½ in. (89 mm.), measured at the end of the pedals nearest player. The “black” pedals shall be centered between adjacent “white” pedals.

22 The width of the pedals shall be 1 3/16 in. (30 mm.).

23 The effective length of the playing surface of the “white” pedal shall be not less that 4 ¾ in. (121 mm.) nor more than 5 in. (127 mm.), the former being recommended.

24 The effective length of the playing surface of the “black” pedal should be not less than 4 in. (102 mm.) nor more than 4 ¼ in. (108 mm.), the latter being recommended. N.B.: this dimension shall not overlap the preceding (no. 23) by more than ¼” (6 mm.).

25 The depth of stroke of the pedal, measured at the pedal “spreader”, shall be 2 in. ± 1/8 in. (51 mm. ± 3 mm.).

26 *The pedal clavier (having a compass as detailed in point no. 2 above) is to have a slight radiation at the top of the compass and a greater radiation at the bottom. In the case of a four-octave console with no additional pedals below the basic keynote, this radiation is to be as detailed in the accompanying prints; the angle and equivalent radii (approximate) from which these prints where drawn are listed in Table I below:*

Table I
Pedal Radiation

Left Radiation

Note	*Angle*	*Equivalent Radius*
F#3	*1 1/2°*	*67 ½ in. (1,715 mm.)*
F3	*2°*	*61 ½ in. (1,562 mm.)*
E3	*7°*	*55 ½ in. (1,410 mm.)*
D#3	*10 1/2°*	*49 ½ in. (1,257 mm.)*
D3	*14°*	*43 ½ in. (1,105 mm.)*
C#3	*19°*	*37 ½ in. (953 mm.)*
C3	*23°*	*31 ½ in. (800 mm.)*

Right Radiation

Note	*Angle*	*Equivalent Radius*
F4	*2°*	*61 ½ in. (1,562 mm.)*
F#4	*3°*	*61 ½ in. (1,562 mm.)*
G4	*4°*	*61 ½ in. (1,562 mm.)*
G#4	*5°*	*61 ½ in. (1,562 mm.)*
A4	*6°*	*61 ½ in. (1,562 mm.)*
A#4	*7°*	*61 ½ in. (1,562 mm.)*
B4	*8°*	*61 ½ in. (1,562 mm.)*
C5	*10°*	*61 ½ in. (1,562 mm.)*

N.B.: “Angle” is that made by one side of the pedal with a line normal to the pedal “spreader” which passes through the point on that side of the pedal opposite the fulcrum. “Equivalent radii” are measured along the extended centerline of the nearest unradiated pedal key and are measured from the front of the unradiated pedals.

27 *The pedal clavier shall be concave, to a large radius at the top end of the compass, and a smaller radius at the bottom, and the concavity shall be similar and complementary to the radiation specified in item no. 26 above. For the four-octave console having no pedals*

below the basis keynote, the concavity shall be as shown in the accompanying prints, and given in Table II below:

Table II
Pedal Concavity

Left Concavity		*Right Concavity*	
Note	*Elevation*	*Note*	*Elevation*
F#3	*1/8 in. (3 mm.)*	*F4*	*1/8 in. (3 mm.)*
F3	*3 1/6 in. (5 mm.)*	*F#4*	*1/4 in. (6 mm.)*
E3	*½ in. (13 mm.)*	*G4*	*3/8 in. (9 mm.)*
D#3	*7/8 in. (22 mm.)*	*G#4*	*9/16 in. (14 mm.)*
D3	*1 ½ in. (38 mm.)*	*A4*	*13/16 in. (21 mm.)*
C#3	*2 ¼ in. (57 mm.)*	*A#4*	*1 in. (25 mm.)*
C3	*3 1/16 in. (78 mm.)*	*B4*	*1 3/8 in. (35 mm.)*
		C5	*2 1/8 in. (54 mm.)*

N.B.: "Elevation" is the vertical distance of the top of the pedal, when at rest, above the tops of corresponding pedals ("black" or "white") in the range to which no concavity is applied.

28 The playing surface of the pedals should be made with a suitable material to minimize pedal wear.

29 For carillon consoles large than four octaves, the center axis shall remain the same as for the four-octave carillon console.

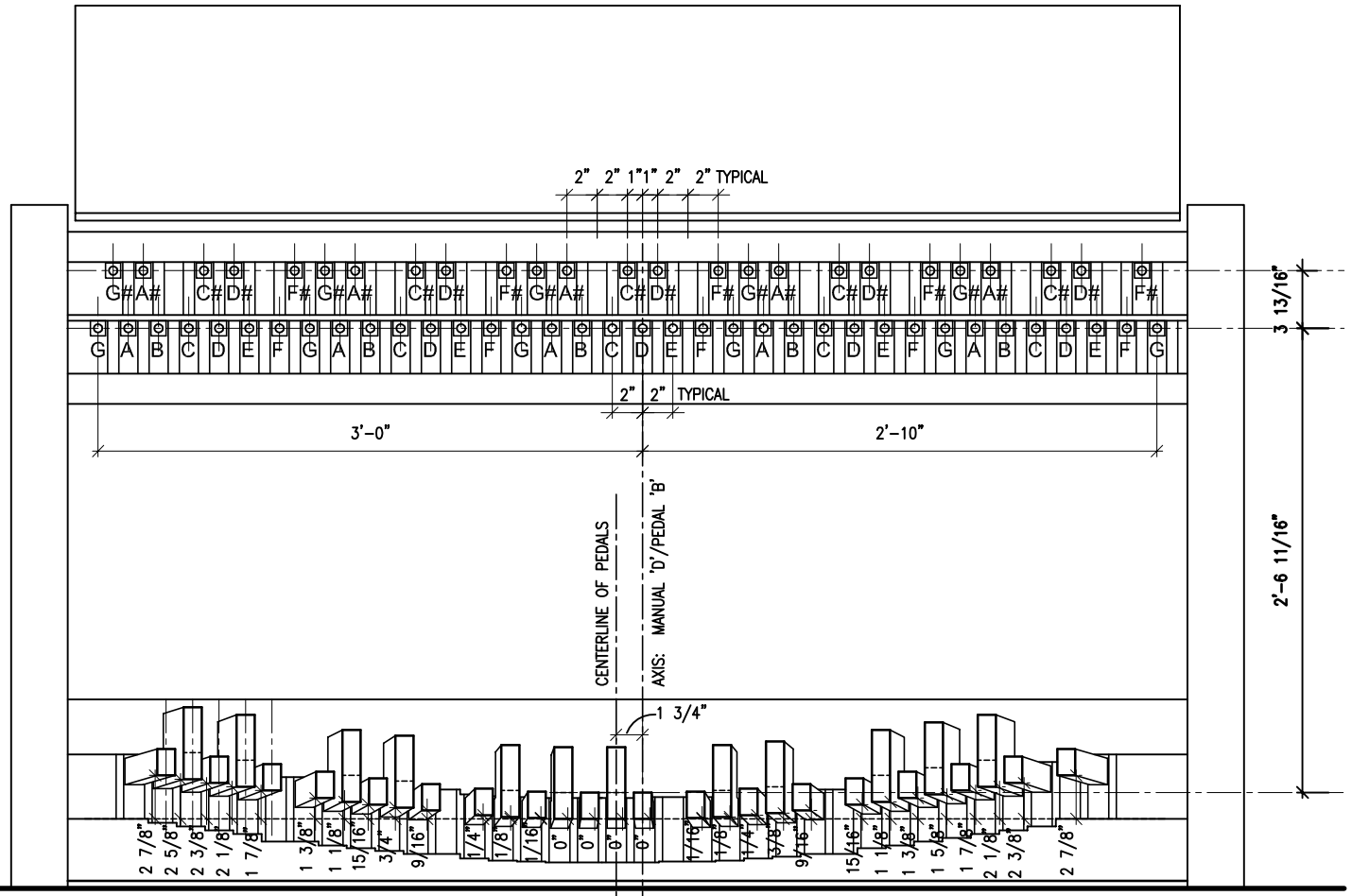
30 The wire adjusters used must reliably hold the adjustment selected by the carillonneur, but must be readily capable of adjustment by the carillonneur using one hand while in front of the console.

31 The wires connecting the "white" keys to the carillon should be attached to the key at a point no less than 11 in. (279 mm.), or more than 12 in. (305 mm.), from the playing end of the key, and the wire connections to the "black" keys shall be attached at a point no less than 8 ¼ in. (210 mm.) and no more than 9 ¼ in. (235 mm.) from the playing end of the key.

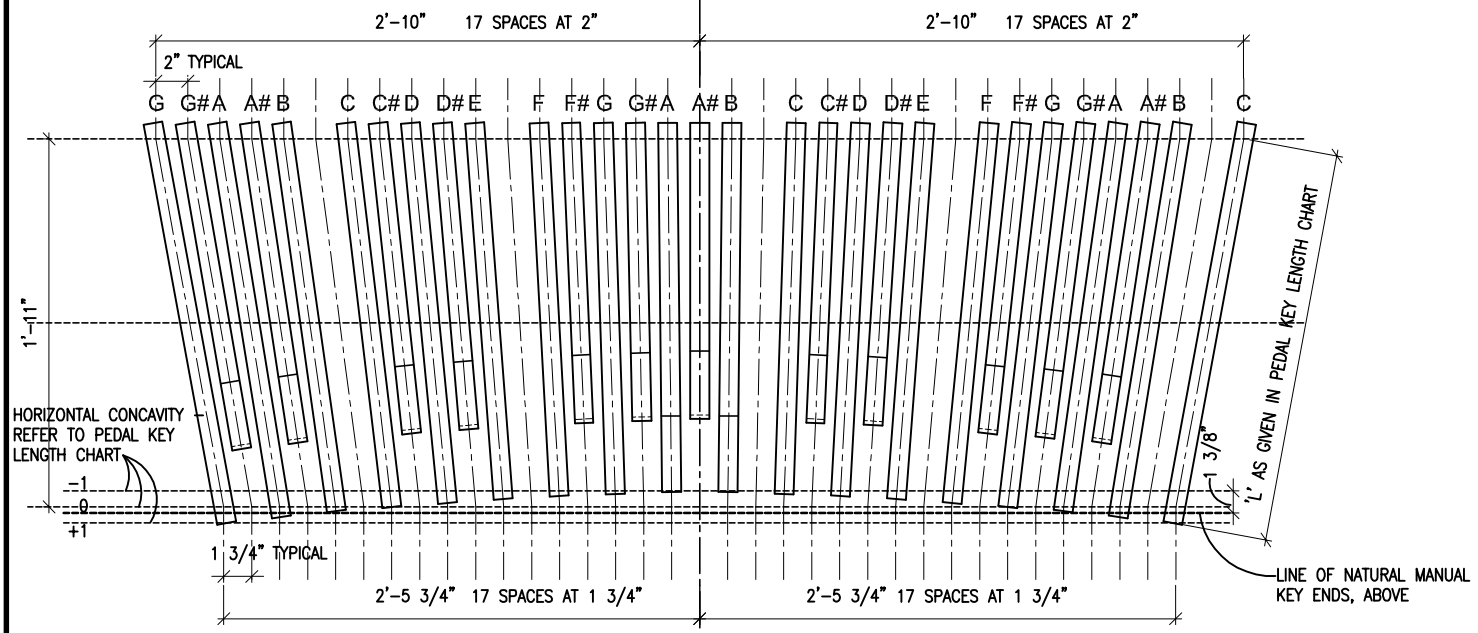
32 The music rack shall be at least as wide as the distance between the centers of the keys at the extreme ends of the compass, shall tilt back as far as practical (without touching the wires), and shall not overhang the front edge of the key "spreader". The height of the rack back shall be 14 in. (356 mm.). The angle between the back and the surface of the lip shall be 90°. The surface of the lip (or ledge) shall be at least 1 ¼ in. (32 mm.) wide, and no wider than 1 ¾ in. (44 mm.).

33 The bench shall be adjustable for height, shall be provided with a footrest (located far enough distant from the pedals to give good clearance when playing the pedals), and shall be at least as long as the distance between the last key "spreader" slot on the left and the last pedal "spreader" slot on the right.

34 It is imperative that the console be constructed in a perfectly sturdy manner; of materials of a high degree of durability and permanence; accurately to the dimensions given, and allowing an absolute minimum of "play" or waste motion; in such a manner and of such materials as to operate smoothly and reliably in all conditions, with a minimum of adjustment and upkeep; and at the same time, to be as noiseless as possible.



Front elevation showing ends of keys



Plan view above pedal keys

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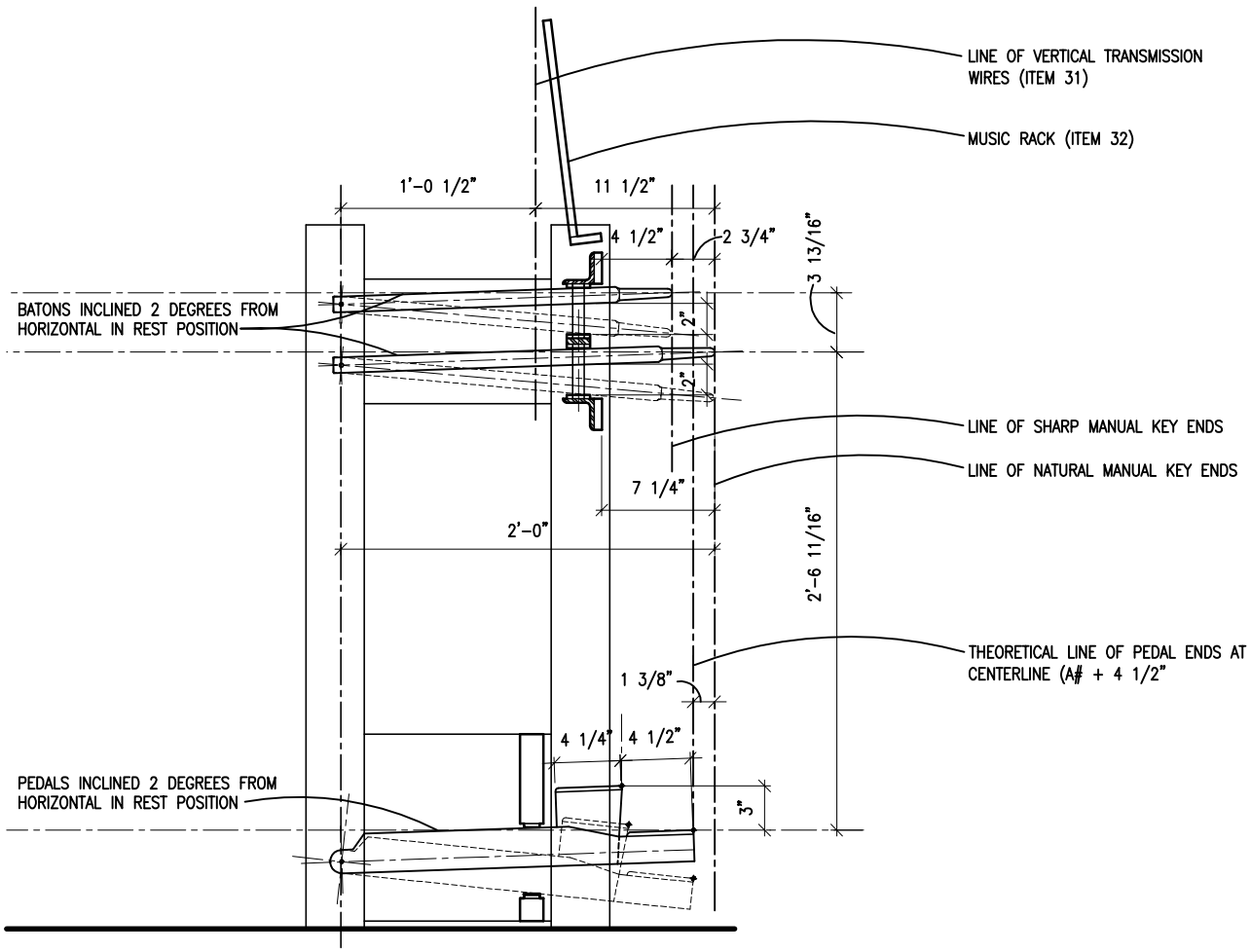
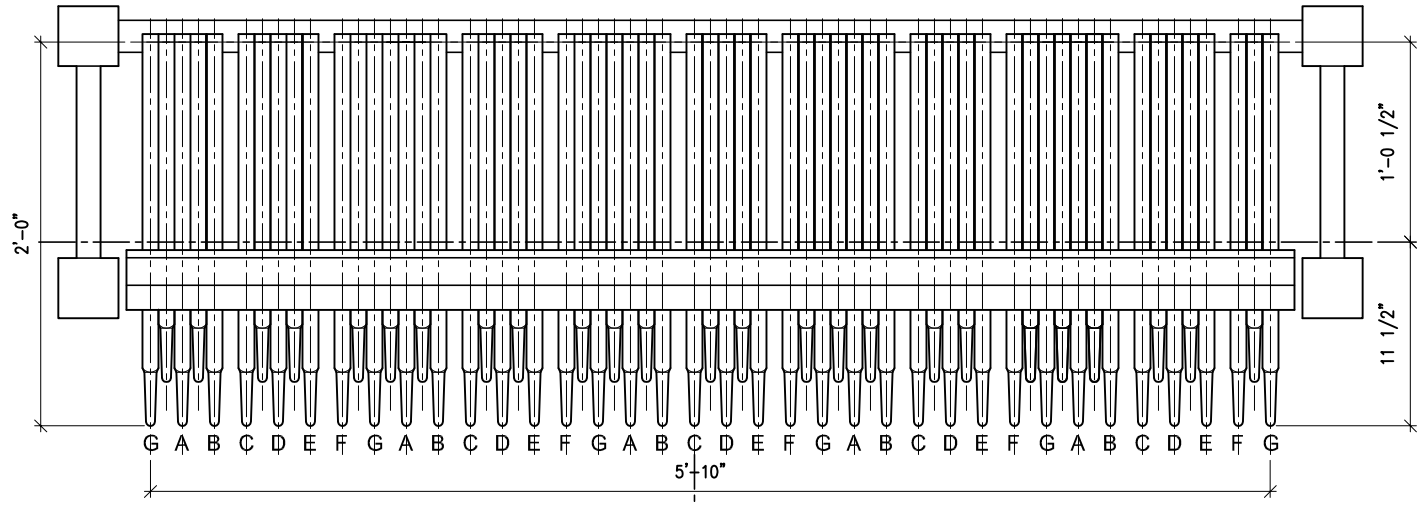


Cross section



Plan view above manual keys

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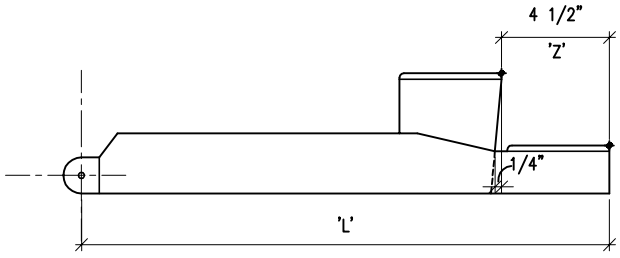


Pedal Key Lengths

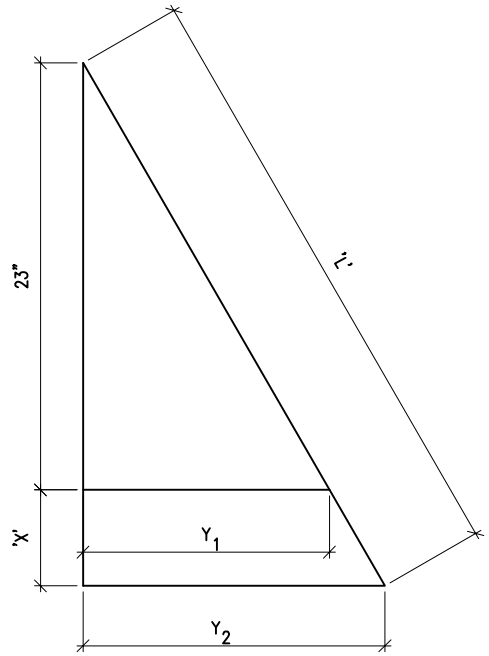
NOTE	HORIZONTAL CONCAVITY	X	Y_1	LENGTH OF PEDAL
G	2	+1	4.25	24.4063
G#	1 13/16	+13/16	4.00	24.1699*
A	1 5/8	+5/8	3.75	23.9370
A#	1 7/16	+7/16	3.50	23.7073*
B	1 1/4	+1/4	3.25	23.4810
	1 1/8		3.00	
C	1	−0−	2.75	23.1638
C#	7/8	−1/8	2.50	23.0097*
D	3/4	−1/4	2.25	22.8586
D#	5/8	−3/8	2.00	22.7104*
E	1/2	−1/2	1.75	22.5650
	3/8		1.50	
F	5/16	−11/16	1.25	22.3454
F#	1/4	−3/4	1.00	22.2710*
G	3/16	−13/16	0.75	22.1993
G#	1/8	−7/8	0.50	22.1302*
A	1/16	−15/16	0.25	22.0638
A#	−0−	−1	0.00	22.0000*
B	1/16	−15/16	0.25	22.0638
	5/16		0.50	
C	3/16	−13/16	0.75	22.1993
C#	1/4	−3/4	1.00	22.2710*
D	5/16	−11/16	1.25	22.3454
D#	3/8	−5/8	1.50	22.4225*
E	1/2	−1/2	1.75	22.5650
	5/8		2.00	
F	3/4	−1/4	2.25	22.8586
F#	7/8	−1/8	2.50	23.0097*
G	1	−0−	2.75	23.1638
G#	1 1/8	+1/8	3.00	23.3209*
A	1 1/4	+1/4	3.25	23.4810
A#	1 7/16	+7/16	3.50	23.7073*
B	1 5/8	+5/8	3.75	23.9370
	1 13/16		4.00	
C	2	+1	4.25	24.4063

* = LENGTH + 'Z'

$$23 : Y_1 : : (23 + X) : Y_2$$

$$Y_2 = \frac{Y_1\ (23 + X)}{23}$$

$$L^2 = (23 + X)^2 + Y^2$$



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