

REGULATION II^{1 2 3}

AIR CONTAMINANT AND PARTICULATE MATTER EMISSIONS

SECTION I.

A. In addition to the previous citations, these Regulations are adopted pursuant to Title 3, Air Management Code, which ~~reads~~provides in part as follows:

1. ~~"Section 3-202,~~ Open Fires.

~~No person shall ignite, burn or permit the continuation of the burning of garbage, refuse, or other waste material, demolition materials, leaves, grass, weeds, trees, batteries, wire, tires, cars, vehicles, or parts thereof, or any other combustible material in an open fire.~~

~~Any open burning for salvage purposes is prohibited. This requirement shall not apply to outdoor home cooking. A special exception may be made by order of the Commissioner of Health where the Fire Commissioner certifies an emergency exists which endangers the public safety, and the Health Commissioner finds that no practical alternative method of disposal of hazardous or flammable material exists. The conditions for allowing open fires shall be approved by both the Health and Fire Commissioners."~~

2. ~~"Section 3-302,~~Power, Powers and Duties of the Air Pollution Control Board.

The Air Pollution Control Board shall have the following powers and duties:

(1) To promulgate regulations, implementing this Title, preventing degradation of air quality, preventing air pollution,~~eliminating air pollution~~ nuisances~~,~~ and~~,~~ limiting, controlling, or prohibiting the emission of air contaminants to the atmosphere from any sources. Such regulations may include, but are not limited to, the following:

¹ Adopted April 1, 1970 by the Air Pollution Control Board. Approved April 1, 1970 by the Board of Health; April 15, 1970 by the ~~Law Department of Law~~; April 29, 1970 by the Department of Records.

² Adopted June 2, 2016 by the Air Pollution Control Board. Approved June 8, 2016 by the ~~Law Department of Law~~; August 11, 2016 by the Department of Records.

³ ~~Adopted _____, 2018 by the Air Pollution Control Board. Approved _____, 2018 by the Department of Law; _____, 2018 by the Department of Records.~~

~~Such regulations may include, but are not limited to, the following:~~

- (a) The concentration, volume, weight, and other characteristics of emissions of air contaminants ~~to the~~ the atmosphere, the circumstances under which such emissions are permitted, and the degree of control of emissions of air contaminants required;
- (b) the emissions of air contaminants to the atmosphere and related actions which are prohibited;
- (c) the types and kinds of control measures and actions, equipment, storage and handling facilities, processes and systems, including specifications and/or performance requirements, which may be required to control or eliminate emissions of air contaminants to the atmosphere;
- (d) the characteristics of fuels and wastes which may be combusted in the city, insofar as such characteristics may affect the emissions of air contaminants to the atmosphere;
- (e) the density, opacity and duration of discharges and emissions of air contaminants to the atmosphere which obscure and reflect light, and the establishment of methods for evaluating density, opacity, ~~opacity,~~ equivalent opacity or density~~."~~.

- B. These Regulations control, and/or prohibit, the discharge or escape of certain air contaminants and particulate matter in the atmosphere.

SECTION II. OPEN FIRES

- A. No person shall ignite, burn or permit the continuation of the burning of garbage, refuse, or other waste material, demolition materials, leaves, grass, weeds, trees, batteries, wire, tires, cars, vehicles, or parts thereof, or any other combustible material in an open fire. Any open burning for salvage purposes is prohibited. Any person who operates, owns or controls premises where junk cars, demolition materials, refuse or other salvaged or waste materials are stored, processed or deposited, shall take all necessary measures to prevent fires and to extinguish any fires which may occur. Fire prevention measures shall include, among others, security measures to exclude unauthorized persons from entering upon the premises.

If a fire occurs when the premises are unattended, the Department may order fencing and/or a watchman to be employed by the owner, operator, or other person who controls the premises, for periods, when there are no other attendants.

- B. It shall be *prima facie* evidence that the person who owns or controls property on which open burning occurs has caused or permitted said open burning.

SECTION III. TOXIC OR RADIOACTIVE AIR CONTAMINANTS

The discharge of toxic or radioactive air contaminants is regulated under the provisions of Air Management Regulation VI, Control of Emissions of Toxic Air Contaminants.

SECTION IV. VISIBLE EMISSIONS

1. No person shall discharge into the atmosphere from any single source of emission whatsoever any air contaminant, except uncombined water,
 - a. for a period or periods aggregating more than three minutes in any one hour which
 - (1) is equal to or darker in shade than that designated as No. 1 on the Ringelmann Chart, as published by the U. S. Bureau of Mines, or
 - (2) is equal to or darker than a comparable standard using such other charts or devices as the Department determines to be equivalent thereto; or
 - b. for any period, which is equal to or darker than No. 3 on the Ringelmann Chart, or its equivalent; or
 - c. of such opacity as to obscure an observer's view to an equal or greater degree than either (a) or (b) above;
 - d. The provisions of (a) above, do not apply to incinerators. Incinerators are regulated under the provisions of Air Management Regulation XI, Control of Emissions from Incinerators.

2. The provisions of (1) above shall apply to visible emissions of air contaminants that are white, black, shades of grey or colored.
3. Trained employees certified by the Department may make observations to determine compliance with the provisions of (1) and (2) above without direct reference to standards.

SECTION V. PARTICULATE MATTER EMISSIONS FROM THE BURNING OF FUELS

No person shall cause, suffer, allow or permit to escape or to be discharged into the atmosphere any particulate matter resulting from the combustion of fuels in excess of the following rates:

1. From ~~exit~~existing units legally constructed or installed under provisions in effect prior to the adoption of these Regulations, particulate matter emissions shall not exceed 0.20 pounds per million BTU gross heat input, except as provided below.
2. From units constructed or installed after the effective date of this Regulation, and any units not covered by (1) above, particulate matter emissions shall not exceed 0.10 pounds per million BTU gross heat input.
3. From existing units burning anthracite coal for space heating purposes subject to Section III(A)(2)(c) of Regulation III, particulate matter emissions shall not exceed the applicable limits set forth in Chapter 123, Standards for Contaminants, Section 123.11, Particulate Matter Emissions-Combustion Units, of the Pennsylvania Air Pollution Control Regulations.
4. From existing industrial units approved by the Department pursuant to Section III(A.3) of Regulation III for conversion to coal as an alternative or supplemental fuel, particulate matter emissions shall not exceed 0.12 pounds per million BTU gross heat input after July 1, 1980, and 0.06 pounds per million BTU gross heat input after July 1, 1984.
5. This section does not apply to motorized vehicles nor to incinerators.

SECTION VI. SELECTION OF FUEL FOR PARTICULATE MATTER EMISSION CONTROL

The fuel used shall be compatible with the burning equipment and the furnace or boiler. Where there occur repeated violations of Sections IV or V, above, the Department may order the use of a specific alternate fuel.

SECTION VII. PARTICULATE MATTER EMISSIONS FROM CHEMICAL, METALLURGICAL, MECHANICAL AND OTHER PROCESSES

No person shall cause, suffer, allow or permit the discharge, emission or escape of particulate matter into the atmosphere from chemical, metallurgical, mechanical or other processes for any one hour period in excess of the amount shown in Table I.

SECTION VIII. FUGITIVE DUST

No person shall cause or permit the handling, transporting, storing or disposing of any substance or material which is likely to be scattered by the wind, or is susceptible to being wind-borne, without taking effective precautions or measures to prevent air contamination. No person shall operate or maintain, or allow or cause to be operated or maintained, any premises, open area, right of way, storage piles, or vehicle~~s~~; or any construction, alterations, demolition, or wrecking operation~~s~~; or any other ~~enterprises,enterprise~~ which involves any material or substance likely to be scattered by the wind, or susceptible to being wind-borne, without effective precautions or measures to prevent air contamination. No person shall maintain, conduct, or use, or cause to be maintained, conducted, or used, any parking lot~~s~~; or similar ~~areasarea~~, unless the lot, area, or roadway is maintained in such manner as to prevent air contamination.

SECTION IX. CONTROL OF DUST FROM CONSTRUCTION AND DEMOLITION ACTIVITIES

Notwithstanding Sections IV., VII., and VIII~~-.2~~ of this Regulation governing visible, particulate, and fugitive dust emissions, the following requirements apply specifically to construction and demolition.

- A. Public Notification of Construction and Demolition Activities to Occupants of Nearby Properties

1. The owner or operator of construction or demolition activity, where the structure being constructed or demolished is less than two (2) stories in height shall:
 - a. ~~Not~~No less than ten (10) days before commencing construction, or demolition activities, distribute written notification that: (1) identifies the owner and ~~or~~ operator of the construction or demolition activity; (2) identifies the construction contractors working on the site; (3) states the date(s) and duration of the construction or demolition activity; (4) identifies dust control measures that will be used on the ~~work site;~~ worksite; (5) ~~advises recipients to take precautionary measures to minimize dust exposure;~~ and (6) includes contact information for the Department. The written notification must be ~~made on a form prescribed by the Department and must be~~ distributed to the occupants of properties that are immediately adjacent to the ~~work site~~ worksite.
2. The owner or operator of ~~construction or demolition~~ any earthworks activity, or any construction or demolition activity where the structure being constructed or demolished is greater than or equal to two (2) stories in height shall:
 - a. ~~Not~~No less than ten (10) days before commencing earthworks, construction, or demolition activities, distribute written notice that: (1) identifies the owner and operator of the construction or demolition activity; (2) identifies the construction contractors working on the site; (3) states the date(s) and duration of the construction or demolition activity; (4) identifies dust control measures that will be used on the ~~work site;~~ and worksite; (5) ~~advises recipients to take precautionary measures to minimize dust exposure ;~~ and (6) includes contact information for the Department. The written notification must be ~~made on a form prescribed by the Department and, at a minimum, must be~~ distributed to the occupants of the three (3) nearest properties on either side of the ~~work site~~ worksite, the seven (7) nearest properties across the street from the ~~work site~~ worksite, and the seven (7) nearest properties to the rear of the ~~work site~~ worksite.
3. If construction or complete demolition is to be performed to correct unsafe or imminently dangerous conditions ~~on the property~~ as determined by the Department of Licenses and Inspections, the public notice requirements of

Section IX.A.1.-2. of this Regulation must be ~~complied with~~completed as early as possible before commencement of such construction or demolition activities.

4. Copies of any written notification required by this Section must be retained at the ~~work site~~worksite by the owner and operator, and otherwise be available for inspection by the Department. For any demolition, implosions, or earthworks performed pursuant to a Dust Control Permit issued under Section IX.B. of this Regulation, a copy of the written notification must be submitted to the Department no less than ten (10) days before such work begins.
5. The public notification requirements of Section IX.A. of this Regulation do not apply to the following activities:
 - a. Construction, installation, or repair of ~~buildings'~~ structural beams, load bearing supports, walls, ceilings, floors, mechanical systems, electrical systems, plumbing, fixtures, cabinets, shelves, countertops, appliances, and other interior finishing work when such construction ~~or~~ installation, or repair will occur in a completely enclosed space or structure that is not open to the outside air.
 - b. Demolition or removal of ~~buildings'~~ structural beams, load bearing supports, walls, ceilings, floors, mechanical systems, electrical systems, plumbing, fixtures, cabinets, shelves, countertops, and other interior finishing work when such ~~construction~~demolition or ~~installation~~removal will occur in a completely enclosed space or structure that is not open to the outside air.
 - c. Installation or removal of portable units, ~~including:~~ ventilation equipment, heating appliances, cooling units, evaporative coolers, clothes drying appliances, and fuel cell appliances that are not connected to a fixed piping system and are not interconnected to a power grid.
 - d. Installation or removal of steam, hot or chilled water piping within any heating or cooling equipment regulated by Title 4 of The Philadelphia Code, known as the "Philadelphia Building Construction and Occupancy Code."
 - e. Construction or demolition of water tanks supported directly on grade where the tank capacity does not exceed five thousand (5,000)

gallons and the ratio of height to diameter or width does not exceed 2-to-1.

- f. Construction, demolition, or repair of utility infrastructure (sewer, electrical, water, telecommunications), street furniture, sidewalks, surface streets, tunnels, bridges, and other similar structures within the public right-of-way.
- g. Replacement of exterior stairs, ramps, platform lifts, steps and landings accessory to a one- or two-family dwelling; provided that the ~~replaced structure~~ replacement does not exceed 6 feet in vertical height; and does not encroach upon the public right-of-way; and the landing does not have a surface area greater than 36 square feet, with no individual dimension greater than 6 feet. This exclusion does not ~~require~~ provide for vertical enclosure of the covered element(s) except guards required by the Philadelphia Building Construction and Occupancy Code.
- h. Construction or demolition of sidewalks, driveways, patios, and similar concrete or other hard surface materials constructed on grade where they are not part of an accessible route. This exception includes decks of any material, ~~if that are~~ if that are accessory to Group R-3 occupancies where the deck is located not more than twelve (12) inches above the ground surface below and is not over a story or basement.
- i. Installation or removal of non-masonry fences that do not exceed six feet in height.
- j. Construction or demolition of masonry fence walls that do not exceed two feet in height.
- k. Construction or demolition of retaining walls that do not exceed two feet in height measured from the lowest level of grade to the top of the wall. This exemption does not ~~include~~ apply to retaining walls that support surcharges or impound Class I, II or III-A liquids.
- l. Installation of window awnings that are supported solely by, and do not project more than fifty-four (54) inches from, the exterior wall of buildings containing Group R-3 or Group U occupancies.

- m. Replacement of non-fire-resistant rated windows and doors in one- and two-family dwellings without structural change (no change in shape or size of existing openings).
- n. Installation or removal of prefabricated swimming pools accessory to Group R-3 occupancies; where the pool is less than twenty-four (24) inches deep, does not exceed five thousand (5,000) gallons and is installed entirely above ground.
- o. Installation or removal of shade cloth structures constructed for nursery or agricultural purposes that do not include service systems.
- p. Installation or removal of swings, playground equipment, and structures limited to the use of a household pet, accessory to Group R-3 occupancies.
- q. Construction or demolition of temporary motion picture, television, ~~and/or~~ theater stage sets and scenery.
- r. Demolition of a structure or building to be performed at the ~~work site~~worksite via implosion; in compliance with the blasting operation guidelines promulgated by the Office of Emergency Management.
- s. Any other construction or demolition activity that the Department determines to be unlikely to release dust into the outside environment.

B. Dust Control Permits

1. Notwithstanding the public notification requirements set forth in Section IX.A. of this Regulation, no person shall -
 - a. completely demolish ~~a~~any building or structure that is more than three (3) stories, greater than forty (40) feet tall; or encompasses more than ten thousand (10,000) square feet; ~~or~~
 - b. completely or partially demolish any building or structure by implosion; or
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c. engage in earthworks as defined in Air Management Regulation I;

without first obtaining a permit from the Department.

2. The Department will not issue a permit pursuant to Section IX.B. of this Regulation unless and until the applicant has met all of the following requirements:
 - a. For demolitions and earthworks specified in ~~Section~~Sections IX.B.1.a. and 1.c. of this Regulation, applicant must submit to the Department a permit application accompanied by the fee required pursuant to Section 3-307(f) of the Air Management Code. The permit application shall include:
 - (1) the name, address, and telephone number of the construction contractor or other person responsible for the demolition;
 - (2) the name, address, and telephone number of the building or structure owner;
 - (3) the address and function (e.g. hospital, office, school, etc.) of the building or structure;
 - (4) a description of the anticipated demolition or earthworks activity, and the various procedures and related equipment that will be used to comply with work practices and requirements established by Section IX.C. of this Regulation, and any Alternative Methods Requests made pursuant to Section IX.E of this Regulation;
 - (5) scheduled starting and completion dates for the project; and
 - (6) any other information which the Department may require.
 - b. For implosions specified in Section IX.B.1.b. of this Regulation, applicant must submit to the Department a permit application accompanied by the fee pursuant to Section 3-307(f) of the Air Management Code at least ninety (90) calendar days prior to the scheduled starting date of the implosion. The permit application ~~shall~~must include:

- (1) the name, address, and telephone number of the construction contractor or other person responsible for the implosion;
 - (2) the name, address, and telephone number of the building or structure owner;
 - (3) the address and function (e.g. hospital, office, school, etc.) of the building or structure;
 - (4) a description of the anticipated implosion activity, and the various procedures and related equipment that will be used to comply with work practices and requirements established by Section IX.C. of this Regulation, and any Alternative Methods Requests made pursuant to Section IX.E of this Regulation;
 - (5) plans for conducting air sampling, dust sampling, and post-implosion dust cleanup that comply with the requirements set forth in Section IX.D. of this Regulation;
 - (6) scheduled starting and completion dates for the implosion activity; and
 - (7) any other information which the Department may require.
3. A copy of any Dust Control Permit issued pursuant to Section IX.B. of this Regulation ~~shall~~must be retained at the ~~work site~~worksite and be available for inspection by the Department.

C. General Work Practice Standards

1. Emission of dust into the outdoor atmosphere from construction, demolition, and earthworks worksites, where such dust is visible at the point that it passes beyond the property line of said worksites, is prohibited.
- ~~1.2.~~ No person shall engage in any cutting, sawing, grinding, wrecking, smashing, or ~~mechanically~~mechanical breaking of construction materials ~~—without the on a worksite open to the outdoor air, absent~~ use of ~~at least one~~ or more of the following dust control methods:

- a. ~~Grinders~~use of grinders, saws, or other power tools equipped with Dust Collection / Extraction Systems; All such tools and Dust Collection / Extraction Systems must be used in accordance with manufacturer recommendations; ~~or~~.
- b. ~~Adequately wetted~~Ensuring that construction materials or structure surfaces are adequately wetted, weather permitting (e.g. > thirty two (32) Degrees Fahrenheit at source of dust emission).

2.3. The requirements of Section IX.C.42.a. of this Regulation notwithstanding, dry abrasive blasting of exterior surfaces, building facades, and other surfaces open to the outdoor air is prohibited when the temperature at point of abrasive blasting is > thirty two (32) Degrees Fahrenheit. When the temperature at point of abrasive blasting is ≤ thirty two (32) Degrees Fahrenheit, dry abrasive blasting of exterior surfaces, building facades, and other surfaces open to the outdoor air will only be permitted only with the erection of a temporary enclosure, maintained under negative air pressure and equipped with a Dust Collection / Extraction System, is erected around the immediate work area.

4. No construction material or debris shall be dropped more than twenty (20) feet to any point lying outside of the exterior walls of a building or outside of a structure, except through the use of a materials chute. All materials chutes, or sections thereof, shall be entirely enclosed, except for openings equipped with closures at or about floor level for the insertion of materials. At all stories below the top floor, such openings shall be kept closed when not in use. Chutes shall be designed and constructed of such strength as to eliminate failure due to impact of materials or debris loaded therein. To prevent dust emissions at the exit of the materials chute, all construction material or debris dropped through a materials chute must be adequately wetted to prevent dust emissions. Alternatively, the material chute exit must be sealed against the top of an appropriate container to prevent dust emissions.

5. Water, or other dust suppressants approved by the Department, must be applied to all worksites with ongoing filling, grading, excavation, land clearing, grubbing, or earthworks activities open to the outdoor air to prevent dust emissions. Application of water as the sole dust suppression agent is prohibited when the temperature drops below thirty two (32) Degrees Fahrenheit at source of dust emission.

- ~~6.~~ Dust control fabric must be securely attached to any temporary worksite perimeter fencing. The dust control fabric material shall be a minimum of five feet in height as measured from the bottom of the perimeter fence, and have a minimum blockage of 50%.
- ~~3.7.~~ Debris generated from earthworks, construction, and demolition activities must be adequately wetted and covered before being transported from the site worksite.
- ~~4.8.~~ ConstructionAny soil, sand, aggregate, or other similar construction materials that are stored on sitea worksite open to the outdoor air must be adequately wetted and covered when possible to prevent dust emissions.
- ~~5.~~ Roadways on the site, and all vehicle access points to the site, must be adequately wetted and swept of materials that will give rise to dust emissions.
- ~~6.9.~~ Sufficient drainage must be provided to prevent the uncontrolled discharge of water or other liquid applied to the site for dust control.
- ~~10.~~ A 10-mph speed limit shall be observed by all equipment and trucks traveling within the worksite.
- ~~11.~~ All roadways on the worksite, and all vehicle access points to the site, must be adequately wetted and swept of materials that will give rise to dust emissions. Vehicle access points must be equipped with dust track out prevention measures (e.g. wheel wash systems, rumble grates, and / or gravel pads).
- ~~7.12.~~ The Department may promulgate Guidelines to establish new work practice requirements, or to clarify existing work practice requirements outlined in this Regulation.

D. Implosion Demolition Requirements

1. Air and Dust Sampling – No person mayshall demolish any building or structure via implosion without conducting sampling that demonstrates the impact of implosion-generated dust in the Dust Impact Zone for the blasting site. Factors including, but not limited to, the location of the blasting site, the condition and use of the various properties around the blasting site, the structure or building to be demolished (e.g. area, height, construction, and age) via implosion, and the prevailing wind direction at the blasting site must

be accounted for when designating the Dust Impact Zone, and the sampling locations within.

- a. At minimum, eight (8) sampling locations spread out within the Dust Impact Zone must be identified. Air and dust wipe samples must be taken at each of the location as follows:
 - (1) Twenty Four – Forty Eight (24-48) Hours Before Implosion – airborne respirable dust sampling, airborne asbestos sampling, and dust wipe samples.
 - (2) Immediately Before Implosion – airborne respirable dust and airborne asbestos sampling only.
 - (3) Fifteen (15) Minutes After Implosion – airborne respirable dust and airborne asbestos sampling only.
 - (4) Fifteen – One Hundred Twenty (120) Minutes After Implosion – airborne respirable dust sampling, airborne asbestos sampling, and dust wipe samples.
- b. All airborne asbestos samples required by Section IX.D.1.a. of this Regulation ~~shall~~must be taken and analyzed in accordance with National Institute for Occupational Safety and Health (NIOSH) Method 7402 or Environmental Protection Agency (EPA) Interim Electron Transmission Microscopy Analytical Method, 40 C.F.R. § 763, Subpart E, Appendix A. Analysis of these samples ~~shall~~must be completed by an analytical testing laboratory certified pursuant to § 6-604(3) of The Philadelphia Code.
- c. All dust wipe samples required by Section IX.D.1.a. of this Regulation ~~shall~~must be taken from window ledges in the vicinity of previously identified sampling locations and analyzed for lead content pursuant to EPA Method SW846/7420 by an accredited laboratory that participates in the Environmental Lead Proficiency Analytical Testing Program or the National Lead Laboratory Accreditation Program.
- d. All airborne respirable dust samples ~~shall~~must be taken and analyzed in accordance with an applicable NIOSH, EPA, Occupational Safety

and Health Administration (OSHA) method, or other equivalent method approved by the Department.

- e. Analysis of all airborne respirable dust, airborne asbestos, and dust wipe sample results ~~shall~~must be submitted to the Department as promptly as possible, but no later than forty eight (48) hours following the implosion event.

2. Post- Implosion Demolition Dust Clean Up

- a. Debris piles on the implosion site shall be adequately wetted as soon as practicable after the implosion event, to suppress dust formation.
- b. All properties, buildings, and sidewalks around the ~~work~~worksite that are impacted by implosion-generated dust shall be cleaned with water applied via hand sprayers.
- c. All streets around the ~~work-site~~worksite impacted by implosion generated dust ~~shall~~must be cleaned with water and swept as necessary.
- d. Discharge of water applied for dust control or post-implosion dust clean up pursuant to this Section into the City sewer system is prohibited.

E. Alternative Method Requests

The Department may approve alternative methods for dust control during construction and demolition activities. Any request for approval of alternative dust control measures shall include the reasons for not using the methods prescribed by Section IX.C.-D. of this Regulation, and descriptions of the proposed alternative methods.

F. Air Monitoring and Dust Sampling

The Department may require air monitoring and/or dust sampling during the performance of any filling, grading, excavation, land clearing, grubbing, earthworks, construction, or demolition activities at a worksite to verify that soil and other contaminants at the worksite will not have adverse impacts beyond the property line.

TABLE 1

Process Wt. /hr. (lbs.)	Maximum Weight Disch. /hr. (lbs.)	Process Wt. /hr. (lbs.)	Maximum Weight Disch. /hr. (lbs.)
50	.24	3300	5.36
100	.46	3400	5.44
150	.66	3500	5.52
200	.85	3600	5.61
250	1.03	3700	5.69
300	1.20	3800	5.77
350	1.35	3900	5.85
400	1.50	4000	5.93
450	1.63	4100	6.01
500	1.77	4200	6.08
550	1.89	4300	6.15
600	2.01	4400	6.22
650	2.12	4500	6.30
700	2.24	4600	6.37
750	2.34	4700	6.45
800	2.43	4800	6.52
850	2.53	4900	6.60
900	2.62	5000	6.67
950	2.72	5500	7.03
1000	2.80	6000	7.37
1100	2.97	6500	7.71
1200	3.12	7000	8.05
1300	3.26	7500	8.39
1400	3.40	8000	8.71
1500	3.54	8500	9.03
1600	3.66	9000	9.67
1700	3.79	10000	10.00
1800	3.91	11000	10.63
1900	4.03	12000	11.28
2000	4.14	13000	11.89
2100	4.24	14000	12.50
2200	4.34	15000	13.13
2300	4.44	16000	13.74
2400	4.55	17000	14.36
2500	4.64	18000	14.97
2600	4.74	19000	15.58
2700	4.84	20000	16.19

2800	4.92	30000	22.22
2900	5.02	40000	28.3
3000	5.10	50000	34.3
3100	5.18	60000	40.0
3200	5.27	or more	