FORMULA WORKSHEET FOR CALCULATING ORGAN PIPE SCALES

ENTER NUMBERS ONLY IN THE GREEN CELLS. THE OUTPUT VALUES ARE IN THE TAN CELLS. MEASURED PIPE SIZES ARE EXPRESSED IN METRIC ONLY. TÖPFER SCALE NUMBERS ARE BASED ON 1001.56 METER = SCALE 1. RANGE OF PIPES INCLUDE FIRST AND LAST PIPES.

TO FIND PIPE HALF RATIO MULTIPLYER AND ITS RECIPROCAL	
ENTER PIPE HALVING RATIO NUMBER	**17**
= MULTIPLYER FOR LARGER DIRECTION	**1.0442738**
= MULTIPLYER FOR SMALLER DIRECTION	**0.9576033**

TO FIND HALVING RATIO BETWEEN ANY TWO PIPES IN A RANGE	
ENTER MM DIAMETER OF FIRST PIPE	**155.25**
ENTER MM DIAMETER OF LAST PIPE	**92.3**
ENTER TOTAL NUMBER OF PIPES IN RANGE	**13**
= HALVING RATIO OF RANGE	**17**

TO FIND TÖPFER SCALE NUMBER OF A PIPE	
ENTER MM DIAMETER OF PIPE	**155.5**
= TÖPFER SCALE NUMBER	**44**

TO FIND MM DIAMETER OF A PIPE	
ENTER TÖPFER SCALE NUMBER	**44.0**
= MM DIAMETER OF PIPE	**155.5**

TO FIND ROUND PIPE DIAMETER EQUIVALENT OF A WOOD PIPE	
ENTER MM WIDTH OF WOOD PIPE	**157.1**
ENTER MM DEPTH OF WOOD PIPE	**312.5**
= MM DIAMETER OF PIPE	**250.0**
= MOUTH RATIO EXPRESSED AS DENOMINATOR ONLY; 1/4 WOULD BE 4, 2/9 WOULD BE 4.5, AND 1/5 WOULD BE 5	**5.0**

TO FIND WOOD PIPE EQUIVALENT OF A ROUND PIPE	
ENTER MM DIAMETER OF PIPE	**250**
ENTER MOUTH RATIO EXPRESSED AS DENOMINATOR ONLY; 1/4 WOULD BE 4, 2/9 WOULD BE 4.5, AND 1/5 WOULD BE 5	**5**
= MM WIDTH OF WOOD PIPE	**157.1**
= MM DEPTH OF WOOD PIPE	**312.5**

DESIGNED BY ROBERT J. VAUGHAN

FORMULA WORKSHEET FOR CALCULATING PIPE ORGAN WINDING SYSTEMS

THE FORMULA DERIVED GOLDEN RATIO NUMBERS	
ASSENDING	**1.61803399**
DECENDING	**0.61803399**

ENTER NUMBERS ONLY IN THE GREEN CELLS. THE OUTPUT VALUES ARE IN THE TAN CELLS. PRESSURE DROP FORMULAS USE ONLY ENGLISH VALUES. OTHERS USE ENGLISH OR METRIC. AIR FORMULAS BASED ON STANDARD AIR; .075 LBS/CU.FT, 70F, SEA LEVEL, 29.92 IN.Hg.

TO FIND THE AREA OF A CIRCLE	
ENTER DIAMETER OF CIRCLE	**10.00**
= AREA OF CIRCLE	**78.54**

TO FIND THE DIAMETER OF A CIRCLE	
ENTER AREA OF CIRCLE	**144.00**
= DIAMETER OF CIRCLE	**13.54**

TO FIND EQUIVALENT PIPE DIAMETER OF TWO DIFFERENT SIZED AIR CONDUCTORS IN PARALLEL,	
ENTER DIAMETER OF 1ST CONDUCTOR	**4.00**
ENTER DIAMETER OF 2ND CONDUCTOR	**4.00**
= EQUIVALENT PIPE DIAMETER	**5.66**

TO FIND EQUIVALENT DIAMETER OF SAME SIZED MULTIPLE AIR CONDUCTOR PIPES IN PARALLEL	
ENTER DIAMETER OF CONDUCTOR PIPE	**4.00**
ENTER NUMBER OF CONDUCTOR PIPES	**3.00**
= EQUIVALENT PIPE DIAMETER	**6.93**

TO FIND THE PRESSURE DROP IN INCHES WATERCOLUMN THROUGH A GIVEN LENGTH OF ROUND BLOWER PIPE	
ENTER REQUIRED AIR VOLUME IN CFM THROUGH PIPE	**729.5**
ENTER INCH DIAMETER OF CONDUCTOR PIPE	**10.00**
ENTER CONDUCTOR PIPE LENGTH IN FEET	**36.00**
= PRESSURE DROP IN INCHES WATERCOLUMN	**0.10**

TO FIND PIPE DIAMETER IN INCHES FOR A GIVEN LENGTH OF ROUND BLOWER PIPE	
ENTER REQUIRED AIR VOLUME IN CFM THROUGH PIPE	**729.5**
ENTER PRESSURE DROP IN INCHES WATERCOLUMN	**0.10**
ENTER CONDUCTOR PIPE LENGTH IN FEET	**36.00**
= CONDUCTOR PIPE DIAMETER IN INCHES	**10.00**

TO FIND AIR VOLUME IN CFM FOR A GIVEN LENGTH OF ROUND BLOWER PIPE	
ENTER INCH DIAMETER OF CONDUCTOR PIPE	**10.00**
ENTER PRESSURE DROP IN INCHES W.C.	**0.10**
ENTER CONDUCTOR PIPE LENGTH IN FEET	**36.00**
= AIR VOLUMN CFM THROUGH PIPE	**729.50**

TO FIND EQUIVALENT ROUND DIAMETER OF RECTANGULAR WINDTRUNK FOR BOTH AIR CAPACITY AND ACTUAL AREA	
ENTER WIDTH OF WINDTRUNK	**12.00**
ENTER DEPTH OF WINDTRUNK	**4.25**
= EQUIVALENT AIR CAPACITY DIAMETER OF ROUND PIPE	**7.56**
= ACTUAL AREA EQUIVALENT DIAMETER OF ROUND PIPE	**8.06**

TO FIND ELEVATION IN FEET ABOVE SEA LEVEL AT A GIVEN ABSOLUTE BAROMETRIC PRESSURE	
ENTER ABSOLUTE PRESSURE INCHES OF MERCURY	**24.68**
= ELEVATION FEET ABOVE SEA LEVEL	**5280**

TO FIND ABSOLUTE BAROMETRIC PRESSURE AT A GIVEN ELEVATION IN FEET ABOVE SEA LEVEL	
ENTER ELEVATION FEET ABOVE SEA LEVEL	**5280**
= ABSOLUTE PRESSURE INCHES OF MERCURY	**24.68**

TO FIND AIR VOLUME IN CFM THROUGH A ROUND CYLINDRICAL ORIFICE IN PRESSURE VESSEL TO ATMOSPHERE	
ENTER HOLE DIAMETER IN INCHES	**2.00**
ENTER PRESSURE DIFFERENCE IN INCHES W.C.	**4.00**
= CFM THROUGH HOLE	**113.6**
= AIR VELOCITY FPM	**5206.6**
= AIR VELOCITY MPH	**59.2**

TO FIND CHANGES IN BLOWER PRESSURE AND VOLUME WITH CHANGES IN ELEVATION	
ENTER RATED CFM OF BLOWER AT SEA LEVEL	**1000.0**
ENTER STATIC PRESSURE OF BLOWER AT SEA LEVEL	**6.00**
ENTER ORGAN ELEVATION IN FEET ABOVE SEA LEVEL	**5280**
= NEW CFM VOLUME OF BLOWER	**1212.5**
= NEW STATIC PRESSURE OF BLOWER IN INCHES W.C.	**4.9**

DESIGNED BY ROBERT J. VAUGHAN

FORMULA WORKSHEET FOR CALCULATING ELECTRICAL WIRE VALUES

ENTER NUMBERS ONLY IN THE GREEN CELLS. THE OUTPUT VALUES ARE IN THE TAN CELLS. WIRE SIZES ARE EXPRESSED IN THOUSANTHS OF AN INCH AND WIRE GAUGE SIZES, "0" AND SMALLER, ARE CONSISTANT WITH THE B&S COPPER WIRE GAUGE TABLES. TEMPERATURE IS FAHRENHEIT DEGREES. FOR NOTE CABLES AND SINGLE RETURN WIRE, ENTER ACTUAL CABLE LENGTH IN FEET. FOR POWER SUPPLY PLUS AND MINUS MAINS, DOUBLE THE CABLE LENGTH. FOR WINDCHEST LOADS, ENTER MEASURED RESISTANCE OF ONE MAGNET AND ENTER MAXIMUM TOTAL NUMBER OF NOTES (MAGNETS) THAT WILL BE PLAYED TOGETHER AS A CHORD.

TO FIND DIAMETER AND WIRE PROPERTIES	
ENTER WIRE GAUGE NUMBER	**24.0**
ENTER TEMPERATURE IN F DEGREES	**68.0**
= WIRE DIAMETER IN THOUSANTHS	**0.020**
= WIRE AREA IN CIRCULAR MILS	**404.0**
= WIRE RESISTANCE IN FEET PER OHM	**39.0**
= WIRE RESISTANCE IN OHMS PER FOOT	**0.026**

TO FIND GAUGE NUMBER AND WIRE PROPERTIES	
ENTER WIRE DIAMETER IN THOUSANTHS	**0.020**
ENTER TEMPERATURE IN F DEGREES	**68.0**
= WIRE GAUGE NUMBER	**24.0**
= WIRE AREA IN CIRCULAR MILS	**400.0**
= WIRE RESISTANCE IN FEET PER OHM	**38.6**
= WIRE RESISTANCE IN OHMS PER FOOT	**0.026**

TO FIND TOTAL LOAD RESISTANCE OF WINDCHEST	
ENTER RESISTANCE OF A NOTE MAGNET	**90**
ENTER TOTAL NUMBER OF MAGNETS PLAYED	**12**
=TOTAL LOAD RESISTANCE IN OHMS	**7.50**

TO FIND VOLTAGE DROP IN LONG WIRE RUNS	
ENTER WIRE GAUGE	**14.0**
ENTER VOLTAGE AT SOURCE	**15.0**
ENTER LOAD RESISTANCE IN OHMS	**7.50**
ENTER CABLE RUN IN FEET	**250.0**
ENTER CABLE TEMPERATURE IN F DEGREES	**95.0**
= RESISTANCE OF WIRE RUN IN OHMS	**0.67**
= VOLTAGE AT LOAD	**13.77**
= VOLTAGE DROP THROUGH WIRE IN VOLTS	**1.23**
= LOAD CURRENT THROUGH WIRE IN AMPS	**1.836**

DESIGNED BY ROBERT J. VAUGHAN