Doc 9303

Machine Readable Travel Documents

Part 1
Machine Readable Passports
Volume 1
Passports with Machine Readable Data Stored in Optical Character Recognition Format

Approved by the Secretary General and published under his authority

Sixth Edition — 2006

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the supplements to the *Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS		
No.	Date	Entered by

CORRIGENDA		
No.	Date	Entered by

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FOREWORD

The sixth edition of Doc 9303, Part 1, updates and replaces the specifications for machine readable passports as published in the fifth edition (2003) and represents a substantial modernization of the material contained in previous editions. In particular, this sixth edition incorporates the new globally interoperable standard for biometric identification of the holder and for the storage of the associated data on a contactless integrated circuit. In consequence, some other biometric identification methods and data storage media, described in the fifth edition, are no longer to be regarded as options within the globally interoperable standard. States may, however, use them for their own or agreed bilateral purposes.

Such is the magnitude of the specification for the new globally interoperable biometric identification system and the data storage using a contactless integrated circuit, that Doc 9303, Part 1, is now divided into two volumes. The first volume, known as Doc 9303, Part 1, Volume 1, is an updated version of the fifth edition containing all the specifications required for a State to issue a machine readable passport book. The second volume, known as Doc 9303, Part 1, Volume 2, contains the specifications for enhancing the machine readable passport with the globally interoperable system of biometric identification and its associated data storage utilizing a contactless integrated circuit. *A State wishing to issue a passport designed to facilitate cross-border travel with enhanced security by incorporating the globally interoperable machine assisted biometric identification/data storage system will therefore need comply with both Volumes of Part 1.* Certain specifications within Volume 1, particularly in relation to the portrait and other identification features, have been amended to ensure that when a State decides to upgrade to a globally interoperable biometric passport, a minimum amount of change to passport production will be involved.

The specifications and guidance material on matters such as naming conventions, transliteration of national characters in the machine readable zone and the calculation of check digits, expanded in the previous edition, have been retained in this first volume of Part 1. The option for the inclusion and placement of a bar code on the data page remains, but it is to be emphasized that the inclusion of a bar code and its data is solely for use by the issuing State or by other States by bilateral agreement; it is not globally interoperable. As before, provision is made for issuing the passport as a wallet-size card in accordance with the specifications for the Size-1 machine readable official travel document as set forth in Doc 9303, Part 3. The emphasis on the security of the document against fraud by alteration or counterfeit is given greater prominence in this sixth edition, as is the need for security of the premises in which a passport is made, personalized and issued, and for the vetting of staff employed in these activities.

A concept highlighted in the fifth edition was that of “global interoperability”. In this context, the term is understood as the capability of inspection systems (either manual or automated) in different States throughout the world to exchange data, to process data received from systems in other States, and to utilize that data in inspection operations in their respective States. Global interoperability is a major objective of the standardized specifications for placement of both eye readable and machine readable data in all MRTDs. In the security-conscious world of today, the need for machine-assisted global interoperability has become pressing. This has necessitated the standardization on one primary biometric identification method and of one method of data storage. The New Technologies Working Group of the Technical Advisory Group on Machine Readable Travel Documents commenced an evaluation in 1998 of the various options and, in early 2001, selected and recommended the face as the primary biometric with contactless integrated circuit as the data storage technology. The recommendation was made specifically in response to the needs of passport issuing and immigration authorities to ensure accurate identification of a passport applicant or holder while minimizing facilitation problems for the traveller. This recommendation was endorsed by the Air Transport Committee of the ICAO Council in 2003.

Applicability. Although the specifications in Doc 9303, Part 1, are intended for particular application to the passport, issuing States and organizations are encouraged to apply them as well to other ID-3 size identity documents, for example the laissez-passer, the seafarer's identity document and refugee travel documents.

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I. INTRODUCTION

ICAO's work on machine readable travel documents began in 1968 with the establishment, by the Air Transport Committee of the Council, of a Panel on Passport Cards. This Panel was charged with developing recommendations for a standardized passport book or card that would be machine readable, in the interest of accelerating the clearance of passengers through passport controls. The Panel produced a number of recommendations, including the adoption of optical character reading (OCR) as the machine reading technology of choice due to its maturity, cost-effectiveness and reliability. In 1980, the specifications and guidance material developed by the Panel were published as the first edition of Doc 9303, titled *A Passport with Machine Readable Capability*, which became the basis for the initial issuance of machine readable passports by Australia, Canada and the United States.

In 1984, ICAO established what is now known as the Technical Advisory Group on Machine Readable Travel Documents (TAG/MRTD), comprised of government officials who specialize in the issuance and border inspection of passports and other travel documents, in order to update and enhance the specifications which had been prepared by the Panel. Subsequently, this group's terms of reference were expanded to include, first, the development of specifications for a machine readable visa and, later, specifications for machine readable cards that may be used as official travel documents. Doc 9303 is now published in separate parts, one for each type of document.

In 1998, the New Technologies Working Group of the TAG/MRTD began work to establish the most effective biometric identification system and associated means of data storage for use in MRTD applications, particularly in relation to document issuance and immigration considerations. The bulk of the work had been completed by the time the events of 11 September 2001 caused States to attach greater importance to the security of a travel document and the identification of its holder. The work was quickly finalized and endorsed by the TAG/MRTD and the Air Transport Committee. The results are published as a standard in Volume 2 of this edition of Doc 9303.

GENERAL CONSIDERATIONS

ICAO's leadership role

ICAO's initiative to develop standard specifications for passports and other travel documents followed the tradition established by the League of Nations Passport Conferences of the 1920s and the work of the League's successor, the United Nations Organization. ICAO's mandate to continue in its leadership role stems from the Convention on International Civil Aviation (the "Chicago Convention") which covers the full range of requirements for efficient and orderly civil aviation operations, including provisions for clearance of persons through border controls, i.e.:

a) the requirement for persons travelling by air and aircraft crews to comply with immigration, customs and passport regulations (Article 13);

b) the requirement for States to facilitate border clearance formalities and prevent unnecessary delays (Article 22);

c) the requirement that States collaborate in these matters (Article 23); and

d) the requirement for States to develop and adopt internationally standard procedures for immigration and customs clearance (Article 37 (j)).

Under this mandate, ICAO develops and maintains international standards in Annex 9 — *Facilitation* to the Chicago Convention for implementation by Contracting States. In the development of such standards, it is a fundamental precept that if public authorities are to facilitate inspection formalities for the vast majority of air travellers, those authorities must have a satisfactory level of confidence in the reliability of travel documents and in the effectiveness of inspection procedures. The production of standardized specifications for travel documents and the data contained therein is aimed at building that confidence.

In 2004, the Assembly of ICAO affirmed that cooperative work on specifications to strengthen the security and integrity of travel documents should be pursued by the Organization as a matter of high priority. In addition to the International Organization for Standardization (ISO), consultants to the TAG/MRTD include the International Air Transport Association (IATA), the Airports Council International (ACI), and the International Criminal Police Organization (INTERPOL).

In 2005, the then-188 Contracting States of ICAO approved a new Standard that all must begin issuing machine readable passports in accordance with Doc 9303, Part 1, no later than the year 2010. This Standard is published in the 12th Edition (2005) of Annex 9.

Relative costs and benefits of machine readable travel documents

Experience with the issuance of machine readable passports, in conformity with the specifications set forth in Doc 9303, Part 1, indicates that the cost of producing MRTDs may be no greater than that of producing conventional documents, though the cost will be higher when biometric identification and electronic on-document data storage are implemented. As traffic volumes grow and more States focus on how they can rationalize their clearance processes with the employment of computerized databases and electronic data interchange, the MRTD plays a pivotal part in modern, enhanced compliance systems. Equipment to read the documents and access the databases may entail a substantial investment, but this can be expected to be returned by the improvements in security, clearance speed and accuracy of verification which such systems provide. Use of MRTDs in automated clearance systems may also make it possible for States to eliminate both the requirement for paper documents, such as passenger manifests and embarkation/disembarkation cards, and the administrative costs associated with the related manual procedures.

Operations

The basic machine readable travel document, with its OCR medium, is designed for both visual and mechanical reading. This sixth edition of Doc 9303, Part 1, specifies one additional machine reading technology for future global interoperability which is to be introduced on an optional basis in the various travel documents; however in documents so enhanced, the OCR will be retained as the basic technology, considered mandatory to ensure global interoperability.

In adopting the machine readable passport as a universal standard, ICAO member States have recognized that standardization is a necessity and that the benefits of adopting the Doc 9303 standard formats for passports and other travel documents extend beyond the obvious advantages for States that have the machine readers and databases for use in automated clearance systems. In fact, the physical characteristics and data security features of the documents themselves offer strong defense against alteration, forgery or counterfeit. Moreover, adoption of the standardized format for the visual zone of an MRTD facilitates inspection by airline

and government officials, with the result that clearance of low-risk traffic is expedited, problem cases are more readily identified, and enforcement is improved. The optional introduction of biometric identification with data stored on a contactless integrated circuit will provide greater security and resistance to fraud and thus make it easier for the legitimate document holder to obtain visas for travel and to be processed through border inspection systems.

Endorsement by ISO

The technical specifications sections of Doc 9303, Parts 1, 2 and 3 have received the endorsement of the International Organization for Standardization as ISO Standards 7501-1, 7501-2, and 7501-3, respectively. Such endorsement is made possible by means of a liaison mechanism through which manufacturers of travel documents, readers and other technologies provide technical and engineering advice to the TAG/MRTD under the auspices of ISO. Through this working relationship, the ICAO specifications have achieved, and are expected to continue to receive, the status of worldwide standards by means of a simplified procedure within ISO.

The liaison mechanism with ISO has been successfully applied not only to the endorsement of new specifications for travel documents as ISO standards but also to the approval of amendments to the specifications. Subsequent revisions to Doc 9303, Parts 1, 2 and 3, will therefore be processed for ISO endorsement in the same manner as previously.

II. TECHNICAL SPECIFICATIONS FOR MACHINE READABLE PASSPORTS — REFERENCES AND DEFINITIONS

Scope

1. Doc 9303, Part 1, Volume 1 defines the specifications for machine readable passports (MRPs), providing for global data interchange using both visual (eye readable) and machine readable (optical character recognition) means. The MRP shall, as a minimum, contain the mandatory data specified in this volume, in the prescribed standard format. This volume also includes specifications for the mandatory and discretionary incorporation of MRP security features, and specifications for a passport card. The combined specifications of this volume and of Volume 2 of Part 1 permit the discretionary incorporation of additional electronic data storage to supplement the machine readable zone, principally to allow for an encoded biometric for identity confirmation of the MRP holder.

Note on Supplement

2. ICAO will issue from time-to-time a “Supplement to Doc 9303, Part 1”, to this standard Doc 9303. The Supplement will contain information intended to clarify, amplify or elaborate on issues with respect to travel document standards, as well as to correct errors encountered from implementation experiences. It is intended that the information contained in the Supplement will augment the existing guidance in Doc 9303 as well as in Technical Reports issued by ICAO. The Supplement will be issued on a continuing and consistent basis.

The specifications of Doc 9303 should always be read in conjunction with the additional information set out in the latest release of the Supplement which will be available on the ICAO web site at www.icao.int/mrtd.

Normative references

3. Certain provisions of the following International Standards, referenced in this text, constitute provisions of Part 1 of Doc 9303. Where differences exist between the specifications contained in Part 1 and the referenced Standards, to accommodate specific construction requirements for machine readable travel documents including machine readable passports, the specifications contained herein shall prevail.

ISO 1073/II:	1976	*Alphanumeric character sets for optical character recognition — Part 2: Character set OCR-B — Shapes and dimensions of the printed image*
ISO 1831:	1980	*Printing specifications for optical character recognition*
ISO 3166-1:	1997	*Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*
ISO/IEC 7810:	1995	*Identification cards — Physical characteristics*
ISO 8601:	2001	*Data elements and interchange formats — Information interchange — Representation of dates and times.*

Note.— The date indicates the most recent edition of the Standard at the time of publishing. Hereinafter, this document will cite the ISO Standards only, without reference to the year.

General Note.— The decimal notation used in these specifications conforms to ICAO practice. The ISO practice is to use a decimal point (.) in imperial measurements and a comma (,) in metric measurements.

Definitions

4. For the purpose of Part 1, Volume 1, of Doc 9303, the following definitions shall apply:

- *Machine readable travel document (MRTD):* Official document, conforming with the specifications contained in Doc 9303, issued by a State or organization which is used by the holder for international travel (e.g. passport, visa, official document of identity) and which contains mandatory visual (eye readable) data and a separate mandatory data summary in a format which is capable of being read by machine.

- *Machine readable passport (MRP):* Passport conforming with the specifications contained in Doc 9303, Part 1, Volume 1 and, optionally, Volume 2. Normally constructed as an ID-3 size book containing pages with information on the holder and the issuing State or organization and pages for visas and other endorsements. Machine readable information is contained in two lines of OCR-B text, each with 44 characters. These specifications permit the MRP to be in the form of a free-standing card of ID-1 size; ID-1 sized passport cards are specified in Doc 9303, Part 3.

- *MRP data page:* A fixed-dimensional page within the MRP containing a standardized presentation of visual and machine readable data. This may be on the front or back of an inner page adjacent to the cover or on the inside of a front or back cover.

- *Machine readable visa (MRV):* A visa (also known as an entry clearance but not referred to as such in these specifications) conforming with the specifications contained in Doc 9303, Part 2. The MRV is normally attached to a visa page in a passport.

- *Full size (Format-A) machine readable visa (MRV-A):* An MRV conforming with the dimensional specifications *contained* in Doc 9303, Part 2, sized to completely fill a passport visa page.

- *Small size (Format-B) machine readable visa (MRV-B):* An MRV conforming with the dimensional specifications (ID-2 size) contained in Doc 9303, Part 2, sized to maintain a clear area on the passport visa page adjacent to the visa to allow, for example, a seal to be placed on the visa and the passport page on which it is affixed or enable a number perforated through the passport pages to remain visible.

- *Size 1 machine readable official travel document (TD-1):* A card with nominal dimensions guided by those specified for the ID-1 type card (ISO/IEC 7810) (excluding thickness). In the case of a plastic card which carries any optional, additional data storage technology, the reading of which requires it to be inserted into a slot reader (i.e. magnetic stripe, optical memory or integrated circuit with contacts), the TD-1 conforms to the precise dimensions and tighter tolerances specified in ISO/IEC 7810.

- *Size 2 machine readable official travel document (TD-2):* A card or label conforming with the dimensions defined for the ID-2 type card (ISO/IEC 7810) (excluding thickness). In the case of a card which carries any optional, additional data storage technology, the reading of which requires the TD-2 to be inserted into a slot reader (e.g. a magnetic stripe), the TD-2 conforms to the precise dimensions and tighter tolerances specified in ISO/IEC 7810.

- *United Nations Laissez-passer:* A document, generally equivalent to a passport, issued under the auspices of the United Nations to allow authorized persons to travel across international borders.

- *Machine readable zone (MRZ):* A fixed-dimensional area located on the MRTD data page, containing mandatory and optional data formatted for machine reading using OCR methods.

- *Effective reading zone (ERZ):* A fixed-dimensional area, common to all MRTDs, in which the machine readable data in the MRZ can be read by document readers.

- *Visual inspection zone (VIZ):* Those portions of the MRTD (data page in the case of MRP), i.e. front and back (where applicable), not defined as the MRZ.

- *Issuing State:* The country issuing the MRTD.

- *Receiving State:* The country to which the MRTD holder is applying for entry.

- *Issuing organization:* Organization authorized to issue an official travel document (e.g. the United Nations Organization, issuer of the laissez-passer).

- *Zone:* An area containing a logical grouping of data elements on the MRTD. Seven (7) zones are defined for MRTDs.

- *Field:* Specified space for an individual data element within a zone.

- *Caption:* Printed word or phrase to identify a field.

- *Portrait:* A visual representation of the facial image of the holder of the document.

- *Fingerprint(s):* One (or more) visual representation(s) of the surface of the holder's fingertip(s).

- *Bar code:* A means of storing data as a pattern of lines or dots.

- *Laminate:* A protective film with a degree of cohesive strength bonded over some or all of the MRP data page to protect and secure the page and its personalization data.

- *Overlay:* A very thin protective layer with negligible cohesive strength bonded over some or all of the MRP data page to protect and secure the page and its personalization data.

- *Biometric Identification:* A means of identifying or confirming the identity of the holder of an MRTD by the measurement of one or more properties of the holder's person.

- *ePassport:* A machine readable passport (MRP) containing a contactless Integrated Circuit (IC) chip within which is stored data from the MRP data page, a biometric measure of the passport holder, and a security object to protect the data with PKI cryptographic technology, and which conforms to the specifications of Doc 9303, Part 1.

Technical specifications for machine readable passports

5. Technical specifications for MRPs are presented in two sections as follows:

Section III — Technical specifications for the security to be incorporated into the book at its time of manufacture and of personalization, together with specifications for the security of the facilities in which such operations are carried out in addition to secure methods of auditing and issuance.

Section IV — Technical specifications applicable to all machine readable passports.

A separate Volume 2 of Part 1 of Doc 9303 contains the additional specifications necessary for a State to issue a globally interoperable, electronically enabled MRP, incorporating biometric identification.

III. TECHNICAL SPECIFICATIONS FOR THE SECURITY OF THE DESIGN, MANUFACTURE AND ISSUANCE OF MACHINE READABLE PASSPORTS

Scope

1. This section provides mandatory and optional specifications for the precautions to be taken by an issuing State to ensure that its passport, and the passport's means of personalization to its rightful holder, are secure against fraudulent attack. Mandatory and optional specifications are also provided for the physical security to be provided at the premises where the passport is produced and personalized and for the vetting of personnel involved in these operations.

Security of the MRP and its personalization

2. The MRP, and its method of personalization, shall be designed to incorporate safeguards to protect the document against fraudulent attack during its validity period. Methods of fraudulent attack can be classified as follows:

2.1 *Counterfeit* involves the creation of all or part of a document which resembles the genuine MRP with the intention that it be used as if it were genuine. Counterfeits may be produced by attempting to duplicate or simulate the genuine method of manufacture and the materials used therein or by using copying techniques.

2.2 *Fraudulent alteration, also known as forgery*, involves the alteration of a genuine document in an attempt to enable it to be used for travel by an unauthorized person or to an unauthorized destination. The biographical details of the genuine holder, particularly the portrait, form the prime target for such alteration.

2.3 There are established methods of providing security against both types of fraudulent attack. These involve the use of materials which are not readily available, combined with highly specialized design systems and manufacturing processes requiring special equipment and expertise. Appendix 1 to this Section lists some of the techniques currently known to be available to provide security to an MRP enabling an inspecting officer to detect a counterfeit or fraudulently altered document either visually or with the aid of simple equipment such as a magnifying glass or ultraviolet lamp.

2.4 All MRPs constructed as an ID-3 size book shall use the specified Basic Security Features listed in Table III-A1 of Appendix 1.

Machine assisted document verification

3. An issuing State may wish to incorporate into its MRP one or more security features which require the use of detection equipment to detect and verify their presence within the normal time for immigration clearance. Such features are of three types as described in 3.1 to 3.3. Doc 9303, Part 1, does not specify any feature as a means of globally interoperable machine assisted document verification, as the use of a single feature worldwide would make the feature highly vulnerable to fraudulent attack. The features may vary in size from less than 1 mm (0.04 in) square up to the whole area of the data page. Where the area occupied is less than the page area, this document recommends (in Appendix 10 to Section IV) preferred locations for two of

the three types of feature. States are therefore free to select none or one or more machine verifiable features to assist in document verification but such feature(s) will be for their own or agreed bilateral use.

3.1 *Substance features.* A substance feature involves the incorporation into the MRP of a material which would not normally be present and is not obviously present on visual inspection. The presence of the material may be detected by the presence and magnitude of a suitable property of the added substance. Appendix 2 to this Section provides details of some available substances.

3.2 *Structure features.* A structure feature involves the incorporation of a measurable structure into or onto the MRP data page. The presence of the structure may be detected and measured by the detection machine. Appendix 2 gives details of some currently available structures.

3.3 *Data features.* A data feature involves the incorporation of encoded information into the document data or image structure, usually into the personalization data, especially the portrait. The term steganography, in this context, describes a special class of data features typically taking the form of digital information which is concealed within an image, usually either the personalization portrait or the background security printing. The concealed image may be made visible by the use of a suitable device which could be built into a passport reader. The concealed image may contain data such as the holder's name or passport number which may be read by the immigration officer using the detector. In more complex forms the amount of stored data can be significant, and this can be verified by electronic comparison with data stored in the contactless integrated circuit. Appendix 2 gives details of some currently available techniques.

Security of MRP production and issuance facilities

4. The State issuing the MRP shall ensure that the premises in which the MRP is printed, bound, personalized and issued are appropriately secure and that staff employed therein have an appropriate security clearance. Appropriate security shall also be provided for MRPs in transit between facilities and from the facility to the MRP's holder. Appendix 3 to this Section provides recommendations as to how these requirements can be met.

Provision of information on newly issued MRPs

5. It is recommended that a State launching a new design of MRP inform all other States of the details of the new MRP including evident security features, preferably providing personalized specimens for use as a reference by the receiving State's department which is responsible for verifying the authenticity of passports. The distribution of such specimens should be made to established contact points agreed by the receiving States.

Provision of information on lost and stolen passports

6. States should provide specific information on lost or stolen passports, such as passport or booknumbers, to the central database operated by INTERPOL at the appropriate time and according to agreed procedures. This includes details of any unpersonalized MRPs which may be stolen from a production or issuance facility or in transit.

INFORMATIVE APPENDIX 1 to Section III

SECURITY STANDARDS FOR MACHINE READABLE TRAVEL DOCUMENTS

1. Scope

1.1 This Appendix provides advice on strengthening the security of machine readable travel documents made in accordance with the specifications set out in Doc 9303, Part 1 (Machine Readable Passports), Part 2 (Machine Readable Visas) and Part 3 (Machine Readable Size 1 and Size 2 Official Travel Documents). The recommendations cover the security of the materials used in the document's construction, the security printing and copy protection techniques to be employed, and the processes used in the production of document blanks. Also addressed are the security considerations that apply to the imaging and finishing processes involved in personalization and the protection of the biographical data in the document. Those States not yet issuing machine readable travel documents shall also consider this Appendix.

2. Introduction

2.1 Historically, Doc 9303 has not made recommendations on the specific security features to be incorporated in travel documents. Each issuing State has been free to incorporate such safeguards as it deemed appropriate to protect its nationally issued travel documents against counterfeiting, forgery and other forms of attack, as long as nothing was included which would adversely affect their OCR machine readability.

2.2 The growth in international crime and illegal immigration has led to increasing concerns over the security of travel documents and calls for recommendations on what may be done to help improve their resistance to attack or misuse.

2.3 To meet this need, ICAO's technical advisors decided it would be desirable to publish a set of "recommended minimum security standards" as a guideline for all States issuing machine readable travel documents. This Appendix describes security measures to be taken within the structure of the MRP and of the premises in which it is produced. Appendix 2 describes the security measures to be taken to ensure the security of the personalization operations and of the documents in transit. Appendix 3 describes optional means of achieving machine-assisted document verification.

2.4 This Appendix identifies the security threats to which travel documents are frequently exposed and the counter-measures that may be employed to protect these documents and their associated personalization systems. The lists of security features and/or techniques offering protection against these threats have been subdivided into: 1) basic security features and/or techniques considered essential and; 2) additional features and/or techniques from which States are encouraged to select items which are recommended for providing an enhanced level of security. This approach recognizes that a feature or technique that may be necessary to protect one State's documents may be superfluous or of minor importance to another State using different production systems. A targeted approach that allows States flexibility to choose from different document systems (paper-based documents, plastic cards, etc.) and a combination of security features and/or techniques most appropriate to their particular needs is therefore preferred to a "one size fits all" philosophy. However, to help ensure that a balanced set of security features and/or techniques is chosen, it is necessary for each State to conduct a risk assessment of its national travel documents to identify their most vulnerable aspects and select the additional features and/or techniques that best address these specific problems.

2.5 The aim of the recommendations in this Appendix is to improve the security of machine readable travel documents worldwide by establishing a baseline for issuing States. Nothing within these recommendations shall prevent or hinder States from implementing other, more advanced security features, at their discretion, to achieve a standard of security superior to the minimum recommended features and techniques set forth in this Appendix.

2.6 A glossary of technical terms has been included with this Appendix in paragraph 8.

2.7 A summary table of typical security threats relating to travel documents and some of the security features and techniques that can help to protect against these threats is included.

3. Basic principles

3.1 Production of passport books and travel documents, including the personalization processes, should be undertaken in a secure, controlled environment with appropriate security measures in place to protect the premises against unauthorized access. If the personalization process is decentralized, or if personalization is carried out in a location geographically separated from where the travel document blanks are made, appropriate precautions should be taken when transporting the blank documents and any associated security materials to safeguard their security in transit.

3.2 There should be full accountability over all the security materials used in the production of good and spoiled travel documents and a full reconciliation at each stage of the production process with records maintained to account for all material usage. The audit trail should be to a sufficient level of detail to account for every unit of material used in the production and should be independently audited by persons who are not directly involved in the production. Certified records should be kept of the destruction of all security waste material and spoiled documents.

3.3 Materials used in the production of travel documents should be of controlled varieties and obtained only from bona fide security materials suppliers. Materials whose use is restricted to high security applications should be used, and materials that are available to the public on the open market should be avoided.

3.4 Sole dependence upon the use of publicly available graphics design software packages for originating the security backgrounds should be avoided. These software packages may however be used in conjunction with specialist security design software.

3.5 Security features and/or techniques should be included in travel documents to protect against unauthorized reproduction, alteration and other forms of tampering, including the removal and substitution of pages in the passport book, especially the biographical data page. In addition to those features included to protect blank documents from counterfeiting and forgery, special attention must be given to protect the biographical data from removal or alteration. A travel document should include adequate security features and/or techniques to make evident any attempt to tamper with it.

3.6 The combination of security features, materials and techniques must be well chosen to ensure full compatibility and protection for the lifetime of the document.

3.7 Although this Appendix deals mainly with security features that help to protect travel documents from counterfeiting and fraudulent alteration, there is another class of security features comprised of covert (secret) features, designed to be authenticated either by forensic examination or by specialist verification equipment. It is evident that knowledge of the precise substance and structure of such features should be restricted to very few people on a "need to know" basis. The purpose of these features is not to prevent counterfeiting but to enable authentication of documents where unequivocal proof of authenticity is a

requirement (e.g. in a court of law). All travel documents should contain at least one covert security feature as a basic feature.

4. Main threats to the security of travel documents

4.1 The following threats to document security, listed in no particular order of importance, are identified ways in which the document, its issuance and use may be fraudulently attacked:

- Counterfeiting a complete travel document
- Photo-substitution
- Deletion/alteration of text in the visual or machine readable zone of the MRP data page
- Construction of a fraudulent document, or parts thereof, using materials from legitimate documents
- Removal and substitution of entire page(s) or visas
- Deletion of entries on visa pages and the observations page
- Theft of genuine document blanks
- Impostors (assumed identity; altered appearance).

4.2 To provide protection against these threats and others, a travel document requires a range of security features and techniques combined in an appropriate way within the document. Although some features can offer protection against more than one type of threat, no single feature can offer protection against them all. Likewise, no security feature is 100 per cent effective in eliminating any one category of threat. The best protection is obtained from a balanced set of features and techniques providing multiple layers of security in the document that combine to deter or defeat fraudulent attack.

5. Security features and techniques

In the sections that follow, security features, techniques and other security measures are categorized according to the phases passed through during the production and personalization processes and the components of the travel document created thereby with regard to: 1) substrate materials; 2) security printing; 3) protection against copying; and 4) personalization techniques. Issuing States are recommended to incorporate all of the basic features/measures and to select a number of additional features/measures from the list having first completed a full risk assessment of their travel documents. Unless otherwise indicated, the security features may be assumed to apply to all parts of a travel document and to all the interior pages of a passport, comprising the biographical data page, end leaves and visa pages. Care must be taken to ensure that features do not interfere with the machine readability of the travel document.

5.1 *Substrate Materials*

5.1.1 *Paper forming the pages of a travel document*

Basic features

- UV dull paper, or a substrate with a controlled response to UV, such that when illuminated by UV light it exhibits a fluorescence distinguishable in colour from the blue used in commonly available fluorescent materials;

- watermark comprising two or more grey levels in the biographical data page and visa pages;

— appropriate chemical sensitizers in the paper, at least for the biographical data page (if compatible with the personalization technique);

— paper with appropriate absorbency and roughness.

Additional features

— watermark in register with printed design;

— invisible fluorescent fibres and/or planchettes;

— visible (fluorescent) fibres and/or planchettes[1];

— security thread (embedded or window)[1].

5.1.2 *Paper or other substrate in the form of a label used as the biographical data page of a travel document*

Basic features

— UV dull paper, or a substrate with a controlled response to UV, such that when illuminated by UV light it exhibits a fluorescence distinguishable in colour from the blue used in commonly available fluorescent materials;

— appropriate chemical sensitizers in the paper (not normally possible in a plastic label substrate);

— invisible fluorescent fibres and planchettes;

— visible (fluorescent) fibres[1] and/or planchettes[1];

— a system of adhesives and/or other characteristics that prevents the label from being removed without causing clearly visible damage to the label and to any laminates or overlays used in conjunction with it.

Additional features

— security thread, which may be either embedded or partially embedded and may include special effects such as thermochromic, photochromic or magnetic properties[1];

— a watermark need not be used in the paper of a data page in paper label form.

5.1.3 *Security aspects of paper forming the inside cover of a passport book*

— paper used to form the inside cover of a passport book need not have a watermark. However, if an inside cover is used as a biographical data page, alternative measures must be employed to achieve a significant level of security;

1. The use of these features must not interfere with machine readability of the document in the B-900 band of the spectrum or with the legibility of the portrait, signature or other biographical data in the visual zone.

— where an inside cover is used as a biographical data page and if compatible with the personalization technique, the paper forming the inside cover should contain appropriate chemical sensitizers.

5.1.4 *Plastic substrates*

Where the substrate used for the biological data page (or inserted label) of a passport book or MRTD card is formed entirely of plastic, it is not usually possible to incorporate many of the security components described in 5.1.1 through 5.1.3. In such cases additional security properties shall be included, including additional security printed features, enhanced personalization techniques and/or the use of optically variable features over and above the recommendations contained in 5.2 to 5.5.4.

5.2 *Security printing*

5.2.1 *Background and text printing*

Basic features

— two-colour guilloche security background design pattern[2];

— rainbow printing;

— anti-scan pattern;

— microprinted text;

— security background of the biographical data page printed in a design that is different from that of the visa pages or other pages of the document.

Additional features

— single or multi-colour intaglio printing comprising a “black-line white-line” design on one or more of the end leaves or visa pages;

— latent (intaglio) image;

— duplex security pattern;

— relief (3-D) design feature;

— front-to-back (see-through) register feature.

— deliberate error (e.g. spelling) incorporated within microprint;

2. Where the guilloche pattern has been computer-generated, the image reproduced on the document must be such that no evidence of a pixel structure shall be detectable. Guilloches may be displayed as positive images, where the image lines appear printed with white spaces between them, or as negative images, where the image lines appear in white, with the spaces between them printed. A two-colour guilloche is a design that incorporates guilloche patterns created by superimposing two elements of the guilloche, reproduced in contrasting colours.

— every visa page printed with a different security background design;

— tactile feature.

5.2.2 *Inks*

Basic features

— UV fluorescent ink (visible or invisible) on the biographical data page and all visa pages;

— reactive inks, where the substrate of the document pages or of a label is paper, at least for the biographical data page (if compatible with the personalization technique).

Additional features

— inks with optically variable properties;

— metallic inks;

— penetrating numbering inks;

— metameric inks;

— infrared drop-out inks;

— thermochromic inks;

— photochromic inks;

— infrared fluorescent inks;

— phosphorescent inks;

— tagged inks.

5.2.3 *Numbering*

— A number unique to the document should appear on all pages inside the passport, with the exception of the inside cover pages (unless used for biographical data) and on the biographical data face of an MRTD card or visa.

— The number in a passport shall be either printed or perforated. When it is printed it should ideally be in a special style of figures or typeface and be printed with an ink that fluoresces under ultraviolet light in addition to having a visible colour.

— The number on a label used as a biographical data page in a passport, or as a visa, shall be in a special style of figures or typeface and be printed with an ink that fluoresces under ultraviolet light in addition to having a visible colour.

— The number on a card used for the biographical data of a passport or on an MRTD card can alternatively be incorporated using the same technique as is used for applying the biographical data.

5.2.4 *Special security measures for use with non-laminated biographical data pages*

— If a label or a page of a passport is used for biographical data that is not protected by a laminate film or an overlay (see 5.3.2, 5.4.3 and 5.4.4), additional protection shall be provided by the use of intaglio printing incorporating a latent image and microprinting and preferably utilizing a colour-shifting ink (e.g. ink with optically variable properties).

5.2.5 *Special security measures for use with plastic cards*

— Where a travel document is constructed entirely of plastic, optically variable security features shall be employed which give a changing appearance with angle of viewing. Such devices may take the form of latent images, lenticular features, colour-shifting ink, or diffractive optically variable image features.

5.3 *Protection against copying*

5.3.1 *Need for anticopy protection*

— The current state of development of generally available digital reproduction techniques and the resulting potential for fraud means that high-grade security features in the form of optically variable features or other equivalent devices will be required as safeguards against copying and scanning. Emphasis should be placed on the security of the biographical data page of a passport book, travel card or visa, based on an independent, complex optically variable feature technology or other equivalent devices complementing other security techniques.

— Appropriate integration of optically variable feature components or other equivalent devices into the layered structure of the biographical data page should also protect the data from fraudulent alteration. The optically variable components and all associated security materials used to create the layered structure must also be protected against counterfeiting.

5.3.2 *Anticopy protection methods*

— Subject to the minimum recommendations described in 5.4.3 and 5.4.4 on the need for lamination, optically variable features should be used on the biographical data page of a passport book, travel card or visa as a *basic feature*.

— When a biographical data page of a passport book, travel card or visa is protected by a laminate film or overlay, an optically variable feature (preferably based on diffractive structure) should be integrated into the page. Such a feature should not affect the legibility of the entered data.

— When the biographical data page is a paper label or a page in a passport with no overlay or laminate protection, an optically variable feature (preferably based on diffractive structure) with intaglio overprinting or other printing technique shall be used.

— When the machine readable page of a passport book is made entirely of plastic, or where the travel document is itself a plastic card, an optically variable feature should be incorporated. The inclusion of a diffractive optically variable feature is recommended to achieve an enhanced level of protection against reproduction.

— Devices offering equivalent protection may be used in place of an optically variable feature.

5.4 *Personalization technique*

5.4.1 *Document personalization*

This is the process by which the portrait, signature and/or other biographical data relating to the holder of the document is applied to the travel document. This data records the personalized details of the holder and is at the greatest risk of fraudulent alteration. One of the most frequent types of document fraud involves the removal of the portrait image from a stolen or illegally obtained travel document and its replacement with the portrait of a different person. Documents with stick-in portrait photographs are particularly susceptible to photo substitution. Therefore, this method is not recommended.

5.4.2 *Protection against alteration*

To ensure that data are properly secured against attempts at forgery, it is necessary to integrate the biographical data, including the portrait, signature (if it is included on the biographical data page) and main issue data, into the basic material of the document. A variety of technologies are available for imaging the document in this way, including the following, which are listed in no particular order of importance:

- electro-photographic printing;
- thermal transfer printing;
- ink-jet printing;
- photographic processes;
- laser engraving.

The same imaging technologies may also be used to apply data to the observations page of the passport.

5.4.3 *Choice of document system*

The choice of a particular technology is a matter for individual issuing States and will depend upon a number of factors, such as the volume of travel documents to be produced, the construction of the document and whether it is to be personalized during the document or passport book making process or after the document or book has been assembled. Whichever method is chosen, it is essential that precautions be taken to protect the personalized details against tampering. This is important because, even though eliminating the stick-in portrait reduces the risk of photo substitution, the unprotected biographical data remains vulnerable to alteration and needs to be protected, either by the application of a heat-sealed (or equivalent) laminate, or by a heat-transferred, thin film overlay. Exceptionally, where the imaging technology and the substrate material have been specifically designed to provide equivalent or better protection against tampering (e.g. laser engraving onto plastic, ink-jet printing on security paper using an ink with a high resistance to removal by solvents and mechanical erasure), a laminate or overlay may be dispensed with, at the discretion of the issuing State provided that this does not result in a reduction in overall security.

5.4.4 *Protection against photo substitution and alteration of data on the biographical data page of a passport book, travel card or visa*

Basic features

- imaging the portrait and all biographical data by integration into the basic material;

— security background guilloche overlapping the portrait area;

— heat-sealed (or equivalent) laminate or overlay or an imaging technology and substrate material that provide an equivalent resistance to substitution of the portrait and other biographical data (e.g. laser engraved plastic, ink-jet printing on security paper).

Additional features

— an optically variable feature superimposed on (but not rendering illegible) the portrait;

— digital signatures incorporated in the document;

— embedded steganographic images incorporated in the document;

— secondary portrait image of holder;

— duplicate information in a machine readable form in one of the optional data capacity expansion technologies;

— machine verifiable biometric feature.

5.5 *Additional security measures for passport books*

5.5.1 *Position of the biographical data page*

It is recommended that States place the data page on an inside page. When the data page is situated on the inside cover of a MRP, the normal method of construction used in the manufacture of passport covers has facilitated fraudulent attacks on the data page, typically photo substitution or whole-page substitution. However, an issuing State may place the data page on a cover provided that it ensures that the construction of the cover used in its passport offers a similar level of security against all types of fraudulent attack to that offered by locating the data page on an inside page.

5.5.2 *Whole-page substitution*

Issuing States' attention is drawn to the fact that with integrated biographical data pages replacing stick-in photographs in passports, some cases of whole-page substitution have been noted in which the entire biographical data page of the passport has been removed and substituted with a fraudulent one. Although whole-page substitution is generally more difficult to effect than photo substitution of a stick-in photo, nevertheless, it is important that the following recommendations be adopted to help in combatting this category of risk. As with all other categories of document fraud it is better to employ a combination of security features to protect against whole-page substitution rather than relying on a single feature which, if compromised, could undermine the security of the whole travel document.

5.5.3 *Biographical data whole-page substitution*

Basic features

— thread sewing with back-sewn lock stitch or an alternative binding technique with equivalent resistance to unpicking;

— security background of the biographical data page printed in a design that is different from that of the visa pages.

Additional features

— multi-colour and/or fluorescent sewing thread;

— biographical data page to be an integral, bound-in page of the passport book or an insert encapsulated between two bound-in sheets of laminate. Where self-adhesive labels are used for the biographical data page, additional security requirements as described in 5.1.2 and 5.2.4 are advised including linking the label to the passport book by the passport number;

— programmable thread-sewing pattern.

5.5.4 *Visa page whole-page substitution*

Basic feature

— thread sewing with back-sewn lock stitch or an alternative binding technique with equivalent resistance to unpicking.

Additional features

— page numbers integrated into security background design on every visa page;

— index or collation marks printed on the fore-edge of every visa page;

— passport serial number on every visa page (perforated or printed in a non-standard type font).

5.5.5 *Deletion of stamps and removal of labels from passports, including the removal of data from the observations page*

— This section relates to the deletion of ink stamps and the removal of visa labels applied to the visa page of a passport book. This type of fraud may be carried out to remove evidence from a travel document or to transfer a visa label to another passport book.

Basic features

— reactive inks;

— chemical sensitizers in the paper;

— high-tack, non-peelable adhesives (for labels);

— permanent, non-fading inks (for stamps).

Additional features

— over-lamination or overlays on stamps and labels;

— visa page paper with appropriate absorbency and surface characteristics;

— frangible substrate (for labels).

5.6 *Quality control*

Quality checks and controls at all stages of the production process and from one batch to the next are essential to maintain consistency in the finished travel document. This should include quality assurance (QA) checks on all materials used in the manufacture of the documents and the readability of the machine readable lines. The importance of consistency in the finished travel document is paramount because immigration inspectors and border control officers rely upon being able to recognize fake documents from variations in their appearance or characteristics. If there are variations in the quality, appearance or characteristics of a State's genuine travel documents, detection of counterfeit or forged documents is made more difficult.

5.7 *Security control of production and product*

A major threat to the security of the MRP of an issuing State can come from the unauthorized removal from the production facility of genuine finished but unpersonalized MRPs or the components from which MRPs can be made.

5.7.1 *Protection against theft and abuse of genuine document blanks or document components*

Blank documents should be stored in locked and appropriately supervised premises. The following measures should be adopted:

Basic measures

- good physical security of the premises with controlled access to delivery/shipment and production areas, and document storage facilities;
- full audit trail, with counting and reconciliation of all materials (used, unused, defective or spoiled) and certified records of same;
- all document blanks and other security-sensitive components serially numbered with full audit trail for every document from manufacture to dispatch;
- where applicable, tracking and control numbers of other principal document components (e.g. rolls or sheets of laminates, optically variable feature devices);
- secure transport vehicles for movement of blank passports and other principal document components (if applicable);
- details of all lost and stolen travel document blanks to be rapidly circulated between governments;
- appropriate controls to be in place to protect the production systems from internal fraud.

Additional measures

- CCTV coverage/recording of all production areas, where permitted.

6. Glossary of terms

The glossary of terms in this document is included to assist the reader with understanding the general meanings of such terms within the context of this document. This glossary is not intended to be authoritative or definitive.

Anti-scan pattern. An image usually constructed of fine lines at varying angular displacement and embedded in the security background design. When viewed normally, the image cannot be distinguished from the remainder of the background security print, but when the original is scanned or photocopied the embedded image becomes visible.

Biographical data (biodata). The personalized details of the bearer of the document appearing as text in the visual and machine readable zones on the biographical data page of a passport book, or on a travel card or visa.

Black-line white-line design. A design made up of fine lines often in the form of a guilloche pattern and sometimes used as a border to a security document. The pattern migrates from a positive to a negative image as it progresses across the page.

Chemical sensitizers. Security reagents to guard against attempts at tampering by chemical erasure, such that irreversible colours develop when bleach and solvents come into contact with the document.

Counterfeit. An unauthorized copy or reproduction of a genuine security document made by whatever means.

Document blanks. A document blank is a travel document that does not contain the biographical data and personalized details of a document holder. Typically, document blanks are the base stock from which personalized travel documents are created.

Digital signature. A method of securing and validating information by electronic means.

Duplex design. A design made up of an interlocking pattern of small irregular shapes, printed in two or more colours and requiring very close register printing in order to preserve the integrity of the image.

Embedded image. An image or information encoded or concealed within a primary visual image.

Fibres. Small, thread-like particles embedded in a substrate during manufacture.

Fluorescent ink. Ink containing material that glows when exposed to light at a specific wavelength (usually UV) and that, unlike phosphorescent material, ceases to glow immediately after the illuminating light source has been extinguished.

Forgery. Fraudulent alteration of any part of the genuine document, e.g. changes to the biographical data or the portrait.

Front-to-back (see-through) register. A design printed on both sides of the document or an inner page of the document which, when the page is viewed by transmitted light, forms an interlocking image.

Guilloche design. A pattern of continuous fine lines, usually computer generated, and forming a unique image that can only be accurately re-originated by access to the equipment, software and parameters used in creating the original design.

Heat-sealed laminate. A laminate designed to be bonded to the biographical data page of a passport book, or to a travel card or visa, by the application of heat and pressure.

Impostor. A person who applies for and obtains a document by assuming a false name and identity, or a person who alters his[3] physical appearance to represent himself as another person for the purpose of using that person's document.

Infrared drop-out ink. An ink which forms a visible image when illuminated with light in the visible part of the spectrum and which cannot be detected in the infrared region.

Intaglio. A printing process used in the production of security documents in which high printing pressure and special inks are used to create a relief image with tactile feel on the surface of the document.

Laminate. A clear material, which may have security features such as optically variable properties, designed to be securely bonded to the biographical data or other page of the document.

Laser engraving. A process whereby images (usually personalized images) are created by "burning" them into the substrate with a laser. The images may consist of both text, portraits and other security features and are of machine readable quality.

Laser-perforation. A process whereby images (usually personalized images) are created by perforating the substrate with a laser. The images may consist of both text and portrait images and appear as positive images when viewed in reflected light and as negative images when viewed in transmitted light.

Latent image. A hidden image formed within a relief image which is composed of line structures which vary in direction and profile resulting in the hidden image appearing at predetermined viewing angles, most commonly achieved by intaglio printing.

Machine-verifiable biometric feature. A unique physical personal identification feature (e.g. an iris pattern, fingerprint or facial characteristics) stored on a travel document in a form that can be read and verified by machine.

Metallic ink. Ink exhibiting a metallic-like appearance.

Metameric inks. A pair of inks formulated to appear to be the same colour when viewed under specified conditions, normally daylight illumination, but which are a mismatch at other wavelengths.

Micro-printed text. Very small text printed in positive and/or negative form, which can only be read with the aid of a magnifying glass.

Optically variable feature (OVF). An image or feature whose appearance in colour and/or design changes dependent upon the angle of viewing or illumination. Examples are: features including diffraction structures with high resolution (diffractive optically variable image device/DOVID), holograms, colour-shifting inks (e.g. ink with optically variable properties) and other diffractive or reflective materials.

Optional data capacity expansion technologies. Data storage devices (e.g. integrated circuit chips) that may be added to a travel document to increase the amount of machine readable data stored in the document. See Doc 9303, Part 1, Volume 2, for guidance on the use of these technologies.

Overlay. An ultra-thin film or protective coating that may be applied to the surface of a biographical data or other page of a document in place of a laminate.

3. Throughout this manual, the use of the male gender should be understood to include male and female persons.

Penetrating numbering ink. Ink containing a component that penetrates deep into a substrate.

Personalization. The process by which the portrait, signature and biographical data are applied to the document.

Phosphorescent ink. Ink containing a pigment that glows when exposed to light of a specific wavelength, the reactive glow remaining visible and then decaying after the light source is removed.

Photochromic ink. An ink that undergoes a reversible colour change when exposed to UV light.

Photo substitution. A type of forgery in which the portrait in a document is substituted for a different one after the document has been issued.

Physical security. The range of security measures applied within the production environment to prevent theft and unauthorized access to the process.

Planchettes. Small visible (fluorescent) or invisible fluorescent platelets incorporated into a document material at the time of its manufacture.

Rainbow (split-duct) printing. A technique whereby two or more colours of ink are printed simultaneously by the same unit on a press to create a controlled merging of the colours similar to the effect seen in a rainbow.

Reactive inks. Inks that contain security reagents to guard against attempts at tampering by chemical erasure (deletion), such that a detectable reaction occurs when bleach and solvents come into contact with the document.

Relief (3-D) design (Medallion). A security background design incorporating an image generated in such a way as to create the illusion that it is embossed or debossed on the substrate surface.

Secondary image. A repeat image of the holder's portrait reproduced elsewhere in the document by whatever means.

Security thread. A thin strip of plastic or other material embedded or partially embedded in the substrate during the paper manufacturing process. The strip may be metallized or partially de-metallized.

Tactile feature. A surface feature giving a distinctive “feel” to the document.

Tagged ink. Inks containing compounds that are not naturally occurring substances and which can be detected using special equipment.

Thermochromic ink. An ink that undergoes a reversible colour change when the printed image is exposed to heat (e.g. body heat).

UV. Ultraviolet light.

UV dull substrate. A substrate that exhibits no visibly detectable fluorescence when illuminated with UV light.

Variable laser image. A feature generated by laser engraving or laser perforation displaying changing information or images dependent upon the viewing angle.

Watermark. A custom design, typically containing tonal gradation, formed in the paper or other substrate during its manufacture, created by the displacement of materials therein, and traditionally viewable by transmitted light.

Table IIIA-1. Summary of security recommendations

Threats	Basic features	Additional features
Counterfeiting		
Paper substrates (5.1.1)	– controlled UV response – two-tone watermark – chemical sensitizers – appropriate absorbency and surface characteristics	– registered watermark – invisible UV fibres/ planchettes – visible UV fibres/planchettes – embedded or window thread
Label substrates (5.1.2)	– controlled UV response – chemical sensitizers – invisible UV fibres/planchettes – visible UV fibres/planchettes – non-peelable adhesive	– embedded or window thread
Plastic/synthetic substrates (5.1.4)	– as per paper or substitute – security features providing an equivalent level of security in plastic	– optically variable feature(OVF)
Security printing (5.2)	– two-colour guilloche background – rainbow printing – anti-scan pattern – microprinting – unique biodata page design	– intaglio printing – latent image – duplex pattern – 3-D design feature – front-to-back register feature – deliberate error in microprint – unique design on every page – tactile feature
Numbering (5.2.3)	– unique document number	– perforated document number – special typefonts
Inks (5.2.2):	– UV inks on all pages – reactive inks	– optically variable properties – metallic inks – penetrating numbering ink – metameric inks – infrared dropout ink – thermochromic ink – photochromic ink – infrared fluorescent ink – phosphorescent ink – tagged ink

Table IIIA-1. Summary of security recommendations

Threats	Basic features	Additional features
Photo-substitution (5.4.4)	– integrated biodata page – guilloche overlapping portrait – secure laminate or equivalent	– OVF over the portrait – digital signature in document – embedded image – secondary portrait image – storage and retrieval system for digital portrait images – biometric feature
Alteration of the biodata (5.4.4)	– reactive inks – secure laminate or equivalent	– chemical sensitizers in substrate – secondary biodata image – OVF over the biodata
Page substitution (5.5.3/4)	– lock stitch or equivalent – unique biodata page design	– programmable sewing pattern – fluorescent sewing thread – serial number on every page – page folio numbers in guilloche – index marks on every page – biodata on inside page
Deletion/removal of stamps and labels (5.5.5)	– reactive inks – chemical sensitizers – high-tack adhesives (labels) – permanent inks (stamps)	– over-lamination – high absorbency substrates – frangible substrate (labels)
Document theft (5.7.1):	– good physical security arrangements – control of all security components – serial numbers on blank documents – secure transport of blank documents – internal fraud protection system – international exchange on lost and stolen documents	– CCTV in production areas – centralized production – digital signature – embedded image

Notes.–

1. Issuing States and Organizations are recommended to include all of the basic features and to select from the additional features those that are best suited to their particular documents and issuing systems after conducting an assessment of the risks to which their documents are most susceptible.

2. The descriptions in the table above are necessarily abbreviated from the main text. For ease of reference the relevant sections of the Appendix are referenced by the paragraph numbers in parentheses in the "Threats" column of the above table.

3. Certain of the features are repeated one or more times in the table. This indicates that the particular feature protects against more than one type of threat. It is only necessary to include these features once within any particular document.

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INFORMATIVE APPENDIX 2 TO SECTION III

MACHINE-ASSISTED DOCUMENT SECURITY VERIFICATION

Note.— Doc 9303 does not specify a machine assisted verification method that is globally interoperable. The reliance on a single feature to verify authenticity carries a high risk that the method will be compromised. States should be aware of this risk should they choose to use a machine assisted feature for their own purposes in their MRP.

1. Scope

1.1 This Appendix indicates machine verifiable security features that a State may optionally use for its own purposes as an aid to the authentication of a travel document, i.e. that help confirm its authenticity as a genuine document made from genuine materials. Features based on the detection of the presence of a substance or of a particular structure at a particular place in the MRP are included, where the means of detection is built into the reader. Features that involve the accessing of data stored on a microchip are excluded as they are considered in Doc 9303, Part 1, Volume 2

2. Types of machine assisted document verification features

2.1 Doc 9303 distinguishes three main categories of machine-verifiable security features. These are described below along with examples of security features that are capable of machine verification. This Appendix only describes features that can be verified by detection equipment built into the MRP reader during the normal reading process.

2.1.1 *Structure feature.* A structure feature is a security feature containing some form of verifiable information based on the physical construction of the feature. Examples include:

— the interference characteristic of a hologram or other optically variable device that can be uniquely identified by a suitable reader;

— retro-reflective images embedded within a security laminate;

— controlled transmission of light through selective areas of the substrate.

2.1.2 *Substance feature.* A substance feature involves the identification of a defined characteristic of a substance used in the construction of the feature. Examples include:

— the use of pigments, usually in inks, which respond in specific and unusual ways to specific wavelengths of light (which may include infrared or ultraviolet light) or have magnetic or electromagnetic properties.

— the incorporation into a component of the data page of materials, e.g. fibres or planchettes whose individual size or size distribution conform to a predetermined specification.

2.1.3 *Data feature*. The visible image of the MRP data page may contain concealed information which may be detected by a suitable device built into the reader. The concealed information may be in the security printed image but it is more usually incorporated into the personalization data especially the portrait. Inserting the concealed information into the MRP data page may involve the application of substance and/or structure features in a way which achieves several levels of security. The information may be decoded by a suitable device built into a whole page reader set to look for the feature in a specific location. The information might, for example, be the passport number. The reader could then be programmed to compare the passport number detected from the feature with the passport number appearing in the MRZ. Such a comparison involves no access to any data stored on the optional microchip described in Volume 2 of Doc 9303, Part 1. Examples of this type of feature are:

— encoded data stored on the document in magnetic media such as special security threads;

— designs incorporating the concealed data which only become detectable when viewed using a specific wavelength of light, optical filters, or a specific image processing software.

2.2 All three types of feature, structure, substance and data features may be incorporated in travel documents and verified with suitably designed readers. Readers are now becoming available that can detect such features and use the responses to confirm the authenticity of the document.

2.3 Machine assisted document security verification uses automated inspection technology to assist in verifying the authenticity of a travel document. It should not be used in isolation to determine proof of authenticity, but when used in combination with visible document security features, the technology provides the examiner with a powerful new tool to assist in verifying travel documents.

2.4 Machine assisted document security verification features are optional data elements that may be included on the MRP at the discretion of the issuing authority. Appendix 10 to Section IV of this volume provides guidance on the positions these features should occupy to facilitate interoperability. However, at present there are no specifications for the functionality or performance of any of these features and hence their use is currently restricted to national and bilateral use.

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INFORMATIVE APPENDIX 3 TO SECTION III

THE PREVENTION OF FRAUD ASSOCIATED WITH THE ISSUANCE PROCESS

Note.— This Appendix is a summary of two papers prepared by a multinational group of experts. A detailed discussion of the recommendations enumerated below may be found in the full papers, published separately by ICAO, on its web site: www.icao.int/mrtd.

1. Scope

1.1 This Appendix describes the fraud risks associated with the process of passport application and issuance. These risks are a consequence of the benefits that can accrue from the possession of a passport from the issuing State that can be used to confirm the holder's identity and citizenship. The Appendix recommends precautions that an issuing State can take to prevent such fraud.

2. Fraud and its prevention

2.1 Fraud perpetrated as part of the issuance process can be of several major types:

— theft of genuine blank passports and completion to make them look valid;

— applying for the passport under a false identity using genuine evidence of nationality and/or identity stolen from another individual, or otherwise obtained improperly;

— applying for the passport under a false identity using manufactured false evidence of nationality and/or identity;

— applying for multiple passports so that a traveller can hide previous suspicious travel evidenced by visas and entry and departure stamps from border officials;

— using falsely declared or undeclared lost and/or stolen passports that can be provided to people who might use them in look-alike fraud or with repetitive photo substitutions;

— reliance on passport employees to manipulate the passport system to issue a passport outside the rules.

2.2 There are two additional categories in which the applicant applies under his own identity but with the intention to be complicit in the later fraudulent use of the passport by:

— altering a genuinely issued document to make it fit a bearer who is not the person to whom the passport was issued;

— applying for a passport with the intention of giving or selling it to someone who resembles the true bearer.

3. Recommended measures against fraud

3.1 To combat the above-mentioned threats, it is recommended that the passport authority of the issuing State undertake the following measures, to the extent that adequate resources are available for their implementation.

3.2 A suitably qualified person should be appointed to be Head of Security directly responsible to the Chief Executive Officer of the issuing authority. The Head of Security should be responsible for ensuring that security procedures are laid down, observed and updated as necessary.

3.3 In each location where passports are issued there should be a designated Security Manager. The Security Manager should be responsible for the implementation and updating of the security procedures and report directly to the Head of Security.

3.4 Vetting procedures should be established to ensure that all staff are recruited only after searches have verified their identity, ensured that they have no criminal record, and verified that their financial position is sound. Regular follow-up checks should also be made to detect staff whose changed circumstances mean they may succumb to temptations to engage in fraudulent activity.

3.5 All staff within the passport authority should be encouraged to adopt a positive attitude toward security matters. There should be a system of rewards for any staff member who reports incidents or identifies measures that prevent fraud.

3.6 Controls should be established that account for key components such as blank books and security laminates. Such items should each bear a unique serial number and should be kept locked in suitable secure storage. Only the required number should be issued at the start of each working day or shift. The counting of the items should be done and the figures agreed by two members of staff who should also record the unique numbers of the items. The person to whom they are issued must account for all items at the end of the shift in the form of either personalized books or defective product. All items should be returned to the secure store at the end of the working period, again having been counted by two people and the unique numbers logged. The records should be kept at least for the life of the issued passports.

3.7 Defective product or materials should be destroyed under controlled conditions and the unique numbers recorded.

3.8 The issuance process should be divided into discrete operations that are carried out in separate locations within the facility. The purpose is to ensure that no one person can carry out the whole issuance process without venturing into one or more areas that the person has no authorization to enter.

4. Procedures to combat fraudulent applications

4.1 The following procedures are recommended to prevent the issue of a genuine passport as a result of receipt of a fraudulent application. Again full implementation would require adequate resources.

4.2 The passport office should appoint an appropriate number of anti-fraud specialists (AFS) who have received a high level of training in the detection of all types of fraud used in passport application. There should be at least one AFS present in each location in which passport applications and applicants are processed. An AFS should at all times be available to support those whose task it is to process applications (Authorizing Officers [AO]) and thus to provide assistance in dealing with any suspicious application. AFS personnel should regularly provide training to AOs to increase their awareness of potential fraud risks.

4.3 The passport issuing authority should establish close liaisons with the issuers of “breeder documents” such as birth and marriage certificates and driving licences. The State should ensure that the departments holding records of births, marriages and deaths are reconciled and the data stored in a database, secure access to which should be available to the passport office. The aim is to facilitate rapid verification that submitted breeder documents are genuine and that an application is not being made, for example, in the name of a deceased person.

4.4 An applicant for a passport who has not held one previously should be required to present himself at a passport office with supporting breeder documentation for an interview with an AO and, where necessary, an AFS.

4.5 The procedure specified in 4.4 may also be used to process applications for a passport to replace an expiring one. Alternatively, provided the passport office has an adequate database of personal information, including portraits, a replacement application may be processed by submission of the documentation, including a new portrait, by mail. In such cases it is desirable that the application and new portrait be endorsed by a responsible person. The return of the expiring passport with the new application should be required.

4.6 The passport office should initiate procedures that would prevent the fraudulent issue of more than one passport to an individual who may have attempted to assume more than one identity. Computer database checks of stored portraits using facial recognition and, where available, fingerprints can assist in this process.

4.7 Procedures in the passport office should prevent an applicant from selecting the AO with whom to deal. Conversely the work flow should be such as to prevent any employee from selecting which applications he is to process.

4.8 The issuance of a passport to a young child should require the attendance at the passport office of, preferably, both parents and of the child. This is to lower the risk of child smuggling or abduction of a child by one parent.

4.9 The replacement of a passport claimed to be lost or stolen should be made only after exhaustive checks including a personal interview with the applicant.

4.10 It is recommended that details, particularly document numbers, of lost or stolen passports be provided to the database operated by INTERPOL. This database is available to all participating countries and can be used in the development of watch lists.

5. Control of issuing facilities

5.1 A State should consider issuing all passports from one or, at most, two centres. This reduces the number of places where blank documents and other secure components are stored. The control of such a central facility can be much tighter than is possible at each of many issuing centres. If central issuance is adopted, the provision of centres where applicants can attend interviews is required.

IV. TECHNICAL SPECIFICATIONS FOR MACHINE READABLE PASSPORTS

Scope

1. This section defines the specifications for machine readable passports (MRPs). These specifications are necessary for global interoperability. They also apply to electronically enabled MRPs, further specifications for which are contained in Doc 9303, Part 1, Volume 2. Technical specifications for a passport card are also included, with references to specifications elaborated in Doc 9303, Part 3, for optional use by States and organizations.

Physical characteristics

2. Issuing States and organizations have the freedom to choose the materials to be used. Nevertheless, the MRP shall, in normal use throughout its period of validity, meet the following requirements.

2.1 *Deformation.* The MRP shall be of such nature that bends (not creases), i.e. deformation due to normal use, can be flattened by the reading device without impairing the use of the MRP or the functioning of the reader.

2.2 *Toxicity.* The MRP shall present no toxic hazards in the course of normal use (see also ISO/IEC 7810).

2.3 *Resistance to chemicals.* The MRP shall be resistant to chemical effects arising from normal handling and use, except where chemical sensitivity is added for security reasons.

2.4 *Temperature stability.* The MRP shall remain machine readable at operating temperatures ranging from –10°C to +50°C (14°F to 122°F). The MRP should not lose its reliability after being stored or exposed at temperatures ranging from –35°C to +80°C (–31°F to 176°F).

2.5 *Humidity.* The MRP shall be machine readable at a relative air humidity ranging from 5 per cent to 95 per cent, with a maximum wet bulb temperature of 25°C (77°F) (see also ISO/IEC 7810). The MRP should not lose its reliability after being stored at, or exposed to, a relative air humidity ranging from 0 per cent to 100 per cent (non-condensing).

2.6 *Light.* The MRP shall resist deterioration from exposure to light encountered during normal use (see also ISO/IEC 7810).

2.7 While material choices remain at the discretion of the individual issuing State or organization, no materials shall adversely affect any other component in the MRP.

Construction and dimensions of the MRP and MRP data page

3. The MRP shall take the form of a book consisting of a cover and a minimum of eight pages and shall include a data page onto which the issuing State enters the personal data relating to the holder of the document and data concerning the issuance and validity of the MRP.

4. The dimensions shall be as follows.

4.1 *MRP data page nominal dimensions.* The nominal dimensions shall be as specified in ISO/IEC 7810 (except thickness) for the ID-3 size card, i.e.:

88.0 mm ± 0.75 mm × 125.0 mm ± 0.75 mm (3.46 in ± 0.039 in × 4.92 in ± 0.039 in).

4.2 *MRP data page edge tolerances.* The edges of the data page following final preparation shall be within the area circumscribed by the following concentric rectangles as illustrated in Figure IV-1.

Inner rectangle: 87.25 mm × 124.25 mm (3.44 in × 4.89 in)
Outer rectangle: 88.75 mm × 125.75 mm (3.49 in × 4.95 in)

4.3 *MRP data page margins.* The dimensional specifications refer to the outer limits of the MRP data page. A margin of 2.0 mm (0.08 in) along each outer edge, with the exception of the header zone, must be left clear of data.

4.4 *MRP data page thickness.* The thickness, including any final preparation (e.g. laminate), shall be as follows.

4.4.1 Minimum: No minimum thickness is specified. However, States are advised that currently available materials are unlikely to provide an adequately robust data page if the thickness is below 0.15 mm (0.006 in).

4.4.2 Maximum: 0.90 mm (0.035 in).

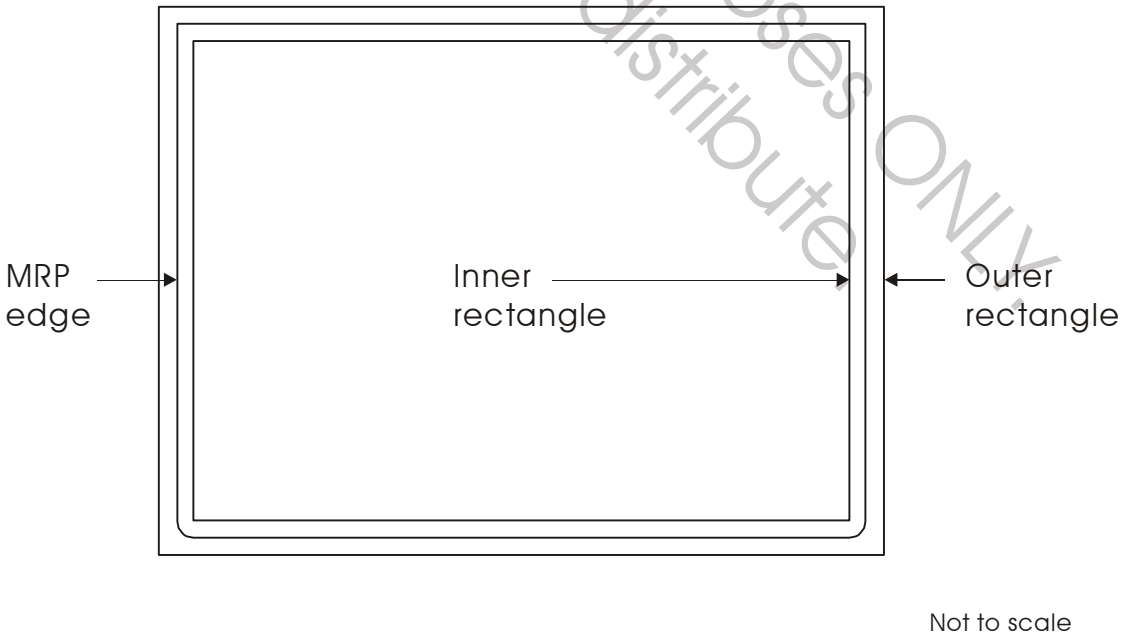


Figure IV-1. MRP data page dimensional illustration

4.4.3 The thickness of the area within the machine readable zone shall not vary by more than 0.10 mm (0.004 in).

4.5 *MRP dimensions*. The dimensional specifications defined in 4.1 and 4.2 also apply to the MRP. If required for binding purposes, the 88.0 mm (3.46 in) dimension may be increased.

General layout of the MRP data page

5. The MRP data page follows a standardized layout to facilitate reading of data globally by visual and machine readable means.

5.1. The MRP data page should either be an inner page in close proximity to an end leaf of the MRP or form part of the cover of the MRP. Where the MRP is part of the cover, precautions must be taken to ensure that the endleaf/cover assembly combined with the means of personalization are together resistant to fraudulent attack, particularly by delamination of the cover structure. Where the MRP data page is not constructed as part of the cover, the recommended practice is to locate the MRP data page on page 2 or on the penultimate page of the MRP. The location of the MRP data page in any other position in the MRP will give rise to problems for document examiners in the operation of swipe readers reading the MRZ. The MRZ shall be positioned adjacent to the outside edge of the book, parallel to the spine of the book, as illustrated in Appendix 3 to this section.

5.2 To accommodate the various requirements of States' laws and practices and to achieve the maximum standardization within those divergent requirements, the MRP data page is divided into seven zones as follows:

Front of MRP data page

Zone I	Mandatory header
Zone II	Mandatory and optional personal data elements
Zone III	Mandatory and optional document data elements
Zone IV	Mandatory holder's signature or usual mark (original or reproduction)
Zone V	Mandatory identification feature
Zone VII	Mandatory machine readable zone (MRZ)

Back of MRP data page, or an adjacent page

Zone VI	Optional data elements

Note.— When the data page is situated on an inside page of the MRP, the issuing State may place elements 01 and 02 of Zone 1, the mandatory header, on an adjacent or earlier page.

5.3 Zones I to V, which, together with Zone VI, form the Visual Zone (VIZ), and Zone VII, which is the Machine Readable Zone (MRZ), contain mandatory elements in a standard sequence which represent the minimum requirements for the MRP data page. The optional elements in Zones II, III and VI accommodate the diverse requirements of issuing States and organizations, allowing for presentation of additional data at the discretion of the issuing State or organization, while achieving the desired level of standardization. The location of zones and standard sequence for data elements are set out in Appendix 1 to this section. Appendix 2 (Diagram 1) to this section illustrates the dimensional specifications for the MRP data page. The technical specifications for the printing of data on the MRP data page are defined in Appendices 2 and 3 to this section. Appendix 4 to this section outlines the guidelines for positioning and adjusting the dimensional specifications of Zones I to V to accommodate the flexibility desired by issuing States and organizations. Examples of personalized MRP data pages are shown in Appendix 5 to this section.

5.4 *Zone IV — Location of holder's signature or usual mark*. Field 18, the holder's signature or usual mark (or a reproduction thereof), shall normally be placed in Zone IV of the MRP data page (see Appendix 4 to this section). Where the issuing State or organization wishes to locate the holder's signature or usual mark on a page other than the MRP data page, it may, as specified in the data element directory (see 8.6), locate Field 18 on the page adjacent to the MRP data page. In this case, the size of adjacent fields in the visual zone on the MRP data page may be increased.

5.5 *Zone V — Position of holder's portrait*. Within Zone V, the holder's portrait shall be at least 2.0 mm (0.08 in) from the left-hand edge of the MRP data page. When using an affixed photograph, it is recommended that this dimension be increased to 6.0 mm (0.24 in) in an effort to reduce the potential for photograph substitution. Where this recommendation is implemented, a consequent reduction in the width of Fields 06 to 18 and in the number of character positions of the data elements appearing in Fields 8, 10 and 12 shall occur. Issuing States should be aware of the additional risk of photo substitution if affixed photographs are used; digital printing of the portrait is strongly recommended.

Content and use of zones

6. *Data elements*. The data elements to be included in the zones, the preparation of the zones and guidelines for the dimensional layout of zones shall be as described hereunder.

6.1 *Mandatory zones*

6.1.1 The MRP data page shall contain Zones I through III, Zone V and Zone VII. If the State practice is to omit mandatory elements 01 and 02 (issuing State or organization, in full, and document, in full) from the header (Zone I), these data elements shall be placed on an adjacent or earlier page.

6.1.2 Zone IV shall be present either on the data page or on an adjacent page and contain the holder's signature or usual mark i.e. original or reproduction. Zone V shall include the personal identification feature(s) which shall include a portrait solely of the holder. At the discretion of the issuing State or organization, the name fields in Zone II and the holder's signature or usual mark in Zone IV may overlay Zone V provided this does not hinder recognition of the data in any of the three zones.

6.1.3 Data elements shall appear in a standard sequence as defined in Appendix 1 to this section.

6.1.4 All MRZ (Zone VII) data elements shall be shown as defined in 9.6 and 9.7.

6.2 *Optional data zone*. Zone VI, which may be on the back of the data page or on an adjacent page, is a zone for optional data for use at the discretion of the issuing State or organization.

6.3 *Dimensional flexibility of Zones I to V*

6.3.1 Zones I to V may be adjusted in size and shape within the overall dimensional specifications of the MRP data page to accommodate the diverse requirements of issuing States and organizations. All zones, however, shall be bounded by straight lines, and all angles where straight lines join shall be right angles (i.e. 90 degrees). It is recommended that the zone boundaries not be printed on the MRP data page. The nominal position of the zones is shown in Appendix 4 to this section.

6.3.2 When an issuing State or organization chooses to produce an MRP data page that contains a transparent or otherwise unprintable border, this will result in a reduction of the available area within the zones. The full MRP data page dimensions and zone boundaries shall be measured from the outside edge of this border, which is the external edge of the MRP data page.

6.3.3 Zone I shall be located along the top edge of the MRP data page and extend across the full 125.0 ± 0.75 mm (4.92 ± 0.03 in) dimension. (The top edge is the edge coincident with the spine of the MRP.) The issuing State or organization may vary the *vertical* dimension of Zone I, as required, but this dimension shall be sufficient to allow legible interpretation of the data elements in the zone and shall not be greater than 17.9 mm (0.70 in).

6.3.4 Zone V shall be located such that its left edge is coincident with the left edge of the MRP data page as defined in Appendix 4 to this section. The dimensions of the portrait contained in Zone V are specified in 7.1 of this section.

6.3.5 Zone V may move *vertically* along the left edge of the MRP data page and overlay a portion of Zone I as long as individual details contained in either zone are not obscured.

6.3.6 The upper boundary of Zone II shall be coincident with the lower boundary of Zone I.

6.3.7 When there is a specific requirement for the name fields to extend across the MRP data page, Zone II may extend up to the full 125.0 ± 0.75 mm (4.92 ± 0.03 in) dimension of the MRP data page. In the event the full dimension is used, Zone II shall overlay a portion of Zone V. In this case, issuing States and organizations shall ensure that data contained in either zone are not obscured.

6.3.8 The lower boundary of Zone II may be positioned at the discretion of the issuing State or organization. Enough space must be left for Zones III and IV below the boundary. This boundary does not need to be straight across the 125.0 ± 0.75 mm (4.92 ± 0.03 in) dimension of the MRP data page. This is illustrated in Example 1 of Appendix 4 to this section.

6.3.9 Zone III should start at the right vertical boundary of Zone V and may extend, at the discretion of the issuing State or organization, to the right edge of the MRP data page. The nominal position diagram and Examples 1 and 2 of Appendix 4 illustrate the flexibility permitted to issuing States.

6.3.10 If Zone IV is placed on the MRP data page, it shall be at the bottom of the VIZ on the front of the MRP data page, its lower boundary coincident with the top edge of the MRZ. The nominal position diagram and Example 1 of Appendix 4 show two alternative positions for Zone IV. Example 2 shows an MRP data page where Zone IV has been placed on an adjacent page.

6.3.11 Zone IV may also overlay Zone V, though this practice is not recommended. In this case, issuing States and organizations shall ensure that individual details contained in either zone are not obscured. See Example 3 of Appendix 5.

6.3.12 When an issuing State decides to use a bar code to store data relating to the holder and/or the document on the data page, it is recommended that this be sited immediately above the MRZ to the right of the portrait. The size of the bar code shall be such that it does not prevent the inclusion of all the mandatory data in Zones II and III. Such a bar code is for use by the issuing State for its own purposes or for bilateral use by agreement between two or more States; it is not intended to support globally interoperable applications and therefore is not an internationally acceptable alternative to the contactless integrated circuit as specified for an electronically enabled passport in Doc 9303, Part 1, Volume 2. Consequently, the format and data content of bar codes are not specified in this document.

6.3.13 When an issuing State wishes to have a displayed image of an MRP holder's fingerprint, the image may be displayed within the area designated for Zone II as illustrated in Example 4 in Appendix 5 to this Section.

6.4 The dimensions and boundaries of Zone VII, the machine readable zone, are fixed. Zone VII conforms in height to the MRZ defined for all MRTDs so that the machine readable data lines fall within the effective reading zone (ERZ) specified in paragraph 10 and Appendix 3 to this section.

Displayed identification feature(s) of the holder

7. *Displayed identification feature(s)*. The MRP shall incorporate on the data page a mandatory displayed portrait of the holder. It may optionally display a fingerprint of the holder or reproduction thereof.

7.1 *Displayed portrait*. A displayed portrait of the rightful holder shall be either a photograph or other faithful reproduction of the image of the holder securely affixed to or represented on/within the substrate of the MRP. See Appendix 11 to this section for examples of acceptable and unsatisfactory portraits. Necessary measures shall be taken by the issuing State or organization to ensure that the displayed portrait is resistant to forgery and substitution. The displayed portrait shall have been taken within the six months preceding the issue of the MRP. The portrait shall not be larger than 45.0 mm x 35.0 mm (1.77 in x 1.38 in) and no smaller than 32.0 mm x 26.0 mm (1.26 in x 1.02 in). Digital imaging is strongly recommended, as affixed photographs are prone to fraudulent photo substitution.

7.1.1 *Pose*. The displayed portrait shall depict the face of the rightful holder of the MRP in a full-face frontal pose with both eyes visible, i.e. captured perpendicular to an imaginary plane formed parallel to the front surface of the face. The pose should be such that an imaginary horizontal line drawn between the centres of the eyes is parallel to the top and bottom edges of the rectangular image and, when inserted into the MRP, to the long edge of the data page. (See Appendix 11 to this section.)

7.1.2 *Depth of field*. The full-face frontal pose shall be in focus from the crown (top of the head ignoring any hair) to the chin and from the nose to the ears.

7.1.3 *Orientation*. The crown (top of the head ignoring any hair) shall be nearest the top edge of the MRP, i.e. the crown-to-chin orientation covering the longest dimension defined for Zone V.

7.1.4 *Face size*. The crown-to-chin portion of the full-face frontal pose shall be 70 to 80 per cent of the longest dimension defined for Zone V, maintaining the aspect ratio between the crown-to-chin and ear-to-ear details of the face of the holder. The 70 to 80 per cent requirement may mean cropping the picture so that not all the hair is visible.

7.1.5 *Centring*. The full-face frontal pose shall be centred within Zone V.

7.1.6 *Capturing the full-face frontal pose of the holder*

7.1.6.1 *Lighting*. Adequate and uniform illumination shall be used to capture the full-face frontal pose, i.e. appropriate illumination techniques shall be employed and illumination used to achieve natural skin tones (and avoid any colour cast) and a high level of detail, and minimize shadows, hot spots, red eye and reflections (such as sometimes caused by spectacles).

7.1.6.2 *Background*. A uniform light-coloured background shall be used to provide a contrast to the face and hair. For colour portraits, light blue, beige, light brown, pale grey or white are recommended for the background.

7.1.6.3 *Quality of captured portrait*. The quality of the original captured portrait should at least be comparable to the minimum quality acceptable for photographs (resolution comparable to 6–8 line pairs per millimetre). To achieve this comparable image quality in a digital reproduction, careful attention must be given

to the image capture, processing, digitization, compression and printing technology and the process used to produce the portrait, including the final preparation of the MRP.

7.1.7 *Colour*. The displayed portrait shall be black and white or a true-colour representation of the holder.

7.1.8 *Facial ornaments*. The issuing State shall use its discretion as to the extent to which facial ornaments (e.g. nose rings, studs) may appear in the portrait. A facial ornament should appear only if it is permanently worn.

7.1.9 *Digitally printed reproduction*

7.1.9.1 *Digital reproduction quality*. The digital reproduction shall yield an accurate recognizable representation of the rightful document holder. The quality of a digitally reproduced portrait should be visually comparable to a minimally acceptable photograph. To achieve this comparable image quality in a digital reproduction, careful attention must be given to the image capture, processing, digitization, compression and printing technology and the process used to reproduce the portrait in the final document, including the final preparation of the MRP.

7.1.9.2 *Border*. A border or frame shall not be used to outline a digitally printed reproduction.

7.1.9.3 *Coexistence with background security treatment(s)*. A digitally printed reproduction shall coexist with background security treatment(s) located within Zone V, i.e. background security printing shall not interfere with proper viewing of the displayed portrait, and vice versa.

7.1.10 *Coexistence with final preparation treatment(s) of the MRP*. A displayed portrait shall coexist with final preparation treatment(s), i.e. final preparation treatment(s) shall not interfere with proper viewing of the displayed portrait, and vice versa.

7.1.11 *Portraits of babies*. A portrait of a baby should be produced if possible conforming to the above specifications. Ideally, the baby should be photographed in an upright position but it is acceptable to capture the portrait with the baby lying on a white or plain light-coloured blanket. Alternatively the baby may be placed in a baby seat but there shall be white or plain light-coloured background behind the head. The baby's eyes shall be open and no supporting hands visible.

7.2 *Displayed signature or usual mark*. A displayed signature or usual mark shall be an original created on the MRP or a digitally printed reproduction of an original. The displayed signature is located in Zone IV (see 6.3.10 and 6.3.11 of this section). Necessary measures shall be taken by the issuing State or organization to ensure that the displayed signature or usual mark is resistant to forgery and substitution. The displayed signature or usual mark shall meet the following requirements.

7.2.1 *Orientation*. The displayed signature or usual mark shall be displayed with its A-dimension parallel to the reference edge of the MRP as defined in Figure IV-2.

7.2.2 *Size*. The displayed signature or usual mark shall be of such dimensions that it is discernible by the human eye, and the aspect ratio (A-dimension to B-dimension) of the original signature or usual mark is maintained. (See 6.3.10 and 6.3.11 for guidance on the location of the signature when placed on the data page.)

7.2.3 *Scaling for reproduction using digital printing*. In the event the displayed signature or usual mark is scaled up or scaled down, the aspect ratio (A-dimension to B-dimension) of the original signature or usual mark shall be maintained.

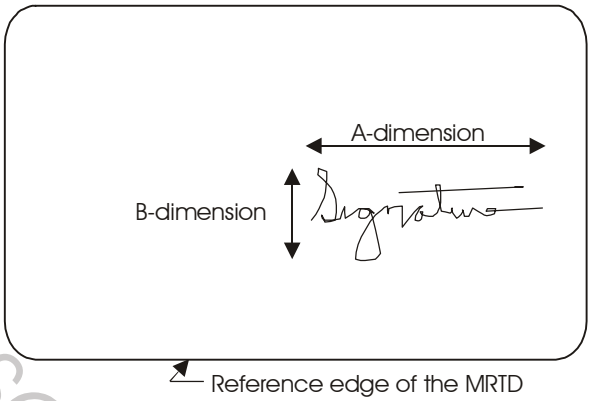


Figure IV-2. Orientation of the displayed signature or usual mark

7.2.4 *Cropping for reproduction using digital printing*. The issuing State or organization should take steps to eliminate or minimize cropping.

7.2.5 *Colour*. The displayed signature or usual mark shall be displayed in a colour that affords a definite contrast to the background.

7.2.6 *Borders*. Borders or frames shall not be permitted or used to outline the displayed signature or usual mark.

7.3 *Displayed single-digit fingerprint*. A displayed single-digit fingerprint, if required by the issuing State, shall be either an original created on the MRP substrate by the holder or a digitally printed reproduction of an original. Necessary measures shall be taken by the issuing State or organization to ensure that the single-digit fingerprint is resistant to forgery and substitution. The single-digit fingerprint shall meet the following requirements.

7.3.1 *Orientation*. The A-dimension (width) of the displayed single-digit fingerprint shall be parallel to the reference edge of the MRP as defined in Figure IV-3. The top of the finger shall be that portion of the single-digit fingerprint furthest away from the reference edge of the MRP. See Example 4 in Appendix 5 to this section.

7.3.2 *Size*. The displayed single-digit fingerprint shall be a one-to-one replication (A-dimension versus B-dimension) of the original print.

7.3.3 *Scaling for reproduction using digital printing*. Scaling of a single-digit fingerprint shall not be permitted.

7.3.4 *Cropping for reproduction using digital printing*. The issuing State or organization should take steps to eliminate or minimize cropping.

7.3.5 *Colour*. The displayed single-digit fingerprint shall be displayed in a colour that affords a definite contrast to the background.

7.3.6 *Borders*. Borders or frames shall not be permitted or used to outline the displayed single-digit fingerprint.

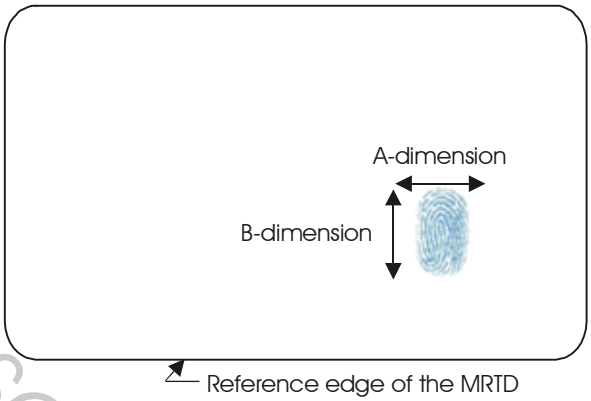


Figure IV-3. Orientation of the displayed single-digit fingerprint

Detailed layout of the MRP data page

8. *Visual Inspection Zone (VIZ) (Zones I through VI)*

8.1 The VIZ consists of zones containing mandatory and optional data fields to accommodate the diverse requirements of issuing States and organizations while maintaining sufficient uniformity to ensure global interoperability for all MRPs.

8.2 *Entered data in the VIZ*

8.2.1 *Typeface and type size*. The selection of typeface and type size used within the VIZ is at the discretion of the issuing State or organization. For good legibility a type size with 10 characters per 25.4 mm (1.0 in) is recommended. A maximum horizontal printing density of 15 characters per 25.4 mm (1.0 in) should not be exceeded. This printing density has been chosen as the smallest in which information is clear and legible by a person with normal eyesight.

8.2.2 Use of upper-case characters is recommended. However, where a name includes a prefix, an appropriate mixture of upper and lower case characters may be used in the prefix (see 11.1 in this section).

8.2.3 Diacritical marks (accents) may be used with either lower- or upper-case characters, at the option of the issuing State or organization.

8.3 *Languages and characters*. These specifications provide for entered data in the VIZ to appear in Latin-alphabet characters, i.e. A to Z, and Arabic numerals, i.e. 1234567890. When the mandatory elements of Zones I, II and III are in a national language that does not use the Latin alphabet, a transliteration shall also be provided. States that use other than Arabic numerals to represent numerical data in the VIZ shall provide a translation into Arabic numerals. It is strongly recommended that issuing States using non-Latin alphabet characters in the optional fields of the VIZ translate the entered data into English, French or Spanish in these fields as well, in the interests of facilitation. In the case of the name of the issuing State, or place of issue or place of birth, the representation in the original language shall be accompanied by a translation of the name into English, French or Spanish, when the translated name is more familiar to the international community. Optional data elements should be entered in both the national language and one of the English, French or Spanish languages. Optional data in Zone VI may be entered entirely in the national script and/or language.

8.4 *Fields*. Captions shall be used to identify all fields for mandatory data elements in the VIZ except as specified in the directory below and may be in the official language of the issuing State or working language of the issuing organization. If the official language of the issuing State or working language of the issuing organization used for captions is other than English, French or Spanish, one of these languages shall also be used, and the translation of the caption should be presented in italics.

8.4.1 *Unused fields*. When a field is not used, the caption shall not appear on the MRP data page.

8.4.2 *Print spacing*. The design of the MRP data page in Zones II and III is based on a horizontal printing density of 10 characters per 25.4 mm (1.0 in). This printing density has been chosen for good legibility for the normal amount of data required by States in these zones. If any optional field or data element is not used, the data may be spread more evenly in the visual zone of the MRP data page consistent with the requirement for sequencing zones and data elements. The horizontal printing density and the font and the vertical line spacing may be adjusted at the discretion of each State or organization, provided that in the VIZ all data shall be printed in a size such that they can be easily read and assimilated by a person with normal eyesight. The horizontal printing density should not, however, exceed 15 characters per 25.4 mm (1.0 in). Various configurations are shown in Appendix 5 to this section.

8.5 If any optional field or data element is not used, the data may be spread more evenly in the visual zone of the MRP data page consistent with the requirement for sequencing zones and data elements.

8.6 *Data element directory*. The data elements in the VIZ are specified as follows.

Visual inspection zone — Data element directory

Field/ zone no.	*Data element*	*Specifications*	*Maximum no. of character positions*	*References and notes**
01/I	Issuing State or organization (in full)	State or organization responsible for issuing the MRP. This should be printed, the type font being selected at the discretion of the issuing State or organization. A translation of the name into one or more languages, one of which should be English, French or Spanish, should be given when the translated name is more familiar to the international community.	Variable	Notes a, c, d, f, g. If omitted, shall appear on an adjacent or earlier page in the passport.
02/I	Document	The word for “passport” in the language of the issuing State or organization, plus either PASSPORT (English), PASSEPORT (French) or PASAPORTE (Spanish) if the language of the issuing State or organization is not English, French or Spanish, the type font being selected at the discretion of the issuing State or organization.	Variable	Notes a, c, g, d, m. If omitted, shall appear on an adjacent or earlier page in the passport.
03/I	Document code	Capital letter P to designate an MRP. One additional capital letter may be used, at the discretion of the issuing State or organization, to designate other types of passports such as MRP issued to diplomatic staff, an MRP issued for travel on government business, or a passport issued for a special purpose.	2	Notes a, g, l, m
04/I	Issuing State or organization (in code)	As abbreviated in the three-letter code specified in Appendix 7 to this section .	3 Fixed	Notes a, f, l
05/I	Passport number	As given by the issuing State or organization.	9	Notes a, b, c, g, l

Field/ zone no.	*Data element*	*Specifications*	*Maximum no. of character positions*	*References and notes**
06/07/II	Name	The full name of the holder, as identified by the issuing State or organization. The name shall be divided where possible by the issuing State or organization into two parts, the first representing that portion of the name that the issuing State or organization defines as the "primary identifier" for the holder (e.g. surname, maiden name plus married name, family name) and the second representing all remaining components (e.g. given names, initials) of the holder's name, which the issuing State or organization considers as collectively representing a "secondary identifier". The two parts, i.e. primary and secondary identifiers, once integrated, constitute the name of the passport holder. Where the issuing State or organization determines that the holder's name cannot be divided into the required two parts, as defined above, the full name of the holder shall be defined as the primary identifier.	Variable	Section IV, 11; Notes a, c, g, h, k, l
06/II	Primary identifier	Predominant component(s) of the name of the holder as described above. In cases where the predominant component(s) of the name of the holder (e.g. where this consists of composite names) cannot be shown in full or in the same order, owing to space limitations of Field(s) 06 and/or 07 or national practice, the most important component(s) (as determined by the State or organization) of the primary identifier shall be inserted.	Variable	Section IV, 11; Notes a, c, g, h, k, l
07/II	Secondary identifier	Secondary component(s) of the name of the holder as described above. The most important component(s) (as determined by the State or organization) of the secondary identifier of the holder shall be inserted in full, up to the maximum dimensions of the field frame. Other components, where necessary, may be represented by initials. Where the holder's name has only predominant component(s), this data field shall be left blank. A State may optionally utilize the whole zone comprising Fields 06 and 07 as a single field. In such a case, the primary identifier shall be placed first, followed by a comma and a space, followed by the secondary identifier.	Variable	Section IV, 11; Notes a, c, g, h, k, l
08/II	Nationality (in full)	Nationality of the holder as recorded by the issuing State, in the language(s) of the State of issue.	Variable	Notes a, c, f, g, h
09/II	Date of birth	Holder's date of birth as recorded by the issuing State or organization. For unknown dates, see 15.1.7 of Section IV.	Variable	Section IV, 15 Notes a, b, c, g, l
10/II	Personal number	Field optionally used for personal identification number given to holder by issuing State or organization.	Variable	Notes a, b, c, e, g, h
11/II	Sex	Sex of the holder, to be specified by use of the single initial commonly used in the language of the State where the document is issued and, if translation into English, French or Spanish is necessary, followed by a dash and the capital letter F for female, M for male, or X for unspecified.	3	Notes a, c, g, l
12/II Optional element in mandatory zone	Place of birth	Field optionally used for city and State of the holder's birthplace. A translation of the name into one or more languages, one of which should be English, French or Spanish, should be given when the translated name is more familiar to the international community. At the discretion of the issuing State, the town or suburb of birth may be used. When the MRP is issued to a person whose place of birth was outside the State issuing the document and it is desired	Variable	Notes a, c, e, f, g, h

Field/ zone no.	Data element	Specifications	Maximum no. of character positions	References and notes*
		that the State or territory of birth be shown, the three-letter code appearing in Appendix 7 shall be used.		
13/II Optional element in mandatory zone	Optional personal data elements	Optional personal data elements e.g. personal identification number or fingerprint, at the discretion of the issuing State or organization. If a fingerprint is included in this field, it should be presented as a 1:1 representation of the original. If a date is included it shall follow the form of presentation described in 15 of Section IV.	Variable	Notes a, b, c, e, g, i
14/III	Date of issue	Date of issue of the MRP.	Variable	Section IV, 15; Notes a, b, c, g, i, l
15/III	Authority or issuing office	Authority or issuing office for the MRP. This field may be used to indicate both the issuing authority or issuing office and its location, which shall be printed or stamped within this field. A translation of the name into one or more languages, one of which should be English, French or Spanish, should be given when the translated name is more familiar to the international community.	Variable	Notes a, b, c, f, g, h
16/III	Date of expiry	Date of expiry of the MRP.	Variable	Section IV, 15; Notes a, b, c, g, l
17/III Optional element in mandatory zone	Optional document data elements	Optional data elements relating to the document.	Variable	Notes a, b, c, e, g
18/IV	Holder's signature or usual mark	Signature of holder or usual mark of holder (original or reproduction), either directly on the data page in this field or on a label to be affixed within this field. Alternatively, at the discretion of the issuing State or organization, the signature or usual mark may be located in Zone VI. The size of the field to be allocated to the signature or usual mark on the adjoining page shall be at the discretion of the issuing State or organization, subject to the overall dimensional limits of the MRP.	Variable	Notes e, j
19/V	Identification feature	This field shall contain a portrait of the holder. The portrait shall not be larger than 45.0 mm x 35.0 mm (1.77 in x 1.38 in) and no smaller than 32.0 mm x 26.0 mm (1.26 in x 1.02 in). At the option of the issuing State or organization, this field may contain another biometric identifier or a security feature(s) provided this does not obscure the portrait.		Note d
20/VI	Optional data elements	Additional optional data elements at the discretion of the issuing State or organization.		Notes a, b, c, e, g, i

* Notes can be found following 9.7

Mandatory machine readable zone (MRZ) (Zone VII)

9. *Purpose of the MRZ*

9.1 MRPs produced in accordance with Doc 9303, Part 1, incorporate an MRZ to facilitate inspection of travel documents. In addition, the MRZ provides verification of the information in the VIZ and may be used to provide search characters for a database inquiry. As well, it may be used to capture data for registration of arrival and departure or simply to point to an existing record in a database.

9.1.1 The MRZ provides a set of essential data elements in a standardized format that can be used by all receiving States regardless of their national script or customs.

9.1.2 The data in the MRZ are formatted in such a way as to be readable by machines with standard capability worldwide. It must be stressed that the MRZ is reserved for data intended for international use in conformance with international Standards for MRPs. The MRZ is a different representation of the data than is found in the VIZ. The VIZ contains data not specifically intended to be read by machine, and herein data can be included in the national script of the issuing State provided that it is also transliterated into Latin-alphabet characters in conformance with 8.3. On the other hand, the constraints posed by machine reading in the MRZ do not permit such flexibility.

9.2 *Properties of the MRZ*

9.2.1 In consideration of national privacy laws, the data in the MRZ must be visually readable as well as machine readable. Data presentation must conform to a common standard such that all machine readers configured in conformance with Doc 9303 can recognize each character and communicate in a standard protocol (e.g. ASCII) that is compatible with the technology infrastructure and the processing requirements defined by the receiving State.

9.2.2 To meet these requirements, OCR-B typeface is specified in Doc 9303 as the medium for storage of data in the MRZ. The MRZ as defined herein is recognized as the machine reading technology essential for global interchange and is therefore mandatory in all types of MRPs.

9.3 *Constraints of the MRZ*

9.3.1 The characters allowed in the MRZ are a common set (as defined in Appendix 8 to this section) which can be used by all States. National characters generally appear only in the computer-processing systems of the States in which they apply and are not available globally. They shall not, therefore, appear in the MRZ.

9.3.2 Diacritical marks are not permitted in the MRZ. Even though they may be useful to distinguish names, the use of diacritical marks in the MRZ would confuse machine-reading equipment, resulting in less accurate database searches.

9.3.3 The number of character positions available for data in the MRZ is limited. The length of the data elements inserted in the MRZ must conform to the size of the respective fields as specified in the data element directory in the applicable part of Doc 9303.

9.3.4 In some instances, names in the MRZ may not appear in the same form as in the VIZ. In the VIZ, non-Latin and national characters may be used to represent more accurately the data in the script of the issuing State or organization.

9.4 *Transliteration of national characters in names in the MRZ*

9.4.1 Names in the MRZ are represented differently from those in the VIZ. National characters must be transliterated using only the allowed OCR character set defined in Appendix 8 to this section. Issuing States or organizations should adopt the recommended transliterations specified in Appendix 9 to this section, if applicable. Appendix 9 represents the most commonly used national characters of the Latin and Cyrillic families of languages.

9.5 *Data position/data elements/check digits/print specifications/print position in the MRZ*

9.5.1 *Data position.* The MRZ is located on the front of the MRP data page. Appendix 3 to this section defines the location of the MRZ and the nominal position of the data therein.

9.5.2 *Check digits*. The data structure of the machine readable lines provides for the inclusion of check digits. The position of check digits and the data used in their calculation are set out in a table in paragraph 15 of this section.

9.5.3 *Print specifications.* Machine readable data shall be printed in OCR-B type font, size 1, constant stroke width characters, at a fixed width spacing of 2.54 mm (0.1 in), i.e. horizontal printing density of 10 characters per 25.4 mm (1.0 in) as specified in ISO 1073-II. Printed characters are restricted to those defined in Appendix 8 to this section.

9.5.4 *Data elements*. The data elements corresponding to Fields 03 to 9, 11 and 16 of the VIZ shall be printed in machine readable form, in the MRZ, beginning with the left most character position in each field in the sequence indicated in the data structure specifications shown below. Appendix 6 to this section indicates the structure of the MRZ.

9.5.5 The three-letter codes listed in Appendix 7 to this section shall be used to complete the fields identifying the issuing State or organization and the nationality of the holder. The codes listed in Appendix 7 are based on the Alpha-3 codes for entities specified and regularly updated in ISO 3166-1, with extensions for certain States and organizations being identified by an asterisk. The current version of the codes may be obtained from the ISO 3166 maintenance agency (ISO 3166/MA), ISO's focal point for country codes.

9.5.6 *Print position*. The position of the left-hand edge of the first character shall be 6.0 ± 1.0 mm (0.24 ± 0.04 in) from the left-hand edge of the document. Reference centre lines for the OCR lines and the minimum starting position for the first character of each line are shown in Appendix 3 to this section. The positioning of the characters is indicated by those reference lines and by the printing zones for the two code lines in Appendix 3 to this section.

Data structure of machine readable data for MRP data page

9.6 *Data structure of the upper machine readable line*

MRZ character positions (line 1)	*Field no. in VIZ*	*Data element*	*Specifications*	*Number of characters*	*References and notes**
1 to 2	03	Document code	The first character shall be P to designate an MRP. One additional letter may be used, at the discretion of the issuing State or organization, to designate a particular MRP. If the second character position is not used for this purpose, it shall be filled by the filler character (<).	2	Notes a, d, m

MRZ character positions (line 1)	*Field no. in VIZ*	*Data element*	*Specifications*	*Number of characters*	*References and notes**
3 to 5	04	Issuing State or organization	The three-letter code specified in Appendix 7 to this section shall be used. Spaces shall be replaced by filler characters (<).	3	Notes a, d, f
6 to 44	06, 07	Name	The name consists of primary and secondary identifiers which shall be separated by two filler characters (<<). Components within the primary or secondary identifiers shall be separated by a single filler character (<). When the name of the document holder has only one part, it shall be placed first in the character positions for primary identifier, filler characters (<) being used to complete the remaining character positions of the MRZ.	39 [Primary identifier(s), secondary identifier(s) and fillers]	Section IV, 12 Notes a, c, d
		Punctuation in the name	Representation of punctuation is not permitted in the MRZ.		Section IV, 12.9
		Apostrophes in the name	Components of the primary or secondary identifiers separated by apostrophes in the VIZ shall be combined and no filler character (<) shall be inserted. *Example:* VIZ: D'ARTAGNAN MRZ: `D A R T A G N A N`		Section IV, 12.9
		Hyphens in the name	Hyphens (-) in the name shall be converted to the filler character (<) (i.e. hyphenated names shall be represented as separate components). *Example:* VIZ: Marie-Elise MRZ: `M A R I E < E L I S E`		Section IV, 12.9
		Commas	Where a comma is used in the VIZ to separate the primary and secondary identifiers, the comma shall be omitted in the MRZ and the primary and secondary identifiers shall be separated by two filler characters (<<).		Section IV, 12.9
			Where a comma is used in the VIZ to separate two name components, it shall be represented in the MRZ by a single filler character (<).		Section IV, 12.9
		Name prefixes and suffixes	Prefixes and suffixes (such as Dr, Sir, Jr., Sr., II or III) shall not be included in the MRZ except as permitted by Section IV, 12.7.		Section IV, 12.7
		Filler	When all components of the primary and secondary identifiers and required separators (filler characters) do not exceed 39 characters in total, all name components shall be included in the MRZ and all unused character positions shall be completed with filler characters (<) repeated up to position 44 as required.		
		Truncation of the name	When the primary and secondary identifiers and required separators (filler characters) exceed the number of character positions available for names (i.e. 39), they shall be truncated as follows: Characters shall be removed from one or more components of the primary identifier until three character positions are freed, and two filler characters (<<) and the first character of the first component of the secondary identifier can be inserted. The last character (position 44) shall be an alphabetic character (A through Z). This indicates that truncation may have occurred.		Section IV, 12.6 and 12.11. Notes a, d

MRZ character positions (line 1)	Field no. in VIZ	Data element	Specifications	Number of characters	References and notes*
			Further truncation of the primary identifier may be carried out to allow characters of the secondary identifier to be included, provided that the name field shall end with an alphabetic character (position 44). This indicates that truncation may have occurred. When the name consists of only a primary identifier which exceeds the number of character positions available for the name, i.e. 39, characters shall be removed from one or more components of the name until the last character in the name field is an alphabetic character.		

* Notes can be found following 9.7

9.7 *Data structure of the lower machine readable line*

MRZ character positions (line2)	Field no. in VIZ	Data element	Specifications	Number of characters	References and notes*
1 to 9	05	Passport number	As given by the issuing State or organization to uniquely identify the document. Any special characters or spaces in the passport number as shown in the VIZ shall be replaced by the filler character (<). The number shall be followed by the filler character (<) repeated up to position 9 as required.	9	Notes a, b, d
10		Check digit	See 16.	1	Notes b, d
11 to 13	08	Nationality	As a three-letter code representing the holder's nationality as listed in Appendix 7 to this Section. Spaces are replaced by filler characters.	3	Notes a, d, f
14 to 19	9	Date of birth	The structure is YYMMDD, where: YY = year (2 positions) MM = month (2 positions) DD = day (2 positions). For unknown dates, see 15.2.2	6	Section IV, 15.2; Notes b, d, i
20		Check digit	See 16.	1	Notes b, d
21	11	Sex	F = female; M = male; < = unspecified.	1	Notes a, d
22 to 27	16	Date of expiry	Structure is YYMMDD, where: YY = year (2 positions) MM = month (2 positions) DD = day (2 positions).	6	Section IV, 15.2; Notes b, d, i
28		Check digit	See 16.	1	Notes b, d

MRZ character positions (line2)	*Field no. in VIZ*	*Data element*	*Specifications*	*Number of characters*	*References and notes**
29 to 42	10	Personal number or other optional data elements	Any special characters, including spaces in the personal identification number given to the holder by the issuing State or organization, shall be replaced by the filler character (<). The number shall be followed by the filler character (<) repeated up to position 42 as required. When the personal number field is not used, the character positions 29 to 42 in the second MRZ line should be completed with filler characters (<) (see also under "check digit", character position 43 below).	14	Notes a, b, d
43		Check digit	See 16. When the personal number field is not used and filler characters (<) are used in positions 29 to 42, the check digit may be zero or the filler character (<) at the option of the issuing State or organization.	1	Notes b, d
44		Composite check digit	Composite check digit for characters of machine readable data of the lower line in positions 1 to 10, 14 to 20 and 22 to 43, including values for letters that are a part of the number fields and their check digits.	1	Section IV, 16; Notes b, d

** Notes for 8.6, 9.6 and 9.7.*

a) Alphabetic characters (A to Z) as defined in Appendix 8 to this section.

b) Numeric characters (0 to 9) as defined in Appendix 8 to this section.

c) Punctuation or other special characters allowed only in the VIZ.

d) The field caption is not printed on the document.

e) The use of a caption to identify the field is at the option of the issuing State.

f) In the case of the United Nations laissez-passer, Field 01 (Issuing State or organization) in the VIZ shall be completed with the words "UNITED NATIONS — NATIONS UNIES". In keeping with the international character of United Nations officials, neither nationality nor place of birth shall be shown. The caption for Field 08 (Nationality) shall read instead: "Official of/Fonctionnaire des" and the words "UNITED NATIONS/ NATIONS UNIES" entered instead of nationality. Field 12 (Place of birth) shall be left blank. The codes to be used in Field 04 (Code for issuing State or organization) in the VIZ as well as in character positions 3 to 5 (Issuing State or organization) in the upper line of the MRZ and in character positions 11 to 13 (Nationality) in the lower line shall be as specified in Appendix 7 to this section.

g) Space.

h) With respect to the maximum number of character positions and/or the width of the field for this data element, refer to the specifications given for Field 19, when it is necessary to move the holder's portrait 4.0 mm (0.16 in) to the right.

i) The method of writing dates is given in 15.

j) The space reserved for Field 15 may be expanded to include additionally the space for Field 18 when the option is taken of locating the holder's signature or usual mark on the adjacent page. In this instance, the Authority or issuing office may be expressed as two lines of variable numbers of character positions.

k) When the name cannot be accommodated in the space provided for it in the VIZ, a notation giving the full name may be written on another page of the MRP. Alternatively, a smaller type font may be selected for use in the VIZ only.

l) The field caption shall be printed on the document.

m) In documents other than passports, e.g. United Nations laissez-passer, seafarer's identity document or refugee travel document, the official title of the document shall be indicated instead of "Passport". However, the first character of the document code should be P.

Machine reading requirements and the effective reading zone

10. *Effective reading zone*. A fixed-dimensional reading area (effective reading zone or ERZ of 17.0 mm × 118.0 mm (0.67 in × 4.65 in)), sized to accommodate the MRP, is defined to allow use of a single machine reader for all sizes of MRTDs. The location of the ERZ is as defined in Appendix 3 to this section. The provision of the ERZ is not intended to allow additional tolerance for the printing positions defined in the appendices to the section(s) specific to the preparation of the different types of MRTDs contained in the applicable part of Doc 9303. The ERZ is intended to allow for variances due to the manual placement of machine readable visas (MRVs) and the fanning effect of the pages that takes place when reading an interior page of an MRP. It also allows for the reading of MRTDs with either two or three lines of machine readable data.

10.1 To combat the threat to travel document security posed by the use of items such as photocopiers, security features are permitted in the MRZ, and any such security feature shall not interfere with accurate reading of the OCR characters at the B900 range, as defined in ISO 1831. While OCR characters must be visible, as specified in 9.2.1, to ensure that all MRPs, including those with security features in the MRZ, can be successfully read, the OCR characters in the MRZ shall be machine readable only in the near infrared portion of the spectrum (i.e. the B900 band defined in ISO 1831).

Convention for writing the name of the holder

11. *Visual inspection zone (VIZ)*

11.1 The issuing State or organization shall establish which part of the name is the primary identifier — this may be the family name, the main name, the surname, and in some cases, the entire name. This shall be entered in the field for the primary identifier in the VIZ. It is recommended that upper-case characters be used, except in the case of a prefix, e.g. "von," "Mc" or "de la," in which a mixture of upper and lower case is appropriate.

11.2 The remaining parts of the name are the secondary identifier. These may be the forenames, familiar names, given names, or any other secondary names. These names shall be written in the field for the secondary identifier in the VIZ. It is recommended that upper-case characters be used throughout. If a single field is used for the name, then the secondary identifier should be separated from the primary identifier by a single comma (,). A comma is not needed if multiple fields are used.

11.3 It is recommended that prefixes and suffixes including titles, professional and academic qualifications, honours, awards, and hereditary status, not be included in the VIZ. However, if an issuing State or organization considers a prefix or suffix to be legally part of the name, the prefix or suffix can appear in the VIZ. Numeric characters should not be written in the name fields of the VIZ. Where the use of numeric characters is a legal naming convention in the issuing States, these should be represented in Roman numerals. Any prefixes, suffixes or Roman numerals shall be entered in the secondary identifier field.

11.4 National characters may be used in the VIZ. If the national characters are not Latin-based, then a transliteration into Latin characters shall be provided.

12. *Machine readable zone (MRZ)*

12.1 To achieve global interoperability, the primary and/or secondary identifiers shall conform to requirements of the limited OCR-B character set permitted in the MRZ and to the number of character positions available. The issuing State or organization shall be responsible for any transliteration or truncation, specifications for which are provided in 12.6.

12.2 In the MRZ, the name of the holder shall be printed using upper-case OCR-B characters, specified in Appendix 8 to this section, without diacritical marks.

12.3 The primary identifier, using the Latin character transliteration (if applicable), shall be written in the upper machine readable line, with the starting character position as set out in Appendix 3 to this section. It shall be followed by two filler characters (<<). The secondary identifier, using the Latin character transliteration (if applicable), shall be written starting in the character position immediately following the two filler characters.

12.4 If the primary or secondary identifiers have more than one name component, each component shall be separated by a single filler character (<).

12.5 Filler characters (<) should be inserted immediately following the final secondary identifier (or following the primary identifier in the case of a name having only a primary identifier) through to the last character position in the machine readable line.

12.6 The name field in the MRZ of the MRP allows for a maximum of 39 characters in the upper line. If the primary and secondary identifiers using the above procedure exceed the available character positions, then truncation shall be carried out using the procedure set out in the following paragraphs. If the total number of characters in the name, including filler characters, is 39 or fewer the name shall not be truncated.

12.6.1 In truncating the name components, the last character of the name field shall be an alpha character (A to Z inclusive) as an indication that truncation has occurred (see the data element directory of the MRZ in 9.6).

Note.— Where long names extend to the last character position in the name field, the presence of an alpha character means that the name must be treated as though truncation had occurred.

12.6.2 Examples of truncation of names are contained in 12.10.3, 12.10.4 and 12.10.5.

12.7 Prefixes and suffixes, including titles, professional and academic qualifications, honours, awards, and hereditary status, shall not be included in the MRZ except where the issuing State considers these to be legally part of the name. In such cases, prefixes or suffixes shall be represented as components of the secondary identifier(s).

12.8 Numeric characters shall not be used in the name fields of the MRZ.

12.9 Punctuation characters are not allowed in the MRZ. Where these appear as part of a name, they should be treated as follows:

Apostrophe:

This shall be omitted; name components separated by the apostrophe shall be combined, and no filler character shall be inserted in its place in the MRZ.

Example VIZ: D'ARTAGNAN
MRZ: D A R T A G N A N

Hyphen:

Where a hyphen appears between two name components, it shall be represented in the MRZ by a single filler character (<).

Example VIZ: MARIE-ELISE
MRZ: MARIE<ELISE

Comma:

Where a comma is used in the VIZ to separate the primary and secondary identifiers, the comma shall be omitted in the MRZ, and the primary and secondary identifiers shall be separated in the MRZ by two filler characters (<<).

Example VIZ: ERIKSSON, ANNA MARIA
MRZ: ERIKSSON<<ANNA<MARIA

Otherwise, where a comma is used in the VIZ to separate two name components, it shall be represented in the MRZ as a single filler character (<).

Example VIZ: ANNA, MARIA
MRZ: ANNA<MARIA

Other punctuation characters:

All other punctuation characters shall be omitted from the MRZ (i.e. no filler character shall be inserted in their place in the MRZ).

12.10 *Transliteration of national characters in names in the MRZ*

12.10.1 When the alphabet used in the issuing State exceeds or is different from the character set defined in Appendix 8 to this section, the names in the MRZ are represented differently from those in the VIZ. National characters must be transliterated using only the allowed OCR character set defined in Appendix 8 to this section. Issuing States or organizations should adopt the recommended transliterations specified in Appendix 9 to this section, if applicable. Appendix 9 represents the most commonly used national characters of the Latin and Cyrillic families of languages.

12.10.2 *Examples of name of the holder in the MRZ*

Note.— In the following examples, the document is assumed to be a passport issued by the State of Utopia. The first five characters of the upper machine readable line are P<UTO.

a) Usual representation:

Name: Anna Maria Eriksson
VIZ: ERIKSSON, ANNA MARIA
MRZ: P<UTOERIKSSON<<ANNA<MARIA<<<<<<<<<<<<<<<<<<<

b) Central primary identifier:

Name: Deborah Heng Ming Lo
VIZ: HENG, DEBORAH MING LO
MRZ: P<UTOHENG<<DEBORAH<MING<LO<<<<<<<<<<<<<<<<<<<

c) Hyphen as part of the name:
Name: Susie Margaret Smith-Jones
VIZ: SMITH-JONES, SUSIE MARGARET
MRZ: P<UTOSMITH<JONES<<SUSIE<MARGARET<<<<<<<<<<<

d) Apostrophe as part of the name:
Name: Enya Siobhan O'Connor
VIZ: O'CONNOR, ENYA SIOBHAN
MRZ: P<UTOOCONNOR<<ENYA<SIOBHAN<<<<<<<<<<<<<<<<<<

e) Multiple name components:
Name: Martin Van Der Muellen
VIZ: VAN DER MUELLEN, MARTIN
MRZ: P<UTOVAN<DER<MUELLEN<<MARTIN<<<<<<<<<<<<<<<<

f) No secondary identifier:
Name: Arkfreith
VIZ: ARKFREITH
MRZ: P<UTOARKFREITH<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

12.10.3 Truncated names — secondary identifier truncated

a) One or more name components truncated to initials:
Name: Nilavadhanananda Chayapa Dejthamrong Krasuang
VIZ: NILAVADHANANANDA, CHAYAPA DEJTHAMRONG KRASUANG
MRZ: P<UTONILAVADHANANANDA<<CHAYAPA<DEJTHAMRONG<K

b) One or more name components truncated:
Name: Nilavadhanananda Arnpol Petch Charonguang
VIZ: NILAVADHANANANDA, ARNPOL PETCH CHARONGUANG
MRZ: P<UTONILAVADHANANANDA<<ARNPOL<PETCH<CHARONGU

12.10.4 Truncated names — primary identifier truncated

a) One or more components truncated to initials:
Name: Dingo Potoroo Bennelong Wooloomooloo Warrandyte Warnambool
VIZ: BENNELONG WOOLOOMOOLOO WARRANDYTE WARNAMBOOL, DINGO POTOROO
MRZ: P<UTOBENNELONG<WOOLOOMOOLOO<WARRANDYTE<W<<DI

b) One or more components truncated:
Name: Dingo Potoroo Bennelong Wooloomooloo Warrandyte Warnambool
VIZ: BENNELONG WOOLOOMOOLOO WARRANDYTE WARNAMBOOL, DINGO POTOROO
MRZ: P<UTOBENNELONG<WOOLOOM<WARRAND<WARNAM<<DINGO

c) One or more components truncated to a fixed number of characters:
Name: Dingo Potoroo Bennelong Wooloomooloo Warrandyte Warnambool
VIZ: BENNELONG WOOLOOMOOLOO WARRANDYTE WARNAMBOOL, DINGO POTOROO
MRZ: P<UTOBENNEL<WOOLOO<WARRAN<WARNAM<<DINGO<POTO

12.10.5 Names that just fit, indicating possible truncation by letter in the last position of the name field, but which are not truncated

Name: Jonathon Warren Trevor Papandropoulous
VIZ: PAPANDROPOULOUS, JONATHON WARREN TREVOR
MRZ: P<UTOPAPANDROPOULOUS<<JONATHON<WARREN<TREVOR

Note.— Even though there is an alpha character in the 44th position of this passport upper machine readable line, this name has not been truncated but it must be assumed that it has been truncated.

Representation of issuing State or organization and nationality of holder

13. *Visual inspection zone (VIZ)*

13.1 Where the issuing State and/or the place of issue or place of birth are in a national language that does not use Latin characters, the name of the State or other location shall appear in the national language and also shall be either transliterated into Latin characters or translated into one or more languages (at least one of which must be English, French or Spanish) by which the name may be more commonly known to the international community. The name in the different languages shall be separated by an oblique character (/) followed by at least one blank space.

13.2 Where the name of the issuing State or place of issue or place of birth is in a language that uses the Latin alphabet, but the name is more familiar to the international community in its translation into another language or languages (particularly English, French or Spanish), the name in the national language should be accompanied by one or more translations of the name. The name in the different languages shall be separated by an oblique character (/) followed by at least one blank space.

13.3 The three-letter codes listed in Appendix 7 to this section may also be used, at the discretion of the issuing State or organization, to complete the field for the place of birth in the VIZ.

14. *Machine readable zone (MRZ)*

14.1 The three-letter codes listed in Appendix 7 to this section shall be used to complete the field for the issuing State or organization and the nationality in the MRZ.

14.2 Use of three-letter codes is mandatory in the MRZ and Field 04 in the VIZ and optional for the holder's nationality in the VIZ. Specific locations are defined in the following table.

	Zone	*Field no.*	*Character position no.*	*Number of character positions*
Issuing State or organization	VIZ	04		3
	MRZ (upper line)		3-5	3
Holder's nationality	VIZ	08		3
	MRZ (lower line)		11-13	3

Representation of dates

15. Dates shall be presented as set forth hereunder.

15.1 *Dates in the VIZ*. Such dates on the MRP data page shall be entered in accordance with the Gregorian calendar as follows.

15.1.1 Days shall be shown by a two-digit number, i.e. the dates from one to nine shall be preceded by a zero. This number shall be followed by a blank space.

15.1.2 The month may be printed in the language of the issuing State or organization or abbreviated, using up to four character positions.

15.1.3 Where the language of the issuing State or organization is not English, French or Spanish, the month as defined in 15.1.2 shall be followed by an oblique character (/) and the month or the abbreviation of the month up to four character positions, in one of the three languages, as shown in the table below.

Abbreviations of months in English, French and Spanish

Month	*English*	*French*	*Spanish*
January	Jan	Jan	Ene
February	Feb	Fév	Feb
March	Mar	Mars	Mar
April	Apr	Avr	Abr
May	May	Mai	Mayo
June	Jun	Juin	Jun
July	Jul	Juil	Jul
August	Aug	Août	Ago
September	Sep	Sept	Sept
October	Oct	Oct	Oct
November	Nov	Nov	Nov
December	Dec	Déc	Dic

Note.— Where the language of the issuing State or organization is English, French or Spanish, the issuing State or organization should use one of the other two languages (shown in the table above) following the oblique character (/).

15.1.4 The year will normally be shown by the last two digits and be preceded by a blank space.

15.1.5 As an example, a date of 12 July 1942 on an MRP data page issued in Italian with French translation of the month would normally appear as follows:

12bLUGb/JUILb42

where b = a single blank space, i.e. 12 LUG /JUIL 42

15.1.6 The month may, however, be printed in numerical form in the VIZ, at the discretion of the issuing State or organization, particularly where this might facilitate the use of the MRP by countries using other than the Gregorian calendar. Following a practice established to facilitate the visual inspection of travel documents,

a date would be written DDbMMbYY, where b = a single blank space. For example, a date of 12 July 1942 would appear in the visual zone as follows: 12 07 42. However, when the month is represented numerically, the issuing State or organization may use the four-digit representation of the year in the VIZ, e.g. 12 07 1942.

15.1.7 *Unknown date of birth*. Where a date of birth is completely unknown, that data element shall appear as XXbXXXbXX where b = a single blank space. If only part of the date of birth is unknown, that part shall be represented by XX if it is the day or year, or by XXX if it is the month.

15.2 *Dates in the MRZ*. Such dates on the MRZ shall, in accordance with the principle set forth in ISO 8601, be shown as a six-digit number consisting of the last two digits for the year (YY) immediately followed by two digits for the number of the month (MM) and by two digits for the day (DD). The structure is as follows: YYMMDD.

15.2.1 Following this format, the example given in 15.1.6 will be shown as: 420712.

15.2.2 If all or part of the date of birth is unknown, the relevant character positions shall be completed with filler characters (<).

Check digits in the machine readable zone

16. The data structure of the lower machine readable line in 9.7 provides for the inclusion of five check digits as follows:

Check digit	*Character positions (lower MRZ line) used to calculate check digit*	*Check digit position (lower MRZ line)*
Passport number	1-9	10
Date of birth	14-19	20
Date of expiry	22-27	28
Personal number	29-42	43
Composite check digit	1-10, 14-20, 22-43 *Note.— Positions 11-13 and 21 are excluded when calculating the composite check digit.*	44

16.1 *Calculation of check digits in the MRZ*. A special check digit calculation has been adopted for use in MRPs. The check digits shall be calculated on modulus 10 with a continuously repetitive weighting of 731 731 ..., as follows.

16.1.1 *Step 1*. Going from left to right, multiply each digit of the pertinent numerical data element by the weighting figure appearing in the corresponding sequential position.

16.1.2 *Step 2*. Add the products of each multiplication.

16.1.3 *Step 3*. Divide the sum by 10 (the modulus).

16.1.4 *Step 4*. The remainder shall be the check digit.

16.1.5 For data elements in which the number does not occupy all available character positions, the symbol < shall be used to complete vacant positions and shall be given the value of zero for the purpose of calculating the check digit.

16.1.6 When the check digit calculation is applied to data elements containing alphabetic characters, the characters A to Z shall have the values 10 to 35 consecutively, as follows:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

16.1.7 *Example 1 — Application of check digit to date field*. Using 27 July 1952 as an example, with the date in numeric form as specified in ISO 8601, the calculation will be:

	Date:	5	2	0	7	2	7
	Weighting:	7	3	1	7	3	1
Step 1 (multiplication)	Products:	35	6	0	49	6	7

Step 2 (sum of products) 35 + 6 + 0 + 49 + 6 + 7 = 103

Step 3 (division by modulus) $\frac{103}{10}$ = 10, remainder 3

Step 4. Check digit is the remainder, 3. The date and its check digit shall consequently be written as `5207273`.

16.1.8 *Example 2 — Application of check digit to document number field*. Using the number AB2134 as an example for coding a 9-character, fixed-length field (e.g. passport number), the calculation will be:

Sample data element:	A	B	2	1	3	4	<	<	<
Assigned numeric values:	10	11	2	1	3	4	0	0	0
Weighting:	7	3	1	7	3	1	7	3	1
Step 1 (multiplication) Products:	70	33	2	7	9	4	0	0	0

Step 2 (sum of products) 70 + 33 + 2 + 7 + 9 + 4 + 0 + 0 + 0 = 125

Step 3 (division by modulus) $\frac{125}{10}$ = 12, remainder 5

Step 4. Check digit is the remainder, 5. The number and its check digit shall consequently be written as `AB2134<<<5`.

16.1.9 *Example 3— Application of composite check digit to MRZ.* Using the lower line of MRZ data from an MRP data page that follows, as an example for coding the composite check digit, the calculation will be:

Character positions 1-43: Example with no alpha-numeric characters in “optional data” field.

```
HA672242<6UT05802254M9601086<<<<<<<<<<<<<<0
```

Sample data element:	H	A	6	7	2	2	4	2	<	6
Assigned numeric values:	17	10	6	7	2	2	4	2	0	6
Weighting:	7	3	1	7	3	1	7	3	1	7
Step 1 (multiplication) Products:	119	30	6	49	6	2	28	6	0	42

Sample data element:	5	8	0	2	2	5	4	9	6	0
Assigned numeric values:	5	8	0	2	2	5	4	9	6	0
Weighting:	3	1	7	3	1	7	3	1	7	3
Step 1 (multiplication) Products:	15	8	0	6	2	35	12	9	42	0

Sample data element:	1	0	8	6	<	<	<	<	<	<
Assigned numeric values:	1	0	8	6	0	0	0	0	0	0
Weighting:	1	7	3	1	7	3	1	7	3	1
Step 1 (multiplication) Products:	1	0	24	6	0	0	0	0	0	0

Sample data element:	<	<	<	<	<	<	<	<	0	
Assigned numeric values:	0	0	0	0	0	0	0	0	0	
Weighting:	7	3	1	7	3	1	7	3	1	
Step 1 (multiplication) Products:	0	0	0	0	0	0	0	0	0	
Step 2 (sum of products)	119	+ 30	+ 6	+ 49	+ 6	+ 2	+ 28	+ 6	+ 0	+ 42
Step 2 (sum of products)	15	+ 8	+ 0	+ 6	+ 2	+ 35	+ 12	+ 9	+ 42	+ 0
Step 2 (sum of products)	1	+ 0	+ 24	+ 6	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
Step 2 (sum of products)	0	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0	
Step 2 (sum of products)	448									
Step 3 (division by modulus)	$\frac{448}{10}$ = 44, remainder 8									

Step 4. Check digit is the remainder, 8. The lower line of MRZ data together with its composite check digit may consequently be written as follows:

```
HA672242<6UT05802254M9601086<<<<<<<<<<<<<<08
```

Character sets and fonts

17. The character sets and fonts to be used on the MRP data page shall be as indicated hereunder.

17.1 *Captions*

17.1.1 Captions shall be printed in a clear, linear type font in a size of 1.0 mm to 1.8 mm (0.04 in to 0.07 in).

17.1.2 Captions shall be in the language of the issuing State or organization. When such language uses the Latin alphabet, regular font style should be used to print the captions.

17.1.3 Where the language of the issuing State or organization is not English, French or Spanish, the printed caption as defined in 17.1.2 shall be followed by an oblique character (/) and the equivalent of the caption in English, French or Spanish. An italic font style should be used for the second language.

Note.— Where the language of the issuing State or organization is English, French or Spanish, the issuing State or organization should use at least one of the other two languages to print the caption following the oblique character (/).

17.1.4 Entered data, visual inspection zone (VIZ). See 8.2.

17.1.5 Entered data, machine readable zone (MRZ). See 9.5.3.

Characteristics of the machine readable zone

18. Except as otherwise specified herein, the MRP data page shall conform with ISO 1831 concerning the following matters:

— Optical properties of the substrate to be used;
— Optical and dimensional properties of the image patterns forming OCR characters;
— Basic requirements related to the position of OCR characters on the substrate.

18.1 Machine readable data shall be arranged from left to right in fixed-length fields in two lines (upper and lower) in the order specified in the data structure tables shown in 9.6 and 9.7, respectively, and located on the document as shown in Appendix 3 to this section. Data shall be entered in each field, beginning with the left-hand character position.

18.2 Where the entered data do not occupy all the character positions specified for the relevant field, the symbol < shall be used to fill the unoccupied positions.

Quality specifications of the machine readable zone

19. In general, the print quality shall conform to ISO 1831 Range X, except as otherwise provided herein. All quality specifications set forth hereunder shall apply to the MRP data page after final preparation, except where otherwise noted, and conform to the requirements in paragraph 2 to this section.

19.1 *Substrate quality*. ISO 1831, 4.3 through 4.3.2, shall be used for reference only.

19.2 *Substrate opacity*. The substrate used, measured before and after final preparation, shall be within the definition of at least medium opacity (ISO 1831, 4.4.1 and 4.4.3).

19.3 *Substrate gloss*. The level of gloss is not specified.

19.4 *Fluorescence*. The reflectance of the substrate in the visible spectrum shall exhibit no visibly detectable fluorescence when irradiated by ultraviolet light, except where this is a predictable fluorescence for security reasons.

19.5 *Alternative substrates*. The guidelines in 19.1 to 19.4 should be followed irrespective of the substrate material.

19.6 *Spectral band*. The OCR print shall be legible visually and shall be black (B425 through B680 as defined in ISO 1831). The OCR print shall also absorb in the B900 band as defined in ISO 1831 (i.e. near infrared). Any protective layers must not adversely affect this property.

19.7 *Print contrast signal (PCS)*. After final preparation, e.g. after the application of any protective layer, the minimum print contrast signal (PCS/min), when measured as specified in ISO 1831, shall be as follows: PCS/ min ≥ 0.6 at the B900 spectral band.

19.8 *Character stroke width*. The stroke width after final preparation shall be as specified for Range X in ISO 1831 (5.3.1).

19.9 *Contrast variation ratio (CVR)*. After final preparation, i.e. after the application of any protective layer, the CVR should be as is shown for Range X in ISO 1831, i.e. CVR < 1.50.

19.10 *Spots and extraneous marks*. ISO Standard 1831 (5.4.4.6 and 5.4.5.12) shall apply at the reading surface (see also B.6 of Appendix B and C.5.10 of Appendix C to ISO 1831).

19.11 *Voids*. The value of “d” as defined in ISO 1831 (5.4.5.9) shall be equal to 0.4 at the reading surface.

19.12 *Line separation*. See 9.5.6 and Appendix 3 to this section.

19.13 *Line spacing*. See 9.5.6 and Appendix 3 to this section.

19.14 *Skew.* The provisions relating to skew shall be as follows.

19.14.1 *Skew of MRZ characters*. The skew of individual MRZ characters on the MRP data page shall not exceed 3 degrees measured from the reference edge.

19.14.2 *Skew of the MRZ lines*. The effect of the actual skew of the MRZ lines and the actual skew of the MRZ characters shall not exceed the limit specified in 19.14.1 nor shall the skew of MRZ or character misalignment result in the MRZ lines or any part thereof appearing outside the printing zone as defined in Appendix 3 to this section.

20. *Machine assisted document verification*

20.1 Should an issuing State wish to incorporate into its MRP a means by which the document can be authenticated with the aid of a machine, these specifications provide for the use of two generic means using either a substance or a structure as described in Section III, 3. Appendix 10 to this Section shows the recommended areas and nominal centres for these two types of features on all sizes of MRTD.

20.2 It is emphasized that Doc 9303 does not at this time specify any means of globally interoperable machine assisted verification. Issuing States may incorporate such means for their own or bilaterally agreed use only.

Passport card

21. Should a State or organization wish to issue a machine readable passport card specifically for purposes such as facilitating travel to States accepting a passport card without visa for entry (*recognizing that issuing States or organizations must reach specific agreements with such receiving States on acceptance of the passport card*), facilitating identity confirmation of the rightful holder to enhance security or in case of loss/theft of the MRP, and/or *approved* use in automated passenger clearance schemes, the issuing State or organization shall issue an ID-1 size card in accordance with the specifications for a TD-1 in Part 3 of Doc 9303. This card, consistent with its status as a passport, shall be identified as a passport card and conform as follows.

21.1 *General layout*. The passport card shall comply with the specifications governing the general layout of the TD-1 (see Doc 9303, Part 3).

21.2 *Detailed layout of VIZ*. The passport card shall comply with the specifications governing layout of the VIZ of the TD-1 (see Doc 9303, Part 3) with the following exception:

21.2.1 *Document*. The designation of the document (Field 01/Zone I) shall be “PASSPORT CARD”.

21.3 *Detailed layout of the MRZ*. The passport card shall comply with the specifications governing layout of the MRZ for the TD-1 (see Doc 9303, Part 3) with the following exception:

21.3.1 *Document code*. The document code (Line 1) shall be “IP”.

21.4 *Document number*: Where a State issues a passport card to a holder who also holds an MRP book, the numbering schemes used for the book and the card should be different so that it is possible to differentiate between the two in the event that one is stolen or lost.

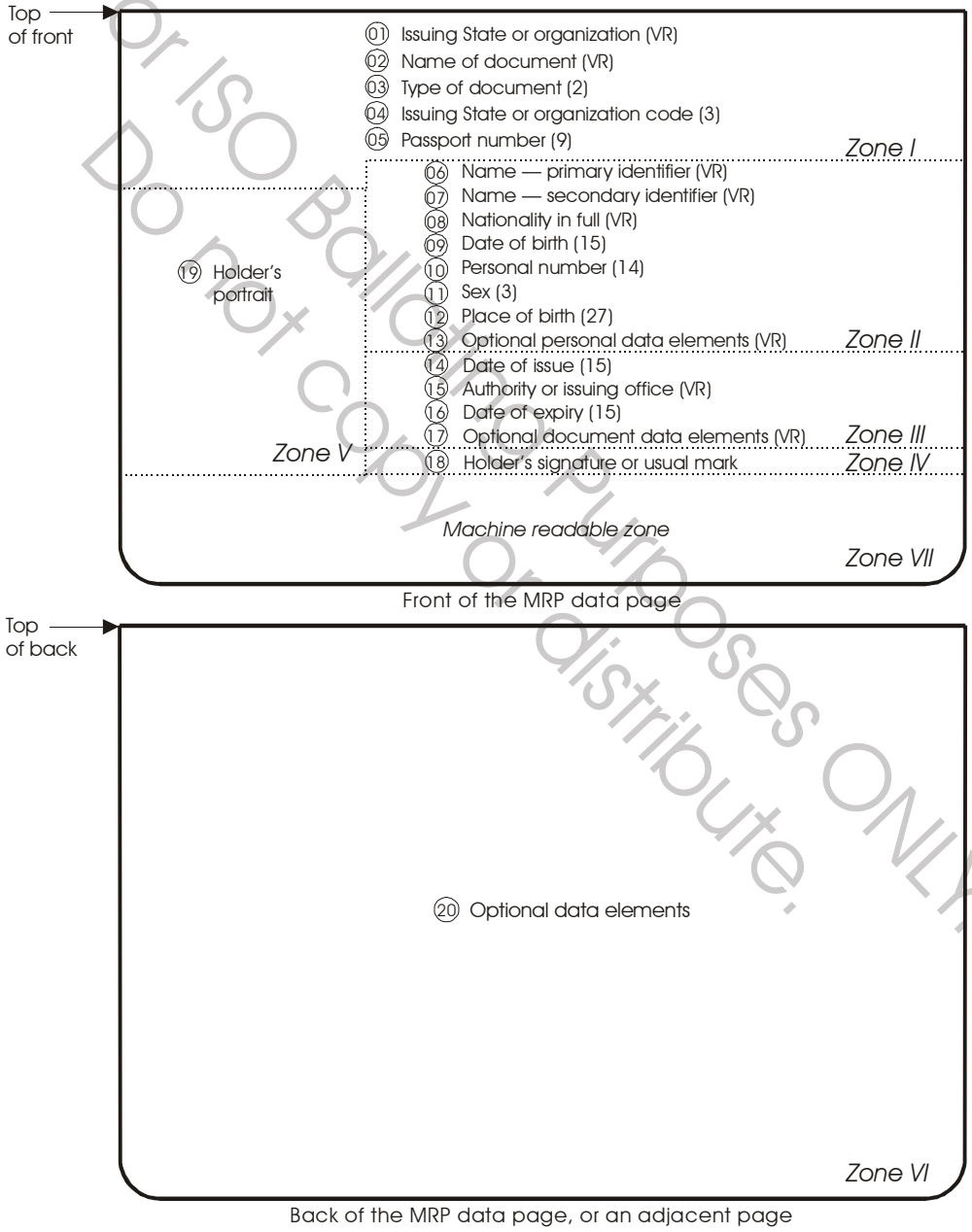
Passports with additional data storage and biometric capability

22. Doc 9303, Part 1, Volume 2 contains specifications for increasing the data storage capacity and global interoperability of an MRP by the incorporation of a contactless integrated circuit into the structure of the MRP. The resulting extra data capacity may be used for various purposes including the mandatory storage of a globally interoperable image of the face of the holder for use as the input into facial recognition systems. Optionally, fingerprint and/or iris images may also be stored as secondary globally interoperable biometrics.

APPENDIX 1 to Section IV

SEQUENCE OF DATA ELEMENTS FOR THE MACHINE READABLE PASSPORT (MRP) DATA PAGE

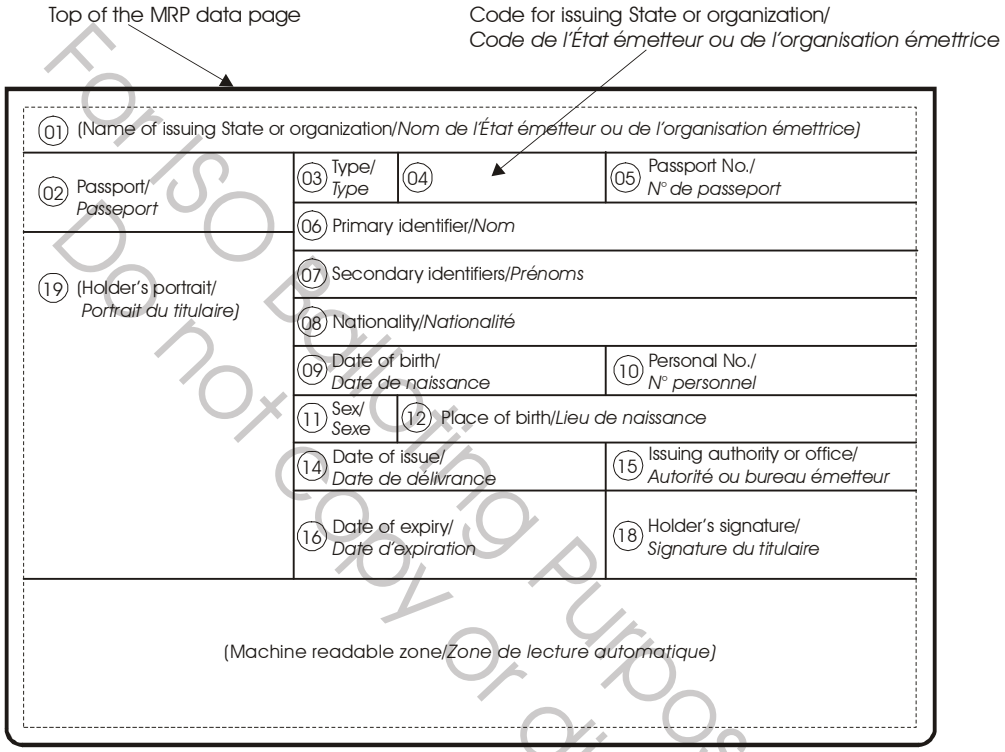
Diagram 1. Sequence of data elements



Notes:
1. (VR) =variable number of characters.
2. ( ) =maximum or fixed number of characters (see 8.6 -- Date Element directory)
3. ◯ =field number.

APPENDIX 1 to Section IV (cont.)

Diagram 2. Location of data elements — Recommended practice



Not to scale

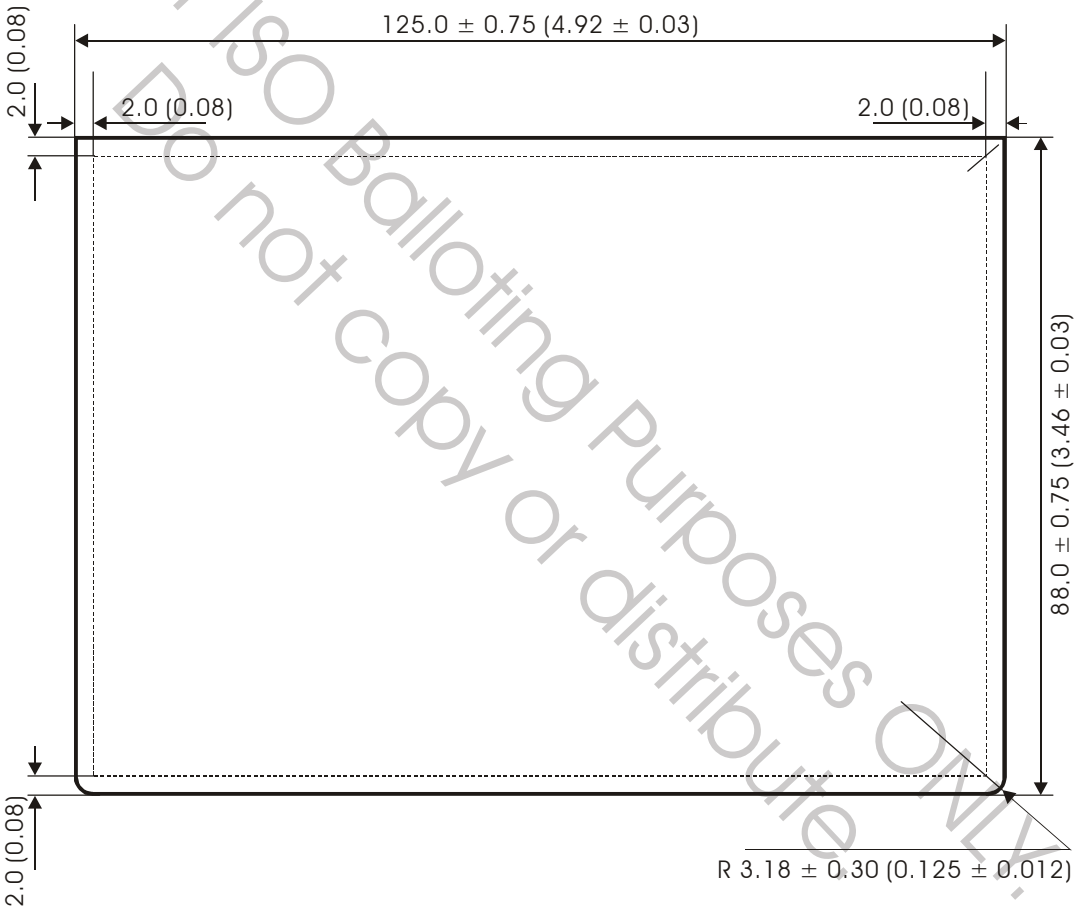
NOTES:

1. Optional data Fields 13 and 17 are excluded in the recommended practice.
2. Captions corresponding to the field names printed in the above illustration, except those within parentheses, shall be printed on the MRP.

APPENDIX 2 to Section IV

SCHEMATIC DIAGRAM OF THE MACHINE READABLE PASSPORT (MRP) DATA PAGE

Diagram 1. Dimensional specifications



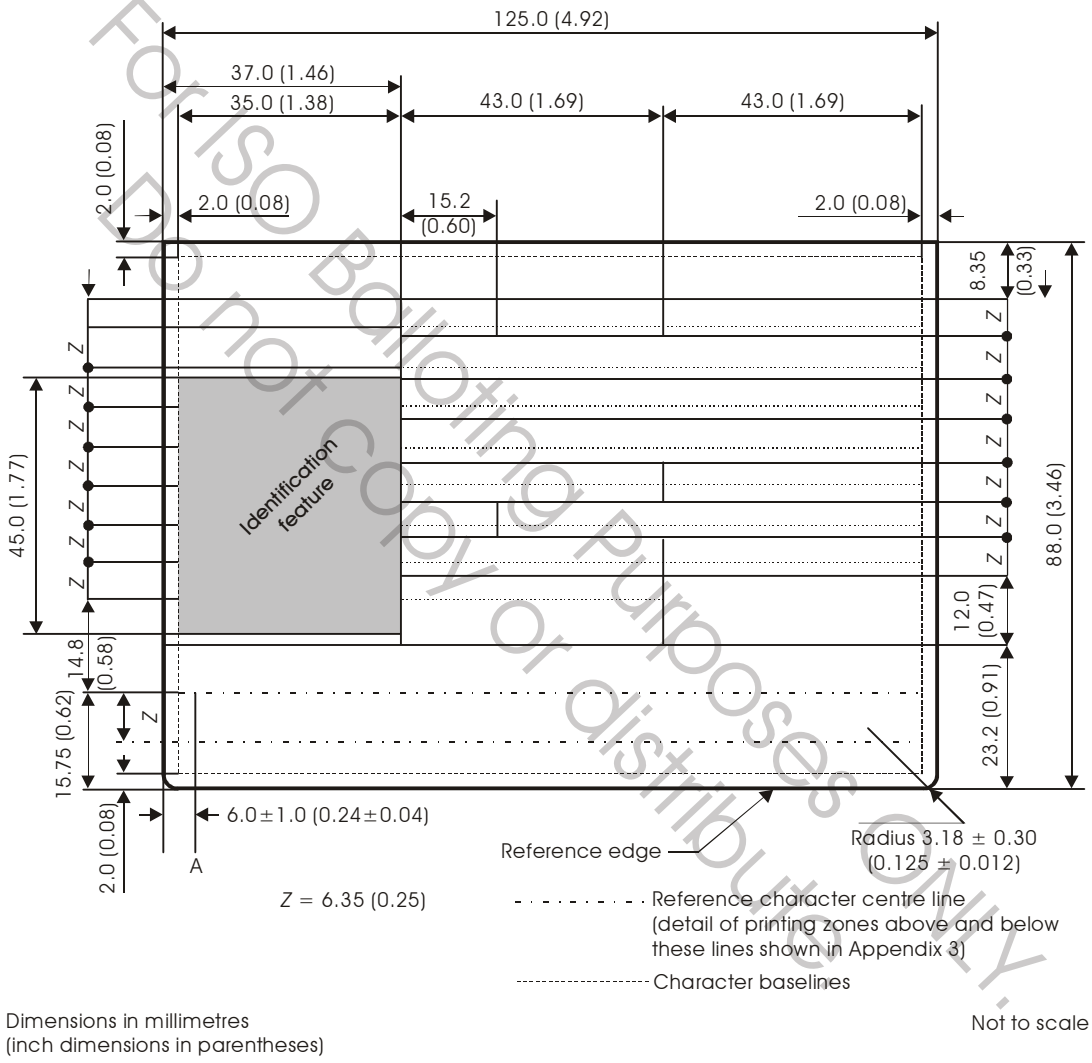
R = Radius

Dimensions in millimetres
(inch dimensions in parentheses)

Not to scale

APPENDIX 2 to Section IV (cont.)

Diagram 2. Printing specifications — Nominal layout

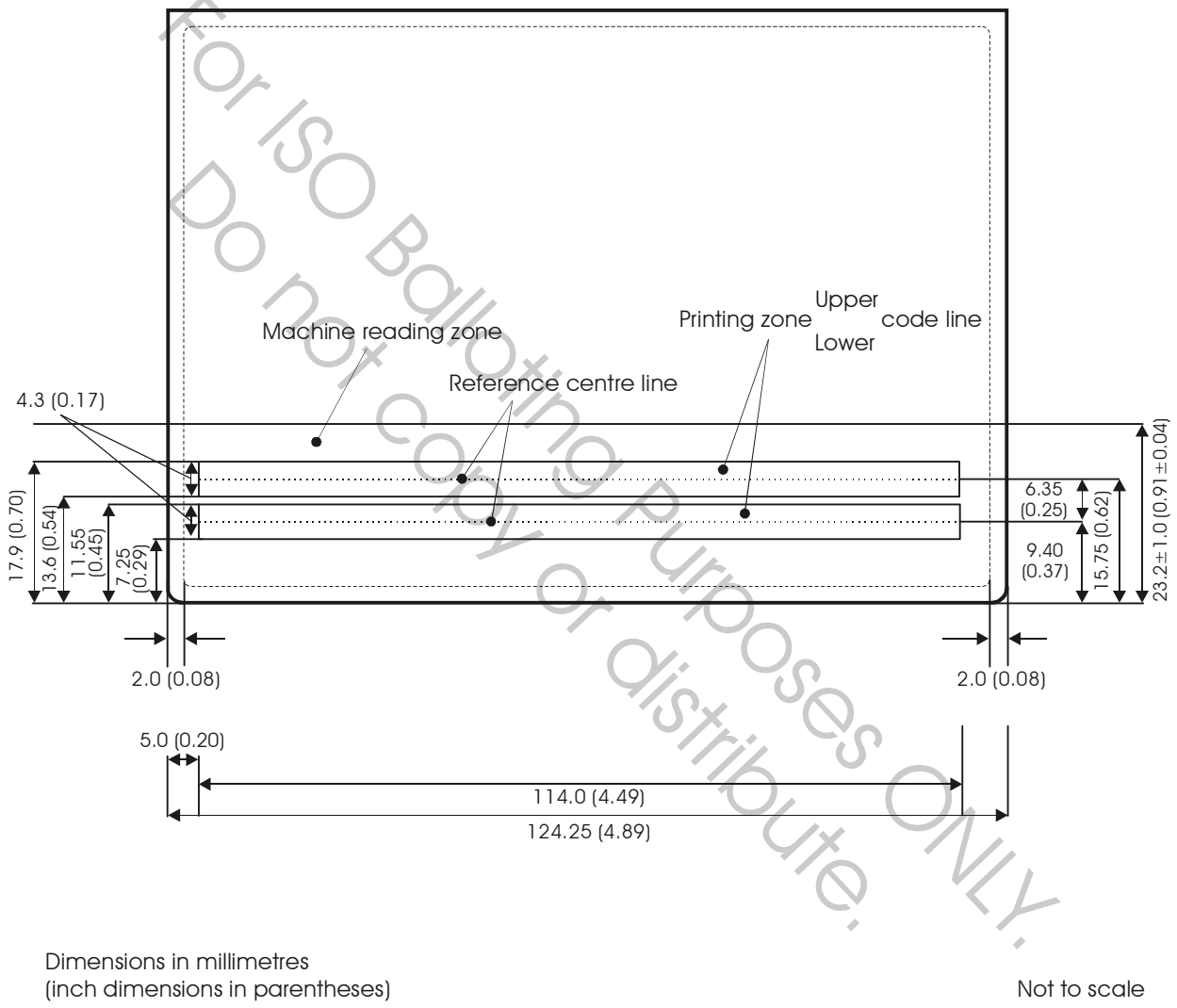


NOTES:

1. See 4.2 for the overall dimensional tolerances.
2. To allow for variations during manufacture of the MRP, a tolerance of ± 1.0 mm (± 0.04 in) is allowed for the 23.2 mm (0.91 in) dimension of the MRZ and within that overall tolerance the boundary between the VIZ and the MRZ shall not be skewed more than 0.5 mm (0.02 in) over the 125.0 mm (4.92 in) dimension.
3. 'A' — There shall be no text to the left of this line in the MRZ.
4. Except for background security print as referred to in 10.1, there shall be no print in the 2.0 mm (0.08 in) margins.
5. The borderlines of the fields should be omitted on the actual MRP data page.
6. Refer to 5.5 concerning optional extension of Field 19 (Holder's portrait) 4.0 mm (0.16 in) to the right, with the consequent reduction in the fields to its right and Field 18 (Holder's signature or usual mark) which may be placed on the page adjacent to the data page with consequent increase in the size of Field 15 (Issuing authority).

APPENDIX 3 to Section IV

SCHEMATIC DIAGRAM OF THE MACHINE READABLE ZONE (MRZ)



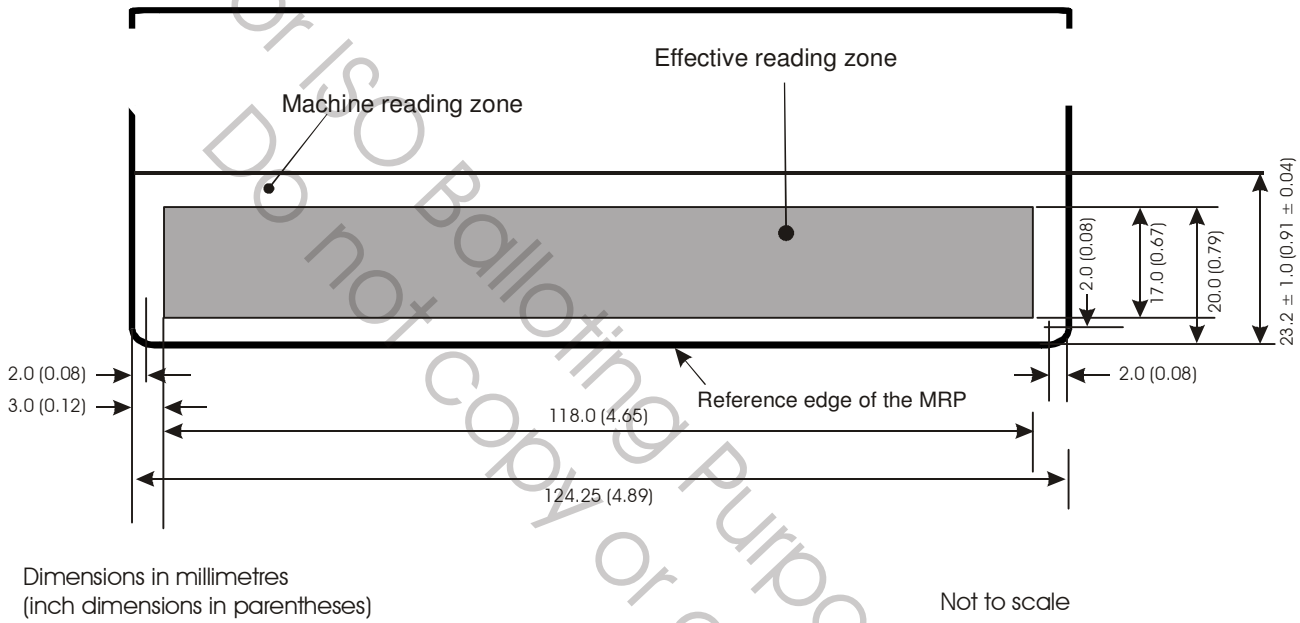
NOTE:

In this illustration the smallest dimensions allowed for the 125.0 mm (4.92 in) dimension of the MRP data page and for the left-hand margin in the MRZ have been selected.

APPENDIX 3 to Section IV (cont.)

SCHEMATIC DIAGRAM OF THE EFFECTIVE READING ZONE

Shown in relation to an MRP page

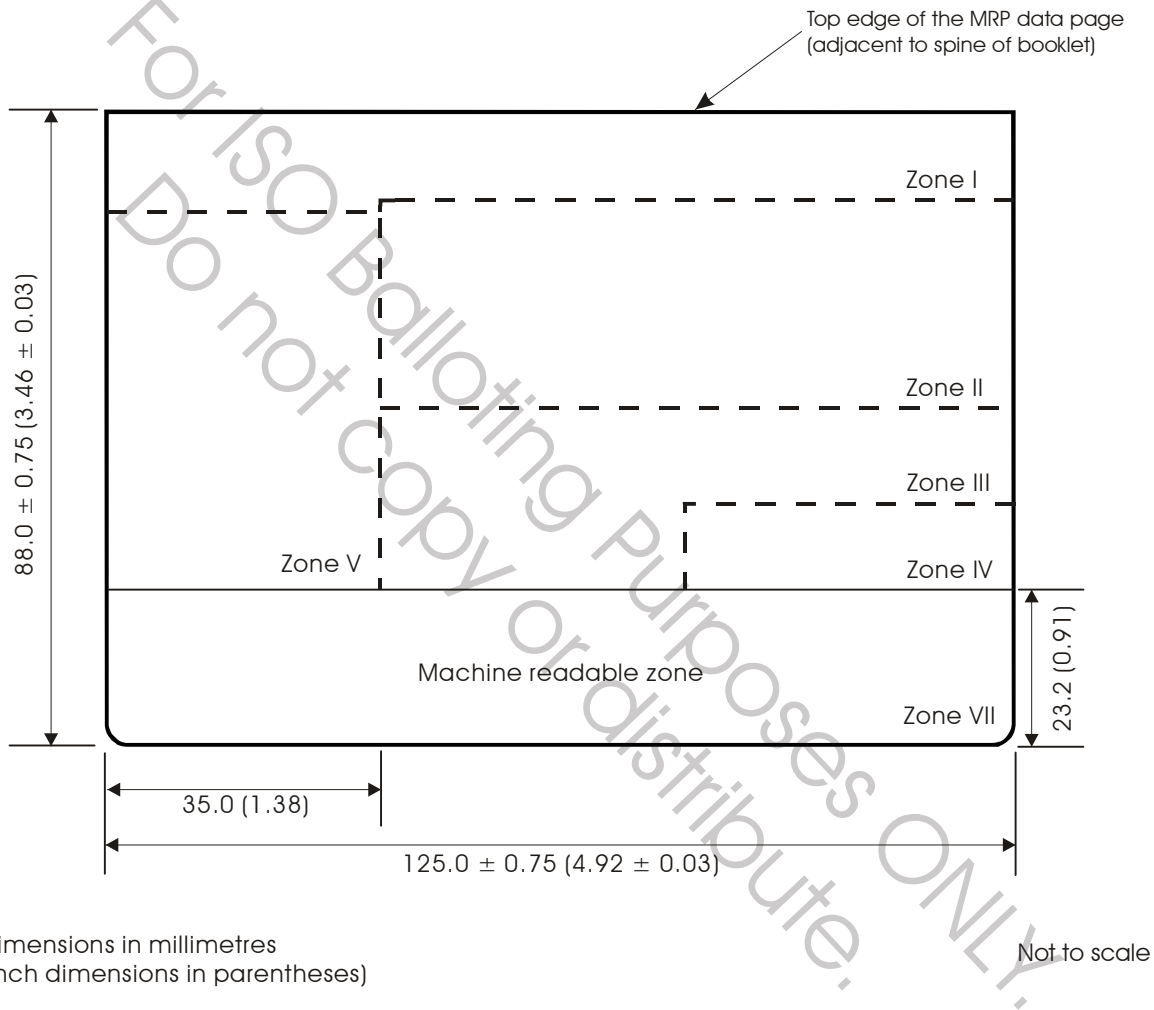


Dimensions in millimetres
(inch dimensions in parentheses)

Not to scale

APPENDIX 4 to Section IV

NOMINAL POSITIONING OF ZONES I TO V ON THE MRP DATA PAGE



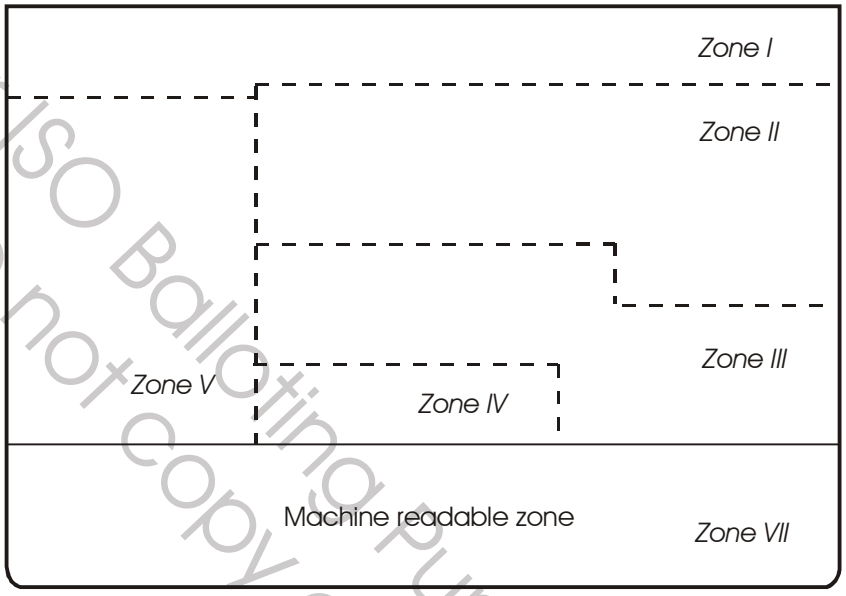
NOTES:

1. These diagrams should be considered in conjunction with Section IV, 5.
2. Dotted lines indicate zone boundaries whose positions are not fixed, enabling issuing States and organizations flexibility in the presentation of data. See Section IV, 5.3.
3. Zone VI, where used, appears on the back of the data page or on an adjacent page.

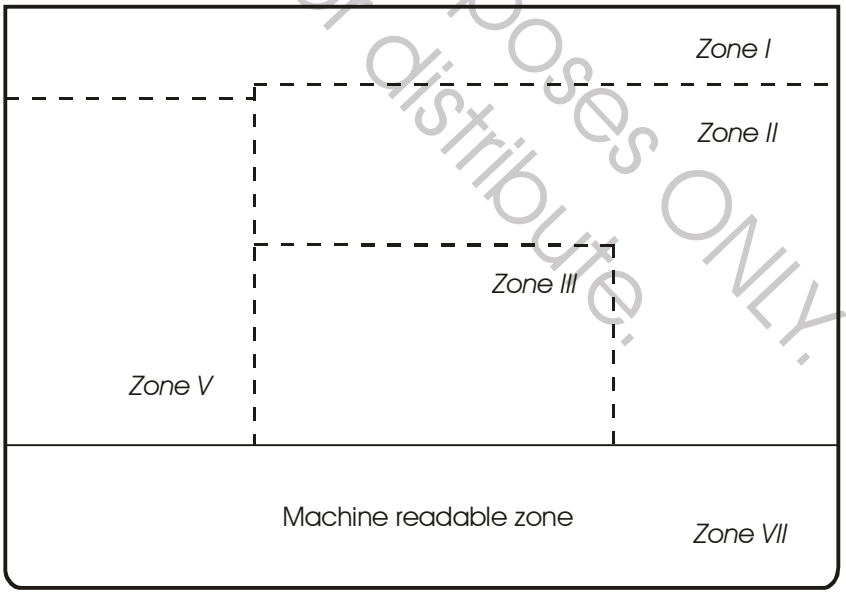
APPENDIX 4 to Section IV (cont.)

FLEXIBLE POSITIONING OF ZONES I TO IV ON THE MRP DATA PAGE

Example 1



Example 2



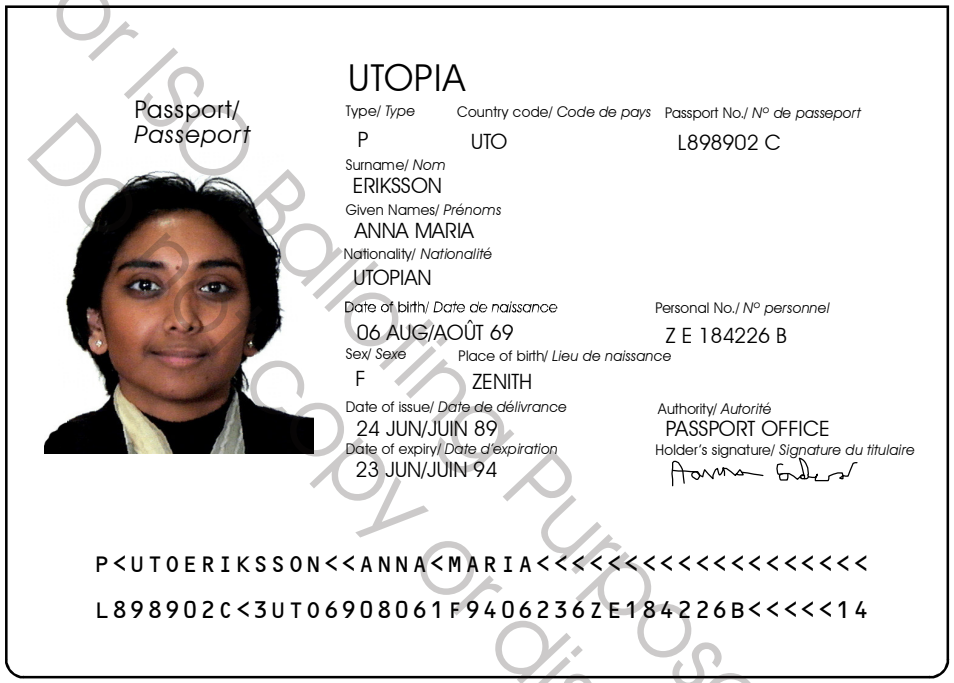
NOTES:

1. Example 1 illustrates a staircase lower boundary between Zones II and III.
2. Example 2 shows a situation where Zone IV (Signature) is moved to an adjacent page, and Zone III positioned so it does not extend to the right-hand edge of the data page.

APPENDIX 5 to Section IV

EXAMPLES OF A PERSONALIZED MRP DATA PAGE

Example 1



Note.— The MRP data page in Example 1 conforms with the recommended practice layout.

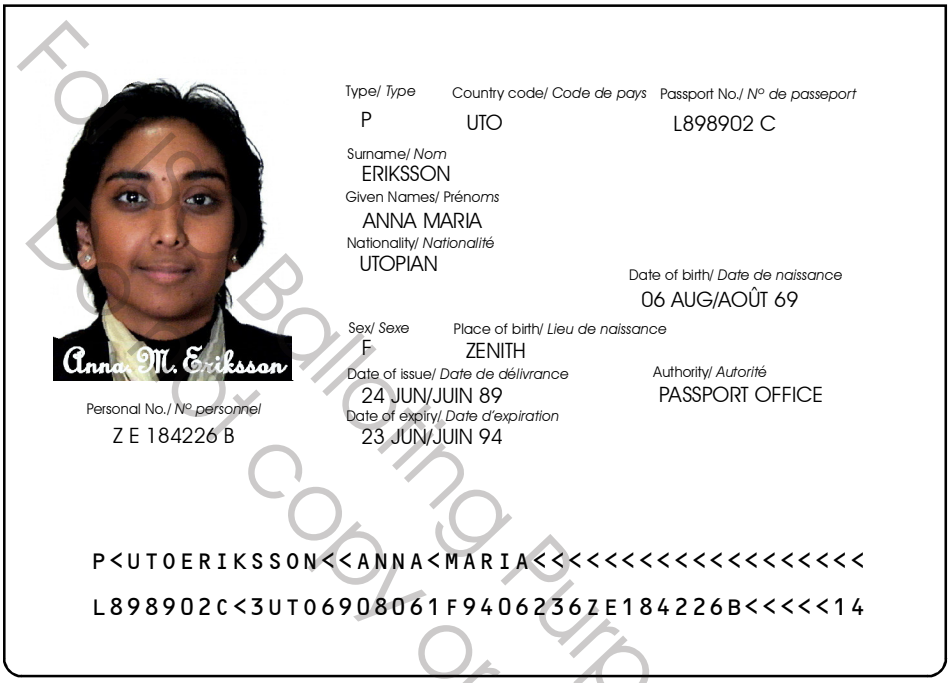
APPENDIX 5 to Section IV (cont.)

Example 2

Note.— The MRP data page in Example 2 illustrates an indented Zone V (Holder's portrait) as defined in 5.5, the absence of Zone IV (Holder's signature or usual mark) on the data page, and the introduction of optional data (i.e. Field 13, Optional personal details) in Zone II (i.e. Occupation).

APPENDIX 5 to Section IV (cont.)

Example 3



Note.— Example 3 illustrates an MRP data page appearing on an interior page of the book. The name of the issuing State and the name of the document have appeared on an earlier page and are therefore omitted from the data page. The example also illustrates Zone V (the portrait) moved vertically upwards with Zone IV (the signature) overlaying the portrait, and the personal number from Zone II placed beneath the portrait.

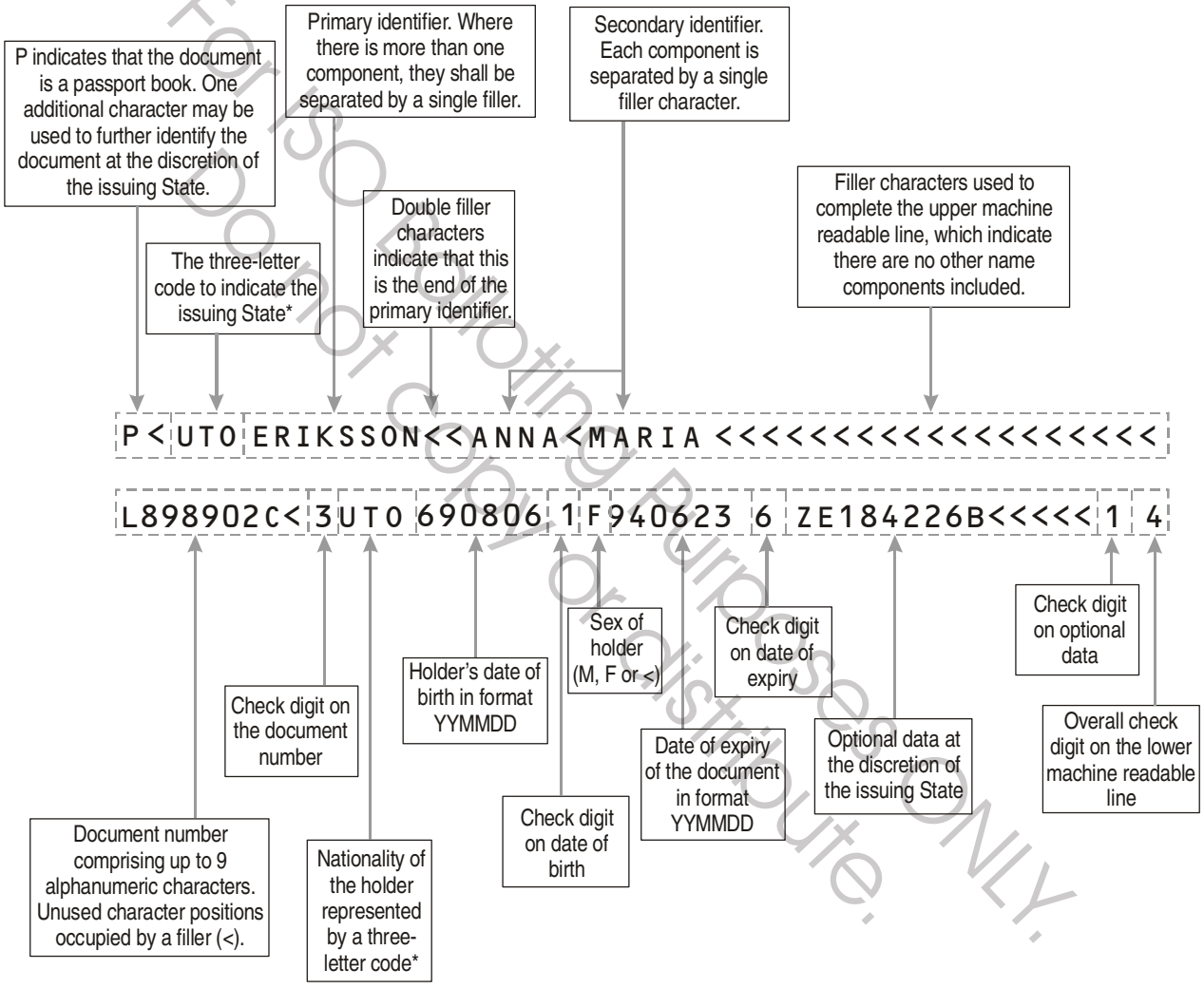
APPENDIX 5 to Section IV (cont.)

Example 4

Note.— An MRP data page with the layout adjusted to accommodate a displayed fingerprint in Zone II. See 7.3 of Section IV.

APPENDIX 6 to Section IV

CONSTRUCTION OF THE MACHINE READABLE ZONE OF THE PASSPORT DATA PAGE



NOTES

1. * Three letter codes are given in Appendix 7.
2. Dotted lines indicate data fields; these, together with arrows and comment boxes, are shown for the reader's understanding only and are not printed on the document.
3. Data is inserted into a field beginning at the first character position starting from the left. Any unused character positions shall be occupied by filler characters (<).

APPENDIX 7 to Section IV

THREE-LETTER CODES

(based on Alpha-3 codes for entities specified in ISO 3166-1,
with extensions for certain States being identified by an asterisk)

Part A — Codes for designation of nationality, place of birth or issuing State/authority

Entity (short name)	*Code*	*Entity (short name)*	*Code*
Afghanistan	AFG	Burundi	BDI
Åland Islands	ALA	Cambodia	KHM
Albania	ALB	Cameroon	CMR
Algeria	DZA	Canada	CAN
American Samoa	ASM	Cape Verde	CPV
Andorra	AND	Cayman Islands	CYM
Angola	AGO	Central African Republic	CAF
Anguilla	AIA	Chad	TCD
Antarctica	ATA	Chile	CHL
Antigua and Barbuda	ATG	China	CHN
Argentina	ARG	Christmas Island	CXR
Armenia	ARM	Cocos (Keeling) Islands	CCK
Aruba	ABW	Colombia	COL
Australia	AUS	Comoros	COM
Austria	AUT	Congo	COG
Azerbaijan	AZE	Cook Islands	COK
Bahamas	BHS	Costa Rica	CRI
Bahrain	BHR	Côte d'Ivoire	CIV
Bangladesh	BGD	Croatia	HRV
Barbados	BRB	Cuba	CUB
Belarus	BLR	Cyprus	CYP
Belgium	BEL	Czech Republic	CZE
Belize	BLZ	Democratic People's Republic	
Benin	BEN	of Korea	PRK
Bermuda	BMU	Democratic Republic	
Bhutan	BTN	of the Congo	COD
Bolivia	BOL	Denmark	DNK
Bosnia and Herzegovina	BIH	Djibouti	DJI
Botswana	BWA	Dominica	DMA
Bouvet Island	BVT	Dominican Republic	DOM
Brazil	BRA	Ecuador	ECU
British Indian Ocean Territory	IOT	Egypt	EGY
Brunei Darussalam	BRN	El Salvador	SLV
Bulgaria	BGR	Equatorial Guinea	GNQ
Burkina Faso	BFA	Eritrea	ERI

Estonia	EST
Ethiopia	ETH
Falkland Islands (Malvinas)	FLK[4]
Faroe Islands	FRO
Fiji	FJI
Finland	FIN
France	FRA
France, Metropolitan	FXX
French Guiana	GUF
French Polynesia	PYF
French Southern Territories	ATF
Gabon	GAB
Gambia	GMB
Georgia	GEO
Germany	D*
Ghana	GHA
Gibraltar	GIB
Greece	GRC
Greenland	GRL
Grenada	GRD
Guadeloupe	GLP
Guam	GUM
Guatemala	GTM
Guernsey	GGY
Guinea	GIN
Guinea-Bissau	GNB
Guyana	GUY
Haiti	HTI
Heard and McDonald Islands	HMD
Holy See (Vatican City State)	VAT
Honduras	HND
Hong Kong Special Administrative Region of China	HKG
Hungary	HUN
Iceland	ISL
India	IND
Indonesia	IDN
Iran (Islamic Republic of)	IRN
Iraq	IRQ
Ireland	IRL
Isle of Man	IMN
Israel	ISR
Italy	ITA
Jamaica	JAM
Japan	JPN
Jersey	JEY
Jordan	JOR
Kazakhstan	KAZ
Kenya	KEN
Kiribati	KIR
Kuwait	KWT
Kyrgyzstan	KGZ
Lao People's Democratic Republic	LAO
Latvia	LVA
Lebanon	LBN
Lesotho	LSO
Liberia	LBR
Libyan Arab Jamahiriya	LBY
Liechtenstein	LIE
Lithuania	LTU
Luxembourg	LUX
Macau Special Administrative Region of China	MAC
Madagascar	MDG
Malawi	MWI
Malaysia	MYS
Maldives	MDV
Mali	MLI
Malta	MLT
Marshall Islands	MHL
Martinique	MTQ
Mauritania	MRT
Mauritius	MUS
Mayotte	MYT
Mexico	MEX
Micronesia (Federated States of)	FSM
Monaco	MCO
Mongolia	MNG
Montserrat	MSR
Morocco	MAR
Mozambique	MOZ
Myanmar	MMR
Namibia	NAM
Nauru	NRU
Nepal	NPL
Netherlands	NLD
Netherlands Antilles	ANT
Neutral Zone	NTZ
New Caledonia	NCL
New Zealand	NZL
Nicaragua	NIC
Niger	NER
Nigeria	NGA
Niue	NIU
Norfolk Island	NFK
Northern Mariana Islands	MNP

4. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

Norway	NOR
Oman	OMN
Pakistan	PAK
Palau	PLW
Panama	PAN
Papua New Guinea	PNG
Palestinian Territory, Occupied	PSE
Paraguay	PRY
Peru	PER
Philippines	PHL
Pitcairn	PCN
Poland	POL
Portugal	PRT
Puerto Rico	PRI
Qatar	QAT
Republic of Korea	MDA
Republic of Moldova	KOR
Réunion	REU
Romania	ROU
Russian Federation	RUS
Rwanda	RWA
St. Helena	SHN
Saint Kitts and Nevis	KNA
Saint Lucia	LCA
St. Pierre and Miquelon	SPM
Saint Vincent and the Grenadines	VCT
Samoa	WSM
San Marino	SMR
Sao Tome and Principe	STP
Saudi Arabia	SAU
Senegal	SEN
Serbia and Montenegro	SCG
Seychelles	SYC
Sierra Leone	SLE
Singapore	SGP
Slovakia	SVK
Slovenia	SVN
Solomon Islands	SLB
Somalia	SOM
South Africa	ZAF
South Georgia and the South Sandwich Islands	SGS
Spain	ESP
Sri Lanka	LKA
Sudan	SDN
Suriname	SUR
Svalbard and Jan Mayen Islands	SJM
Swaziland	SWZ
Sweden	SWE
Switzerland	CHE
Syrian Arab Republic	SYR
Taiwan, Province of China	TWN
Tajikistan	TJK
Thailand	THA
The former Yugoslav Republic of Macedonia	MKD
Timor-Leste	TLS
Togo	TGO
Tokelau	TKL
Tonga	TON
Trinidad and Tobago	TTO
Tunisia	TUN
Turkey	TUR
Turkmenistan	TKM
Turks and Caicos Islands	TCA
Tuvalu	TUV
Uganda	UGA
Ukraine	UKR
United Arab Emirates	ARE
United Kingdom	
British	
— Citizen	GBR
— Dependent territories citizen	GBD*
— National (Overseas)	GBN*
— Overseas citizen	GBO*
— Protected person	GBP*
— Subject	GBS*
United Republic of Tanzania	TZA
United States	USA
United States Minor Outlying Islands	UMI
Uruguay	URY
Uzbekistan	UZB
Vanuatu	VUT
Vatican City State (Holy See)	VAT
Venezuela	VEN
Viet Nam	VNM
Virgin Islands (British)	VGB
Virgin Islands (U.S.)	VIR
Wallis and Futuna Islands	WLF
Western Sahara	ESH
Yemen	YEM
Zambia	ZMB
Zimbabwe	ZWE

Part B — Codes for use in United Nations travel documents

*UNO — Designates the United Nations Organization or one of its officials.

*UNA — Designates a specialized agency of the United Nations or one of its officials.

*UNK — Designates a resident of Kosovo to whom a travel document has been issued by the United Nations Interim Administration Mission in Kosovo (UNMIK).

Part C — Codes for other issuing authorities

*XOM — Designates the Sovereign Military Order of Malta or one of its emissaries.

Part D — Codes for persons without a defined nationality

*XXA — Stateless person, as defined in Article 1 of the 1954 Convention Relating to the Status of Stateless Persons.

*XXB — Refugee, as defined in Article 1 of the 1951 Convention Relating to the Status of Refugees as amended by the 1967 Protocol.

*XXC — Refugee, other than as defined under the code XXB above.

*XXX — Person of unspecified nationality, for whom the issuing State does not consider it necessary to specify any of the codes XXA, XXB or XXC above, whatever that person's status may be. This category may include a person who is neither stateless nor a refugee but who is of unknown nationality and legally residing in the State of issue.

* These are the extensions to the ISO 3166-1 codes referred to in 9.5.5 of this section.

APPENDIX 8 to Section IV

SUBSET OF OCR-B CHARACTERS FROM ISO 1073-II FOR USE IN MACHINE READABLE TRAVEL DOCUMENTS

(constant stroke width)

(for illustrative purposes only)

1. Machine readable zone (MRZ)

Only the following characters shall appear in the MRZ.

0123456789
ABCDEFGHI
JKLMNOPQR
STUVWXYZ <

The above characters are shown larger than actual size. The typeface required in the MRZ on MRTDs is OCR-B, size 1, constant stroke width with a character width spacing of 2.54 mm (0.10 in), i.e. a horizontal printing density of 10 characters per 25.4 mm (1.0 in).

2. Visual inspection zone (VIZ)

The typeface and type size used within the VIZ is at the discretion of the issuing State or organization, although use of OCR-B, size 1, is preferred. Irrespective of typeface used, the printing density should not exceed 15 characters per 25.4 mm (1.0 in).

APPENDIX 9 to Section IV

TRANSLITERATIONS RECOMMENDED FOR USE BY STATES

A. Transliteration of multinational characters

Sequence number	*National character*	*Description*	*Recommended transliteration*
1	Á	A acute	A
2	À	A grave	A
3	Â	A circumflex	A
4	Ä	A diaeresis	AE
5	Ã	A tilde	A
6	Ă	A breve	A
7	Å	A ring	AA
8	Ā	A macron	A
9	Ą	A ogonek	A
10	Ć	C acute	C
11	Ĉ	C circumflex	C
12	Č	C caron	C
13	Ċ	C dot accent	C
14	Ç	C cedilla	C
15	Đ	Eth	D
16	Ď	D caron	D
17	É	E acute	E
18	È	E grave	E
19	Ê	E circumflex	E
20	Ë	E diaeresis	E
21	Ě	E caron	E
22	Ė	E dot accent	E
23	Ē	E macron	E
24	Ę	E ogonek	E
25	Ĕ	E breve	E
26	Ĝ	G circumflex	G
27	Ğ	G breve	G
28	Ġ	G dot accent	G
29	Ģ	G cedilla	G

Sequence number	*National character*	*Description*	*Recommended transliteration*
30	Ħ	H bar	H
31	Ĥ	H circumflex	H
32	I	I without dot (Turkey)	I
33	Í	I acute	I
34	Ì	I grave	I
35	Î	I circumflex	I
36	Ï	I diaeresis	I
37	Ĩ	I tilde	I
8	İ	I dot accent	I
39	Ī	I macron	I
40	Į	I ogonek	I
41	Ĭ	I breve	I
42	Ĵ	J circumflex	J
43	Ķ	K cedilla	K
44	Ł	L slash	L
45	Ĺ	L acute	L
46	Ľ	L caron	L
47	Ļ	L cedilla	L
48	Ŀ	L dot	L
49	Ń	N acute	N
50	Ñ	N tilde	N or NXX
51	Ň	N caron	N
52	Ņ	N cedilla	N
53	ŋ	Eng	N
54	Ø	O slash	OE
55	Ó	O acute	O
56	Ò	O grave	O
57	Ô	O circumflex	O
58	Ö	O diaeresis	OE
59	Õ	O tilde	O
60	Ő	O double acute	O
61	Ō	O macron	O
62	Ŏ	O breve	O
63	Ŕ	R acute	R
64	Ř	R caron	R
65	Ŗ	R cedilla	R

Sequence number	*National character*	*Description*	*Recommended transliteration*
66	Ś	S acute	S
67	Ŝ	S circumflex	S
68	Š	S caron	S
69	Ş	S cedilla	S
70	Ŧ	T bar	T
71	Ť	T caron	T
72	Ţ	T cedilla	T
73	Ú	U acute	U
74	Ù	U grave	U
75	Û	U circumflex	U
76	Ü	U diaeresis	UE or UXX
77	Ũ	U tilde	U
78	Ŭ	U breve	U
79	Ű	U double acute	U
80	Ů	U ring	U
81	Ū	U macron	U
82	Ų	U ogonek	U
83	Ŵ	W circumflex	W
84	Ý	Y acute	Y
85	Ŷ	Y circumflex	Y
86	Ÿ	Y diaeresis	Y
87	Ź	Z acute	Z
88	Ž	Z caron	Z
89	Ż	Z dot	Z
90	Þ	Thorn (Iceland)	TH
91	Æ	ligature AE	AE
92	Ĳ	ligature IJ	IJ
93	Œ	ligature OE	OE
94	ß	double s (Germany)	SS

B. Transliteration of Cyrillic characters

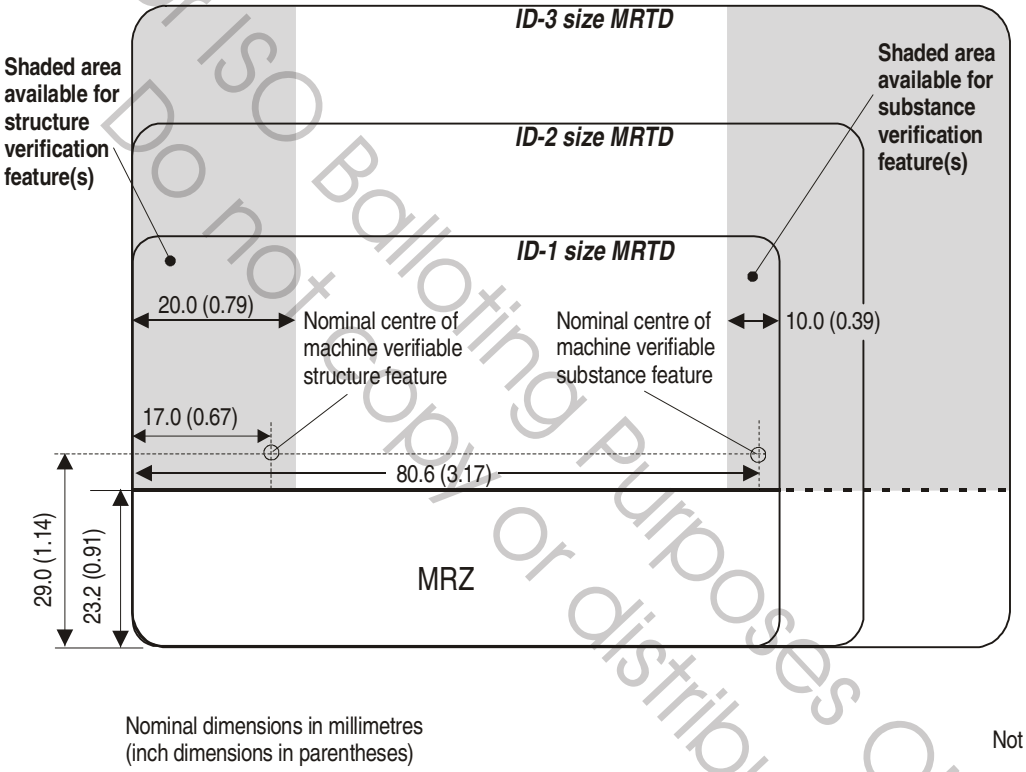
Sequence number	*National character*	*Recommended transliteration*
1	А	A
2	Ь	B
3	В	V

Sequence number	*National character*	*Recommended transliteration*
4	Г	G (except Belorussian and Serbian = H)
5	Д	D
6	Е	E
7	Ё	E (except Belorussian = IO
8	Ж	ZH (except Serbian = Z)
9	З	Z
10	И	I (except Ukrainian = Y)
11	І	I
12	Й	I
13	К	K
14	Л	L
15	М	M
16	Н	N
17	О	O
18	П	P
19	Р	R
20	С	S
21	Т	T
22	У	U
23	Ф	F
24	Х	KH (except Serbian and Macedonian = H)
25	Ц	TS (except Serbian and Macedonian = C)
26	Ч	CH (except Serbian = C)
27	Ш	SH (except Serbian = S)
28	Щ	SHCH (except Bulgarian = SHT)
29	Ы	Y
30	Ъ	IE
31	Э	E
32	Ю	IU
33	Я	IA
34	Ѵ	Y
35	Ґ	G
36	ў	U
37	Ӂ	U
38	ƒ	G (except Macedonian = GJ)
39	Ћ	D
40	Ѕ	DZ

Sequence number	*National character*	*Recommended transliteration*
41	Ј	J
42	Ќ	K (except Macedonian = KJ)
43	Љ	LJ
44	Њ	NJ
45	Ћ	C
46	Џ	DZ (except Macedonian = DJ)
47	Є	IE
48	Ї	I

APPENDIX 10 to Section IV

RECOMMENDED LOCATIONS OF STRUCTURE AND SUBSTANCE MACHINE ASSISTED DOCUMENT VERIFICATION FEATURES



This diagram shows the three sizes of MRTD including the MRP (ID-3 size) with recommended positions for machine assisted document verification features. The shaded area on the left is recommended for the incorporation of a structure feature and that on the right for the incorporation of a substance feature.

APPENDIX 11 to Section IV

ILLUSTRATIVE GUIDELINES FOR PORTRAITS IN AN MRP

The illustrations on the following pages provide guidance for the taking of photographs to be used as the portrait of the holder in an MRP and should be viewed in relation to Section IV, 7.

1. Pose

1.1. The photograph shall be less than six months old.

1.2. It should show a close up of the head and shoulders.

1.3. The photograph should be taken so that an imaginary horizontal line between the centres of the eyes is parallel to the top edge of the picture.

1.4. The face should be in sharp focus and clear with no blemishes such as ink marks or creases.

1.5. The photograph should show the subject facing square on and looking directly at the camera with a neutral expression and the mouth closed.

1.6. The chin to crown (crown is the position of the top of the head if there were no hair) shall be 70 to 80 per cent of the vertical height of the picture.

1.7. The eyes must be open and there must be no hair obscuring them.

1.8. If the subject wears glasses, the photograph must show the eyes clearly with no lights reflected in the glasses. The glasses shall not have tinted lenses. Avoid heavy frames if possible and ensure that the frames do not cover any part of the eyes.

1.9. Coverings, hair, headdress or facial ornamentation which obscure the face are not permitted.

1.10. The photograph must have a plain, light-coloured background.

1.11. There must be no other people or objects in the photograph.

2. Lighting, exposure and colour balance

2.1 The lighting must be uniform with no shadows or reflections on the face or in the background.

2.2 The subject's eyes must not show red eye.

2.3 The photograph must have appropriate brightness and contrast.

2.4 Where the picture is in colour, the lighting and photographic process must be colour balanced to render skin tones faithfully.

3. Submission of portrait to the issuing authority

3.1 Where the portrait is supplied to the issuing authority in the form of a print, the photograph, whether produced using conventional photographic techniques or digital techniques, should be on good or photo-quality paper and should be of the maximum specified dimensions.

3.2 Where the portrait is supplied to the issuing authority in digital form, the requirements specified by the issuing authority must be adhered to.

4. Compliance with international standards

4.1 The photograph shall comply with the appropriate definitions set out in ISO/IEC 19794-5.

PORTRAIT QUALITY

The portrait shall be not more than 6 months old.

It shall not be larger than 45 x 35 mm (1.77 x 1.38 in) nor smaller than 32 x 26 mm (1.26 x 1.02 in) in height and width and show a close-up of the applicant's head and the top of the shoulders. The face shall take up 70-80 per cent of the vertical dimension of the picture.

The portrait shall be in sharp focus, of high quality with no creases or ink marks.

The portrait shall show the applicant looking directly at the camera. It should have appropriate brightness and contrast. If in colour, it should show skin tones naturally.

If submitted as a print, it should be on high quality paper with high resolution.

Portraits taken with a digital camera should be at high quality and resolution and be printed on photo-quality paper.

STYLE AND LIGHTING

The portrait shall be colour neutral showing the applicant with the eyes open and clearly visible; there shall be no hair obscuring the eyes. The applicant shall be shown facing square to the camera, not looking over one shoulder (portrait style).

The head should be upright so that an imaginary horizontal line drawn between the centres of the eyes is parallel to the top edge of the picture.

Both edges of the face shall be clearly visible.

The background shall be plain and light coloured.

The lighting shall be uniform with no shadows and no reflections on the face.

There shall be no red eye.

GLASSES AND HEAD COVERS

Glasses:

The portrait shall show the eyes clearly with no light reflection off the glasses and no tinted lenses. If possible, avoid heavy frames. The frames shall not cover any part of the eyes.

Head Coverings:

Head coverings shall not be accepted except in circumstances which the competent State authority specifically approves. Such circumstances may be religious, medical or cultural.

EXPRESSION AND FRAME

The portrait shall show the applicant alone with no other people, chair backs or toys visible. The applicant shall be looking at the camera with a neutral expression and the mouth closed.

— END —