IMPLEMENTATION SPECIFICATION FOR ROAD WORKS

SERIES IM/700 (IMPLEMENTATION) ROAD PAVEMENTS – GENERAL

This Specification Series implements the requirements in Subsidiary Legislation 499.57, Part II (New Roads and Road Works Regulations) in accordance with the Agency for Infrastructure Malta ACT XXV111, CAP. 588, Part I

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700 ROAD PAVEMENTS - GENERAL

701 Pavement Construction

1 Road pavements shall be constructed from one of the permitted options described in IM Appendix 7/1 and in compliance with this Series and the appropriate Clauses of Series 800, 900 and 1000.

2 The naming of the various pavement layers according to the British practice will be subject to change over the next few years to reflect European harmonisation: Wearing Course will become Surfacing, Basecourse will become Binder Course and Roadbase will become Base Course. Cement Stabilization as described in the 'Directives for The Standardization of Pavements for Traffic Areas' will become Cement Bound Material (CBM). This specification uses the new terminology.

3 The Contractor shall, in his choice of permitted materials for sub-bases (foundation course or Cement bound material) and base courses, have regard to the nature of those materials and of the subgrade or any capping and the need to protect them from deterioration due to the ingress of water, the adverse effects of weather and the use of construction plant. The Contractor shall programme the laying and compaction of the sub-base and the subsequent pavement courses and take such other steps as may be considered necessary, to provide protection to the base course, sub-base and subgrade.

702 Horizontal Alignments, Surface Levels, Thickness and Surface Regularity of Pavement Courses Bituminous pavement courses shall be made using the materials described in IM Appendix 7/1.

Horizontal Alignments

1 Horizontal alignments shall be determined from one edge of the pavement surface as described in IM Appendix 1/12. The edge of the pavement as constructed and all other parallel alignments shall be correct within a tolerance of 25 mm therefrom, except for kerbs, channel blocks and edge lines which shall be laid with a smooth alignment within a tolerance of ±13 mm.

Surface Levels and Thickness of Pavement Courses

2 The design levels of pavement courses shall be calculated from the vertical profile, crossfalls and the pavement course thicknesses described in IM Appendix 7/1. The level of any point on the constructed surface of the pavement courses shall be the design level subject to the appropriate tolerances stated in

3 Table 700-1.

Table 700-1: Tolerances in Surface Levels of Pavement Courses

Surface	Level Tolerance
Top Course (Trafficked, Permanent)	± 6mm
Binder Course	± 6mm
Base Course	± 10mm
Top Course when adjacent to a surface water channel *Note 2*	0mm to +10mm
Subbase (Unbound) Course	± 20mm
Foundation Course	± 20mm
Cement Bound Material **a. Below Asphalt Course** **b. Below Unbound Course**	 a. ± 15mm b. ± 20mm
Formation level **a. Below bound course** **b. Below unbound course**	 a. ± 20mm b. ± 25mm

Note 1: Where a surface water channel is laid before the adjacent road pavement layer the top of that layer, measured from the top of the adjacent edge of the surface water channel, shall also be to the tolerances given in

Table 700-1.

Note 2: Where a surface water channel is laid in the trafficked part of the carriageway (especially when transverse to the direction of traffic) the top of that layer-measured from the top of the adjacent edge of the surface water channel shall be to a maximum tolerance of -6mm.

4 Notwithstanding the tolerances permitted in surface levels of pavement courses, the cumulative tolerance shall not result in a reduction in thickness of the pavement. The layer thickness will be calculated as the mean value over the whole construction area. A minimum of 20 values are necessary for the calculation of the mean value. The layer thickness may be determined for partial sections. The partial section should correspond at least to one day of construction work. Higher thicknesses than specified are used to compensate lower thicknesses of courses below the course in question. The provisions in Clause 928, sub-clause 5 may be applied by the Overseeing Organization in respect of on-conforming Works.

a) Cement bound material, foundation course, and unbound base and subbase courses:

The layer thickness after compaction shall not be less than 10% from the specified thickness.

Independently of the mean value, single values of the layer thickness shall not fall below the specified thickness as follows:

i)	Asphalt base course	25mm
ii)	Cement bound material	30mm
iii)	Foundation course	30mm
iv)	Unbound base course	30mm
v)	Subbase course	30mm

Single values which exceed the specified thickness by more than 30mm must not be considered for the calculation of the mean value.

b) Surfacing (Asphalt Binder course and/or Surface course):

The limit for the mean values and single values (percentage from the specified thickness) of Note 1*: Irregularities higher than the lower threshold shall also be included in that lower threshold and added to the number – Eg. An irregularity of 10mm is also included as an irregularity of 4mm and 7mm;*

Table 700-2 shall not be exceeded.

5 For checking compliance with sub-Clause 2 and sub-Clause 3 of this Clause, measurements of the surface levels of all courses will be taken on a grid of points located as described in IM Appendix 7/1. Measurements may be taken at a longitudinal distance of 10m and at points in the transversal direction of a carriageway actually in the axle paths and the two exterior third points of half of the carriageway width (for a 7.5m carriageway at a distance of 2.5 m from the axle). In any length of pavement, compliance shall be deemed to be met for all surfaces, other than the final road surface, when not more than one of ten consecutive measurements taken longitudinally or one in any transverse line, exceeds the tolerances permitted in

6 Table 700-1, provided that this one measurement shall not exceed by more than 5mm the tolerance for the course concerned. For the final road surface the tolerance given in

7 Table 700-1 shall apply to any point on that surface.

Surface Regularity

8 The surface regularity shall be measured using a 3m travelling beam as shown in Figure 1.

Figure 1 3m Travelling Beam (Illustrative)

9 The maximum allowable difference between the pavement surface and the underside of the straightedge - both in the longitudinal and the transverse directions when placed parallel with, or at right angles to the centre line of the road - shall be as follows:

a)	For carriageway, hardstrip and hardshoulder surfaces	4mm
b)	For asphalt binder surfaces	6mm
c)	For asphalt base courses	10mm
d)	For subbase under concrete pavements	10mm
e)	Cement bound material under asphalt	15mm
f)	Cement bound material under unbound base course	20mm
g)	For unbound base courses under asphalt	20mm
h)	For subbase under asphalt	20mm
i)	For Foundation courses	24mm

*Note 1: Any deviation in the road surface (or layer surface) measured by the 3m travelling beam is an **irregularity** - When the irregularity is **less than or equal to** the values in a) to i) above it shall be considered as **permissible** when the number (quantity) over the length indicated does not exceed the value (number of occurrences) in Table 700-2 for each magnitude;*

Note 2: Irregularities higher than the lower threshold shall also be included in that lower threshold and added to the number – Eg. An irregularity of 10mm is also counted as an irregularity of 4mm and 7mm;

Note 3: The section lengths in the longitudinal direction for the measurement of irregularities shall be as described in Table 700-2 (i.e 300m and 75m).

Note 4: Unless otherwise described in IM Appendix 7/1 the transverse measurements shall be made along the nearside and offside wheelpath and at the centre of each lane.

Note 5: Table 700-2 describes the limit values for both the magnitude and the quantity of the irregularities for acceptance and conformity.

10 The number (quantity) of surface irregularities of surface courses, binder courses, base courses, and sub-bases in pavements and concrete slabs shall not exceed the limits stated in Table 700-2. Whenever the number and/or magnitude of irregularities in Table 700-2 is exceeded the Contractor shall rectify the affected area to bring it within the specified limits (or a price reduction is applied as described in Series 150).

Note 1: Irregularities higher than the lower threshold shall also be included in that lower threshold and added to the number – Eg. An irregularity of 10mm is also included as an irregularity of 4mm and 7mm;

Table 700-2: Maximum Permitted Number of Surface Irregularities (Mechanical Paving)

	Surfaces of Carriageway, Hardstrips and Hardshoulders				Surfaces of Other Courses			
Irregularity (mm)	**4mm**		**7mm**		**7mm**		**10mm**	
	Maximum Permitted Number of Irregularities							
Road Length (m)	300	75	300	75	300	75	300	75
A: Arterial and Distributor roads*	20	9	2	1	40	18	4	2
B: Other traffic areas*	40	18	4	2	60	27	6	3
Maximum Irregularity (mm)	10mm				14mm			

** The Category of each section of road is described in IM Appendix 7/1.*

11 No irregularity exceeding 10mm shall be permitted and no irregularity exceeding 14mm shall be permitted for hand-laid surface courses.

Table 700-3: Limiting Values for Layer Thickness Lower than Specified

	Asphalt Surface course over Binder course and Base course together (#)	Asphalt Surface course over Base course together (#)	Asphalt Surface course over Binder course together (#)	Asphalt Wearing course or Base Surface Course over Regulating Course	Asphalt Wearing course over Scarified Asphalt Surface	Combined Base Surface course on Unbound Subbase
Note1	***Thickness compensation of the upper layers onto the lower layers shall apply but only when layer values represent layer thickness superimposition for any one location;***					
Note2	***Thickness to be taken as the sum value - all separate layer values are added together (i.e Combined);***					
Note3	***Not applicable to regulating course;***					
a) <u>Mean Values</u> 1) Arterial and Distributor roads, paved areas greater than 3000m² or other roads over 500m²	≤10%	≤10%	≤10%	≤10%	≤15%	≤15%
2) Arterial and Distributor roads, paved areas greater than 3000m² or other roads over 500m²	≤10%	≤10%	≤10%	≤15%	≤15%	≤15%
b) <u>Individual values</u>	≤10%	≤15%	≤15%	≤25%	≤25%	≤25%

Note: Phased Construction - Single values may be applied by the Overseeing Organisation in case of a phased construction where the final surfacing is laid at a later stage and the base and/or binder course act as a provisional surface (temporary):

i. Phase 1: Base opened to traffic (temporary) ≤25%

ii. Phase 2: Binder over base opened to traffic (temporary) ≤15%

iii. Phase 3: Wearing over binder over base (permanent) ≤15%

12 The permissible irregularities of the surface <u>must transition gradually</u> and not in multiple, short ridges. In cases of hand-laid areas the permissible tolerances are 15mm for combined base/wearing courses and 10mm for binder courses and wearing courses.

13 Deviations of the required cross slope of the road surface must not be more than ± 0.4% and for combined base/wearing courses not more than ± 0.5%. If the cross slope is below 1.5% and the longitudinal slope below 0.5% for transition curves of carriageways for rapid traffic,

the difference between the specified cross slope and the achieved cross slope must not be more than 0.2%

14 Prior to checking any final road surface or course it shall be cleaned of loose or extraneous materials. These operations shall be carried out without damaging the surface, as soon as possible and within 3 days of construction of the pavement.

15 Compliance with the required tolerances and the permitted number of surface irregularities shall be checked by the rolling straight-edge along any line or lines parallel to the edge of pavement on sections of 300 m at regular intervals as stated in IM Appendix 7/1, whether or not it is constructed in shorter lengths. Sections shorter than 300 m forming part of a longer pavement shall be assessed using the number of irregularities for a 300 m length pro-rata to the nearest whole number.

16 Where the total length of pavement is less than 300 m, the measurements shall be taken on 75 m lengths.

17 Pavements shall be measured transversely for irregularities at intervals of 50m or as stated in IM Appendix 7/1, by a 3 m long straightedge placed at right angles to the centre line of the road. The maximum allowable difference between the course surface and the straight edge shall be 3mm.

18 Testing of the longitudinal surface regularity is generally carried out in the middle of the lane.

Rectification

19 Where any pavement area does not comply with the Specification for regularity, surface tolerance, thickness, material properties or compaction, the full extent of the area which does not comply with the Specification shall be made good and the surface of the pavement course shall be rectified in the manner described below:

a) Unbound materials

The top 75mm shall be scarified, reshaped with material added or removed as necessary, and re-compacted. The area treated shall be not less than 20m long and 2m wide.

b) Cement bound sub-bases

The method of correction will depend on the period which has elapsed between detection of the error and the time of mixing of the material. If this is less than 4 hours, the surface shall be scarified to a depth of not less than 50mm, surplus material removed or freshly mixed material added as necessary, and re- compacted in accordance with the Specification. If the period is 4 hours or more the full depth of the layer shall be removed from the pavement and replaced with material in accordance with the Specification. In either case the area treated shall be at least 5 m long and the full width of the paving laid in one operation. If the Contractor proposes rectification

within 7 days of laying he shall comply with Clause 1036. Alternatively, for sub-bases under concrete pavements the Contractor may make up low areas to a level within the tolerances of this Clause with a 1:4 cement and sand mortar or with 3 mm size fine graded wearing course complying with BS 4987 : Part 1.

c) Bituminous base courses

With asphalt base courses, the full depth of the top layer as laid shall be removed and be replaced with fresh material laid and compacted in accordance with the Specification. Any area so treated shall be at least 5m long and the full width of the paving laid in one operation. Alternatively for low.areas in bituminous base courses to be overlaid with a binder course, the Contractor may make up the level with additional binder course material.

d) Wearing courses, base/wearing courses, binder courses and top surface of base courses in pavements without binder course.

These shall have the full depth of the course removed, or in the case of base courses in pavements without binder course, the topmost layer, and replaced with fresh material laid and compacted in accordance with the Specification.

The area rectified shall be the full width of the paving laid in one operation, and at least 5 m long if binder course or base course on pavements without binder course, or 15 m if wearing course or base/wearing course.

Where the number of surface irregularities exceeds the limits in Table 700-3, the area to be rectified shall be 300m or 75m long as appropriate and the full width of the lanes affected, or such lesser length as necessary to make the number of surface irregularities conform with the limits and shall be the full width of the lanes affected.

Checking of the wearing course for compliance with this Clause shall be carried out as soon as possible after completion of the surfacing and remedial works completed before the road is opened to traffic.

Areas to be removed shall be delineated both longitudinally and transversely by saw cutting prior to the material being removed. Joints shall be formed by coating the exposed sawn face with hot bitumen.

e) Concrete slabs

Concrete slabs shall be rectified by planing, grinding or bump cutting. Large depressions, which cannot be dealt with in this way, shall be rectified by cutting out the surface and replacing by a thin bonded surface repair complying with Clause 1029.

Retexturing of hardened concrete shall be carried out by sawing grooves in accordance with the Specification. Texturing of replaced surfaces shall be by brushing in accordance with the Specification. Where the slab cannot be rectified as above, the full depth of slab shall be removed and replaced with a slab constructed in compliance with Clause 1030 to the extent required to obtain compliance to the Specification. Remedial works involving the placing of fresh concrete shall be completed in sufficient time for the concrete strength to have developed as required in Clause 1036, before that section of pavement is opened to traffic.

703 Weather Conditions for Laying of Unbound Granular and Cementitious Materials

1 Road Pavement materials in a frozen condition shall not be incorporated in the Works but may be used, if acceptable, when thawed.

2 Road Pavement materials shall not be laid on any surface which is frozen or covered with ice.

3 The temperature of concrete or cement-bound material in any pavement layer shall not be less than 5˚C at the point of delivery. These materials shall not be laid when the air temperature fall below 3˚C and laying shall not be resumed until the rising air temperature reaches 3˚C unless, with the agreement of the Engineer, all surfaces of the concrete slabs are protected by thermal insulation blankets laid immediately after placing and finishing the concrete. The insulation shall be placed before the temperature of the concrete surface has dropped below 2˚C and shall be retained for a minimum of 3 days or until the concrete is assessed to have reached 50% of the specified characteristic compressive strength provided that the air temperature is above 0˚C and rising at that time. Thermal insulation blankets shall be closed cell polyethylene foam sheets, minimum 10mm thick with a “U” value of 4 watts/m °C (or K value of 0.04 watts/m Kelvin) or suitable material with an equivalent or lower thermal conductivity. They shall be sufficiently robust and capable of being held in place for the necessary curing time.

704 Use of Surfaces by Traffic and Construction Plant

1 Construction plant and traffic used on pavements under construction shall be suitable in relation to the material, condition and thickness of the courses it traverses so that damage is not caused to the subgrade or the pavement courses already constructed.

2 The wheels or tracks of plant moving over the various pavement courses shall be kept free from deleterious materials.

3 Where the Contractor proposes to use the sub- base for construction plant he shall improve the sub-base where necessary, to accommodate the method of construction and the type of plant and vehicles which he proposes to use, in order to avoid damage to the sub-base, any capping and the subgrade. Any permanent thickening shall be across the whole width of the pavement, unless otherwise agreed by the Engineer. Temporary thickening shall not impede drainage of the sub-base or the subgrade.

4 Concrete slabs may be used by traffic when the characteristic compressive strength is assessed to have reached 25 N/mm^2 for pavement surface slabs, or 20 N/mm^2 for base courses with asphalt surfacing. The method of assessing the time when this strength is reached shall be as described in Clause 1004, or as otherwise agreed with the Engineer.

5 In the absence of test data establishing compliance with sub-Clause 4 of this Clause, no vehicle with an axle loading greater than 2 tonnes shall run on concrete slabs within a period of 14 days after placing the concrete. Vehicles with rubber tyres with an axle loading less than 2 tonnes, or wheels or tracks of concreting plant, shall not use any part of a newly constructed pavement within 7 days. The above periods shall be increased at the discretion of the Engineer if the 7-day cube strength is below that required. These periods shall be extended by one day per each night for which the temperature of the layer falls to 0˚C or below.

6 Cement bound material (sub-base) has to be kept moist for at least 3 days or to be protected against drying by other measures according to Clause 1033, sub-Clause 16. Further layers may be applied earlier if during laying no deformations of the sub- base arrive and if curing is not endangered by water content reduction (e.g. application of tack coat before laying of an asphalt base courses). Opening to traffic of the Cement bound material or the pavement including the Cement bound material is only allowed if 70% of the required compressive strength is achieved. Otherwise no vehicle shall run on cement bound material within 7 days of construction. This period shall be extended by one day for each night on which the temperature of the layer falls to 0˚C or below.

705 General Requirements for Sub-bases and Base Courses

1 The Contractor shall, in his choice of materials for base courses have regard to the nature of those materials and of the sub-base, subgrade or any capping and the need to protect them from deterioration due to the ingress of water, the adverse effects of weather and the use of construction plant. The Contractor shall programme the laying and compaction of the sub-base and the subsequent pavement courses and take such other steps as may be considered necessary, to provide protection to the base course, sub-base and subgrade.

Transporting

2 Unbound and cement bound plant-mixed material shall when mixed be removed at once from the mixer, transported directly to the point where it is to be laid and protected from the weather both during transit from the mixer to the laying site and whilst awaiting tipping.

Laying

3 All material shall be placed and spread evenly. Spreading shall be undertaken either concurrently with placing or without delay. Unbound and cement bound material shall be spread using a paving machine and operated with a mechanism which levels off the material to an even depth.

706 Excavation, Trimming and Reinstatement of Existing Surfaces

General

1 The Contractor shall not excavate pits, trenches or other openings in paved areas which have been constructed as part of the Permanent Works in order to construct other parts of the Works, including Statutory Undertakers and other service works, except with the prior approval of the Overseeing Organisation.

2 Where excavation and trimming of existing paved areas and roads not constructed as part of the Permanent Works are required in IM Appendix 7/2, they shall be carried out and reinstated in compliance with this Clause and with any additional requirements described in IM Appendix 7/2. Excavations shall be carried out to the dimensions described in IM Appendix 7/2, or, if not so described, to the minimum dimensions, subject to sub-Clause 3 of this Clause, necessary to carry out the work.

Excavations

3 Excavations in asphalt layer of existing pavements and other paved areas, except those described in sub-Clause 4 of this Clause, shall be cut to neat lines to dimensions at least greater on each side than the dimensions of any further excavation below formation level as follows: 15cm for excavation depths up to 2m and 20cm for excavation depths equal or greater than 2m. Planing shall be carried out in accordance with Clause 912. Concrete surfacing and concrete roadbases, shall be cut back by sawing by at least 300 mm on each side to the level of any reinforcement in reinforced slabs and to the full depth of the slab in unreinforced slabs.

4 If excavations are required to inspect the condition of lower layers, each layer shall be excavated separately and cleaned of debris to permit inspection.

5 Concrete blocks, precast concrete flags, kerbs and channels shall be lifted without cutting, to the nearest joint satisfying sub-Clause 3 of this Clause and carefully stored for re-use or dealt with as described in IM Appendix 2/3. In situ kerbs and channels shall be broken out to at least 150mm beyond the excavation.

Reinstatement of Paved Areas

6 Immediately before bituminous layers are reinstated, the edges of the existing material shall be cleaned of all loose material and be coated with an appropriate hot bituminous binder, or equivalent treatment. Where joints in concrete slabs are affected by the excavation they shall be reinstated by cutting back to at least 0.5 m on each side of a transverse joint and forming an expansion joint on one side of the excavation and a contraction joint on the other and provide longitudinal joints where necessary in the same line before reinstatement in compliance with Series 1000 to match the existing construction.

Reinstatement of Other Areas

7 Where the excavation affects grassed areas, unpaved footpaths, footways, verges, paths and tracks they shall be reinstated to match the existing surface, after backfilling with acceptable material described in IM Appendix 7/2 to a depth of not less than 150 mm below the finished surface.

Junctions Between New Pavement Construction and Existing Pavement or Other Paved Areas

8 Where new pavement construction abuts an existing bituminous pavement which has to be reduced in level or overlaid to match alignment and levels, the existing surface shall be trimmed by the minimum amount of cold-milling (planing) to a depth which will allow the specified thickness of new construction to be laid, the edge being trimmed and treated in compliance with this Clause. Where the difference in level makes it necessary, a regulating course as described in IM Appendix 7/1 and specified in Clause 910 shall be provided. The locations of areas to be trimmed are given in IM Appendix 7/2.

9 Junctions between concrete pavements and between concrete and bituminous pavements shall be constructed as described in IM Appendix 7/2.

Compressed Air

10 When compressed air is used to clean dust, dirt and debris from prepared faces of existing concrete or bituminous pavements which are otherwise ready for reinstatement, only oil-free compressed air shall be used and this shall be at a pressure of not less than 0.5 N/mm^2.

707 Breaking Up or Perforation of Redundant Pavement

1 Where redundant pavement construction is to be perforated or broken up, the pavement shall be treated as described in IM Appendix 7/6.

708 Weather Conditions for Laying of Asphalt Wearing Course and Other Bituminous Pavement Layers

1 Laying of road pavement materials containing bituminous binders may proceed during light precipitation but only if the receiving exposed layer is not covered by the water film and provided the temperature is 2˚C or more and the air temperature is above 3˚C for surface courses, and above 0˚C for binder and base courses. The responsibility for the working methods shall rest with the Contractor including all necessary adjustments to suit changes in the weather conditions.

2 Laying of road pavement materials containing bitumen binders may proceed provided the temperature of the surface to be covered is 2˚C or more, the air temperature is at or above 1˚C and rising and the surface to be covered is dry.

709 Testing for Constituent Materials in Recycled Coarse Aggregate and Recycled, Concrete Aggregate

1 Constituent materials shall be tested analogous to MSA EN13108-8

710 Price Reductions

1 The Overseeing Organisation may carry out price reductions for non-conforming materials and for the following characteristics in lieu of remedial work:

a) surface design levels

b) compacted layer thickness (individual and/or combined);

c) surface regularity.

Unless otherwise indicated in IM Appendix 1-5/1 these shall be according to the formulae in Series 150. If the defects are for more than a single characteristic the price reductions are added unless stated otherwise.

2 The Overseeing Organisation shall not be under any contractual obligation to apply price reductions for non-conforming and/or defective works.