AIR FORCE MANUAL
NO. 127–100G

DEPARTMENT OF THE AIR FORCE
Washington, *8 September 1967*

Safety

EXPLOSIVES SAFETY MANUAL

AFM 127–100, 20 April 1964, is changed as follows, and implements DOD Instruction 4145.25, 7 April 1967:

1. Pen and Ink Changes:

Page	*Paragraph*	*Line*	*Action To Take*
2–3	0206	24	Change "500 foot intervals" to "500 foot intervals or less."
3–2	0302.6(1)	5	Change "to the extending" to "to and extending"
5–2	0502.	1	Change "0502. Limitations" to "0502.2 Limitations".
5–14.1	Fig 5–1	Page No.	Change page number from "5–14.1" to "5–12.1" and insert in proper order.
6–5	0615	Last	Add "See para 0612" at the end of the paragraph
7–3	0711.5(3)	7	Change "AFM 32–3" to AFM 127–101.
7–12	0714.3	6, 7	Change "an unbarricaded aboveground" to "an aboveground"
8–6.2	0812	5	Change "AFM 32–3" to AFM 127–101.

2. Page Changes:

Remove		*Insert*
Page	*Date*	*Page*
2–8.1, 2–8.2	1 Feb 67	
2–9, 2–10	7 Sep 66	
2–10.1	27 May 65	2–9 thru 2–10.3
3–3, 3–4	27 May 65	3–3 thru 3–4.1
5–5 thru 5–6.1	7 Sep 66	5–5 thru 5–6.4
5–13, 5–14	7 Sep 66	
5–15, 5–16	9 Nov 64	5–13 thru 5–16
5–26.5 thru 5–26.9	7 Sep 66	5–26.5 thru 5–26.9
6–2.1	27 May 65	
6–3, 6–4	20 Apr 64	6–3 thru 6–4.1

3. New or Revised Material. Indicated by ★.

4. Filing. After necessary action, file change sheet in back of the manual.

DISTRIBUTION: S

BY ORDER OF THE SECRETARY OF THE AIR FORCE

J. P. McCONNELL, *General, USAF*
Chief of Staff

OFFICIAL

R. J. PUGH, *Colonel, USAF*
Director of Administrative Services

2. All information necessary to prompt and thorough consideration will be provided, as required for normal renewals under para 0209.5(1).

3. Extended waivers or "permanent" waivers will cover only the conditions stated in the original request and will automatically expire when such conditions change.

4. All details of each approved extended or "permanent" waiver case will be maintained by appropriate echelons as long as the waiver or exemption is in effect (paras 0209.1, 0209.2 (3)).

5. Major commands will insure that all extended and permanent waivers are reviewed periodically but not less than yearly. This review will determine whether corrective action has become feasible or whether the waiver should continue.

0209.6 *Cancellation.* When a waiver has been eliminated, the approving authority will be notified through normal channels, with an information copy to HQ USAF, Director of Aerospace Safety (AFIAS-G), Norton AFB CA 92409.

0210 Explanation of Terms. The following definitions are simple descriptions of terms and phrases commonly used in conjunction with explosives. These are listed to provide a degree of uniformity of description in the use of technical information throughout the manual.

0210.1 *Administration Areas.* The area in which administrative offices for the entire establishment are located. This area differs from that directly associated with and a part of the explosives area, such as an ammunition operations office.

★**0210.1.1** *Aircraft Explosives Cargo Parking Area.* See para 0210.20(1).

0210.2 *Ammunition Maintenance Shop.* A special building equipped to permit the servicing, repair and care of explosives items.

0210.3 *Ammunition Operations Office.* Any office, exclusive of the main administrative area, adjacent to or within an explosives area, in which operational administrative functions pertaining to explosives are performed.

0210.4 *Auto-Ignition Temperature.* The minimum temperature that combustible materials in contact with air will ignite, without an ignition source, and will continue to support combustion.

0210.5 *Auxiliary Building.* Any building that supplements an operational building, line or area, but which is not directly used for the productive activity. Examples of such auxiliary buildings are fan houses, valve houses and similar units.

0210.6 *Barricade.* An intervening barrier, natural or artificial, of such type, size and construction as to limit in a prescribed manner the effect of an explosion on nearby buildings or exposures.

0210.7 *Biological Warfare (BW).* The military use of biological agents to produce death or disease in man, animals, and growing plants.

0210.8 *Change House.* A building provided with facilities for employees to change to and from work clothes. Such buildings may be provided with sanitary facilities, drinking fountains, lockers, and eating facilities.

0210.9 *Chemical Munitions.* Ammunition such as bombs, projectiles, grenades, or the like, containing a chemical agent(s). Such agents include war gases, smokes, and incendiaries.

0210.10 *Classification Yard.* A group of railroad tracks used for receiving, shipping and switching rail cars containing explosives.

★**0210.10.1** *Combat Aircraft Parking Area.* See para 0210.20(2).

0210.11 *Deflagrate and Detonate*:

(1) *Deflagrate.* A rapid burning action that consumes an explosives mass at a rate less than that normally considered to be a detonation. Propellants would normally fall within this category.

(2) *Detonate.* A very rapid decomposition of the mass, normally at speeds upward of 1500 feet a second. High explosives (para 0210.39) would fall within this category.

0210.12 *Demilitarize.* To mutilate, disarm or accomplish any other action required to render explosives unusable for military use.

0210.13 *Dustproof.* Constructed or protected so that dust will not interfere with its successful operation.

0210.14 *Dust Tight.* Constructed so that dust will not enter the enclosing case.

0210.15 *Electrical Equipment.* A general term including apparatus,, appliances, devices, wiring, fixtures, fittings, material, and the like, used as a part of or in connection with an electrical installation.

0210.16 *Electro-Explosives Device.* Any explosives device, such as: blasting caps, squibs, switches, valves, igniter, etc., which is designed to be initiated by an electric current.

0210.17 *Electro-Magnetic Radiation.* An energy wave consisting of electric and magnetic lines of force, as a radio wave.

0210.18 *Explosion Proof.* The term explosion proof as used in connection with electrical equipment means that such equipment is enclosed in a case which is capable of withstanding an internal burning or explosion of elements contained inside the case and prevent ignition by spark, flash or explosion of any outside gas or vapor surrounding the enclosure.

0210.19 *Explosives.* Includes all ammunition, biological and chemical fillers, demolition material, solid rocket motors, liquid propellants, cartridges, pyrotechnics, mines, bombs, grenades, warheads of all types, explosive elements of ejection and aircrew egress systems, explosive components of missile systems and space systems, and assembled kits and devices containing explosives material. The terms explosives, explosives weight, net weight, and other like terms, also refer to the fillers of an explosives item. Fillers may be propellants, TNT, Composition B, pyrotechnics, chemical agents, biological agents, etc.

★**0210.20** *Explosives Area or Location.* Any area or location specifically designated and aside from other areas, and used for manutacturing, maintenance, storage, demilitarization, shipping and receiving, and other similar type explosives operations. Such areas may also be referred to as explosives parking or loading areas when armed or explosives-loaded aircraft are involved. Following are some specific terms of special significance, under this general definition:

(1) *Aircraft Explosives-Cargo Parking Area.* Any area specifically designated for parking aircraft loaded with transportation configured explosives cargo, or those being loaded, unloaded, or awaiting loading.

(2) *Combat Aircraft Parking Area.* Any area specifically designated for parking aircraft loaded with combat configured explosives, or those being loaded, unloaded, or awaiting loading. This includes alert hangers and alert shelters.

(3) *Explosives Storage Area.* A designated area set aside for the exclusive storage of explosives containing *facilities* (magazines, operating buildings, modules, revetments, outdoor storage sites, etc.) for "warehousing" the bulk of the explosives stocks of the base.

(4) *Explosives Operating Facility.* See para 0210.40.

(5) *Ready Explosives Facility.* A designated area, usually near the flight line, where munitions and components are temporarily positioned awaiting transfer to air-

craft. (Often referred to as a flight line munitions "holding area," "holding point," or "transfer point.")

(6) *Explosives Facility.* Any structure or location containing explosives *except* aircraft, aircraft parking areas, and facilities specifically defined in subparagraphs (4) and (5) above.

0210.20.1 *Explosives Facility.* See para 0210.20(6).

0210.21 *Explosives Hazard.* Any condition which may result in the occurrence or contribute to the severity of an explosives accident or incident.

0210.22 *Explosives Safety Distance (Quantity-Distance).* The prescribed minimum distance between various classes and quantities (net weight) of explosives and between such explosives and specified exposures (inhabited buildings, public highways, public railways, petroleum, aircraft, etc.) affording an acceptable degree of protection and safety. (See chapter 5.)

0210.22.1 *"Exposed" Explosives* are those:

(1) That are *actually* visible (such as unpackaged bulk explosives, disassembled or open components, etc.) and that *also are* susceptible to initiation directly by static or mechanical spark, or

(2) That create (or accidentally create) explosives dust or give off vapors, fumes or gases in explosive concentrations (see paras 0203.2, 0210.28, 0602.4, 0612, and 0613.3).

0210.23 *Fire-Resistive.* The type of construction in which the structural members, including walls, partitions, columns, floor and roof construction are of "noncombustible" materials that do not burn or have specific fire resistance ratings in terms of hours. See attachment 3, AFM 88–15 for details.

0210.24 *Fire Retardant.* Combustible materials or structures which have been treated or had surface coverings designed to retard ignition or fire spread.

0210.25 *Fire Wall.* A wall of fire-resistive construction designed to prevent the spread of fire from one side to the other. A fire wall may also be termed a "fire division wall."

0210.26 *Flameproof.* Combustible materials, such as clothing which have been treated or coated to decrease their burning characteristics.

0210.27 *Fragment Distance.* The limiting range of a considerable number of fragments from the quantity and types of explosives involved in certain explosives safety-distance (quantity-distance) tables. (Formerly referred to as "missile distance.")

0210.28 *Hazardous Locations for Electrical Equipment.* Locations where flammable gasses or vapors are or may be present in the air in explosive or ignitible mixtures or where combustible dust or easily ignitible particles or fibers may be present (see para 0602.4).

0210.29 *Holding Yard.* A specified area (group of railroad tracks, motor vehicle parking facility, etc.) designed or used to accommodate explosives-laden carriers for limited periods (normally no longer than is required to expeditiously effect transfer to a proper storage area, etc.)

0210.30 *Inert.* (As applicable to explosives.) Containing no explosives, active chemicals or pyrotechnics but not necessarily noncombustible.

0210.31 *Inhabited Building or Buildings.* All buildings, locations or structures, other than explosives locations, magazines or operating buildings, used in whole or in part as a habitation or place of assembly for personnel (residence, church, school, railroad station, and similar transportation facilities, store, theater, factory, shop, hangar recreational areas described in para 0540, etc.),

both within and outside military establishments. *Exceptions:* Buildings and locations for which lesser distances are permitted by other provisions of this manual (such as in paras 0514 and 0519).

0210.32 *Intraline Operations.* Those operations accomplished within one operating line.

0210.33 *Intraline Separations.* Basically, the distance to be maintained between any two operating buildings and/or sites within an operating line, at least one of which contains or is desgined to contain explosives. See para 0505 for other applications.

0210.34 *Loading Docks.* Facilities at ground level or elevated structures designed and installed for transferring explosives between motor vehicles, rail cars and/or cargo-type aircraft.

0210.35 *Magazine.* Any building or structure, except an operating building, used for the storage of explosives. Magazines are of two general types—igloo (earth covered) and above ground (non-earth covered).

(1) Igloo Magazine—earth covered, concrete arch-type Igloo magazines or Steel Arch-Earth Mounded Igloo (multiple steel arch spaces in a common earth mounding) magazines meeting requirements of approved definite drawings (or similar acceptable contractors' facilities).

1. Special Igloo Magazine—igloo-type magazine constructed with steel or wood (instead of concrete) arches and steel, wood or concrete end walls.

(2) Above Ground Magazine — any magazine other than an igloo magazine meeting the requirements of approved definitive drawings (or similar acceptable contractors' facilities).

0210.36 *Magazine Area.* An area specifically designated and set aside from other portions of the installation for the exclusive storage of explosives.

0210.37 *Magazine Distance.* The distance between magazines that is expected to prevent propagation detonation by blast (shock wave) of an explosion from one magazine to another. (See para 0506.)

0210.38 *Magazine Placard.* Air Force Visual Aid 127-2.

0210.39 *Mass-Detonating Explosives.* Explosives which can be expected to explode and consume most of the entire mass virtually instantaneously when a small portion is subject to fire, to severe concussion or impact, to the impulse of an initiating agent, or to the effect of a considerable discharge of energy from without, are considered to be mass-detonating. Explosives of this category, when detonated, cause severe structural damage to adjacent objects and may induce simultaneous detonation of other explosives stored sufficiently close to the initial explosion. When the explosives are located on or near the surface of the ground a mass detonation is normally characterized by a crater. High explosives (TNT, etc.), black powder, certain combinations used in propellants, certain pyrotechnics, other similar explosives alone or in combination, and some complete items containing different classes of explosives in various components may be found in this category.

★**0210.40** *Operating Building, Facility, or Location.* A building or site in which any of the following operations are conducted; the manufacture of explosives; the assembly, disassembly, modification, reconditioning, renovation, maintenance, inspection, surveillance, testing or demilitarization of explosives. Flight line explosives loading activities in areas defined in paragraphs 0219.20 (1) and (2) are not operational locations within the meaning of this paragraph.

0210.41 *Operating Line.* A group of separated operations or buildings, of specific arrangement, used to perform related or consecutive steps in the assembly, disassembly, modification, reconditioning, renovation,

maintenance inspection, surveillance, testing, demilitarization, or manufacturing of explosives.

0210.42 *Operational Shield.* A barrier that will protect personnel, material, or equipment from the effects of fire, fragments, or blast occurring at a particular operation.

0210.43 *Outdoor Storage Sites.* An open location selected within the magazine area for storage of explosives and/or components.

0210.44 *Photoflash Devices.* Magnesium flashlights or photoflash bulbs (used in photography) are not permited in "hazardous locations" (see para 0210.28). Only lighting equipment bearing the label of approval of the Underwriters' Laboratories for the appropriate hazard involved will be used in any necessary photography.

0210.45 *Propagating Explosion.* The communication of an explosion (detonation or deflagration) from one explosives source to another by fire, fragment or blast (shock wave), where the time interval between explosions is sufficient to limit the total overpressure at any given time to that which each explosion produces independently. (This condition, where detonation occurs, would be evidenced by a distinct shock wave from each detonation with a discernible pressure drop between each explosion.) (See para 0210.51.)

0210.46 *Public Highway.* Any public street, public alley, public road, or navigable stream. "Navigable streams" are only those part of streams susceptible to use, in their ordinary condition, as highways of commerce over which trade and travel are (or may be) conducted in the customary modes. Streams which are not capable of extensive navigation by barges, tug-boats, and other large vessels are excluded.

0210.47 *Public Railway.* Any railroad which carries passengers for hire.

0210.48 *Quantity-Distance.* See Explosives Safety Distance (para 0210.22).

0210.48.1 *Ready Explosives Facility.* See para 0210.20(5).

0210.49 *Safety Shoes.* Specifically designed footwear of three general types, identified as:

(1) Industrial safety shoes with hard toes.

(2) Sparkproof safety shoes containing no exposed metal.

(3) Conductive sole safety shoes. (To be used in conjunction with conductive floors, or static grounded mats where static electricity hazards are present.)

0210.50 *Service Magazine.* A building servicing an operation used for the intermediate storage of explosives.

0210.51 *Simultaneous Detonation.* The detonation of two or more items which are in close proximity to one another, one item detonating after the next within such a short time interval between detonations that, for all intent and purpose, the over-all detonation would appear to have emanated from a single item. Such an explosion would produce peak over-pressures in excess of that of each independent source. The presure curve would be more nearly like that resulting from the total weight of explosives

sions of this paragraph (normal parking regulations apply).

0302.9 *Stacking Combustible Material.* Boxes, containers, dunnage, and lumber will be stacked in an orderly manner when in the vicinity of an explosives renovation, handling, or storage operation. Stacks will be limited to areas between fire breaks. Stacks should be limited to 1,500 square feet and protected by 25-foot firebreaks. Bulk stacking of combustible materials will not be closer than intraline distance from locations containing explosives. Working quantities may be stacked in the vicinity of explosives, but not closer than 50 feet. Water barrels and pails should be provided in these areas.

0303 Auxiliary Fire Fighting Equipment and Personnel. A fire involving explosives may result in conflagration or explosion, therefore prompt action against the first small blaze detected in the vicinity of an explosives area and/or operation is vitally important and immediate use will be made of available fire fighting equipment.

0303.1 *Fire Extinguishers.* A minimum of two water type fire extinguishers will be available for immediate use when explosives are being handled. Each fire extinguisher will have a minimum capacity of 2½ gallons. They need not be permanently located at the operation site although this should be done if practicable, but it is required that they be in accessible location and properly maintained. Serious fires may be avoided by the prompt use of hand fire extinguishers. They are required primarily for use on fires in their beginning or early stages involving combustibles such as wood, paper, rubbish or grass. Personnel other than the one using the extinguisher should seek safety immediately, reporting the fire enroute.

0303.2 *Water Barrels.* Water barrels and pails provide a recognized means of combatting fires where grass, wood, dunnage, boxes, etc., are involved. *Where used,* at least two pails will be available for each barrel. Water barrels should be winterized when there is a possibility of freezing. Under normal conditions, however, water barrels and pails may not be necessary in an extensive explosives storage area if subparagraphs (1) through (3) below are complied with.

(1) Vegetation control is complied with as specified in sub-paragraphs 0302.5 and 0302.6.

(2) Working crews operating in the area are equipped with two water-type hand extinguishers, perferably of the back-pack or 4 gallon hand pump type. (Vehicle transporting explosives in the area need only be equipped with extinguishers as set forth in paragraph 0712.3.)

(3) The installation has an organized fire fighting force equipped with pumpers or brush trucks, tank trucks, and other necessary equipment to combat grass and brush fires.

0303.3 *Mobile Equipment.* During freezing weather, fire fighting trucks and trailers filled with water will require heated storage. Provision will be made for rapid movement of the equipment to the scene of the fire. Plows, graders, and bulldozers should be available for cutting firebreaks to control fires.

0303.4 *Fire Fighting Personnel.* The duties of guards, watchmen, firemen, or military personnel will be so arranged that a fire fighting force is available at all times. Fire fighting forces will be instructed thoroughly in the hazards of fires involving explosives, the safety precautions to be taken, and the means and methods to be used in preventing and fighting fires, Fire drills and inspections will be conducted at sufficiently frequent intervals as to insure that fire fighting forces understand their duties and that fire alarm systems and fire fighting equipment functions properly under actual operating conditions. Unannounced fire drills involving the response of motorized emergency vehicles are prohibited.

0304 Directing Fire Fighting Personnel. When

a fire is discovered in a building, one responsible messenger will be dispatched in the direction from which the fire department is expected, to inform them of the location, nature, and extent of the fire. The person in charge of fire fighters will not permit them to advance to a fire unless he has what he believes to be accurate information as to the existing conditions and concludes that he is justified in doing so. (Reference para 0306.6.)

0305 Extinguishing Agents for Fires. Table 3–1 lists agents for fighting fires not involving explosives.

TABLE 3–1. EXTINGUISHING AGENTS FOR FIRES

Type of Fire	*Extinguishing Agent*
Class A—Combustibles (Materials such as wood, paper, rubbish, or grass)	Water Soda Acid
Class B—Volatile Flammables (Materials such as Oil, Gasoline, Grease, or Paint)	Carbon dioxide, Vaporizing liquid, Foam or Dry powder
Class C—Electrical (Electrical Equipment)	Carbon dioxide, Vaporizing liquid, or Dry powder

0306 Fire Symbols. These symbols provide guidance for fire fighting forces and other concerned personnel when explosives are involved in a fire. Explosives, other than liquid propellants, are divided into four groups in accordance with the general burning or explosive characteristics of the materials and the danger of fighting fires in which they are present. The four groups are identified by Symbols 1 through 4 (see paragraphs 0306.3 through 0306.6.) (Reference AFVA 32–7.) Liquid propellants independently present a wide variety of hazards that are not directly associated with symbols 1 through 4. Extensive fire fighting guidance for these liquids, based upon the individual characteristics of each commodity, will be found in pertinent publications, as AFMs 160–39, 127–201 and AFP 92–1–2. Therefore, these fire symbols have no application to liquid propellants except for the use of symbol 4 to indicate situations presenting the *additional* hazard of detonation (as explained in para 0306.(2)). *EXCEPTION:* Fire symbols need not be posted on operational missile sites (e.g., Titan, Minuteman, etc.) where only single types of weapons systems are involved, written fire fighting plans or instructions exist, and personnel concerned have been specifically advised of the hazards involved.

★**0306.1** *Storage Locations and Operating Buildings.* The appropriate symbol will be plainly marked on or near all explosives buildings, magazines of all types and individual storage sites (including outdoor storage sites) in such a manner as to be clearly visible from outside the building from approach roads used by fire fighters. The symbol applying to the most hazardous material in the specific building or site will be used for the primary identification. Fire symbols will also be placed on the entrance to small rooms (or areas) in large buildings (such as hangars) that are being used for storing or holding authorized quantities of explosives. Where it is considered desirable, the varied explosives contents of individual segregated storage bays of a building may be additionally identified by appropriate symbols on the door of each bay. One symbol on or near the door end of an igloo-type magazine is normally considered sufficient. Symbols up to one or more to a side may be needed on other buildings to provide proper guidance to fire fighters. The symbols may be placed directly on the exterior of buildings but removable symbols are preferred. Symbols will be black on an orange background. Reflectorized material is preferred. The minimum over-all dimensions are shown in figures 3–1, 3–2, 3–3, and 3–4. It will be the responsibility of the person in charge of the operation to post or change fire symbols and to notify the fire department in each instance. Service and

ICC type "transportation" placards covered in para 0306.2 and chapter 7 will not be used to meet mandatory requirements for fire symbols.

EXCEPTION: Symbols need not be posted on maintenance hangers housing aircraft containing *only* exempted installed explosive and safety devices described in paragraph 0519.1(2)4.

0306.2 *Railcars, Motor Vehicles, and Aircraft Laden with Explosives Shipments.* Fire symbols are not required for such transporting vehicles. "EXPLOSIVES A" or "EXPLOSIVES B"

the greater safety distance will apply. (See paras 0422, 0501, 0510, and 0526.)

★(3) Determine the explosives weight of the total quantity of all items of each class stored.

(4) When all items stored in a single building or location are of the same class use the appropriate tables and instructions covering the net quantity and class of explosives and "exposures" involved to determine proper safety distances.

(5) Where items of different classes are stored together (see para 0423) in the same building or location: Applicable explosives weight for the total number of items in each explosives class will be added together to determine the total explosive weight. This total explosives weight will be used with the instructions and tables applicable to the most hazardous class (class requiring the greater separation) involved to determine proper safety distances.

0513 Quantity of Explosives Permitted in Magazines or Other Storage Points or Stacks. The maximum explosives weight (calculated upon the basis of individual item explosives content as explained in para 0510) permitted in magazines or other storage points or "stacks" will be determined by the distance such explosives are actually separated from the various exposures (other explosives, inhabited buildings, public highways, etc.) set forth in the appropriate explosives safety distance (quantity-distance) tables for the class of explosives involved. Where explosives within a building are divided into smaller protected or separated "stacks," in accordance with para 0511, the actual distance from the various exposures will control the maximum quantity permitted in each of such separate stacks. Where several magazines, storage points or stacks are being considered in connection with several different exposures, the maximum quantity permitted in each "stack" will be limited by the most restrictive exposure and will be determined by the table permitting the least quantity in each instance.

0514 Separation of Associated Structures. Miscellaneous structures exclusively serving explosives areas or locations will be separated from explosives magazines or other explosives locations by the following minimum distances. Greater separations, up to inhabited building distance, should be provided where possible (see para 0505):

Facility	*Distance from Explosives Magazine or Locations Containing:*	
	Mass Detonating Explosives	*Nonmass Detonating Explosives*
(1) Guard shelters, gate houses, small explosives area field offices[1] and similar facilities.	Intraline	Magazine
(2) Dunnage storage and preparation buildings; small packing and shipping buildings; explosives area motor pool or dispatch points; supply warehouses for inert materials associated with explosives functions where personnel are frequently present[1]; lunch rooms, change houses and similar supporting facilities.	Intraline	Intraline
(3) Magazines or warehouses for inert munitions items and material where personnel are infrequently present.	Magazine	Magazine

[1] *Exemption:* Some especially designed operating buildings include attached office and supply room. Distance given above do not apply inside such buildings constructed in accordance with approved Air Force definitive drawings. See para 0505.2.

0515 Separation of Operating Buildings (Para 0210.40). Buildings forming an operating line will be separated from each other by intraline distance. Outdoor operations or operations conducted under the sheds within an operating line will be located at intraline distances. Where fragments may be a hazard, intraline distances may not provide sufficient protection, in which case a barrier or barricade should be provided as additional protec-

tion. This is particularly important where personnel concentrations are high. See paragraph 0505 for further details and distances to other types of explosives locations.

0516 Separation of Railcars or Motor Vehicles from an Operating Building. Where railroad cars or motor vehicles containing explosives are not separated from an operating building containing explosives by a distance and/or barricade that will prevent simultaneous detonation, then the total quantity of explosives in the operating building and railcars or motor vehicles will be combined and the required separation will be measured from the nearest outside wall of the operating building, car or vehicle, as applicable, to the target. If the explosives in the operating building are separated into smaller concentrations so that simultaneous detonation may not occur when the explosives in the railroad cars and motor vehicles are added to the appropriate inside concentrations, the distance will be measuerd from the wall nearest the controlling unit, care, or vehicle, as applicable, to the target.

0517 Spotting Railcars or Motor Vehicles at Operating Buildings. Railcars and motor vehicles containing explosives, which are spotted nearer than intraline distance to an explosives operation or building and not separated from the explosives operation by a barricade will be included in computations as part of the explosive limits of the operation or operating building. This prevents vehicles containing explosives from being used as service magazines when parked at less than intraline distances from the operation or operating building.

0518 Separation of Classification Yards. Cars of explosives in classification yards should be switched for transfer as soon as possible. Cars should not remain in the yard for more than 24 hours. Classification yards through which cars containing explosives are handled will be separated from inhabited buildings, administration areas, magazines containing explosives, operating buildings handling explosives, and installation boundaries by a minimum distance of 1800 feet. This distance may be reduced to 1400 feet for igloo magazines, if the door end of the magazine does not face, the classification yard. Barricades will not be interposed for the purposes of reducing distances to classification yards. Efforts should be made to segregate cars into groups to reduce, concentrations of explosives and potential hazards.

★0519 Separations Applicable to Explosives Loaded Aircraft, Related Supporting Facilities, and Holding Yards:

★**0519.1** *Separations Applicable to Explosives Loaded Aircraft and Related Facilities:*

(1) Explosives, explosives facilities, and parked explosives loaded aircraft (or those being loaded, unloaded, or awaiting loading) must be excluded from "explosives prohibited" areas described in paragraph 0525 and figure 5–2. Such aircraft are not "explosives facilities" requiring separation from *other* airfield areas. However, in the interest of explosives (and aircraft) safety, explosives loaded aircraft are required to comply with minimum airfield criteria in AFM 86–8 (defining aircraft as "movable obstacles" in determining clearances from runways and taxiways). The foregoing airfield clearance criteria has been established as the "explosives safety distance" (quantity-distance) criteria required between explosives loaded aircraft and taxiways and run ways. Explosives safety distance (Q–D) portion of waiver requests involving explosive loaded aircraft/airfield criteria will be prepared, handled, recorded and distributed in the manner prescribed for other explosives safety distance waivers under para 0209. Procedures for obtaining major command approval of the airfield criteria portion of such waivers are prescribed in AFM 86–8.

(2) Generally, with the exception of paragraph (1) above, explosives safety distances (quantity-distances) required for parked explosives loaded aircraft (or aircraft being loaded, unloaded, or awaiting loading) are identical to the distances ap-

plicable to a like quantity and class of explosives in any other explosives location (above ground barricaded or unbarricaded as appropriate under the circumstances). See paras 0508 through 0513 for further information. The following applications are *minimum* requirements. Greater distance should be used where possible or where a greater degree of protection is considered or desirable. The preceding paragraphs of this chapter (indicating the degree of protection provided by the various distances) will be considered in determining whether these *minimum* separations will provide the required degree of protection for facilities, equipment, other aircraft, etc., considered essential to the particular mission:

1. Distances shown below are required. In each instance these distances (magazine, intraline, public railroad/highway, and inhabited building) are those applicable to the *specific military class or classes* of explosives involved. These distances are computed in the normal manner (see paragraphs 0509 through 0513). The CAUTION note * below is especially important where aircraft are involved:

APPLICATION OF EXPLOSIVES SAFETY DISTANCES (QUANTITY-DISTANCE)**

Line	Column (See para 0210 for definitions) TO: / FROM:	1 Combat Aircraft Parking Area	2 Aircraft Explosives-Cargo Parking Area	3 Explosives Facilities, Except Columns 4 & 5	4 Ready Explosives Facilities	5 Explosives Operating Facilities	6 Inhabited Buildings	7 Passenger Carrying Railroads & Public Highways	8 Runways & Taxiways—Military Use Only***	9 Runways & Taxiways—Joint Military/Nonmilitary Use***	10 Non-Explosives-Loaded Aircraft Parking Area	11 Recreational Area	12 Aircraft Passenger Loading/Unloading Area in the Open	13 Facilities for Combat Aircraft Alert Force
1.	Combat Aircraft Parking Area	5*	5*	7	3*	7	1	2	13/15	6	9	8	10	14
2.	Aircraft Explosives Cargo Parking Area	5*	5*	7	3*	4*	1	2	13/15	6	9	11	10	14
3.	Explo. Facilities, Except Lines 4 & 5	7	7	3	3	4	1	2	7/16	6	12	11	10	1
4.	Explosives Operating Facilities	7	4*	4	4	4	1	2	7/16	6	12	11	10	7
5.	Ready Explosives Facilities	3*	3*	3	3	4	1	2	13/16	6	9	8	10	14

KEY TO TABLE

Example: Minimum distance required from "combat aircraft," line 1, to "explosives facilities," column 3, will be found in note 7.

Notes:

1. Use inhabited building distances. (Military and nonmilitary air passenger terminals are inhabited buildings.)
2. Use public railway/highway distances.
3. Use aboveground magazine distances*.
4. Use intraline distances*.

Notes:—Continued

5. Use aboveground magazine distances* for Class 2 and for all mass-detonating items; i.e., Class 7 and all "M" designated items per para 0530(2)2. As much separation as possible should be given between aircraft*. However, *no specific* minimum separation is assigned or required *between explosives loaded aircraft* for quantity-distance purposes for *non*-mass-detonating items (non-"M" designated items) of Classes 3, 4, 5, and 6. See note 9 for instructions concerning alert tanker aircraft. See para 0519.1(2)*3*, *4*, and *5* for certain exemptions for combat loads and installed items.

6. Use Table 5-11 columns 3 or 4 distances for mass-detonating explosives (Class 7 and all "M" designated items). Use public railway/highway distances for all non-mass-detonating explosives. See para 0519.1(2)*3*, *4*, and *5* for certain exemptions for combat loads and installed items. Combat aircraft parking areas, aircraft explosives cargo parking areas, alert hangers, and alert shelters will be sited as explained above, except that no separation is required between such locations and their *exclusive* taxiways serving, or constructed as a part of, the location.

7. Use table 5-11, column 5 distances, for mass-detonating explosives (Class 7 and all "M" designated items). Use public railway/highway distances for all non-mass-detonating explosives.

8. Use intraline distances to recreational areas which are used *exclusively* for alert personnel manning the combat loaded aircraft, where response time will not permit greater separation. For other recreational areas: Use public railway/highway distances where people are in the open and inhabited building distances where structures, including bleacher stands, are a part of the area. See para 0540.1.

9. Use public railway/highway distances on military*** airfields, heliports, and seadroms. On joint military/nonmilitary*** airfields, heliports, and seadroms, separations will be in accordance with note 6.

EXCEPTION: Fuel loaded alert tanker aircraft which are an integral part of the alert force are considered (and may be parked) upon the same basis as their associated combat loaded aircraft, i.e., they are assigned to column 1 and separations shown in that column apply.

10. Use public railway/highway distances for locations in the *open* where passengers emplane or deplane. Structures where passengers assemble, such as passenger terminal buildings, are inhabited buildings and note 1 applies.

11. Use public railway/highway distances where people are in the open and inhabited building distances where structures, including bleacher stands, are a part of the area. See para 0540.1.

12. Use Table 5-11 column 5 distances in separating explosives facilities shown from military*** non-explosives-loaded aircraft parking areas and distances shown in note 6 from nonmilitary aircraft***.

13. Use airfield clearance criteria in AFM 86-8. These clearances have been established as the explosives safety distance (quantity-distance) criteria. See para 0519.1(1).

14. Use intraline distances (where response time will not permit greater separation) to buildings used primarily for housing alert personnel for the combat loaded aircraft (see paragraph 0505). Use greater separations wherever possible (see paragraph 0502).

EXCEPTION: Distances less than intraline may be used (without waiver action) where such personnel are housed in especially approved alert hangers or buildings constructed in compliance with standard AF definitive drawings.

15. Where "passenger transport operations****" are conducted on "military use only" runways and taxiways, distances in note 6 will apply (instead of note 13) *unless* it has been determined by the major command of the base concerned that it is operationally necessary to use the smaller distances permitted under note 13. When such a determination has been made the approving correspondence will be retained by the base as a matter of permanent record. No action under para 0209 is required in such instances. However, periodic reviews will be made to determine whether changing circumstances have made compliance with note 6 separations feasible.

16. Where "passenger transport operations****" are conducted on "military use only" runways and taxiways distances in note 6 will apply (instead of note 7 or 13 as the case may be).

* *CAUTION NOTE:* Magazine distance will prevent mass (simultaneous) detonation of loads on adjacent aircraft. Thus permitting safety distances to other "exposures" (inhabited buildings, etc.) to be based upon the quantity of explosives isolated by magazine distances. Magazine distances will *not* prevent nonsimultaneous propagation (para 0210.45) from one explosives loaded aircraft to another. Considering the susceptibility of aircraft to fire-starting fragments and blast overpressures, "*unbarricaded* intraline" distance (right hand column of table 5-9) is the minimum known to offer a reasonable degree of protection against *nonsimultaneous propagation* between explosives loaded aircraft *provided* such aircraft are adequately barricaded (para 0524) (or in approved revetments of sufficient height) to limit low angle high velocity fragments and protect vital portions of adjacent aircraft. Further, aircraft located at intraline distances may be expected to suffer major structural damage or be lost completely (see para 0543.5). Minor damage must be expected, as a minimum, at public railway/highway distances. If anything approximating complete protection of aircraft

Notes:—Continued

against damage is desired, inhabited building distances or some other means of protection (such as hardened cover) must be provided.

** See paragraphs 0509 and 0525 for details. Normally, explosives safety distance (quantity-distance) measurements are made from or to:

a. The nearest point of the explosives loaded on an aircraft, or the nearest point of an aircraft without explosives.

b. The nearest point of an explosives location, building, or taxiway.

c. The centerline of the runway or runway extended to the limit of the "explosives prohibited zone" shown in figure 5–2. (Where magazine distance is not provided between explosives-loaded aircraft the total net weight of all aircraft loads of mass-detonating explosives involved must be added together to determine distances required to all other exposures. See para 0511.)

*** "Military" in this instance means those airfields *or areas of airfields* used exclusively by DOD components. "Nonmilitary" (non-DOD) means any entity (government, private, or corporate) which is not a part of the DOD. See para 0519.1 (2) *2* concerning the status of contract carriers.

**** "Passenger transport operations" are defined as follows only for the purpose of applying explosives safety distance (quantity-distance) requirements: Passenger transport traffic involving military dependents and civilians *other than* those employed by or working directly for DOD components (military services). The following are *not* considered "passenger transport operation":

a. Infrequent flights of base and command administrative aircraft that may, on occasion, provide some "space available" travel to authorized personnel.

b. Civil Service personnel employed by any echelon under the DOD.

c. Such personnel as contractor technical representatives traveling to or from direct support assignments at military installations.

2. For purposes of calculating explosives safety distance (quantity-distance) only, aircraft of contract carriers performing exclusive military functions are considered upon the same basis as military aircraft performing like functions.

3. Exemption for certain combat loads:

Aircraft armed *only* with combat configured 20MM ammunition, 2.75-inch and AIM–4 series rockets are exempt from the usual explosives quantity-distance requirements. Such items are not expected to mass detonate in their loaded configuration and, therefore, need not be added together to determine total net explosives weight for siting purposes. However, the parking area will be designated a "combat aircraft parking area" and treated as such in all other respects. The primary safety objective is to orient the aircraft in the direction affording the least exposure to personnel, equipment, and facilities in the line of fire. See T.O. 11A–1–33.

4. Aircraft containing only installed explosive and safety devices: Authorized signals, flares, egress systems components, squibs and detonators for jettisoning external stores, engine starter cartridges, fire extinguisher cartridges, destructors in electronic equipment, explosive components of emergency kits and equipment, and other such items necessary to flight operations and safety (including moderate quantities of small arms ammunition for crew use), are not considered in determining aircraft parking and quantity-distance requirements. See T.O. 11A–1–33. Such aircraft are considered "non-explosives-loaded", within the meaning of para 0519.1 and should be parked accordingly, unless they are awaiting an explosives load.

5. Explosives loaded aircraft containing items exempted under subparagraph *4* above: Exempted items are not added to the explosives load in determining quantity-distance requirements.

0519.2 *Separations Applicable to Holding Yards or Areas.* Such areas are considered explosives locations requiring the same explosives safety distance consideration as any other explosive area. Explosives laden carriers being held in the area (rail cars, motor vehicles, trailers, etc.) are considered upon the same basis as any aboveground barricaded or unbarricaded (as appropriate)

storage point for explosives safety distance purposes. Maximum use will be made of internal separation of transporting carriers in the best interest of safety (see para 0511). Carriers should be individually separated where possible rather than divided into groups, especally where mass detonating explosives are involved.

0520 Separation of Suspect Vehicle Area. When inspection of a motor vehicle or railcar indicates that it may be in a hazardous condition, it should be moved at once to an isolated area for opening. This area should be located so that suspect vehicles can be moved there without entering locations where there is a high concentration of explosives. The distance between the suspect vehicle area and installation boundaries, classification yards, holding yards, inhabited buildings, administrative area, operating buildings, magazines, inert storage locations, public railways, and public highways should be at inhabited building distance. Only one vehicle will be permitted in this area at any one time.

0521 Separation Applicable to Loading Docks. Explosives loading docks are considered upon the same basis as aboveground barricaded or unbarricaded (as appropriate) explosives locations for explosives safety distance purposes. Appropriate separation for the various classes of explosives and exposures involved are required. The separation between loading docks and the nearest explosives storage magazine will be not less than the magazine distance given in the appropriate table.

Earth cover and side fill requirements are the same as for barricades in para 0524.1. Larger stones in the material should be confined to lower center of fills and, as far as practicable, restricted from the earth cover (between spring lines for arch type structures). Igloo magazines are considered barricaded except when the exposure is within the area (in front of the magazines) bounded by lines drawn from the center of the door and inclined 30° on either side of a perpendicular to the door. If the door end is provided with an effective separate barricade (para 0524.1) then barricaded distances are applicable for all exposures.

(2) Aboveground magazines are considered to be effectively barricaded when they are separated from exposures by natural or artificial barricades meeting the requirements of para 0524.1.

(3) It is possible that requirements of the explosives safety distance (quantity-distance) criteria may be reduced to some extent for protected storage facilities built under the ground, into hills, or separated by hills. However, due to the many variables involved, *each* such problem, utilization, or site plan proposing reduced distances will require specific consideration. All details necessary to reach conclusions in each case will be required. Normally such requests should follow the applicable portions of para 0802 for site plans, with the additional topographical maps required to reveal terrain and other pertinent conditions.

(4) Steel Arch-Earth Covered Igloos (para 0421.2) are considered the favored type of "barricaded" magazine for storing maximum amounts of Class 7 explosives with minimum separation between igloos (cells). See table 5–7A for quantities and distances.

0524.5 *Reduction of Distances for Magazines;*

(1) Igloo magazines are considered barricaded (except the unbarricaded door end) for maximum permitted quantities of classes of explosives indicated in tables 5–3, 5–4, 5–5, 5–6 and 5–7. Footnotes in these tables indicate where and to what extent prescribed table distances may be reduced by one-half in recognition of the protection afforded by barricading.

(2) Distances prescribed in tables 5–3 and 5–4 will not be reduced for storage of these classes in barricade aboveground magazines. Distances prescribed in tables 5–5 and 5–6 may be reduced where indicated by footnote when these classes are stored in barricaded aboveground magazines.

(3) Quantities of explosives in the basic class 2 and the 2A subclass may be stored in igloo type magazines to the maximum physical capacity of such buildings where spacing between buildings meets applicable requirements of table 5–7 or 5–8. Other distances (inhabited building, public highway and public railway) will be calculated on an unbarricaded basis, except where specific reductions are permitted by footnote to the Class 2 and 2A tables.

★0525 Airfield and Heliport Explosives Prohibited Areas. All limiting factors of explosives safety distances (quantity-distance), airfield prohibited areas, and airfield and airspace criteria (AFM 86–8), must be considered in separating explosives from airfield areas set forth below. In all instances the criteria requiring the greater distance will establish the minimum separation permitted. See paragraph 0519.1 for additional information and instructions.

(1) All explosives will be *excluded* from:

1. Ground areas represented by the crossed hatched prohibited areas shown in figure 5–2.

2. Ground areas on either side of runways and taxiways out to the outer limits of the "lateral safety zones" described in AFM 86–8.

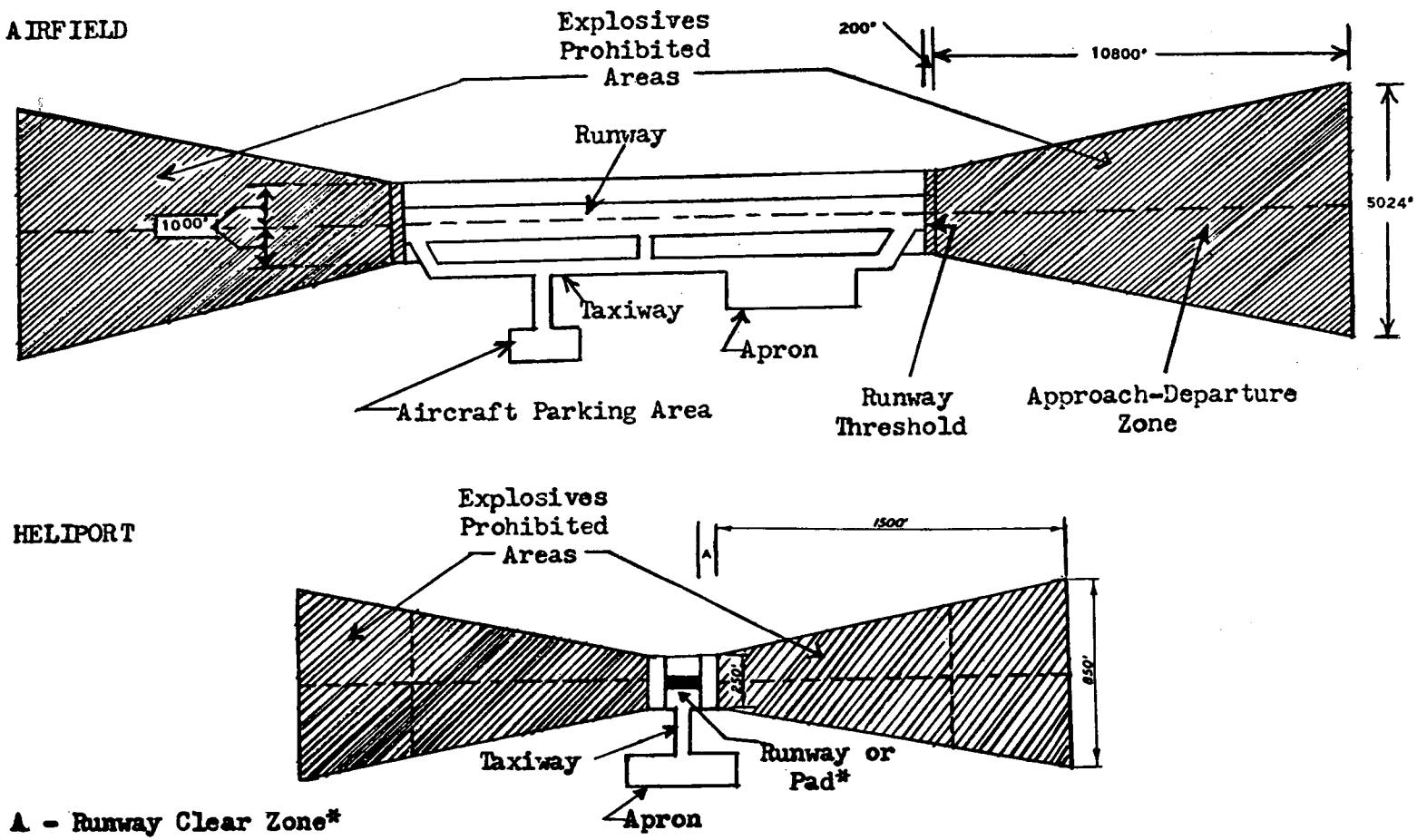
(2) On airfields for fixed wing aircraft, it is preferable but not mandatory, to keep explosives out of that portion of the approach departure zones that extend beyond the prohibited zones for the entire distance out to the 50,000 foot line. Approach-departure zones flare uniformly and are 16,000 feet wide at the 50,000 foot line.

(3) Separation distances for mass-detonating explosives in table 5–11 will be measured from the nearest point or wall of the explosives facility (or from the nearest substantial dividing wall of the controlling quantity, where applicable as stated in para 0511), or from the nearest point of explosives loaded on an aircraft, to:

1. To the nearest point of aircraft that are not loaded with explosives.

2. To the centerline of runways and their extensions through the clear zones and approach-departure zones to the point such centerline meets the outer boundary of the approach-departure zone prohibited area as shown in figure 5–2.

3. To the nearest edge of taxiways or aircraft parking areas as shown in figure 5–2.



A - Runway Clear Zone*

* - See AFM 86-8 for proper dimensions.

Figure 5-2. Airfield and Heliport Explosives Prohibited Areas.

0526 Application of Tables. Explosives are divided into classes (hazard classifications) according to their characteristics (see para 0501, 0541 and T.O. 11A-1-47) for explosives safety distance (quantity-distance) purposes. These classes and appropriate safety distances for various "exposures" and circumstances appear in the following paragraphs and tables of this chapter. Explosives safety distances do not specifically encompass the possible flight range of propulsive units (see para 0416 and 0416.1). Except for liquid propellants (para 0541), explosives have, heretofore, been divided into 12 classes These 12 classes have been realigned and converted into 8 new divisions. The transitional period for this conversion begins on 15 August 1964 (or upon receipt) and expires on 30 Sep 1966. The following instructions are applicable:

(1) The service that had principal development or hazard classification responsibility for each explosive or explosives item now in use will, in coordination with other using services, assign the appropriate new hazard classification (class designation) under the 8 class system. AFLC will provide interim "conversion lists" as individual classifications become firm and will incorporate this data into appropriate technical publications and stock lists at the earliest possible date. (It is expected that early classification of some items will do nothing more than preserve present separations pending the outcome of more detailed considerations, including some testing).

(2) Explosives *safety distance criteria* for explosives assigned to classes 2, 9, 10 and 11 under the old 12 class system have not been changed under the new system. However, Classes 9 and 10 (and the previously combined 9-10 tables) have been redesignated Class 7 and Class 11 has been redesignated Class 8 under the new system. Paragraphs and tables covering classes under the old 12 class system that have not been carried *over* into the new system will be identified as transitional by "(T)" during the conversion period set forth above. Paragraphs and tables covering the unchanged safety distances that have been redesignated under the new system will (during the transition period) carry the new designation followed by the old designation in parenthesis, such as: "Class 7 (9-10)". Instructions and tables for the new classes (1, 3, 4, 5 and 6) will not bear any special identification.

(3) All explosives safety distance and associated criteria *other than those marked "(T)"* are permanent and applicable to all pertinent situations. This applicability includes all construction plans initiated after receipt of these instructions and to earlier construction plans whenever replanning can be economically accomplished (see para 0801 and 0803). When existing facilities and arrangements pertaining to explosives safety criteria do not meet the minimum standards set forth for the new classes 1, 3, 4, 5 and 6, reasonable efforts will be made to comply at an early date. Where early compliance is not possible, long term written plans will be made to complete conversion as soon as possible but not later than the end of the transitional period set forth above. In the interim, transitional (T) criteria will continue to apply to all unconverted situations. Initiation of extensive rewarehousing or relocation projects solely for the purpose of complying with criteria for the new classes 1, 3, 4, 5 and 6, is not mandatory; however, required rewarehousing or other changes will be accomplished concurrently with normal stock movements or changes in facilities or other arrangements wherever possible.

(4) Where it has been determined that the explosives safety distance criteria set forth in these tables are not applicable to specific weapons systems or given situations because of unusual circumstances, configurations, protection afforded, hazards presented, etc., specific separate instructions will be

★(5) Separations between mass-detonating explosives and specific airfield and associated exposures. The following table gives separation distances between such explosives and the various exposures as set forth in paragraph 0519.1. Points of measurement applicable to distances shown are explained in paragraph 0525 (3). The provisions of paragraph 0525, figure 5-2, and the following table will be considered and in all instances the criteria requiring the greater distance will establish the minimum separation permitted:

TABLE 5-11. CLASS 7—EXPLOSIVES SAFETY DISTANCES BETWEEN MASS-DETONATING EXPLOSIVES AND SPECIFIC AIRFIELD AREAS AND ASSOCIATED EXPOSURES

Net Pounds of Explosives		*Distance In Feet From Explosive Hazard*		
Over	Not Over	To Runways, Taxiways, and Aircraft Parking Areas		To Specific Exposures Shown In Para 0519.1(2)
		Joint Military-Nonmilitary		
		Barricaded	Unbarricaded	Unbarricaded [2]
Column 1	Column 2	Column 3	Column 4	Column 5
0	50	75	1235	110
50	100	120	1235	140
100	200	180	1235	175
200	300	260	1235	200
300	400	320	1235	220
400	500	360	1235	240
500	600	400	1235	255
600	700	430	1235	265
700	800	460	1235	280
800	900	490	1235	290
900	1000	510	1235	300
1000	1500	530	1235	345
1500	2000	630	1235	380
2000	3000	720	1235	435
3000	4000	795	1235	480
4000	5000	855	1235	515
5000	6000	910	1235	545
6000	7000	955	1235	575
7000	8000	1000	1235	600
8000	9000	1040	1235	625
9000	10,000	1075	1235	645
10,000	15,000 [1]	1235	1235	740
15,000	20,000		1355 [2]	815
20,000	25,000		1460 [2]	875
25,000	30,000		1555 [2]	935
30,000	35,000		1635 [2]	980
35,000	40,000		1710 [2]	1025
40,000	45,000		1780 [2]	1070
45,000	50,000		1840	1105
50,000	55,000		1900	1140
55,000	60,000		1960	1175
60,000	65,000		2010	1205
65,000	70,000		2060	1235

See footnote at end of table.

TABLE 5-11. CLASS 7—EXPLOSIVES SAFETY DISTANCES BETWEEN MASS-DETONATING EXPLOSIVES AND SPECIFIC AIRFIELD AREAS AND ASSOCATED EXPOSURES—Continued

Net Pounds of Explosives		*Distance In Feet From Explosive Hazard*		
Over	Not Over	To Runways, Taxiways, and Aircraft Parking Areas		To Specific Exposures Shown In Para 0519.1(2)
		Joint Military-Nonmilitary		
		Barricaded	Unbarricaded	Unbarricaded [2]
Column 1	Column 2	Column 3	Column 4	Column 5
70,000	75,000		2110	1265
75,000	80,000		2155	1295
80,000	85,000		2200	1320
85,000	90,000		2240	1345
90,000	95,000		2280	1370
95,000	100,000		2320	1390
100,000	125,000		2500	1500
125,000	150,000		2655	1595
150,000	175,000		2795	1675
175,000	200,000		2925	1755
200,000	225,000		3040	1825
225,000	250,000 [3]		3150	1890
250,000	275,000		3250	1950
275,000	300,000		3345	2005
300,000	325,000		3440	2065
325,000	350,000		3525	2115
350,000	375,000		3605	2165
375,000	400,000		3685	2210
400,000	425,000		3760	2250
425,000	450,000		3830	2300
450,000	475,000		3900	2340
475,000	500,000		3970	2380

[1] For quantities up to 15,000 lbs. which are effectively barricaded, the barricaded distances may be used if the airfield clearance criteria in AFM 86-8 permits (see para 0525). Barricades will meet the requirements of para 0524.

[2] To protect against low angle high speed missiles, barricades should be provided; however, these distances will not be reduced because of barricades.

[3] Maximum quantity permitted in any one location without specific approval for the deviation (see para 0105) unless larger quantities are permitted by an applicable table elsewhere in this manual.

0536 Class 8 (11) Explosives Safety Distance Items. Items assigned to this class are those CBR agents and munitions items not normally assembled with explosives components or where explosives components present little or no blast or fragment hazards. No safety distance separations except those set forth in para 0522.7, 0525(1) and 0907(2) have been specifically established for this class as a whole. Where special safety criteria has not been provided with (or for) the stocks involved and safety separation appears necessary because of agent persistency, volatility, toxicity or other particular feature, requests for information should be directed to OOAMA (OOY), Hill AFB Utah 84401. (See AFM 355-2.)

0537 Class 12(T) Explosives Safety Distance Items. Items assigned to this class are relatively insensitive and can normally be deto-

nated only by very strong means of initiation. Such items as ammonium nitrate, wet nitrocellulose (8 to 30 percent water), DNT, and detonating cord (Primacord) are included in this class. Class 12 (T) items may be a fire or blast hazard depending upon exposure to other items that might cause initiation. See para 0523.3 for applicable explosives safety separations under conditions stated.

0538 Application of Quantity-Distance Standards Between Interservice Support Explosives Facilities and/or Interservice Tactical Facilities. Safety distances given in this para may be applied between facilities shown regardless of the location of the boundry between the two service installations. Safety criteria pertaining to noise, radiation, toxicity, flight hazards, etc., may be greater than explosives safety distance criteria. In such cases the criteria of the predominant hazard should be used. If service echelons are not able to agree upon the safety distances to be provided (as set forth in this para) the problem will be forwarded thru their respective service channels for resolution. Unresolved problems involving Air Force units will be forwarded to HQ USAF, Director of Aerospace Safety (AFIAS-G) Norton AFB, CA 92409 for appropriate action with the other service involved or for a decision by the Armed Services Explosives Safety Board (ASESB).

(1) *Support Explosives Facilities of One Service to Like Facilities of Another Service.* Support facilities in this case are *explosives* facilities or locations used to support the mission of an installation. They *do not* include central explosive storage depots which serve many support facilities, nor do they include plants or manufacturing facilities.

SUPPORT FACILITY OF ONE SERVICE	*TO*	*SUPPORT FACILITY OF ANOTHER SERVICE*	*APPLICABLE QUANTITY—DISTANCE CRITERIA FOR SEPARATION*	*NOTES. See Subpara (4) below*
Magazine		Magazine	Intermagazine	1 & 2
Magazine		Operating Bldg	Inhabited Bldg	1 & 2
Magazine		Ship & Recv Bldg	Inhabited Bldg	1 & 2
Operating Bldg		Operating Bldg	Inhabited Bldg	1 & 2
Operating Bldg		Ship & Recv Bldg	Inhabited Bldg	1 & 2
Ship & Recv Bldg		Ship & Recv Bldg	Inhabited Bldg	1 & 2

(2) *Support Facilities of One Service to Tactical Facilities of Another Service.* Support facilities are described above. Tactical facilities in this case are *prepared locations* with an assigned "combat" mission, such as missile launch facilities, alert or explosives loaded aircraft parking areas or fixed gun positions.

SUPPORT FACILITY OF ONE SERVICE	*TO*	*SUPPORT FACILITY OF ANOTHER SERVICE*	*APPLICABLE QUANTITY—DISTANCE CRITERIA FOR SEPARATION*	*NOTES. See Subpara (4) below*
Magazine		Tactical Facilities	Inhabited Bldg	3
Operating Bldg		Tactical Facilities	Inhabited Bldg	2 & 3
Ship & Recv Bldg		Tactical Facilities	Inhabited Bldg	2 & 3

(3) *Tactical Facilities of One Service to Tactical Facilities of another Service.* Tactical facilities are those explained above. Normal magazine, intraline, inhabited building and other safety criteria, applicable to the explosives and the situation involved, may be used provided the degree of safety afforded by these distances is mutually acceptable. Such distances are acceptable to HQ US Air Force unless specific objections to the additional hazards imposed are expressed by the major command concerned. Note 3 in subpara (4) below will apply where appropriate.

(4) *Notes:*

1. Intraline safety distance tables may be used where the operation(s) conducted in each facility present similar hazards *or* the degree of hazard of the explosives operation(s) does not exceed those normally associated with surveillance, check-out, inspection, minor retrofit, limited assembly and disassembly and packaging and shipping operations.

2. Explosives facilities may be jointly used for tactical support by mutual agreement.

3. Explosives "facilities" will be separated from "airfield areas" as required by para 0525.

0539 Minuteman Separations. Normal explosives safety criteria and safety distances (Q–D) of this manual are applicable to the explosives in this system, in the usual manner, *except* where specific instructions are given in this para. Such deviations were made necessary or possible because of facilities, equipment, explosives, and operational peculiarities of the weapon system. Distances shown are based upon the propellant composition of motors through LGM–30F and a high explosives (Class 7) equivalency of 7400 pounds for the assembled missile, less warhead:

(1) Missile site. Explosives safety distances are measured from the center of the launcher:

1. 1570 feet from schools, churches, hospitals, and other such buildings of public assembly.

2. 1200 feet from all inhabited buildings.

3. 720 feet from public highways and public (passenger) railways.

(2) Aircraft loading/unloading sites for propellant motors in the "Shipping and Storage Container, Ballistic Missile" (SSCBM):

1. 1200 feet from inhabited buildings.

2. 1200 feet from facilities, aircraft, or other equipment considered essential to the mission of the base. (See para 0105.)

3. 720 feet from public highways and public railways.

4. Where refueling of an aircraft loaded with these motors is essential, fully manned fire fighting truck will be on standby at the aircraft during the fueling operation.

5. Site plans for the construction of new facilities will be prepared and processed in accordance with para 0802.

6. A waiver will be required (para 0209) if existing facilities located at reduced distances must be employed for loading/unloading operations because of impelling operational conditions. Major commands may approve waivers in the normal manner for justifiable reductions to no less than 800 feet for subparagraphs *1* and *2* above and 480 feet for *3* above. Major commands will, where approval is recommended, forward proposed waivers for distances less than the foregoing minimums to HQ USAF, Director of Aerospace Safety (AFIAS–G Norton AFB, CA 92409.

(3) Railroad loading/unloading sites for the roll-on/roll-off handling of propellant motors in the "Shipping and Storage Contained, Ballistic Missile" (SSCBM) being transported by the "piggy-back" method. This operation is considered a "change-of-mode-of-transportation" requiring only the use of good judgment in the site selection and proper control of operations in the local environment (see para 0208) to insure that exposures are reduced to an absolute minimum. The following stipulations apply:

1. Rail site and facilities will be adequate for the operation and located as far away as possible from hazardous or populated areas.

2. Containers (SSCBM) will not be opened at the site.

3. Units will be expeditiously removed from the railroad cars and dispatched from the area or scheduled for prompt loading upon arrival at the site, as the case may be.

0540 Explosives Safety Distance Criteria Applicable to Certain Recreational Facilities and Utilities:

★**0540.1** *Separations Applicable to Recreational Facilities.* The following provides specific requirements for separating facilities shown from explosives locations:

TABLE 5-12. SEPARATIONS BETWEEN RECREATIONAL FACILITIES AND EXPLOSIVES

Facility	*Following Explosives Safety Distances Will Apply*
Inhabited Buildings, Golf Clubhouses, Caddy Houses, Pro Shops.	Inhabited Building Distance (Places of public assembly).
Recreational Areas with people in the open where no structures are involved.	Public Highway Distance, measured to the nearest edge of the area.
Recreational Areas used *exclusively* be alert personnel manning aircraft combat loaded with explosives.	See para 0519.1(2)*1*, note 8.
Golf Courses.	Public Highway Distance. The distance will be measured to the nearest edge of the course. The edge of the course, for this purpose, will be the nearest edge of the tee, fairway, green, or line designated as out-of-bounds.
Ball Fields, Tennis Courts, and similar Personnel Congregational Points where structures, including bleacher stands, are a part of the facility.	Inhabited Building Distance measured to the nearest edge (area or structure) of the facility.

★**0540.2** *Separations Applicable to Utilities.* The following separations apply to utilities, *except* power lines under para 0604 and POL facilities under para 0522:

(1) Permanent government controlled underground utilities (such as water, natural gas, steam, sewage, air, etc) should, for their protection, be separated from the location of mass-detonating explosives as follows:

Quantity of Explosives (Not Over)	*Distance (Feet)*
100	15
200	20
500	30
1,000	40
2,000	50
5,000	80
10,000	100
20,000	135
50,000	200
100,000	275
250,000	400

(2) Privately owned or operated utility installations (aboveground and underground) and aboveground government controlled utilities should be separated from explosive locations by inhabited building distances. In no case will this separation be less than public highway distance.

of all types will, except for local telephone connections and similar low voltage "intercom" or alarm systems, be run underground from a point at least 50 feet away from the building. The line side of the main disconnecting switch or circuit breaker will be provided with suitable lightning arrestors, normally located at the point of the overhead to underground-riser service connection. Where service entrance conductors terminate in a normally open switch or a single transformer (in, on or near the building) a second set of properly grounded lightning arrestors will be provided adjacent to these devices. The overhead portions of all lines, including the following, will be in accordance with para 0604 (1) above. While not mandatory from the explosives safety viewpoint, local telephone service and similar low voltage "intercom" or alarm systems should, where possible, also comply with the same underground routing for the last 50 feet. Where overhead "service drops" are employed, the installation must protect the stored explosives from undue exposure to lightning and the introduction of excessive power through the line from other outside sources (broken power lines, etc).

0606 Location of Electrical Motors. Electrical motors preferably should not be installed in rooms or buildings which are either Class I or Class II hazardous locations. They should be located outside of the room or building with no connection to the building except through mechanical glands or apertures adequately sealed against entrance of hazardous materials into both the location where motors are positioned and the motor itself. The provisions of para 0602 are applicable in the event it becomes necessary to mount electrical motors within hazardous locations.

0607 Portable Magazine Lighting System. An approved portable system of magazine lighting consists of floodlights with clear lens mounted on heavy portable stands and placed outside of the magazine door.

0608 Permanent Lighting for Storage Magazines. Where permanent lighting is essential, an approved type of disconnect switch will be located outside the magazine (preferable on the nearest power pole) and so arranged that the switch is locked in the open position. The power will be on only when personnel are working in the magazine.

0609 Portable Generators. Portable generators have proven satisfactory as a source of electric power. When in use, the exposed non-current carrying metallic frame and parts will be grounded. Generators will be parked at least 50 feet from magazine doors and in a place where fuel will not flow toward the magazine in the event of a break in the fuel system. Electric cords will be so placed that they will not be trucked over or walked on. Generators will be equipped with a first-aid fire extinguisher of a type suitable for use on electrical fires.

0610 Flexible Cords. Flexible cords should be type SO hard service cord. Cords for equipment in Class I and II locations, should be three wire with the third wire acting as the ground for the exposed non-current carrying metal parts of the appliance. In no case will the white identified neutral power conductor be used as a ground wire. Splices will not be permitted. Plugs will be equipped with three prongs, the third prong (green wire) acting as ground.

0611 Flashlights and Lanterns. Flashlights and hand lanterns powered by low voltage dry cell batteries and "Miners' Cap Lamps," each approved as "Permissible" by the United States Bureau of Mines and/or for Class I hazardous locations by Underwriters' Laboratories Inc., are considered satisfactory for both Class I and Class II hazardous locations.

0612 Static Electricity. The generation of static electricity is not the hazard. The hazard is created when charges are allowed to accumulate to the extent that an uncontrolled discharge occurs through, or in the presence of, a hazardous substance susceptible to ini-

tiation, such as: A discharge as a spark across an air gap in the presence of highly flammable or explosive material, or a discharge directly through electrically initiated explosive devices (primers, squibs, blasting caps, dimple motors, etc.). It is especially important that unit personnel employed in hazardous locations (para 0602.4) or in handling or installing unpackaged electrically initiated explosives devices and ammunition avoid the use of clothing made of materials having high static generating characteristics (such as rayon, nylon, silk, wool, and certain plastics). Normally, clothing materials acceptable for flight line use where fire hazards are prevalent are acceptable from an explosives safety viewpoint for handling munitions. Personnel, *regardless* of the type of clothing worn, can collect a charge of static electricity by being in contact with moving non-conductive substances (such as blowing dust) or coming in contact with a mass that has been previously charged (transport vehicles, etc.). Therefore, in addition to the requirements of para 0613.3, personnel will be *particularly careful* in the presence of explosives in any form to *discharge themselves* or equalize their static electrical potential to that of the explosives item to be handled, where circumstances are such that hazards may be created. See para 0208 regarding SOPs. Detailed discussions of static electricity and methods of minimizing the hazards may be found in the following pamphlets:

"Static Electricity," published by the National Fire Protection Association (NFPA).

"Static Electricity," Bulletin No. C438, United States Department of Commerce.

"Standards for Grounding and Bonding Equipment," published by the Underwriters' Laboratories Incorporated.

0613 Static Grounding:

0613.1 *Grounding Equipment.* The general method for eliminating or reducing the hazard from static is to provide an electrically continuous path to the ground. This will allow the charges to dissipate as fast as they are generated. When all the objects concerned are conductive, grounding can be readily accomplished by electrically connecting all parts to a common ground conductor. Grounding exterior parts of containers alone does not necessarily eliminate all of the danger from static electricity, for in order to be completely effective, grounding must include the contents. Partial grounding or using conductors of insufficient strength or too high resistance may increase the static hazard by providing opportunities for discharge through an uncontrolled path to ground. Electrical continuity may be broken by oil on bearings, paint, or rust at any contact point. To obtain a continuous circuit, grounding straps should be used to bridge such locations. Permanent equipment in contact with conductive floors or table tops is not adequately grounded. Static grounds should not be made to electrical conduit systems; gas, steam, or air lines; dry pipe sprinkler systems; or air terminals of lightning protection systems. The size of wires used as static ground conductors should be large enough to withstand mechanical damage. In no case will this wire be less than AWG No. 8 for permanent grounds.

0613.2 *Belting.* Nonstatic producing belting will be used in locations where static electricity is a hazard. Such belting will have a resistance to ground not exceeding 600,000 ohms.

0613.3 *Conductive Floors and Conductive Shoes.* Standard conductive floors and shoes will be used to provide proper static grounding for personnel at operations where explosives such as primer, initiator, igniter, tracer, and incendiary mixtures are exposed. Some materials sensitive to static spark (easily ignited or detonated) are lead styphnate, lead azide, mercury fulminate, tetrazene, diazodinitrophonol, potassium chlorate-lead styphnate mixtures, igniter composition, grade B magnesium powder, and black powder dust when exposed in layers. Dust of solid propellants can also be ignited from the spark energy that can be accumulated on a person

and conductive floors and shoes will be employed when the dust is present. In addition, dust-air mixtures of ammonium picrate, tetryl, tetrytol, and dust of solid propellants are sensitive to static electricity discharge. Many flammable liquids and air mixtures tested (ethyl ether, ethyl alcohol, ethyl acetate, acetone, and gasoline) can be ignited by static discharge from a person. When personnel come into the proximity of (possible contact with) explosives or mixtures enumerated above, condutive floors will be installed except where the hazards of dust-air or flammable vapor-air mixtures are eliminated by adequate housekeeping, dust collection, ventilation, or solvent recovery methods. Where conductive floors and shoes are required, table tops upon which exposed explosives or dusts are encountered should be covered with a properly grounded conductive material meeting the same requirements as those for flooring. Conductive floors are not required throughout an entire building or room if the hazard remains localized. In such small areas conductive mats or runners may be substituted. Personnel, except electricians, in locations where conductive floors or coverings are required and installed will wear conductive footwear (see para 0803 for further information concerning conductive floors). Where conductive floors and shoes are required, the resistance between the ground and the wearer will not exceed 1,000,000 ohms; i.e., total resistance of conductive shoes on a person, plus the resistance of floor to ground. The maximum floor resistance is 250,000 ohms. The maximum electrical resistance permitted for each conductive shoe is 450,000 ohms. Conductive rubbers which are to be used by visitors will meet the same resistance requirements. Conductive shoes and floors require care to insure retention of their conductive properties. When the shoes are not in use they should be stored in lockers close to the room in which they are to be worn, and the change from nonconductive to conductive shoes should be made at the location. A thin layer of dust or wax on the conductive floor may insulate conductive shoes from the floor. Adequate supervision will be maintained to ensure that conductive shoes are not altered so as to negate their safety features. Only conductive material will be used for the repair of conductive soled shoes. Conductive shoes will be thoroughly cleaned before being repaired. (See para 0512–10, AFM 127–101 for further information on conductive shoes.) Tests of conductive shoes and floors will be made initially and at sufficient intervals thereafter, but not less than semiannually, to insure that resistance requirements stated above are met. A record of test results will be maintained. Instruments used in making tests will not be used until all exposed explosives subject to possible initiation have been removed from the room or hazardous area.

0614 Installed System and Equipment Grounds. Where explosives are involved particular attention will be given to the installation (para 0601)