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**AMERICAN NATIONAL STANDARD**  
**Estimating Airblast Characteristics for Single Point**  
**Explosions in Air, With a Guide to Evaluation of**  
**Atmospheric Propagation and Effects**

**ABSTRACT**

This standard provides consensus quantitative definitions of explosion characteristics for a single point explosion in air, along with methodologies for scaling these characteristics for a wide range of yield and ambient air conditions. Factors for use with common solid explosives are also included. Methods are provided for predictions of long range propagation under atmospheric refractive influences. Target damage estimation procedures are provided for use in explosion operation planning and evaluation.

## AMERICAN NATIONAL STANDARDS ON ACOUSTICS

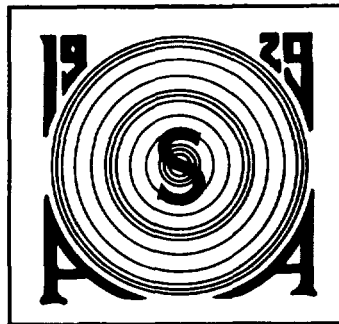
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## FOREWORD

[This Foreword is not a part of American National Standard Estimating Airblast Characteristics for Single Point Explosions in Air, with a Guide to Evaluation of Atmospheric Propagation and Effects, S2.20-1983 (ASA Catalog No. 20-1983).]

This standard is the first in a planned series of definitions, standards, and specifications for use in airblast acoustics. It has been developed under the American National Standards Institute by the Standards Committee Method of Procedure under the American National Standards Committee S2, whose Secretariat is held by the Acoustical Society of America.

American National Standards Committee S2, under whose jurisdiction this standard was developed, has the following scope:

Standards, specifications, methods of measurement and test, and terminology, in the fields of mechanical shock and vibration, but excluding those aspects which pertain to biological safety, tolerance, and comfort.

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Suggestions for improvements in this standard will be welcomed. They should be sent to the Standards Secretariat, Acoustical Society of America, 335 East 45th Street, New York, NY 10017.

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# American National Standard

## Estimating Airblast Characteristics for Single Point Explosions in Air, With a Guide to Evaluation of Atmospheric Propagation and Effects

### 1 SCOPE

This standard is intended to provide methods for determining blast wave characteristics for single point or spherical explosions, estimating the variations of characteristics caused by the atmospheric medium of propagation, and predicting the expected effects on populations and structures. It applies to chemical or nuclear explosions, of yields ranging from about 1 kg to many megatons, at burst heights to at least 50 km altitude, and to distances where wave pressure amplitudes drop below 1 Pa. The phenomenology is less well defined for many practical explosions of distributed charges or shapes, wholly or partially confined explosions, either underground or underwater. In many cases, however, these effects may be normalized and an equivalent point explosion used for evaluation.

### 2 DEFINITIONS OF SYMBOLS AND ABBREVIATIONS

#### 2.1 Quantity Symbols

$A_i$	= constant coefficients ( $i = 1, 2, 3$ )
$c$	= sound speed in air
$C$	= cost of damage repairs
$F$	= atmospheric blast focus factor, or magnification, referenced to spherical wave expansion
$\bar{F}$	= geometric average blast focus factor
$h$	= height above ground
$I$	= blast overpressure impulse
$I_d$	= dynamic-pressure impulse
$K$	= proportionality constant
$K_r$	= airblast overpressure reflection factor
$N$	= population (human)
$p$	= ambient air pressure
$p_0$	= sea level standard air pressure
$p_k$	= peak-to-peak pressure amplitude in the blast wave

$\Delta p$	= peak blast overpressure, or maximum positive deviation from ambient pressure in the blast wave
$\Delta p_-$	= negative peak blast pressure
$\Delta p/p$	= shock strength
$\Delta p(P)$	= overpressure causing $P$ percent probability of window damage
$P$	= probability of damage
$Q$	= number or quantity
$R$	= slant range from the center of explosion
$R_1$	= slant range to nearest vulnerable residence
$t$	= time
$t_d$	= blast wave arrival time after detonation
$t_r$	= compression rise time
$t_+$	= positive phase duration in explosion wave
$t_-$	= negative phase duration in explosion wave
$T_C$	= temperature (Celsius)
$T_K$	= temperature (Kelvin)
$V$	= sound velocity (directed)
$W$	= explosion energy yield
$W_a$	= apparent airblast yield
$x, y$	= Cartesian horizontal coordinates
$\theta$	= blast ray incidence angle, measured from the horizontal
$\sigma_G$	= geometric standard deviation

#### 2.2 Unit symbols

Pa	= pascal (N/m <sup>2</sup> )
K	= kelvin
kg	= kilogram
m/s	= meters per second