

Engineering Introduction

System balancing is essential for any heating/cooling air distribution system to perform to plans and specifications, delivering the required amount of air through each register or diffuser. The terminal velocity is a critical element in system balancing and will have a major effect on the throws listed. The terminal velocity is listed for each product, at the bottom of the engineering charts. Symbols and a glossary of terms and definitions used throughout the engineering catalog can be found on pages 95, 96 & 97.

Method of measurement for a supply:

Using the Alnor series 2220A velometer and jet probe identified on the air measurement supply chart (fig.#1), position the velometer probe flush to the register or diffuser face bars and centered in the opening. Removeable guide fins are provided with the probe to accurately position the probe vertically, horizontally and radially. Obtain at least four (4) face velocity or outlet velocity (V_k) readings in the face areas not to exceed an 6" x 6" area. The average face velocity or outlet velocity in feet per minute (FPM) is used in the equation: $CFM = A_k \times V_k$

Method of measurement for returns:

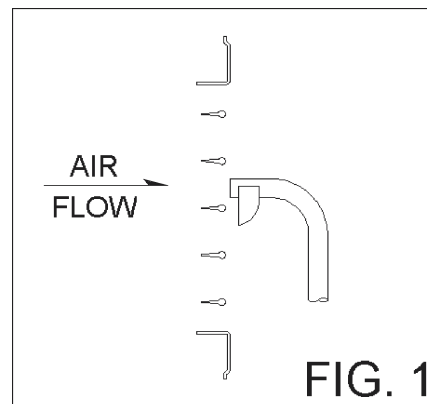
Using the Alnor series 2220A velometer and jet probe identified on the air measurement return chart (fig.#2), position the probe at a distance of 1" from the face of the grille for accurate readings. A position gauge is usually attached to the probe to accurately measure a minimum of four (4) readings.

Applying the Engineering data:

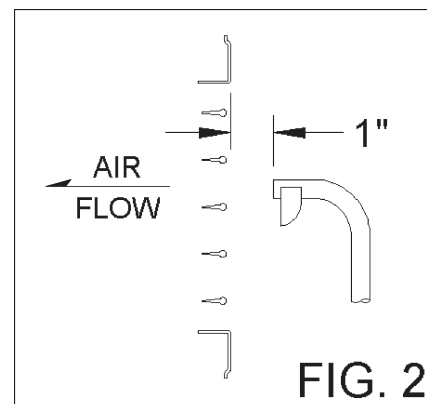
Select the locations and style of registers to be used. Locate the engineering chart for the particular style of register and select a size that delivers the required CFM at a velocity that is recommended for the particular application or throw requirement. Noise increases with increasing velocities. If the CFM is constant an increase in either the register size or the number of registers of a given size will decrease the velocity, throw and related noise.

No single style of supply register or diffuser will provide optimum air distribution for year around air conditioning since the selected register style and outlet for one season will be a compromise for the other season. The success of an air supply system is dependent almost entirely of the location of the supply registers or diffusers. The location of return air grilles is less critical. Return air flow only affects the room air motion in the immediate vicinity of a return air grille.

AIR MEASUREMENT SUPPLY



AIR MEASUREMENT RETURNS



Recommended Velocities/Noise Criteria Chart

RECOMMENDED VELOCITIES

The sound caused by an air outlet in operation is directly proportional to the velocity of the air passing through it. By selecting outlets of proper sizes, air velocities can be controlled within safe sound limits.

The following recommended outlet velocities are within safe sound limits for most applications.

APPLICATIONS	RECOMMENDED VELOCITIES
Apartments	500-750 fpm
Broadcasting studios	500 fpm
Churches	500-750 fpm
General offices	1200-1500 fpm
Hotel bedrooms	500-750 fpm
Industrial buildings	1500-2000 fpm
Legitimate theaters	500-1000 fpm
Motion picture theaters	1000-1250 fpm
Private offices, acoustically treated	500-1000 fpm
Private offices, not treated	1000-1250 fpm
Residences	500-750 fpm
Stores, main floors	1500 fpm
Stores, upper floors	1500 fpm

NOISE CRITERIA CHART

	COMMUNICATION ENVIRONMENT	TYPICAL OCCUPANCY
BELOW NC 25	Extremely quiet environment; suppressed speech is quite audible; suitable for acute pickup of all sounds	Broadcasting studios, concert halls, music rooms
NC 30	Very quiet office; suitable for large conferences; telephone use satisfactory	Residences, theaters, libraries, executive offices, directors' rooms
NC 35	Quiet office; satisfactory for conference at a 15 ft. table; normal voice 10-30 ft.; telephone use satisfactory	Private offices, schools, hotel rooms, courtrooms, churches, hospital rooms
NC 40	Satisfactory for conferences at a 6-8 ft. table; normal voice 6-12 ft.; telephone use satisfactory	General office, labs, dining rooms
NC 45	Satisfactory for conferences at a 4-5 ft. table; normal voice 3-6 ft.; raised voice 6-12 ft.; telephone use occasionally difficult	Retail stores, cafeterias, lobby areas, large drafting & engineering offices, reception areas
ABOVE NC 50	Unsatisfactory for conference of more than two or three persons; normal voice 1-2 ft.; raised voice 3-6 ft.; telephone use slightly difficult	Computer rooms, stenographic pools, print machine rooms, process areas

NC= Noise Criteria rating. NC is based on 10db room absorption (ref. 10-12 watts). • Tested in accordance with ASHRAE 36-72, ADC 1062; GRD84 and ISO 3741.

Terms & Definitions

REGISTER- A grille which is equipped with a damper or control valve, and which directs air in a non-spreading jet.

DAMPER - A device used to control the volume of air passing through a duct by varying the cross-sectional area.

DIFFUSER- An outlet discharging supply air in a spreading pattern.

GRILLE - A louvered covering for an opening through which air passes.

RETURN - Any opening through which air is removed from a conditioned space.

CORE AREA - The total plane of the portion of a grille, face or register bounded by a line tangent to the outer opening through which air can pass. The core area is less than the register size. Example: A 14 x 8 register may have a core that is 1" less than the listed size; therefore the core area is $13 \times 7 = 91$ sq. in.

FREE AREA - The actual measured perpendicular area between the fins of a grille or register which air can pass through.

EFFECTIVE AREA (AK) - The calculated area of an outlet based on the average measured velocity between the fins.

OUTLET VELOCITY - The average velocity of air emerging from the outlet measured in the plane of the outlet in feet per minute (fpm).

JET VELOCITY - The average measured velocity of air passing between the fins.

C.F.M. - A measure of volume of air in cubic feet per minute.

F.P.M. - A measure of air velocity in feet per minute.

TOTAL PRESSURE (PT) - The sum of the velocity and static pressures measured in inches of water.

STATIC PRESSURE (PS) - The outward force of air within a duct measured in inches of water.

VELOCITY PRESSURE (PV) - The forward moving force of air measured in inches of water.

PRESSURE LOSS (WG) - The term used in the register industry to indicate how much total pressure is required to move air through a register.

TERMINAL VELOCITY - The point at which the discharged air from an outlet decreases to a given speed, generally accepted as 50 feet per minute.

THROW - The distance, measured in feet, that the air stream travels from the outlet to a point where the terminal velocity of 50 feet per minute occurs.

RADIUS OF DIFFUSION - The horizontal distance (in feet) from the diffuser to a point where the terminal velocity of 50 feet per minute occurs.

SPREAD - The maximum total width (in feet) of the air pattern at the point of terminal velocity.

DROP - The vertical distance (in feet) between the base of an outlet and the bottom of the air stream at the end of the horizontal throw.

INDUCTION - The process of drawing room air into the projected air stream because of the velocity of the projected air stream (sometimes called aspiration).

NOISE CRITERIA (NC) - a single number noise rating system that indicates what broad band, continuous sounds are reasonably acceptable.

Symbols

CFM	Volume (in cubic feet per minute)
FA	Free Area (in sq. in.)
PL	Total pressure loss (in w.g.)
FPM	Feet per minute
AN	Neck area (in sq. ft.)
PS	Static pressure
Face Velocity	The average calculated velocity (in fpm)
Throw	Throw (in fpm)
Spread	The horizontal distance of the air pattern (in fpm)
AK	Effective area (in sq. ft.)
NC	Noise criteria

NOTE: This guide is meant for use as a general reference guide only.

Continental Register Co. assumes no liability or responsibility as to accuracy or omissions.

CONTINENTAL REGISTER * METALINE, established in 1955, along with **AUER REGISTER**, purchased in 1997, takes pride in manufacturing the best value registers and grilles for both residential and light commercial needs in the warm air heating and air conditioning industry.

In the event that our products or any parts thereof should prove to be defective in material or workmanship, under normal use and service, we will repair or replace, at our option, whatever is necessary to eliminate the defect. We assume no responsibility for incidental or consequential damages arising from defective products. Nor do we assume any responsibility for failures, breakage, or cost which results from abuse, abnormal use, misuse, negligence or accident or causes other than the above described. Except as stated above, we make no warranties, either expressed or implied, as to any matter whatsoever, including, without limitation, the condition of our products, their merchantability or fitness for any particular purpose.



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