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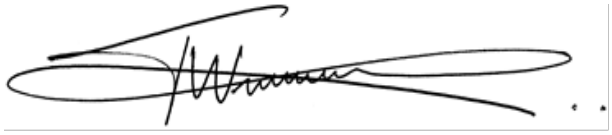
Contents

DEPARTMENT OF EMPLOYMENT AND LABOUR

NO. R. 5048 **23 July 2024**

EXPLOSIVES REGULATIONS, 2024

I, Thembelani Waltermade Nxesi, Minister of Employment and Labour has, in terms of section 43 of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), after consultation with the Advisory Council for Occupational Health and Safety, made the regulations in the Schedule.



MR TW NXESI, MP
MINISTER OF EMPLOYMENT AND LABOUR
DATE: 25 APRIL 2024

SCHEDULE

Arrangement of regulations

Definitions

1. In these regulations "the Act" means the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), and any word or expression to which a meaning has been assigned in the Act, has the meaning so assigned and, unless the context otherwise indicates–

"ammonium nitrate" means–

(a) ammonium nitrate as referred to in SANS 10228: *The identification and classification of dangerous goods for transport by road and rail modes*, and listed as UN number 1942;

(b) uniform mixtures of ammonium nitrate as defined in paragraph (a) with inorganic compatible materials where the total nitrogen content exceeds 28% with not more than 0,2% total combustible substances, including any organic substance calculated as carbon; and

(c) solutions of ammonium nitrate as defined in paragraph (a) containing less than 40% (volume per volume) water.

"authorised explosive" means any article, substance or mixture that has the properties of an explosive and is approved by the Minister of Police and published by notice in the *Gazette* as an explosive;

"blasting" means the firing of blasting explosives for such purposes as breaking rock or other material, moving material, or other similar activity approved by the chief inspector of explosives, and "blast" has a similar meaning;

"blaster" means a competent person who is in possession of a valid blasting permit issued by the chief inspector of explosives;

"burning grounds" means a fenced-in area with a controlled entrance where explosives may be exposed to a naked flame under safe controlled conditions;

"**certificated person"** means any person to whom a certificate of competency in explosives has been granted or issued by the South African Qualifications Authority,

an accredited service provider or any other organisation approved by the chief inspector of occupational health and safety;

"chief inspector of explosives" means the chief inspector appointed in terms of section 2(1) of the Explosives Act, 1956 (Act No. 26 of 1956); or any other act that can supersede the above act;

"class 1.1–1.6" means classes 1.1–1.6 of explosives as defined in SANS 10228: *The identification and classification of dangerous goods for transport by road and rail modes*;

"class 5.1" means a class of oxidizing substances as defined in SANS 10228: *The identification and classification of dangerous goods for transport by road and rail modes*;

"competent person" means a person who –

a) has in respect of the work or task to be performed the required knowledge, training and experience and, where applicable, qualifications, specific to that work or task: provided that where appropriate qualifications and training are registered in terms of the provisions of the National Qualification Framework Act, 2008 (Act No 67 of 2008), those qualifications and that training must be regarded as the required qualifications and training; and
b) is familiar with the act and the applicable regulations made under the Act;

"complex" means a group of danger buildings in the same danger area;

"danger area" means an area surrounded by a fence provided with a guarded entrance in which are situated explosives testing, manufacturing and storage buildings, and as much of the land surrounding them as is shown on the official explosives workplace site plan;

"danger building or room" means any licensed building or room used as an explosives workplace or explosives magazine;

"danger zone" means the region inside the area encompassed by the larger safety distance applicable to a danger building in terms of the safety distances stipulated in Annexure 1;

"explosive" means–

(a) a substance, or a mixture of substances, in a solid or liquid state, which is capable of producing an explosion;

(b) a pyrotechnic substance in a solid or liquid state, or a mixture of such substances, designed to produce an effect by heat, light, sound, gas or smoke, or a combination of these, as the result of non-detonative self-sustaining exothermic chemical reactions, including pyrotechnic substances that do not evolve gases;

(c) any article or device containing one or more substances contemplated in paragraph (a);

(d) any plastic explosive;

(e) mixtures of ammonium nitrate, with or without inorganic compatible substances, with unrestricted combustible material and where the total nitrogen content exceeds 15%; or

(f) any other substance or article that the Minister of Police may from time to time by notice in the *Gazette* declare to be an explosive;

"explosives compatibility groups" means explosives grouped together for their safe storage and transportation as defined in SANS 10228: *The identification and classification of dangerous goods for transport by road and rail modes*;

"explosives magazine" means any building licensed under these regulations for the storage of explosives;

"explosives manager" means a person appointed in terms of regulation 12(1)(a);

"explosives workplace" means any workplace licensed under these regulations for the manufacture, testing, use and storage of explosives, together with every mound, building and works therein or thereon for whatever purpose used;

"explosives workplace licence" means a licence referred to in regulation 4(2) or issued in terms of regulation 4(3) in respect of an explosives workplace for the manufacture, testing, use and storage of explosives;

"from magazines" means from one danger building where explosives are stored to another danger building where explosives are stored;

"guarded entrance" means an entrance through which no person, equipment or material can pass without the approval of the explosives manager or a person authorised by him and the monitoring by a guard or guarding system approved by the explosives manager;

"loose article" means any tool, furniture, cleaning material, handling equipment, stationery or any other item that is not permanently affixed in a danger building where explosives are present;

"loose article list" means a list approved by the explosives manager and posted in a conspicuous position in a building or room specifying the number and types of loose articles allowed and present in that building or room;

"magazine license" means a license referred to in regulation 4(2) or issued in terms of regulation 4(3) in respect of a magazine for the storage of explosives;

"manufacture" means the making or processing of any explosive including the division of any explosive from or into its component parts by any process, and the conversion of an explosive of one kind into an explosive of another kind, including the alteration, fitting for use, testing, on-site manufacture, repair or destruction of any explosive;

"mobile workplace" means any mobile workplace licensed under these regulations for the manufacture, testing, use and storage of explosives;

"National Explosives Council" means the council established under regulation 17;

"non-danger building or room" means any building or room within the danger area that is used in connection with the manufacture, testing or storage of explosives, but in which no explosives are kept, used, tested or manufactured;

"non-detonatable explosive" means an explosive that needs extreme conditions to initiate;

"non-explosives worker" means an employee in an explosives workplace who normally performs his or her duties outside a danger area;

"non-sensitised explosive" means any explosive or substance that needs to be sensitised by the addition of a gassing agent, chemical sensitiser, gas bubbles, organic fuel or micro balloons, or the like, for it to be used as an explosive;

"official explosives workplace site plan" means a plan as contemplated in regulation 4(5)(b);

"operating instruction" means a document approved by the explosives manager setting out in detail the methods, materials, equipment, tools and precautions to be used in a given operation;

"permanent and full-time capacity" means employed by one employer only to work during all normal working hours of that employer;

"plant office" means an office for the exclusive use of personnel for the direct control of the operations in the danger area and so situated that exposure to explosions is minimised;

"plant workshop" means a workshop used exclusively to maintain equipment and buildings in the danger area;

"private use" means the legal use of explosives by individuals for a specific purpose not connected with any other person, trade or business;

"process building" means a danger building where work on explosives takes place;

"process magazine" means a magazine within the safety circle of a process building in which explosives for one day's use are kept;

"professional engineer" means an engineer who has received professional status from the Engineering Council of South Africa;

"public building" means a structure beyond the danger zone to which members of the public have access and in which non-explosives workers are stationed;

"schedule licence" means a licence categorised as–

(a) a schedule I explosives workplace licence, which is a schedule to the explosive workplace licence, in a format acceptable to the chief inspector of occupational health and safety, certified by the explosives manager and approved by the chief inspector of occupational health and safety; in which a description is given of all explosives that may be manufactured, tested, stored or used in a danger area, specifying nominal formulas, with tolerances, components, construction and packaging;

(b) a schedule II explosives workplace licence, which is a schedule to the explosives workplace licence pertaining to each danger building or room in the danger area, in a format acceptable to the chief inspector of occupational health and safety, certified by the explosives manager and approved by the chief inspector of occupational health and safety, specifying the name and number of the building or room, the maximum number of persons and the maximum mass of explosives allowed in the building or room, the operations authorised and which of these operations may be carried out simultaneously; or

(c) a schedule III explosives workplace licence, which is a schedule to the explosives workplace licence for a non-danger building or room in a danger area, in a format acceptable to the chief inspector of occupational health and safety, certified by the explosives manager and approved by the chief inspector of occupational health and safety, specifying the name and number of the building or room, the purpose of the building or room and the number of persons allowed therein;

"to magazines" means from an explosives process building to any danger building where explosives are stored;

"to public buildings" means from a danger building to public buildings as defined in these regulations, and includes main offices, main workshops and dwelling houses other than those defined under to railways, roads, etc.;

"to railways, roads, etc." means from a danger building to railways, roads or open sports grounds, or to dwelling houses under the same ownership as the explosives factory and occupied by the owner or an employee;

"unauthorised explosive" means any substance or mixture that has the properties of an explosive but has not been approved and published as an authorised explosive.

Scope of application

2. (1) Subject to subregulation (2), these regulations will apply to any employer, self-employed person or user who operates an explosives workplace for the purpose of manufacturing, testing, storing or using explosives.

(2) These regulations will not apply to any place where the loading or reloading of cartridges for small arms is being carried out for private use and is not offered for sale, trade or any other use: provided that these regulations do not detract from the requirements of the Firearms Control Act, 2000 (Act No. 60 of 2000).

(3) The chief inspector of occupational health and safety may, upon receiving a written request, grant exemption, in writing, from any of these regulations on such conditions as he or she may determine to ensure the safe manufacture, storage, testing and handling of explosives.

(4) Any exemption granted under subregulation (3) may at any time in writing be withdrawn or the conditions amended by the chief inspector of occupational health and safety.

Authorised and classified explosives

3. (1) The chief inspector of explosives must make available to the chief inspector of occupational health and safety the list of authorised explosives and the classification of explosives contemplated in the Explosives Act, 1956 (Act No. 26 of 1956), as amended or replaced.

(2) The chief inspector of occupational health and safety may, after consultation with the chief inspector of explosives, classify any chemical combination as an explosive or reclassify any explosive for the purposes of these regulations.

(3) No person may manufacture or use any explosives that are not authorised or classified in terms of subregulations (1) and (2).

(4) No person may manufacture explosives in any manner not provided for in these regulations unless written permission for such manufacture has been obtained from the chief inspector of occupational health and safety.

Licensing of explosives workplaces

4. (1) Any person who desires to erect or operate a new explosives workplace for the manufacture, testing, use or storage of explosives must apply in writing in a prescribed form for a licence to the chief inspector of occupational health and safety.

(2) The chief inspector of occupational health and safety must acknowledge receipt of any application within 30 calendar days of receipt.

(3) The chief inspector of occupational health and safety may–

(a) issue a licence subject to compliance with these regulations and after consultation with the relevant employer, self-employed person or user and local government: provided that such licence will lapse after 12 months if the erection of the building has not started within that period;

(b) attach any condition to the licence that he or she deems reasonably necessary;

(c) alter the condition of an existing licence after consultation with the employer, self-employed person, user and employees;

(d) not issue a licence where an explosives manager has not been appointed in terms of regulation 12(1) or where the prescribed requirements have not been met;

(e) upon application in writing, transfer a licence into the name of another person: provided that the application will be made prior to the transfer and the transferee will have appointed an explosives manager;

(f) revoke any licence issued in terms of this regulation if the prescribed conditions are no longer being complied with or where no explosives manager is appointed; and

(g) issue, amend, replace or withdraw guidelines, codes, standards or best practices on any matter covered in these regulations.

(4) Any person applying for a magazine or explosives workplace licence must attach to such application–

(a) a written authorisation from the relevant local government for the proposed new magazine or workplace;

(b) the written approval from the chief inspector of explosives concerning security aspects for the area and buildings of the proposed workplace or magazine;

(c) the letter of appointment of the competent explosives manager, including the acceptance of the appointment;

(d) the physical address of the explosives workplace or magazine;

(e) documentary proof of the explosives manager's competency and certification; and

(f) a full written report on the risk assessment compiled by an approved inspection authority.

(5) Any person applying for a licence to manufacture, use, test or store explosives in the proposed explosives workplace or magazine must submit draft schedule licences, certified by the explosives manager, and drawings in duplicate setting forth, the following:

(a) An area plan of the proposed site indicating the danger zone;

(b) A site plan drawn to scale, which is easily readable and clearly indicates the complete layout of the site and the danger zone;

(c) The safety distances, as contemplated in Annexure I, that are to be maintained between danger buildings, and between danger buildings and other buildings or works used in connection with the explosives workplace;

(d) The compatibility of materials to be used in the construction of danger buildings;

(e) Building plans for all danger buildings or works as designed and approved by a professional engineer;

(f) The nature of the process to be used in the workplace and the place at or in which he or she intends to implement each manufacturing process, activity and type of work;

(g) The places at or in which he or she proposes to store, destroy or test–

(i) any ingredient of explosives;

(ii) other articles or substances that are liable to spontaneous ignition; and

(iii) articles that are otherwise dangerous;

(h) The quantity of explosives, or any other partly or wholly mixed ingredients thereof, that he or she intends to use simultaneously in any danger room, danger building or complex;

(i) The maximum number of persons that he or she intends to employ in each danger room, danger building or complex; and

(j) Any additional information that may be required by the chief inspector of occupational health and safety;

(k) a full written report on the risk assessment conducted and compiled by an approved inspection authority;

(l) a structural assessment report compiled by a structural engineer.

(6) Any person who desires to erect or operate a magazine for the storage of explosives must apply in writing to the chief inspector of occupational health and safety for written approval.

(7) No person may erect burning grounds within or near a danger area without an appropriate safe **distance (refer to table of safety distances annexure1)**.

(8) Any person who desires to use explosives in a workplace for any purpose must apply in writing to the chief inspector of occupational health and safety for written approval.

Non-detonatable and non-sensitised explosives

5. (1) Ammonium nitrate fertilizers must be manufactured in such a way that the constituents cannot be separated mechanically from one another.

(2) Mixtures of ammonium nitrate with calcium carbonate, or dolomite, or calcium carbonate and dolomite, must be manufactured in such a way that the calcium carbonate or dolomite is incorporated in the prills or granules of the mixture and must be approved, in writing, by the chief inspector of explosives.

(3) Ammonium nitrate emulsions, gels and suspensions intermediate for blasting explosives, listed in SANS 10228 as UN number 3375, must pass test series 8 of the United Nations' *Manual of Tests and Criteria* and be authorised by the chief inspector of explosives.

(4) Every person or concern manufacturing non-detonatable or non-sensitised explosives may apply to the chief inspector of occupational health and safety for exemption from these regulations with the exception of regulation 5.

(5) Application for exemption from these regulations is subject to the conditions that the chief inspector of occupational health and safety may stipulate for the safe manufacture, storage, testing and handling of non-detonatable or non-sensitised explosives.

(6) The basis for the safe manufacture of non-detonatable or non- sensitised explosives referred to in subregulation (5) must include provision for the following safety measures:

(a) Access control measures and equipment at the entry to the workplace area where the non-detonatable or non-sensitised explosives are manufactured, tested or stored will restrict access to the manufacturing, testing and storage areas to authorised persons only;

(b) Unauthorised access to manufacturing operations will not be allowed, and measures and equipment to prevent access to potentially hazardous areas will be provided;

(c) The following controls will be in place at the separator stage in non-detonatable or non-sensitised explosives manufacture:

(i) Temperature control;

(ii) pH control;

(iii) An inventory dumping system;

(iv) Control of process steam temperature and pressure; and

(v) Procedures to prevent unsafe confinement of non-detonatable or non-sensitised explosives during operation or cleaning activities;

(d) The following controls will be in place at the storage and pumping stage in non-detonatable or non-sensitised explosives manufacture:

(i) A pump management system with interlocks that is able to trip;

(ii) Temperature control in heated storage tanks; and

(iii) Tank level control with overfill and under fill protection;

(e) The following controls will be in place during evaporation and heating of ammonium nitrate for prilling and granulation:

(i) Temperature control;

(ii) pH control;

(iii) An inventory dumping system; and

(iv) Control of process steam temperature and pressure;

(f) Procedures to manage unsafe confinement of non-detonatable or non-sensitised explosives during operation or cleaning activities will be in place;

(g) Control of contaminants and additives and unsafe accumulation of such substances will be prevented;

(h) Control of contaminants will be in place during prilling or granulation;

(i) Control of reducing components in the drying air will be in place;

(j) The construction materials in all processes will be checked for compatibility with non-detonatable or non-sensitised explosives with respect to corrosion and potential sensitising effects in the process;

(k) The following control during the storage and packing stages of non detonatable or non-sensitised explosives will be in place:

(i) Control over use of combustible materials inside and close to storage areas;

(ii) Control over use of liquid fuels and vehicles in storage areas;

(iii) Control of mechanical condition of non-detonatable or non-sensitised explosives transport and storage equipment;

(iv) Control of potential contamination in non-detonatable or non-sensitised explosives transport containers;

(v) Controls for appropriate firefighting equipment;

(vi) Control of pH in solution storage; and

(vii) Prevention of unsafe confinement of non-detonatable or non-sensitised explosives.

Danger area

6. (1) An employer, self-employed person or user must ensure that entry and exit from danger areas is only permitted–

(a) at the permanent authorised point of entry or exit: provided that entry or exit at any other point may be authorised by the explosives manager or a person authorised by him or her if the authorised gatekeeper has been informed thereof;

(b) for persons and vehicles authorised thereto by the explosives manager or a person authorised by him or her; and

(c) to visitors under escort by an authorised person who is aware of the hazards attached to the danger area.

(2) An employer must keep a register of the entries and exits contemplated in subregulation (1) and that register must be available on the premises for inspection by an inspector.

(3) No person may–

(a) enter or exit the danger area through an unauthorised point of entry or exit;

(b) enter or exit the danger area without first submitting themselves to a search by the authorised gatekeeper if so requested;

(c) enter the danger area with–

(i) matches, lighters or other devices or articles capable of generating heat, flames or sparks: Provided that authorisation to enter with the articles contemplated in this paragraph may be granted by the explosives manager for specific authorised use;

(ii) intoxicating liquor or narcotics or under the influence of these substances;

(iii) any other substance which may have an effect on a person's abilities to function in an explosive area; or tobacco, food, medicine or drinkable fluids: provided that authorisation to enter with such articles may be granted by the explosives manager for purposes of consumption in licensed mess rooms and designated smoking areas: provided further that special rules for the control of such consumption and smoking, approved by the chief inspector of occupational health and safety will be made in writing and will be enforced by the employer, self-employed person or user;

(iv) radio transmitters or cellular telephones without the authorisation of the explosives manager based on a risk assessment by an approved inspection authority: Provided that such devices will be used in accordance with any conditions or guidelines that may from time to time be issued by the chief inspector of occupational health and safety; or

(d) do anything that will increase the risk or omit to do anything that will decrease the risk attached to work being performed in a danger area.

(4) An employer, self-employed person or user may not erect any buildings in the danger zone without first obtaining written approval from the chief inspector of occupational health and safety and complying with regulation 4(5).

(5) An employer, self-employed person or user must fence in the danger area in accordance with the South African Police Service's minimum specifications for fencing of explosives magazines (SAPS 412).

(6) An employer, self-employed person or user must ensure that hazard warning signs are maintained and displayed, clearly visible, at the entrance to any danger area, magazine or workplace.

Danger buildings

7. (1) An employer, self-employed person or user must ensure, without derogating from the requirements of the Fire Brigade Services Act, 1987 (Act No. 99 of 1987), that all firefighting appliances and emergency equipment provided in the danger building or room are so placed and kept that they are readily visible, accessible and available for use when required.

(2) No person may discharge any fire extinguisher or tamper with any equipment without, as soon as practicable thereafter, informing the explosives manager.

(3) An employer, self-employed person or user must ensure that no danger building is used unless the ambient temperature and relative humidity inside the building and the temperature of the explosives in the building are within the limits prescribed by the explosives manager.

(4) An employer, self-employed person or user must–

(a) take all reasonable precautions to prevent foreign materials such as grit, stones or similar objects from entering danger buildings;

(b) ensure that no charcoal, whether ground or otherwise, oily rag or other article susceptible to spontaneous ignition is taken into any danger building, unless such article is required for immediate use in a specified place and, upon cessation of such use, is removed forthwith; and

(c) not permit any article not listed on the loose article list to be used or to be present in a danger building.

(5) An employer, self-employed person or user must ensure that–

(a) every danger building is protected against lightning in accordance with SANS 10313: *Protection against lightning – Physical damage to structures and life hazard;*

(b) every lightning protection system is examined and tested by a person with sufficient knowledge, training and experience in lightning protection;

(c) the examination and testing contemplated in paragraph (b) is carried out before the start of each lightning season at least every 12 months, and the final submission must be done in the month of September/January;

(d) the results of every examination and testing contemplated in paragraph (b) are recorded in a register and are made available on the premises for inspection by an inspector;

(e) all danger buildings with metal walls or roofs, and all plant and machinery in such buildings, are adequately earthed and bonded in accordance with SANS 10142: *The wiring of premises, Part 1: Low-voltage installations*, and SANS 10108: *The classification of hazardous locations and the selection of apparatus for use in such locations*; and

(f) the explosives manager prepares and implements a procedure with steps to be taken in the event of lightning or electrical storms to minimise the risks created by such storms.

(6) An employer, self-employed person or user must ensure that–

(a) the official number of the building is affixed on the outer wall near the main door to every building within the danger area;

(b) a copy of the schedule licence of every room in the danger area is permanently affixed in a conspicuous position inside that room; and

(c) a loose article list is permanently affixed in a conspicuous position inside every danger building: Provided that all such numbering and documentation must be printed or typed.

(7) An employer, self-employed person or user must ensure that–

(a) all danger buildings are maintained in good order and that the interior, including benches, shelves and fittings, of every building in which any manufacturing process takes place or that may, at any stage of the process of manufacture, contain explosives or any ingredients thereof, either mixed or partially mixed, is kept clean and free from foreign materials to the extent that is reasonably practicable;

(b) before any maintenance, repairs or new installations are done to or in any danger building, that building is cleaned to the extent that is reasonably practicable, by the removal of all explosives and ingredients thereof, whether mixed or otherwise, and, if necessary, by the thorough washing out of the building or part of the building to or in which such maintenance, repairs or new installations is required;

(c) a work permit, approved by a person authorised to do so by the explosives manager, is prepared, setting out the procedures to be followed for maintenance, repairs or new installations to or in danger buildings, and that the work permit is implemented;

(d) all the doors of the danger building remain unlocked while persons are inside the building;

(e) steps are taken to ensure that doors to schedule II danger buildings do not slam; and

(f) all machinery and fittings in danger buildings are maintained and operated in accordance with the design specifications of the manufacturer and any other specifications determined by the explosives manager.

Safeguarding of explosives workplace

8. (1) An employer, self-employed person or user must ensure that–

(a) an explosives workplace is established, erected, operated and maintained in such a manner as to prevent the exposure of persons to hazardous or potentially hazardous conditions or circumstances;

(b) no part of the explosives workplace is used for any other purpose not authorised by the explosives workplace licence;

(c) all materials used in the construction of a danger building are of a design approved by a professional engineer and acceptable to the chief inspector of occupational health and safety;

(d) in respect of explosives workplaces–

(i) there are escape routes;

(ii) work in confined spaces is done in accordance with regulation 5 of the General Safety Regulations made under the Act and published in Government Notice No. R. 1031 of 30 May 1986;

(iii) the safety of electrical machinery is as per SANS 10086-1: *The installation, inspection and maintenance of equipment used in explosive atmospheres, Part 1: Installations including surface installations on mines*;

(iv) the required lightning protectors are installed and are functional; and

(v) there is no explosives processing or storage of explosives is allowed in a building that is located directly under overhead power lines;

(e) all employees within the danger area are conversant with any applicable regulations, special rules and operating instructions and that copies of these are readily available to them; and

(f) a maintenance and inspection schedule is prepared and implemented by the explosives manager in respect of all danger buildings, fittings, plant and machinery in use in the danger area.

(2) An employer, self-employed person or user must–

(a) in the event of any abnormal conditions being discovered or any unusual occurrence taking place at an explosives workplace, cause operations to be stopped immediately: provided that where this is not possible, owing

to the nature of the process, emergency procedures must be laid down and immediate action taken in terms of those procedures; and

(b) despite authorised licence limits, reduce the quantity of explosives, or raw materials, or the number of persons at any explosives workplace whenever this is reasonably practicable.

Design, construction and manufacture

9. (1) No employer may use or require or permit the use of any building, installation, room, machine or equipment unless–

(a) it has been designed and constructed in accordance with health and safety standards incorporated in these regulations in terms of section 44 of the Act;

(b) the employer is in possession of a written report with assessed risks, preventative and mitigation measures identified, prepared by an approved inspection authority contemplated in regulation 18; and

(c) the employer, self-employed person or user is in possession of a certificate issued by the manufacturer of the machines or equipment, that lists the health and safety standards complied with in the design and construction thereof: provided that such certificate must be countersigned by an approved inspection authority.

Importation of explosives

10. Any person who obtains a permit to import or export explosives in terms of the Explosives Act, 1956, must within seven days of obtaining such permit provide the chief inspector of occupational health and safety with a copy thereof.

Safety distances

11. (1) An employer, self-employed person or user must–

(a) apply the safety distances for the respective categories of explosives as stipulated in Annexure 1 to these regulations;

(b) where less than five kilograms of explosives is used, apply to the chief inspector of occupational health and safety for a determination of a safety distance that the employer must enforce;

(c) in the case of quantities of class 1.1 and class 1.5 explosives exceeding five kilograms, ensure that the structures or areas where they are manufactured, stored, tested or handled in any manner, are mounded: provided that where, with the permission of the chief inspector of occupational health and safety, mounds are dispensed with, the distances given in columns (1), (2) and (3) of Annexure 1 must be doubled.

(2) An employer, self-employed person or user may reduce the distances in column (1) of Annexure 1 in respect of ground-covered magazines used in explosives workplace magazine areas, and the doors of which do not face each other–

(a) between magazines next to each other: by half the distance; or

(b) between magazines behind each other: by three-quarters of the distance.

Supervision of explosives workplace

12. (1) (a) In order to ensure that the provisions of the Act and these regulations in relation to explosives workplaces are complied with, an employer, self-employed person or user must, subject to this regulation, in writing appoint a competent and certificated person, who is the holder of a valid explosives manager's certificate issued by chief inspector of occupational health and safety, and employed in a permanent and full-time capacity, to be explosives manager in respect of every workplace where explosives are being used, tested, stored or manufactured: Provided that the appointment of an explosives manager will not exempt the employer, self-

employed person or user from any liability or responsibility contemplated in section 16 of the Act.

(b) An explosives manager may perform other functions for the employer, provided they do not interfere with the person's obligations as an explosives manager.

(c) The explosives manager must ensure that any preventative and mitigating measures recommended by the approved inspection authority as contemplated in regulation 9(b) are taken into account in addressing the identified risks.

(d) In issuing a person with an explosives manager's certificate for any workplace, the chief inspector of occupational health and safety must have regard to the appropriateness of the person's training and experience in the health and safety aspects of explosives for the workplace concerned.

(2) The chief inspector of occupational health and safety may, subject to the conditions that he or she may impose, permit an employer or user to appoint more than one person as explosives manager.

(3) An employer or user must appoint, in a permanent and full-time capacity, one or more persons, who are suitably qualified and experienced, as supervisor(s) to assist the explosives manager.

(4) An employer, self-employed person or user must ensure that–

(a) the explosives manager, without derogating from any other duties imposed on him or her by the Act and these regulations–

(i) approves in writing the rules, methods, materials, equipment and tools to be used in the danger area;

(ii) ensures that all persons under his or her control are informed of the hazards related to their tasks and are thoroughly trained in safe work procedures, in particular with respect to explosive hazards

such as shock, friction risk of fire or static electricity, and are familiar with the requirements of these regulations;

(iii) stipulates in writing all protective clothing and equipment to be used in the danger area; and

(iv) ensures that the processes and equipment specified in schedule licences are safe and appropriate for the manufacturing processes envisaged for the workplace.

(b) the supervisor, without derogating from any other duties imposed on him or her by the Act and these regulations–

(i) is at all times in a position to exercise control over the operations in the danger building;

(ii) reports without delay to the explosives manager any plant or equipment under his or her control that has or may have posed a risk to the health and safety of persons;

(iii) ensures that all rules implemented in the interest of the health and safety of persons are at all times complied with; and

(iv) stops all explosives manufacturing or any work involving explosives if any risk is posed to the health or safety of persons.

Safe handling of explosives

13. (1) An employer, self-employed person or user must ensure that–

(a) all explosives or ingredients thereof are at all times free of foreign material that could create a risk to the health and safety of persons;

(b) all reasonably practicable precautions are taken to prevent the spillage of explosives;

(c) cleaning procedures in the case of a spillage of explosives are stipulated in writing by the explosives manager and must require that any unusual spillage of explosives must be reported to the supervisor immediately;

(d) all waste, paper, timber, rags, cotton and similar materials that have been in contact with either explosives or an ingredient of an explosive are disposed of in a manner stipulated in writing by the explosives manager: Provided that at the end of the working day all waste and floor sweepings from danger buildings must be deposited in places designated for this purpose by the explosives manager;

(e) the explosives or partly mixed explosives are conveyed as soon and as carefully as possible and taking such precautions and in such a manner as will effectively guard against any accidental ignition or explosion;

(f) only containers provided for the conveyance of explosives are used for transporting explosives or partly mixed explosives and that such containers are at all times kept clean, free from grit and in a good state of repair;

(g) vehicles containing explosives are left unattended only in places designated for this purpose by the explosives manager;

(h) explosives are not exposed to direct rays of the sun or to rain, whether being transported or not, except for preparation on burning grounds or testing; and

(i) manufactured explosives are removed as soon as is reasonably possible from the process building to an explosives magazine or that they are immediately dispatched.

(2) An employer, self-employed person or user must ensure that–

(a) all material, equipment, tools or similar articles used in a danger area are decontaminated after such use and that no person uses any such article unless it has been decontaminated; and

(b) the decontamination process contemplated in paragraph (a) is certified and approved by the explosives manager or a person authorised by the explosives manager.

(3) Unless permission has been granted by the chief inspector of occupational health and safety, no person may use explosives in workplaces other than explosives workplaces approved by the chief inspector of occupational health and safety.

(4) An employer, self-employed person or user must ensure that–

(a) explosives are transported and stored together or separately in the explosives workplace in accordance with the compatibility group assignments given in SANS 10228: *The identification and classification of dangerous goods for transport by road and rail modes*; and

(b) for purposes of manufacturing explosives, when explosives can be categorised in more than one group, they are deemed to belong exclusively to the higher risk compatibility group given in SANS 10228: *The identification and classification of dangerous goods for transport by road and rail modes*.

(5) No person may–

(a) by leaving explosives unattended allow unauthorised access to such explosives; or

(b) bury, dump, hide or abandon any explosives.

(6) No person may use any explosive material for blasting purposes unless–

(a) he or she is in possession of–

(i) documentary proof of relevant and valid registration as a blaster with the chief inspector of explosives;

(ii) a valid explosives license issued by the chief inspector of occupational health and safety; and

(iii) an original, relevant and valid blasting permit issued by the chief inspector of explosives.

(b) he or she is undergoing training while using such blasting material under the immediate and constant supervision of a person who is in possession of the documentation contemplated in paragraph (a); or

(c) he or she informs the chief director of provincial operations not less than 24 hours prior to such use.

(7) No person may permit any other person who is not in possession of the documentation contemplated in subregulation (6)(a) to use any blasting material unless such other person is, while using such blasting material, under the immediate and constant supervision of a person who is in possession of such documentation.

(8) Any explosives for which provision is not made in these regulations may be used only in such manner and under such conditions as may be prescribed, in writing, by the chief inspector of occupational health and safety.

Emergencies

14. (1) An employer, self-employed person or user must ensure that–

(a) an emergency plan, which must provide for the immediate evacuation of persons to areas of safety in the event of any immediate significant risk, such as explosion, fire, dangerous gas escape, etc., is established and implemented; and

(b) the emergency plan is tested in practice at least once every 12 months.

Incidents

15. (1) An employer, self-employed person or user must–

(a) in addition to the requirements of section 24 of the Act and any other legal requirements, whenever an incident involving explosives occurs,

forthwith inform the explosives manager and by means of telephone, facsimile or any other method of communication the chief inspector of occupational health and safety, and must confirm this report in writing, stating full particulars of the incident within seven days of the incident;

(b) where there was a possibility of risk to the health and safety of persons, whether or not persons or property sustained injury or damage as a result, inform the chief inspector of occupational health and safety in writing every month of incidents involving the accidental ignition or detonation of explosives or a danger of such accidental ignition or detonation.

(c) after an incident revisit the risk assessment for the specific equipment/process/area concerned.

(2) When an incident at an explosives workplace causes the immediate death of any person or had the potential to do so, the workplace must not, without the consent of the chief inspector of occupational health and safety, be disturbed or altered before it has been inspected by an inspector.

(3) Subregulation (2) does not apply to the extent that any disturbance or alteration is unavoidable to prevent further incidents, to remove injured persons or to safeguard persons from danger.

Closure of explosives workplaces

16. (1) An employer, self-employed person or user must–

(a) whenever he or she intends to close an explosives workplace for an indefinite period, or permanently, where reasonably practicable, give at least three months' notice of such intention to the chief inspector of occupational health and safety;

(b) ensure that the relevant explosives and ingredients are disposed of in a manner approved by the explosives manager;

(c) submit to the chief inspector of occupational health and safety a proof of return of all explosives and ingredients of explosives that had been in the explosives workplace;

(d) submit a decontamination and safety certificate to the chief inspector of occupational health and safety prior to the delicensing of the building and danger area; and

(e) ensure that no explosives or ingredients of explosives are kept on the premises of an explosives workplace after delicensing.

National Explosives Council

17. (1) The chief inspector of occupational health and safety may establish a National Explosives Council consisting of–

(a) an official from the Department of Employment and Labour, who will be the chairperson;

(b) two other officials from the Department of Employment and Labour;

(c) one person to represent the Department of Mineral Resources;

(d) two persons to represent employers;

(e) one person to represent the South African Police Service;

(f) two persons to represent the mining houses;

(g) two persons to represent the mining unions;

(h) one person to represent the South African National Defence Force;

(i) two persons to represent employees; and

(j) persons co-opted by the National Explosives Council who are knowledgeable about the subject matters to be dealt with by the Council.

(2) The chief inspector of occupational health and safety will appoint the members of the National Explosives Council for the period that he or she may determine at the time of appointment: provided that the chief inspector of occupational health and safety may discharge a member at any time, for reasons that are fair and just, and appoint a new member in his or her place.

(3) The chief inspector of occupational health and safety may dissolve the National Explosives Council on any reasonable grounds.

(4) The National Explosives Council will–

(a) advise the chief inspector of occupational health and safety on explosives legislation, codes, guidelines, standards, best practices and training requirements;

(b) designate persons to examine explosives managers and workers: provided that any accredited or approved training must be in accordance with South African Qualifications Authority standards;

(c) advise the chief inspector of occupational health and safety regarding any matter referred to the council by the chief inspector of occupational health and safety;

(d) perform any other function that may be requested by the chief inspector of occupational health and safety;

(e) refer appeals against its decisions to the chief inspector of occupational health and safety; and

(f) conduct its work in accordance with the instructions and rules of conduct framed by the chief inspector of occupational health and safety.

(5) A person affected by any decision of the National Explosives Council may appeal against such decision to the chief inspector of occupational health and safety.

Approved inspection authorities

18. (1) The chief inspector of occupational health and safety may approve as an inspection authority any organisation that has been accredited in terms of the provisions of the Act and these regulations.

(2) The chief inspector of occupational health and safety may at any time withdraw any approval of an approved inspection authority, subject to section 35 of the Act.

Competencies and standards of training

19. (1) The chief inspector of occupational health and safety may, after consultation with the National Explosives Council, from time to time determine, amend or withdraw minimum competency requirements for purposes of these regulations.

(2) Any competency and training relating thereto must be accredited in accordance with the South African Qualifications Authority standards.

Offences and penalties

20. (1) Any person who contravenes or fails to comply with the provisions of regulation 3(3), 3(4), 4(1), 4(6), 4(7), 4(8), 5, 6, 7, 8, 9(1), 10, 11, 12, 13, 14, 15 or 16 will be guilty of an offence and liable, on conviction, to a fine not exceeding R8000 or to imprisonment for a period not exceeding 12 months, or both, and, in the case of a continuous offence or failure to comply, to an additional fine of R800 for each day on which the offence continues or to additional imprisonment of one day for each day the offence continues: Provided that the period of such imprisonment will in no case exceed 90 days.

(2) The Minister may, from time to time and by publication in the *Gazette*, amend the amounts of the maximum fines in subregulation (1).

Repeal and savings

21. (1) The Explosives Regulations, 2002, are hereby repealed.

(2) Anything done under a provision of the Explosives Regulations, 2002, and that could have been done under a provision of these regulations, is regarded as having been done under the latter provision.

(3) The National Explosives Council established under regulation 17(1) of the Explosives Regulations, 2002, will continue to exist until it is dissolved under regulation 17(3) or a new National Explosives Council is established under regulation 17(1) of these regulations.

Short title

22. These regulations will be known as the Explosives Regulations, 2024.

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993

EXPLOSIVES REGULATIONS, 2024

RADIO FREQUENCY DEVICE GUIDELINES

Based on regulation 6 (3) (c) No person may enter the danger area with-

(iv) Radio transmitters or cellular telephones without the authorisation of the explosives manager based on a risk assessment by an approved inspection authority: provided that such devices will be used in accordance with any conditions or guidelines that may from time to time be issued by the chief inspector of occupational health and safety.

SCHEDULE (Table of contents)

Arrangement of guideline

1 ACRONYMS AND ABBREVIATIONS

AIA	Approved Inspection authority
EDD	Electronic (delay) detonator
EED	Electro explosive device
EMC	Electromagnetic Compatibility
ERP	Effective radiated power
ICASA	Independent Communications Authority of South Africa
RF	Radio Frequency

2 REFERENCED and APPLICABLE Documents

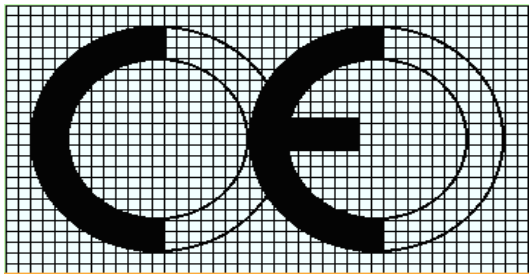
[1] SANS 762:2014 ed2 Assessment of inadvertent initiation of bridge wire electro-explosive devices by radio frequency radiation – Guide.
[2] JSP 482 Edition 4, January 2013. Chapter 24, Radio frequency hazards to electro-explosive devices.

3 DEFINITIONS

In these Regulations any word or expression to which a meaning has been assigned in the Act shall have the meaning so assigned and, unless the context otherwise indicates–

CE Mark

The CEmark has a specific layout not to be confused with similar, but incorrect, logos.



A CE Mark (CE) on a product is a manufacturer's declaration that the product complies with the essential requirements/ performance levels, measured according to Harmonised standards, of the relevant European health, safety and environmental protection legislation and may be legally placed on the market in the European Economic Area.

CE Certificate

A written statement using a “standardized” template declaration drawn up by the manufacturer to demonstrate the fulfilment of the EU requirements relating to a product bearing the CE mark.

EMC

Electromagnetic Compatibility (EMC) The goal of EMC is the correct operation of different equipment in a common electromagnetic environment. By limiting the intentional andunintentional radiation, propagation and reception of electromagnetic energy.

ERP

Effective radiated power (ERP) Power transmitted by a device including system gains andlosses.

Intentional Transmitter

Any device that is designed to produce radio waves.

Spectrum Licensed Equipment

A spectrum license issued by ICASA relates to the right to use a portion of the radio frequency spectrum subject to conditions. 2-way radios are examples.

Type Approved Equipment

Type approval is granted to a product incorporating a radio frequency transmitter and/or receiver that meets a minimum set of regulatory technical and safety requirements and operates in a frequency band reserved for Industrial, Scientific and Medical (ISM) equipment. Type approval by ICASA is required before a product is allowed to be sold or used in South Africa. No spectrum licence is required. WiFi, Bluetooth, Zigbee, Short Range Devices, GSM etc are examples.

Unintentional Radiator

A device that creates radio frequencies as a byproduct that is unintentionally radiated from the device.

4 SCOPE OF APPLICATION

(1) These guidelines are applicable to all persons involved in explosives workplace under Explosives Regulations, 2003 Occupational Health and Safety act regulation 6 (3) (iv).

(2) These guidelines are applicable to any explosives manager who intends to introduce radio frequency (RF) devices within the Danger Area

(3) These guidelines are applicable to Intentional Transmitters that are either Type Approved Equipment or Spectrum Licensed Equipment intended for use in the Danger Area.

Management of RF Devices and or updates/ modifications in the Danger Area can be determined by following the three steps:

1. Assessments of RF equipment and product.
2. Risk assessment of the process, equipment, personnel & structure.
3. Submission to the Department of Employment and Labour for notification.

The following information is required to perform a desktop evaluation of required exclusion zones for intentional radio frequency equipment:

i. Purpose of the assessment.

- Impact on production line (e.g. adding wireless cameras in production area etc)

- Impact on product (e.g. using RFID scanners in a magazine etc)
- Impact on personnel (e.g. radiation hazard due to office location next to radio mast etc)

ii. Production Line

- Block diagram with description of each manufacturing step.
- List of intentional transmitters including manufacturer, model, operational frequency and effective radiated power (ERP). This should be available from the ICASA Certificate.
- Immunity level of equipment critical to the process. This is often available on the CE declaration of conformity or can be assumed based on the declaration for industrial equipment (10V/m) or light industrial (3V/m).

iii. Product

- Detonation mechanism (Shock wave, temperature, impact, spark etc)

In the case where a desktop study would indicate an unacceptable risk, or where intentional transmitter data is not available, tests shall be done. Tests shall be done according to a customer agreed test procedure that shall describe the emission (typically CISPR) and immunity (typically IEC 61000-4-xx series) test set-up and test levels. Laboratory tests shall take preference. Each situation should be evaluated on a case by case basis as there could be intrinsically safe requirements for the test equipment should in-situ tests be required.
The outcome of the assessment is mitigation required to reduce the risk to acceptable levels.

5 ASSESSMENT OF RF DEVICES

5.1 Flow Chart

The flow chart in Figure 1 below provides guidance for determining the exclusion zones (distances) for intentional and unintentional RF emitting devices.

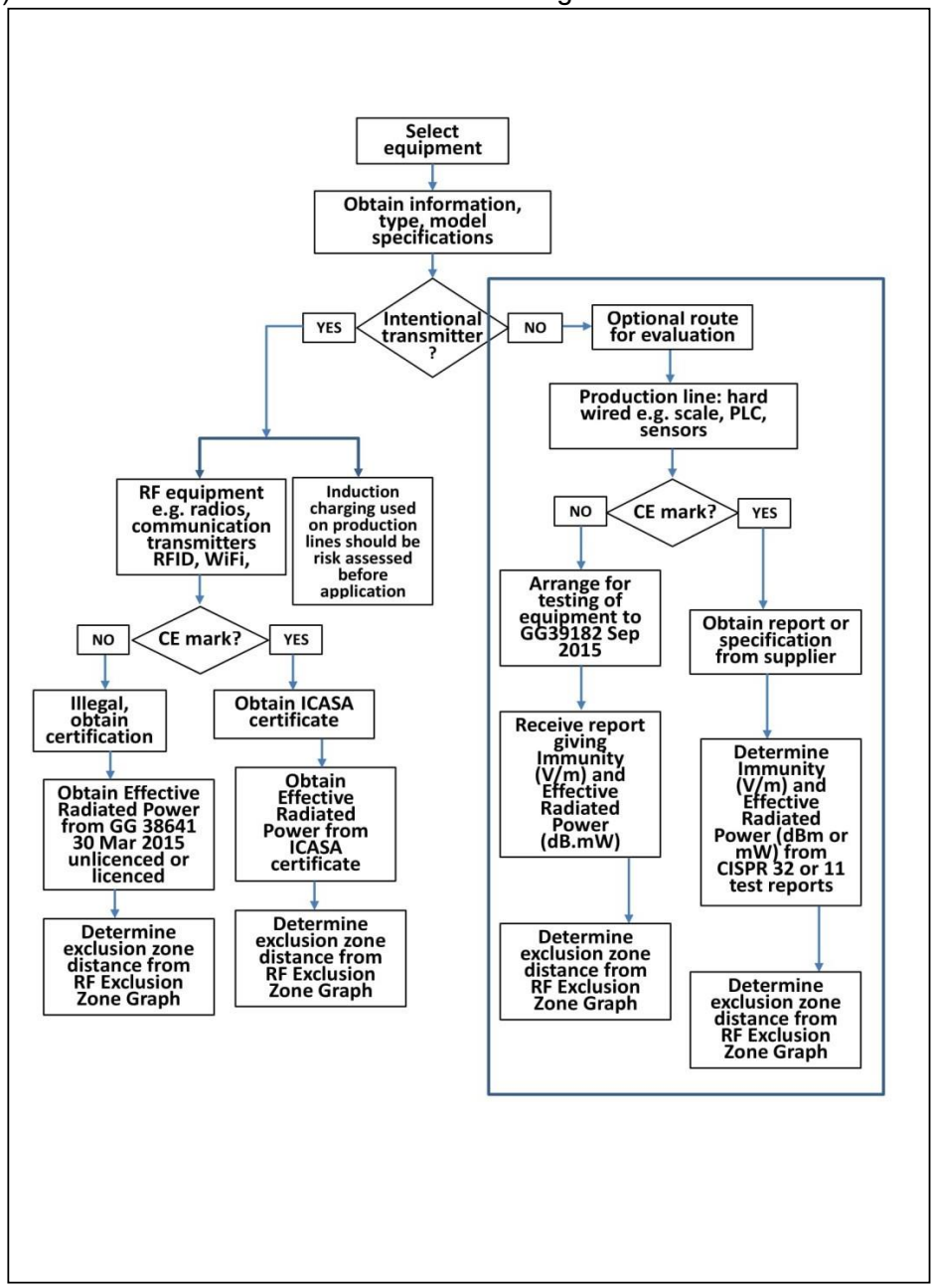


Figure 1 Flow chart for assessing RF compatibilities

5.2 ICASA certificate example

An example of an ICASA certificate is shown in the Figure 2 below

ICASA

Independent Communications Authority of South Africa
Pinmill Farm, 164 Kathering Street, Sandton
Private Bag X100002, Sandton, 2146

Radio Equipment Type Approval Certificate

Radio Equipment Type Approval Number

TA-2012/[redacted]

The Authority, in the exercise of the power conferred upon it by section 35 (1) of the Electronic Communications Act, 2005 (Act No. 36 of 2005), the applicable radio regulations which currently remain in force in terms of section 95 (2) of the Electronic Communication Act and subject to the terms and conditions set out in this document (see overleaf), hereby issues a radio equipment type approval certificate to the company whose name and particulars are listed below.

Company Particulars

Name	:	[redacted] Consultants cc
Street Address	:	[redacted]
Telephone Number	:	
Facsimile Number	:	
Registration Number	:	[redacted]

Description of Apparatus

Category	:	[redacted] Computer
Model	:	
Frequency Range	:	2402 – 2483.5 MHz
ITU Emission Code	:	F1D, G1D
Modulation	:	GFSK, DSSS, OFDM
Power Output	:	15.19 dBm
Channel Spacing	:	1 & 5 MHz
Features	:	-

Only the original or a certified copy of the radio equipment type approval certificate shall be considered valid.

[redacted]
Senior Manager: Engineering & Technology

2012 -09- 20

Figure 2 Example illustrating a typical ICASA certificate

5.3 Exclusion Distance Graph

The exclusion distance graph to be used in conjunction with the flow chart in Figure 1 is shown in Figure 3 below against frequency for different field strengths: 1; 3; 5; 10 V/m.

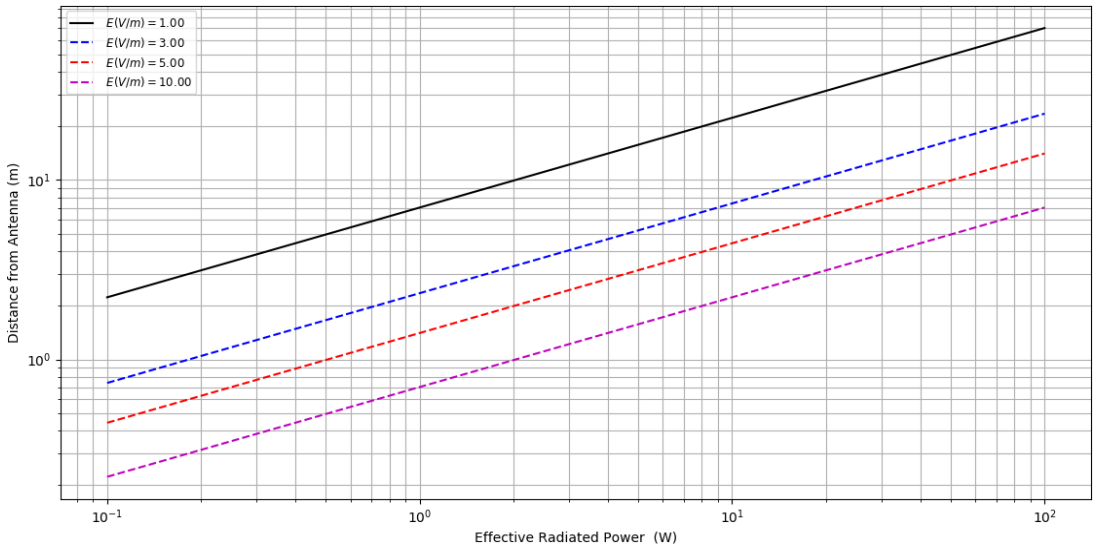


Figure 3 – Exclusion distance against Effective Radiated Power and Field Strength

Following the description below and the formulas 1 to 4, additional field strengths and distances not indicated in the graph in Figure 3 above can be calculated. These are first order calculations that do not account for resonances, reflections, diffraction, or absorption associated with radio waves.

The method for generating the distance map is based on the combination of the following equations. The power density equation is shown in (1) below:

$$S = \frac{PG}{4\pi R^2} \qquad (1)$$

S= Power Density

P = Power output/ power input to antenna (in Watts)

G = gain

R =Distance (in meters)

The E-field- power density S relationship for uniform plane waves in free space is shown in (2). Power density S is in W/m^2.

Equation (2) makes use of the approximate impedance of free space medium, which is 377 Ω.

$$S = \frac{{E_{RMS}}^2}{377} \qquad (2)$$

Equations (1) and (2) are combined to form equation (3). Equation (3) allows the calculation of R, the distance from a point source antenna in metres with gain G and Effective transmitted power P in Watts. R is calculated for a specified E-field strength in volts per meter.

$$R = \sqrt{\frac{377PxG}{4\pi {E_{RMS}}^2}} \qquad (3)$$

The effective power P can account for gain differences for different antenna types and account for uncertainties such as transmitter power variation using equation (4). In (4). U_{dB} is the uncertainty correction factor, P_{TX} is the transmitted power in Watts, and G_{dBd} is the maximum antenna gain in any direction. An example on how to use (4) is given in 6.1.

$$P = P_{TX}x10^{\frac{[U_{dB}+(G)]}{10}} \qquad (4)$$

The effective radiated power in Watt is then calculated as:

$$ERP_{(W)} = \frac{E^2R^2}{30} \qquad (5)$$

Where: E is the field strength from the graph in volts per metre.

R is the test distance from the source in metres.

6 PROCEDURE DETERMINING EXCLUSION DISTANCES

6.1 Intentional transmitters

This may include radios, communication transmitters, RF ID scanners, WiFi and Bluetooth.

(i) Select the equipment.
(ii) Obtain information about the equipment i.e. supplier, manufacturer, model, type specification.
(iii) Confirm ICASA certification.
(iv) Obtain the Effective Radiated Power (ERP) from ICASA certificate.
(v) Using the ERP and with the aid of the graph in Figure 3 above read off the exclusion distance in m for the equipment.

(vi) Repeat the above procedure for all the other intentional transmitting equipment.

6.2 Non-intentional transmitters

This may include equipment installed or used in the explosives production facilities and may include all the hard-wired equipment i.e. scales, programmable logic control systems, distributed control system, process variable transmitters, various sensors, proximately switches, laser devices, cameras.

(i) Select the equipment.
(ii) Confirm whether the equipment has a CE mark, if so, continue with step (iii), if not, then proceed to step (vi).
(iii) Obtain a test report of the equipment from the supplier i.e. model, type, specification.
(iv) Calculate the ERP from the test report and with the aid of the graph of Figure 3 read of the exclusion distance in metres for the equipment.
(v) Repeat the above procedure for all the other non -intentional transmitting equipment.
(vi) Arrange for testing of equipment for RF emissions & immunity to be carried out by an EMC testing laboratory according to Government Gazette 39182 of September 2015.
(vii) Receive from the test laboratory a report showing the Immunity (V/m) and the Effective Radiated Power (dBm or mW).
(viii) Using the ERP and with the aid of the graph in Figure 3 above read off the exclusion distance in m for the equipment.
(ix) Repeat the above procedure for all the other non -intentional transmitting equipment.

7 EXAMPLES DETERMINING EXCLUSION DISTANCES

7.1 Example 1 Intentional transmitter

Assume as an example that a Motorola GM 644 mobile radio 403 – 470 MHz, 4 W (on Motorola website) is to be used in a danger area.

This is an intentional transmitter because it uses RF for functioning i.e. communication.

Then in Government Gazette No. 38641 of 30 March 2015, Annexure B, nearest frequencies 446 - 446.1 MHz, gives a Public mobile radio (PMR), 500 mW EN 300 296 following 12,5 kHz eight channels spacing, but no ERP i.e. no restriction. In Annexure I, 430 -440 MHz, gives Co-primary A = 30 dBW, B = 20 dBW. However, this is for an unlicensed transmitter (less than 1W). Since the Motorola is 4W, an application must be done for a licence.

Using the exclusion distance graph in Figure 3, the exclusion distances are read off for an Effective Radiated Power = 4W as follows:
For 10 V/m exclusion distance is 1,3 m
For 3 V/m exclusion distance is 4,5 m
For 1 V/m exclusion distance is 10,3 m

7.2 Example 2 Unintentional transmitter

Assume as an example that a CCTV camera will be installed on an assembly line hard wired to the PC in the control room to monitor the coiling of shock tubes.

The camera has a CE mark. So, the supplier was asked for the CISPR 32 (Commercial) or CISPR 11 (Industrial) reports. Data sheet for camera states EMC compliance with CISPR 32 Class B, which gives from Figure 4 below a maximum effective radiated power of 34 dBµV/m.

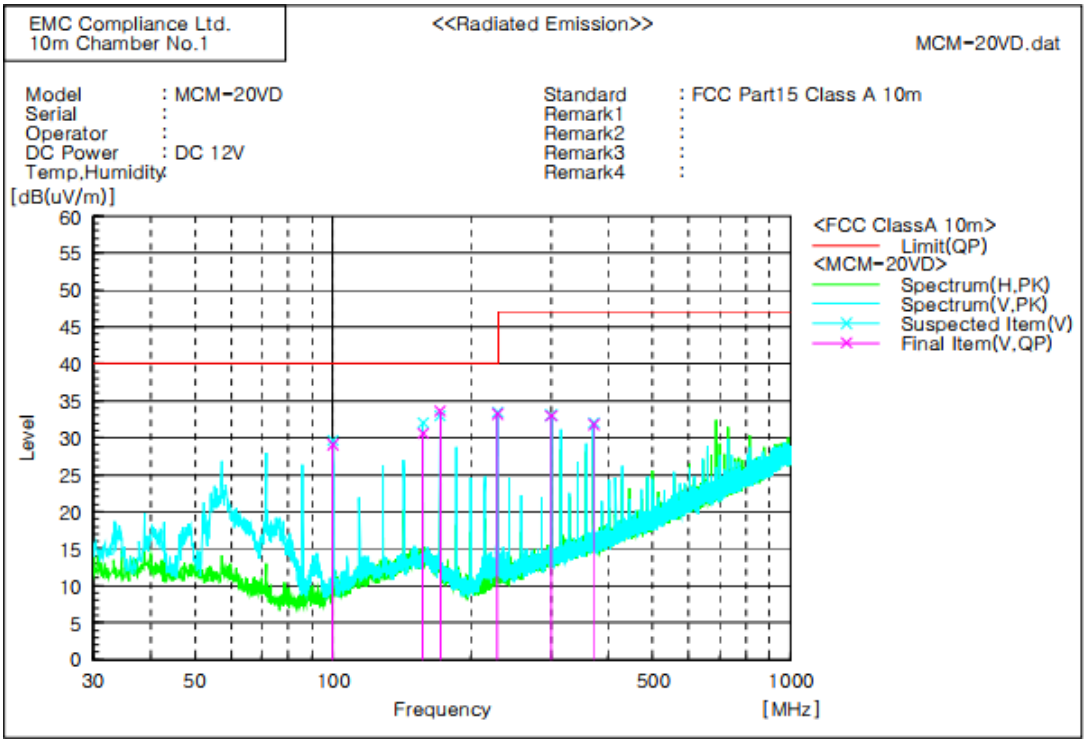


Figure 4 Graph from CISPR 22 Class B report for CCTV camera as illustration

The above graph shows that the radiated power of the camera (34 dBµV/m) is far below 1 V/m and therefore an exclusion distance of 0 can be adopted i.e. no exclusion distance.

7.3 Example 3 Intentional transmitter

Assume as another example that an induction RF barcode reader is installed on an electric detonator assembly line to weld wires to fuse heads. There is no CE mark on the barcode reader. Therefore, arrange for an EMC laboratory to carry out testing or calculations to determine the Effective Radiated Power of the barcode reader. As illustration, after test carried out on the barcode reader the EMC laboratory produced test results as per graph in Figure 5 below. This shows that the maximum emitted field strength (40 dBµV/m) is far below 1V/m and hence no exclusion distance will apply.

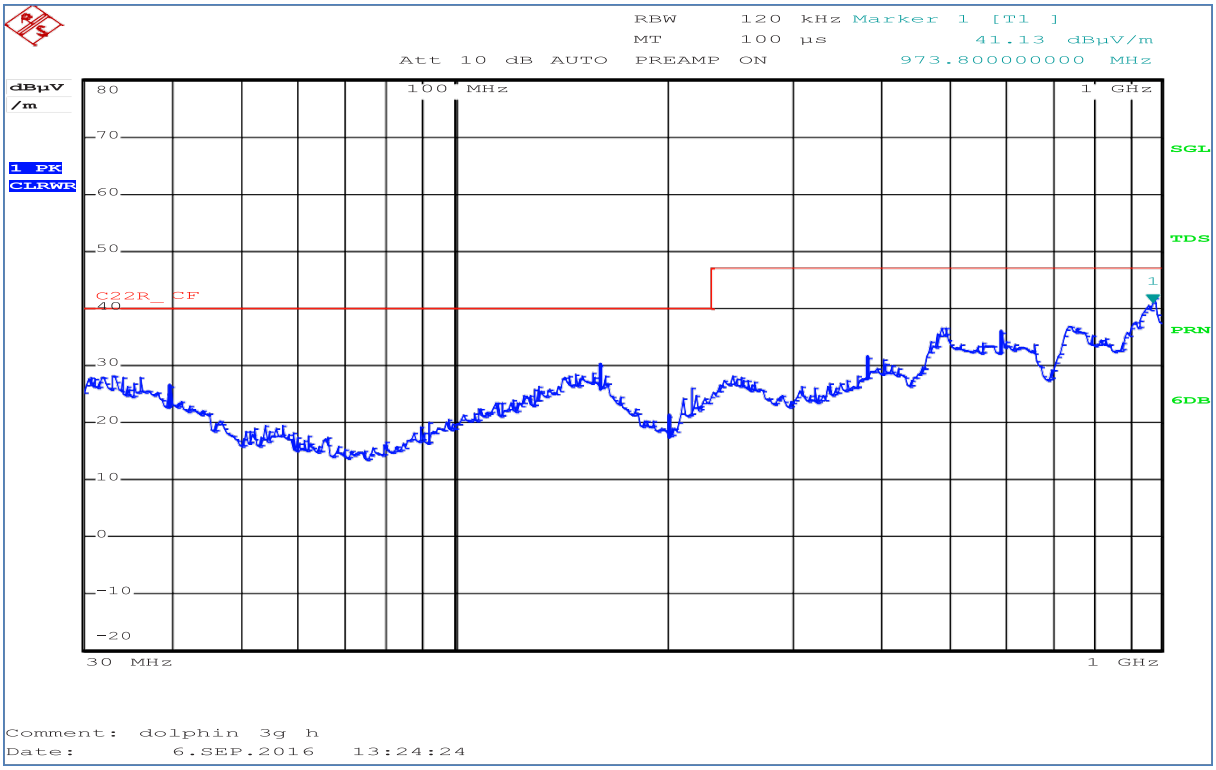


Figure 5 Graph from tests done on barcode reader as per CISPR 22 Class B as illustration

7.4 Applying the exclusion distance formulas

Referring to Example 3, noting that the tested maximum field strength of the RF barcode reader was determined as 40 dBµV/m at a 3m test distance.

Calculating the field strength Erms in linear terms from the logarithmic value (maximum field strength) on the graph as:

$$Erms = 10^{\frac{dB\mu V/m}{20}} = 10^{\frac{40dB\mu V/m}{20}} = 0.0001V/m$$

The effective radiated power in Watts from the barcode reader is then calculated from equation 5 as:

$$ERP_{(W)} = \frac{E^2R^2}{30}$$

where: E is the field strength (Erms) calculated from the information from the graph using the relationship above in volts per metre and R is the test distance from the barcode reader metres

The ERP of the barcode reader based on the 40dBuV/m indicated in the graph is therefore:

$$ERP_{(W)} = \frac{0.0001^2 3^2}{30} = 3.00E-09W\ (3nW)$$

using equation 3, exclusion distance is calculated as:

$$R = \sqrt{\frac{377Px\frac{2.15}{10}}{4\pi E_{crit}{}^2}} = \sqrt{\frac{377*3^{-9}*10^{\frac{2.15}{10}}}{4\pi*(1)^2}} = 0.000384m$$

Where P= barcode reader ERP (W)

E_{crit} = susceptibility level of equipment (assumed to be 1V/m worst case) (V/m)

This confirms a zero-exclusion distance.

7.5 Procedure determining separation of susceptible equipment from transmitters

(i) Select the process control equipment e.g. temperature transmitters, PLC, proximity switches etc.
(ii) Confirm whether the equipment has a CE mark
(iii) Determine the susceptible field strength of the equipment i.e. in V/m from suppliers' specifications
(iv) Compare the susceptible field strength above in (iii) with the separation distance determined for intentional and un-intentional transmitters
(v) Finally specify the required separation distance, for the various process control equipment

7.6 Procedure for determining separation of susceptible explosives

(i) Select the explosives and devices e.g. emulsion, electro explosive device, fuse head etc. (see Table 3).
(ii) Confirm whether the equipment has complied with a test standard.
(iii) Determine the susceptible field strength of the explosives i.e. in V/m from suppliers' specifications (see Table 4 for packaged EED, otherwise refer to supplier).
(iv) Compare the susceptible field strength above in (iii) with the separation distance determined for intentional and unintentional transmitters.
(v) Finally specify the required separation distance, for the various explosives.

Table 3 -*Exclusion distances for other explosive and hazardous products*			
Explosives, materials, and equipment	**Transmitter frequency**	**Radiated power**	**Exclusion distance (m)**
Electronic (delay) detonators (EDD)	Refer to manufacturer or supplier	Refer to manufacturer or supplier	Refer to manufacturer or supplier
Packaged explosive devices (EED)	See Table 4	See Table 4	Risk assessment to SANS 762 [1]
Loose or split wire electro explosive devices (EED)	See Table 4	See Table 4	SANS 762 [1]
Packaged explosives, shock tube, igniter cord, boosters	> 9 kHz	5 W	Note 1
Ammonium nitrate, oxidisers, Anfo, emulsion	> 9 kHz	5 W	Note 1
Lead azide, lead styphnate	> 9 kHz	5 W	5 m Note 1 and 2
Fuse heads	SANS 762 [1]	5 W	SANS 762 [1]
Fuels, diesel, oils	> 9 kHz	5 W	0 Note 2

Note 1: No contact between the radiator and explosive device is allowed

Note 2: Intrinsically safe or explosion protected equipment to be included as per hazardous electrical area classification

Table 4 below shows radio exclusion distances for manufacturer-packaged devices with folded and shunted wires, as classified in SANS 762: 2014 ed 2 for different EED sensitivities with various transmitting devices and approximate operating frequencies. For near-field conditions, less than one wavelength (λ), the more conservative Friss formula is used.

Table 4: Radio exclusion distances for electro-explosive devices (EED's)

Transmitter Details					Minimum recommended exclusion distance from packaged detonators						
Type	ERP (W)	Freq. (MHz)	λ (m)	Dcrit (m)	Type I (m)	Type II (m)	Type III (m)	Type IV (m)	Type V (m)	Type VI (m)	Type VII (m)
Fixed communication	25	150	2	0,35	2	2	2	2	2	0	0
Mobile communication	5	150	2	0,15	2	2	2	2	0	0	0
Modem and mobile	0,5	450	0,7	0,05	0,7	0	0	0	0	0	0
Modems & DECT	0,5	900	0,35	0,05	0,35	0	0	0	0	0	0
RFID, Cellular & Tracker	2	900	0,35	0,1	0,35	0,35	0,35	0,35	0	0	0
Cellular & Tracker	2	1800	0,18	0,1	0,2	0,2	0	0	0	0	0
WiFi, Bluetoooth & Zigbee	0.1	2400	0,13	0,02	0	0	0	0	0	0	0

Notes:

- Grey-shaded blocks indicate that no exclusion zone should be necessary. (Note that where power levels may be higher in practice, this will need to be taken into account to ensure exclusion distances are adequate).
- Managing small exclusion distances with handheld radio equipment for different EED sensitivities is difficult, and **a blanket exclusion of 2 m may be considered**. (This safe distance of 2 m is in line with the UK Ministry of Defence explosives

regulations JSP 482 Edition 4, January 2013. Chapter 24, Radio frequency hazards to electro-explosive devices. Clause 3.1.5 item (6)).

- In the case of fixed vehicle antennas, depending on the power and frequency, smaller safe distances, as indicated in the table, may be considered. Here, a conservative safety factor of two for exclusion distance is recommended to ensure variables such as modulation type and antenna gain are catered for. (For comparison, the United Kingdom MOD recommendations, Clause 4.1.3, indicate that a minimum distance of 0.2 m may be allowed, subject to certain provisions).
- RFID applications can be considered, provided that measures are in place to ensure safe distances are not compromised.
- There are instances, for example in coal mines and for wells, where EED sensitivities of Type V or lower may be used exclusively. Here no exclusion distances would be required for powers of 5 W or less.
- Low-power wireless data devices operating at 100 mW or less should be safe to use in the close proximity of the listed EED.

8 RISK ASSESSMENT

(1) Risk Assessment should cover the following aspects in the report–

- Description of the process, operations and activities, buildings, licensing, safety distances.
- Identification of safety critical equipment, materials (explosives) and explosive devices.
- Identification of risks (hazards) of the explosives and operational control devices.
- Determination of the immunity to RF for the various explosives, devices, and control equipment.
- Determination of the exclusion zones for the various explosives, devices, and control equipment.
- Severity (fatalities, injuries, damage) of any incident caused by RF from any of the intentional and unintentional transmitters (Qualitatively using a risk matrix or quantitatively with calculations).
- Likelihood of incidents caused by RF radiation (this will be based on the exclusiondistance determined e.g. zero distance).
- Risk assessment results (see Table 5 below).
- Risk evaluation to assess the acceptability (see Table 5 below).
- Risk treatment (see Table 5 below).
- Conclusions and recommendations (see Table 5 below).
- Appendix containing the 'Technical Construction File' which contains all relevant information of the installation, process, products that were evaluated.

TABLE 5 - RISK ASSESSMENT RECORD P = Probability or likelihood, *S* ≡ *Severity of consequence, R* ≡ *Risk Rating* SYSTEM: Preparation of coils, fuse heads, e-boards, detonator trays and other materials for automated assembly									
No:	Hazard Incident	Cause	Preventing the Causes	P	Consequence	Protection from Consequences	S	R	Recommendation
1b	Explosion, fire	– Operator using wireless communication devices e.g. mobile phone, handheld radio, no licenced transmitter + Transmitting and receiving Radio frequency emissions Initiate explosive materials	– Exclusion zone verification by tests – Communication devices prohibited in the detonator assembly building – Conditions of explosive materials such that initiation not impossible i.e. electronic detonator assembly complies with SANS 1717-1:2005(radiated susceptibility level of 30V/m (80MHz to 2.6GHz) and conducted immunity levels of 30V (150kHz to 80MHz))	1	•Possible fatalities or injuries of personnel •Damage of plant and equipment, incurring repair or replacement costs •Loss of production and financial effect	– Emergency procedures and evacuation – First aid and medical treatment – Repair and restoration afterwards	D	10 (M)	– Medium, tolerable risk, monitor and manage as appropriate – Prohibit the use of any wireless communication devices in the detonator assembly building – Should the need arise to use a wireless communication device e.g. camera with wireless transmission, the exclusion zones must be adhered to

9 TRAINING OF PERSONNEL

All personnel involved with the RF devices/equipment should be trained in line with the hazard identifications and recommendations from the risk assessment performed by the Approved Inspection Authority (AIA).

10 EXPLOSIVE MANAGER AUTHORISATION

All radio frequency devices, including devices fitted to vehicles must be authorised by the explosives manager according to regulation 6 (3) (c) (iv) before being allowed into the danger area.

11 NOTIFICATIONS TO THE DEPARTMENT OF EMPLOYMENT AND LABOUR

(1) Every explosives manager **shall immediately notify the chief inspector and the provincial chief inspector in writing of-**

(a) **any proposed radio frequency device inside the danger area prior to commencement of such installation thereof; and**

(b) **any existing radio frequency device in the existing explosives workplace.**

(2) **Every** explosives manager intending to introduce radio frequency devices inside the **danger area shall notify the chief inspector within 90 working days of the promulgation of these regulations**.

(3) Notification of radio frequency devices in the danger area shall include-

a) Radio Frequency declared or test results;

b) Risk Assessment report;

c) Radio frequency device placement site plan; and

d) Explosives manager plan to manage the radio frequency device,

12 Appendix 1: Radio frequency sources to be evaluated

Item	Description	Parameter
1	Portable transceivers (Cellular, PDA, Walkie Talkie, remote controls)	Frequency, Power
2	Vehicle devices (Trackers, transceivers)	Frequency, Power
3	Equipment used during construction (Temporary installation during construction – handhelds, remote controls)	Frequency, Power
4	Nonspecific SRD (WiFi, Zigbee, Bluetooth, etc.)	Frequency, Power
5	Fixed (licensed) devices	Frequency, Power

Table 1: Radio frequency device checklist

13 Appendix 2: Calculation Spreadsheet

Allowed Fieldstrength (V/m)	Measured emission dBuV/m	Test Distance (m)	ERP (W)	dcrit (m)
1	40	3	0.000000003	0.000300004
3	40	3	3.00E-09	0.000128087
10	40	3	3.00E-09	3.84261E-05

Allowed Fieldstrength (V/m)	ERP (W)	dcrit (m)
30	5	0.408253099
30	2	0.330719259
30	25	1.169269154

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