



INFRASTRUCTURE MALTA ROADS AND INFRASTRUCTURE AGENCY

Road Directional Informatory Signages

IM Series 1200 (Implementation)



ROAD DIRECTIONAL PERMANENT INFORMATORY SIGNAGES

Roads and Infrastructure Agency

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1 INTRODUCTION



This manual describes how sign faces are designed. It does not include the various methods by which signs are constructed and mounted.

The design rules contained apply to the new Standard which is being implemented throughout all types of public roads.

Through experience and research, a thoroughly new Standard has been set up introducing only the bare minimum necessary repetitive informative description, which can be easily read and understood by all drivers and road users.

It is of utmost importance that a designer follows as closely as possible the design principles set out on the working drawings within this manual.

A new set of symbols, (pictograms) representing locations most frequently visited, have been included and will be implemented whenever possible in any new sign design.

The two most important symbols being the Hospital , and Airport  symbols, will be included in all the signs indicating towards these 2 particular locations. As a common rule, these 2 symbols will be shown at the beginning and inline besides each other.

As per the previous existing local signs, the Route Numbers and Distances, have been removed, and will not be included in the new designs as from the year 2020. This is to make the sign more adaptable and reduce the amount of excess data which through public surveys, most of the drivers do not take note of. This will therefore result with more possibilities to increase the sign sizes to be installed in limited areas, and automatically be more suitable for everyone to read.

The design details within this manual have been specifically made, taking in consideration various limitations. As we have restrictions and not enough space for certain signs, arrangements have been made which deem best for all our Local Road Networks.

As a Common Rule, the Full design process and dimensions shown in this manual are fixed to the x-height of 100mm. As directional signs differ in size, this is achieved as related to the speed limit of the road and the height to which the sign is to be installed.

In the Maltese Islands, speed limits are between 30km/h to 80km/h, according to the type of roads. The x-heights are as follows: 100mm as a Standard height, as the majority of roads have a speed limit of 60km/h. Wherever possible, all Post Mounted signs are designed to this 'x' height. When signs are to be mounted on Gantries, their 'x' height is 160mm, whilst when mounted on Pedestrian Footbridges, their 'x' height is to be 180mm. The 'x' height varies because of the difference between the Clear Heights of both structures. Restrictions may occur in all of these cases.

2 PLANNING

An effective Directional Sign program includes Vehicular and Pedestrian signs. The objective of all directional signage is to clearly direct pedestrians and drivers to their destination.

To begin a site evaluation, one has to obtain a site plan of the area. The siteplan needs to identify all major and minor roadways, alleys and access roads.

Visit the site and walk through the area to perform an evaluation. For best results, it will make more sense to survey the full road.

Wayfinding

Identifying destinations people drive to, where they park and where they walk to, is the process of identifying the paths of travel. Wayfinding is then communicating to people along this pathway with appropriate directional signs.

The intersections along the vehicle roadway and pedestrian pathway system need to be identified in their importance for communication. Major high traffic intersections will require more communication than smaller intersections.

The path of travel and the decision points that are necessary to reach the end point and where these decision points are located, must be considered. At these decision points, information must be communicated to the driver in a priority of need.

Typically a driver can only read up to a maximum 4 messages on a directional sign and a set of inline symbols at the lowest part of the sign, within 4 to 5 seconds of driving at normal speed. Any information that is beyond or greater than this is normally more difficult to be read.

Sign Placement

Directional signs function to communicate to both drivers and pedestrians, and their placement needs to be planned relative to the intended viewer. Sign visibility to the user is a principal objective and that is the basis of correct sign placement.

Signs that are to be read from a moving car down a road need to be large and clearly visible. Poorly placed signs, that are intended to communicate to drivers, can actually create traffic hazards. Also if a sign has too much information, the placement will have to allow for a driver to stop to a very low speed, in order to read the full description.

A simple explanation, a sign that is too small is an annoyance to everyone, because they can't be read. A sign that is large with only the necessary information, will be read by everyone.

Correct placing of signs will usually mean fewer signs are required. Too many signs can create a cluttered appearance and increase the difficulty for a viewer to find the particular destination.

Care also needs to be taken to place signs in a manner that allow clear viewing. Placement of signs so trees and shrubs do not obscure them is critical. It is also critical that signs are not placed in locations that obscure a driver's visibility of vehicular traffic and pedestrians.

Coordination needs to take place with underground services, irrigation systems and any other fixed structure/s which may not allow the fixture of a new sign at a desirable area.

2 PLANNING

Types of Signs

A sign that is illuminated with floodlights can be effective at night, but the ongoing maintenance will be considerably higher.

Non illuminated signs with reflective letters will only function well at night, if they are placed correctly. It is of good practice to have all signs with retroreflective letters.

Therefore the Highest Grade of Reflectivity material, classified as Class RA3, is being implemented in all the new signages.

Viewing Angle

The height of an average standing person's eye level is 1.6m, and 1.2m whilst driving a car.

Normally ground mounted signs for drivers are fixed 1.2m as measured from the finished road level to the bottom edge of sign panel, better known as the Clear Height. This is a common rule in order to avoiding obstructions for drivers normally exiting from besides the same sign.

When signs are fixed on footpaths, a clear distance of 2.4m is necessary for pedestrians to walk underneath it.

Spacing

Signs must be located with respect to other signs. Mounting sites should be carefully selected so that groups of signs are placed without creating a cluttered appearance. Also drivers must be given time to read and react to one sign before another is presented.

Site Preparation

Placement must be carefully considered to ensure that the sign fits the location without major regrading. When installing signages on footpaths, special care is to be taken to avoid any obstruction on the footpaths and without projecting into the carriageway. It may be necessary to clear some shrubs or bushes or relocate an obstruction.

Message Content and Layout

Keep sign messages brief. Do not anticipate decisions that can be made at a later stage.

Unnecessary information on signs will confuse the viewer.

The Font must always be Transport Medium, and same destinations and symbols are to be repetitively included on all signs.

Preferably place not more than 4 destinations, within the same direction, on each sign.

Use Upper and Lower case text, as these are easier to read and understand faster than text in all capital letters.

A thick line, normally the same width of the perimeter line, is to separate each group of destinations, from one direction to another.

Some text forming part of the destination, can be reduced in abbreviations, in order to fit in the sign size.

As for symbols, these can be positioned individually inline at the end of a destination, representing a location with the same destination, or bettermore within an inline set at the lowest part of the sign.

2 PLANNING

Placement of Signs

- Signs should always be perpendicular to the intended viewer.
- Position signs with a clear line of sight from the viewing point to the sign face.
- Typically a driver gathers visual information by viewing to the left first.
- Keep directional signs within the same lane of the road that the driver is driving.
- Always evaluate a sign's location at night as well as in the daylight. Lighting conditions and visibility may change at night making a particular location unsuitable.
- Always consider the landscaping surrounding a sign when determining a sign location. It is important that trees, shrubs and other plants do not obscure the sign.
- Do not place signs in locations where pedestrians may walk into them. Whenever necessary, a clear height of 2.4m is to be taken into consideration.
- Avoid placing post mounted signs on narrow footpaths. The majority of footpaths need to have a Clear Width of minimum 1.2m without any obstacles for Wheelchairs and Pushchair users.
- Never place signs too close to curbs. Car over hungs and door swings should be taken into account.
- Necessary calculations, such as wind force, type of pipe, type of gantries and their foundations, plate material, site environment etc, need to be tackled beforehand. Structural engineering may be required to adequately confirm that a particular footing will be adequate for a sign in the required conditions.

3 COMMON DESIGN RULES

Alphabets

The alphanumeric characters used on traffic directional signs are from a specially designed alphabet known as the Transport alphabet. There are two versions: Transport Medium and Transport Heavy. The best for our roads, is the Transport Medium with white characters on blue and brown backgrounds. Transport Medium with black characters on white backgrounds are used on road name signs and pedestrian signs.

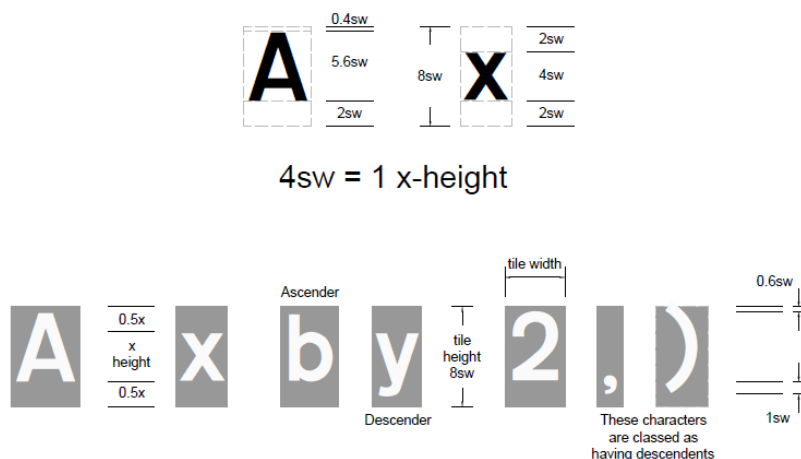
Tiles, X-Heights and Stroke Widths

To ensure correct letter spacing when forming a word, the alphabetical characters are placed on imaginary tiles. The tiles vary in width, according to the size of the character, and have a fixed height which ensures correct line spacing. All design spaces are measured to the edge of the tiles and not to the actual characters. Tile outlines must not appear on the finished sign.

The size of an alphabet is specified in terms of its **x-height**. This is the height of the lower case letter 'x'. The unit of measurement when designing a sign is the **stroke width (sw)** which is one quarter of the x-height and is not necessarily equivalent to the width of any given character. **The dimensions shown in all figures in this manual are given in stroke widths unless otherwise stated.**

The **tile height** is twice the x-height (i.e. 8sw). Thus for an x-height of 100mm the tile height is 200mm.

Figure 1, shows how the characters from the Transport Medium alphabet are placed on the tiles. It can be seen that the lower case letters without ascenders or descenders are centred vertically on the tiles, leaving an equal gap of 2 sw top and bottom. The capital letters and numerals are 5.6sw high, with a gap to the top of the tile of 0.4sw.



Light letters on dark backgrounds

Transport Medium Font

Figure 1

3 COMMON DESIGN RULES

Words and Vertical Spacing

Words are formed by butting the letter tiles together. The tile widths, have been designed to ensure the correct spacing of the letters.

The spacing between two words on the same line is 2.5 sw. When more than one destinations are shown in line and are on the same route, they are separated by a comma and followed by a 1.5sw space. If dates are to be shown, these are abbreviated as '15 Sept' or 'Feb 98' the spacing is 2.5sw. Some spacings may need to be reduced, to fit in desired sign size, keeping in mind to balance the overall design. See illustration in Figure no. 2

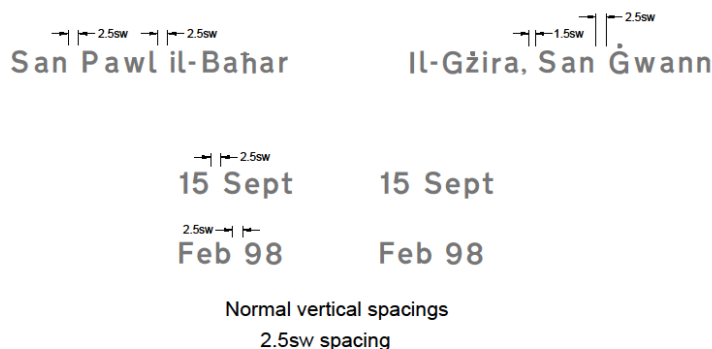


Figure 2

3 COMMON DESIGN RULES

Abbreviations

In some cases it may be desirable to abbreviate place names. An apostrophe is normally used to indicate where letters have been omitted. Generally, an abbreviated word should not use more than one apostrophe. Where the lower case letter 'b', 'h', 'k', or 'l' follows an apostrophe there should be a space of 0.5sw between the apostrophe and that letter. Where a word is expressed as a single letter it is followed by a full stop (this is to ensure that it is linked to the next part of the name without the two capital letters, such as S and P in S. Pawl, being too close together).

Examples of abbreviated place names, together with appropriate vertical spacings are shown in Figure 3.

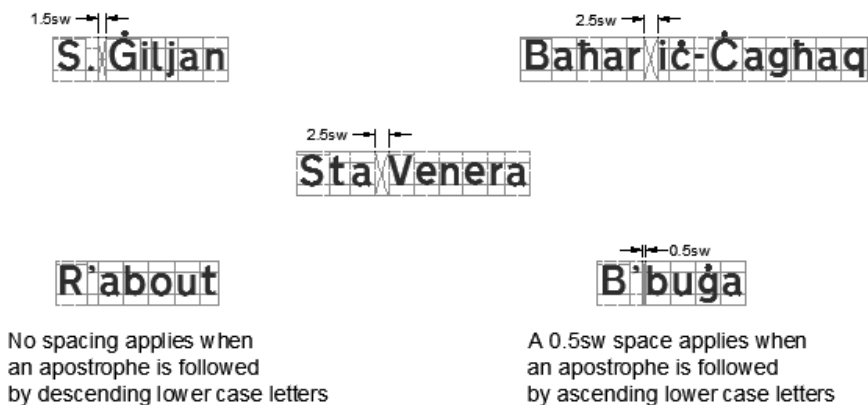


Figure 3

Basic Sign Design

The basic unit of measurement is the stroke width (sw), which is equal to one quarter of the x-height of the letters. As a general rule, the x-height on any one sign should be the same for all legends.

However, there are some designs where more than one x-height is used and in such cases the dimensions given in stroke widths will be based on the main x-height stated otherwise.

Dimensions are measured to the **tile outlines** and not to the actual letter. This also applies to any symbol shown with an outline tile or grid.

A horizontal space is normally inserted between the tiles. The 2.5sw vertical space helps to separate the two parts of the message/destination and make the sign easier to read. Correct horizontal spacing is important, it is the sign designer's equivalent of punctuation. Figure 4 illustrates samples of horizontal spacings.



Horizontal spacings

Figure 4

3 COMMON DESIGN RULES

Where the legend is in lower case letters, only the first word of each message will commence with a capital letter. Capital letters are used at the beginning of each word only where the words form a proper name. Examples are given in figure 5.

San Pawl il-Baħar

Buleben iż-żgħir

Figure 5

A standard border width of $1.5sw$ is to be adopted as the full surrounding perimeter of the overall sign plate size. A dividing line is to be included to separate each set of multi directional destinations, as illustrated in figure 6. The dividing line between each panel has the same width and corner radii as the main border.

Just to note, that signs as per Figure 6, with multi level change in direction signs, are not commonly to be in use, only for very limited areas or locations.



Border and Separator spacings

Figure 6

The overall size of a sign is determined by the chosen x-height. This will depend on the type of sign and in most cases, the speed limit of vehicles using the road. There is a range of standard x-heights from 30mm (for some waiting restriction time plates not intended to be read from moving vehicles) to 180mm. Directional informatory signs, have only minimum and maximum sizes given. In theory any intermediate value could be used, but it is recommended that the main x-height should be nearest 5mm.

4

DIRECTIONAL INFORMATORY SIGNS

GENERAL PRINCIPLES

Types of Directional Signs

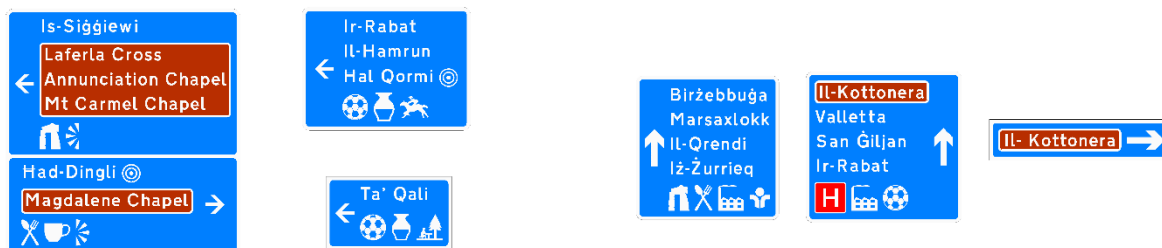
Directional informatory signs can be categorised as follows:

- (a) Direction Signs – those signs placed at a junction and pointing along specific routes. Mostly installed on build outs or islands at the start of the junction. Mostly known as Stack Type Signs.
- (b) Advance Direction Signs – those signs giving route information in respect of a junction ahead. These can be either post mounted or gantry mounted, and sited on the approach to the junctions to give drivers adequate advance warning. These can be either Map Type or Stack Type Signs.

Direction Signs must not be confused with Advance Direction Signs. Direction Signs are placed at the junction, post mounted, and point along the route shown on the sign. The most common type of direction sign is the Stack Type Sign showing a maximum number of 4 destinations and single bottom row of symbols. A single arrow will be pointing mainly to the left side. Only at certain circumstances, there may be an inclusion of another set of destinations showing at the opposite direction with a single right arrow.

Advance Direction Signs can be either post mounted or gantry mounted. Wherever possible, these are sited on the approach to the junctions indicated to give drivers adequate advance warning.

There are two types of post mounted signs: map type and stack type. An example of each is illustrated in figure 7.



Direction Stack Type

Advance Direction Stack Type



Advance Direction Map Type

Figure 7
Post Mounted Signs

4

DIRECTIONAL INFORMATORY SIGNS GENERAL PRINCIPLES

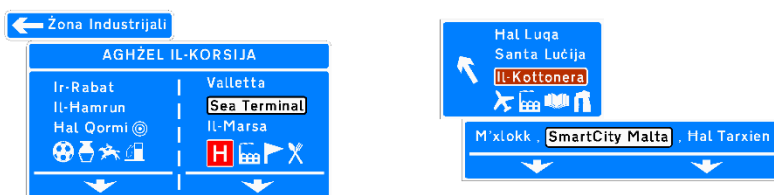
Gantry mounted signs are generally used to instruct drivers from a long distance, to prepare to select their desired route to reach their destination.

They are normally classified under the Advance Directional Signages.

These signs vary in design, as they are particularly designed to the required situation.

It is vitally important that the correct design is used for easy understanding by drivers.

An example of each sign is illustrated below in Figure 8.



Advance Direction Signs for Dedicated Lanes with attachment sign showing directions for junction ahead.
Combination of both Stack type and Single Line Directions.



Advance Direction Signs for a 5 lane road.
A combination of 2 types of signs to suit the required situation.
Dedicated Lane signs and Map Type sign.



Advance Direction Signs for Dedicated Lanes to select desired Destinations for preparation of Change in direction from existing driving route.



Advance Direction Stack type Signs for Individual Uni Directional Lanes

Figure 8

4 DIRECTIONAL INFORMATORY SIGNS

GENERAL PRINCIPLES

Basic Principles for Colour Coding

Colour coding is one of the most important aspects of directional sign design.

- * All road directional signs, are to have a blue background.
- Touristic destinations will incorporate a brown background, either stand alone signs or embedded in with other destinations on a common multi destination sign. The descriptions on these two colours is to be white in colour.
- * General Warning signs will have a yellow background with black lettered characters and symbols.
- * Road names signs are to have a white background with a black border and black lettered characters and symbols. Infrastructure Malta road names will include the IM logo, specifying that this such road falls under the responsibility of Infrastructure Malta.
- * Pedestrian Informative Signs vary in the background, lettered characters and symbols. All General Public destinations are to be in Blue background with White border, letters and symbols. 3rd Party destinations are to be in a White Background with Black border, letters and symbols. Normally, a Pedestrian Informative Sign, will have an 'x' height between 30mm and 50mm. In certain circumstances, these signs can be included to be read by Drivers, and in this case, their 'x' height is increased based on the speed limit of the road.

An example of each sign is illustrated below in Figure 9.

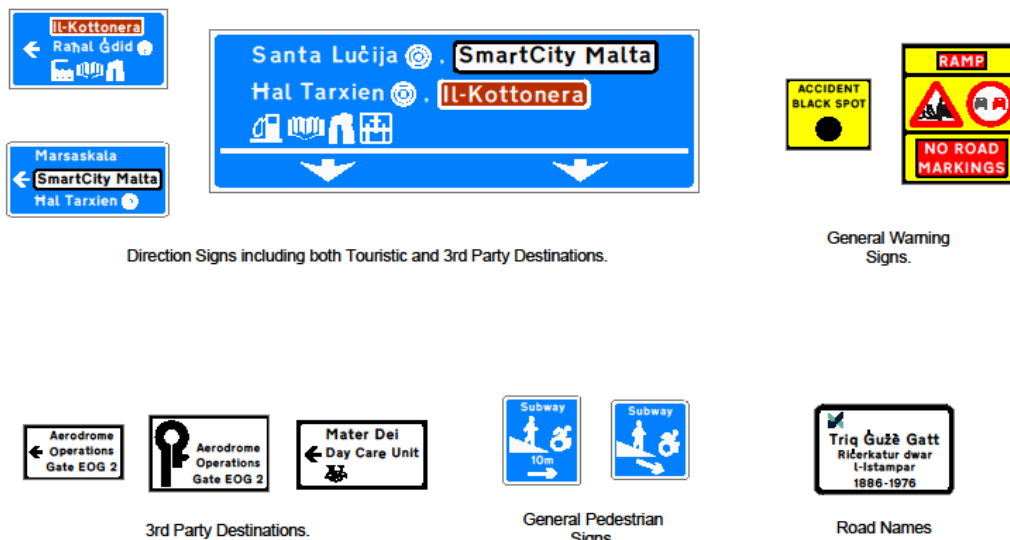


Figure 9

DIRECTIONAL INFORMATORY SIGNS

GENERAL PRINCIPLES

Horizontal Positioning of Symbols (Pictograms).

As illustrated in figure 10, a symbol which also represents a location, is normally centred horizontally alongside the end tiles of a legend, as they vary in their size, to produce a descent design, On a simple sign this has the effect of centring the symbol horizontally between the top and bottom borders whilst maintaining the correct vertical spacing for the legend tiles. The minimum horizontal space between the symbol and the sign borders is 2.5sw.

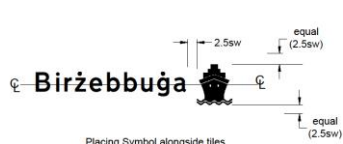


Figure 10

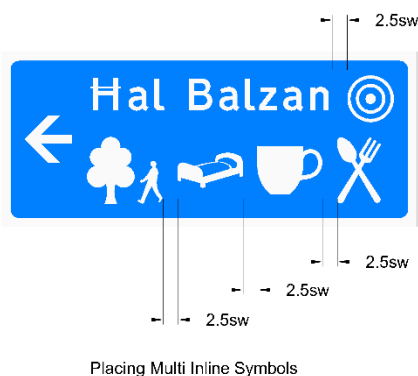


Figure 10.1



Figure 10.2

**Note: Dimensions indicated are based on 'x' height 100mm
They vary proportionally according the required 'x' heights .**

As symbols represent various locations, which can be reached along the same route, they can be placed either at the end of a destination, which will represent a location within the same particular destination shown. Multi symbols are normally placed horizontally inline, besides each other, under the single destination, or under the bottom destination when more than one is shown. with the space between each symbol of 2.5sw.

Normally on Stack type signs, the most common symbol, representing the Village or City Centre of the shown destination, is positioned vertically inline at the far end. See example in figure 10.1.

On Map type signs, the first symbol may vary in positioning, and therefore it will be positioned to suit the best design, whilst all the other remain positioned inline with equal spacings .See example in Figure 10.2.

4

DIRECTIONAL INFORMATORY SIGNS

GENERAL PRINCIPLES

Full set of Common Symbols and their meanings – Possibility of more symbols to be included, as per required. Below Figure 10.3.

An amount of symbols, shown below (paired) in mirror imaged, can be reversed and positioned in relation to the pointed arrow leading to the equivalent direction.



Figure 10.3

5 STACK TYPE ADVANCE DIRECTION SIGNS

General Design Considerations

Stack Type Advance signs are to notify drivers to keep on driving to the same direction, as clearly shown by the length of the arrow, which is longer than a Junction Arrow. There is some flexibility in the design of Stack type Advance signs. These signs are designed to accommodate a single lane or multi lanes roads within the same direction. Figures 11 and 11.1, illustrate alternative layouts for the same junction.



Centrally Positioned Identical Advanced Arrow Signs

Figure 11



Combination of Advanced Arrow Signs together with Dedicated Lane Arrow Sign

Figure 11.1

Figure 11 is an inline set of stack type Advance signs with a common Advance Arrow, covering a 3 lane network with particular destinations for each lane. This layout is normally shown within locations where the three lanes remain inline for a good amount of clear length.

Figure 11.1, which as easily noticed, includes the same exact locations as Figure 11, with a variety of Advance arrows. This design identifies each lane in a particular manner as there is a short time for drivers to select their preferred lane, where each lane includes a change in direction, thus the Arrows are positioned in a much easier and faster to understand manner. The Left arrow sign instructs drivers to select the Left Lane, the Right arrow sign instructs the driver to select the Right Lane, whilst the Down pointing Centre arrow, normally shown in Dedicated Lane Signs but is also a member of the Advance Directional Signages, instructs drivers to select the Centre Lane. Design wise, the 3 signages remain of the same sizes with the same 'x' height.

5 STACK TYPE ADVANCE DIRECTION SIGNS

Design of a simple Stack Type sign

The simplest type of stack type sign is one that indicates a single route, as shown in Figure 11.2. The legend tiles will normally be of equal size, $2.5sw$ from the top and bottom border. Signs shows how a stack type sign is designed to accommodate a single line legend with an arrow pointing at the direction in relation to the upcoming road design. Both the arrow and the panel are centred vertically on the sign. Figure 11.3 shows the design of a sign with a Touristic legend panel insert.

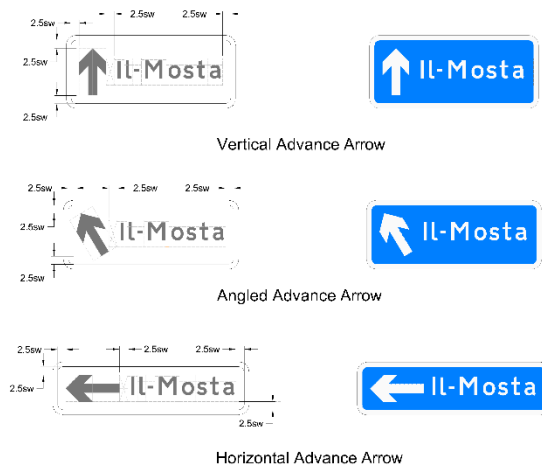


Figure 11.2

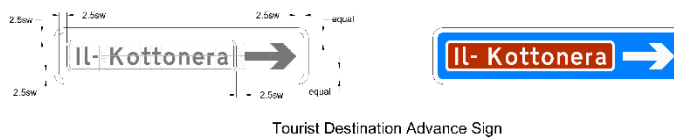
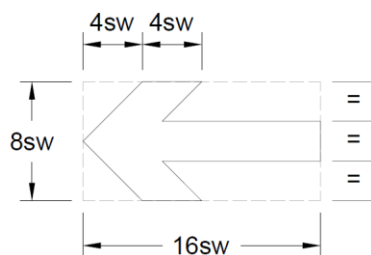


Figure 11.3

5 STACK TYPE ADVANCE DIRECTION SIGNS

The design of the arrow is shown in Figure 11.4. The length of 14sw has been determined as the best and unique length, to be used for all Advance Directional Signages.



Standard Arrow

Figure 11.4

Figure 11.5 shows how the arrow may be inclined to suit the direction being indicated. Arrows may be vertical or horizontal or at any angle between increments of 22.5°. Arrows shown in broken outline are used only in special circumstances. A special arrow may be used to indicate U-turns (e.g. at a roundabout on a dual carriageway).

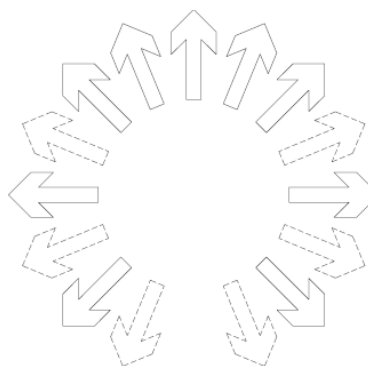


Figure 11.5

Where a sign has more than one direction panel, as shown in Figure 11.6, the arrows should indicate the general direction of the individual route and ideally be at least 45° apart. Most junction layouts can be signed using the arrows shown with a continuous outline as in Figure 11.5.



This sign may reflect the true layout of the junction, but the two arrows are only 22.5° apart



This arrangement is preferred as the two arrows are 45° apart and give clearer indication of the turning movements at the junction ahead

Figure 11.6

5 STACK TYPE ADVANCE DIRECTION SIGNS

Placing of symbols.

Many symbols have a directional element to their design. Just to mention the Airplane symbol. If the arrow is pointing ahead or left (at any angle) the symbol should face left, otherwise the symbol should face right. The aircraft symbol should be rotated to point in the same direction as the arrow, except that the symbol should never point below the horizontal. Where the arrow inclines downwards the aircraft symbol should be horizontal, facing left or right as appropriate. Figure 11.7 shows how an inclined aircraft symbol is positioned alongside a tiled legend. All symbols are to be without a border. The Only symbol indicated with an external border is the Hospital symbol. As the only hospital in Malta which settles Emergency cases is Mater Dei, and this is a Public hospital, then the background of the Hospital symbol is to be in Red. This symbol will be included to as many signs possible as it is of an utmost importance, infact as a Common Rule, it is to be patched first in line to the left side of all following symbols, and it is of a bigger size.

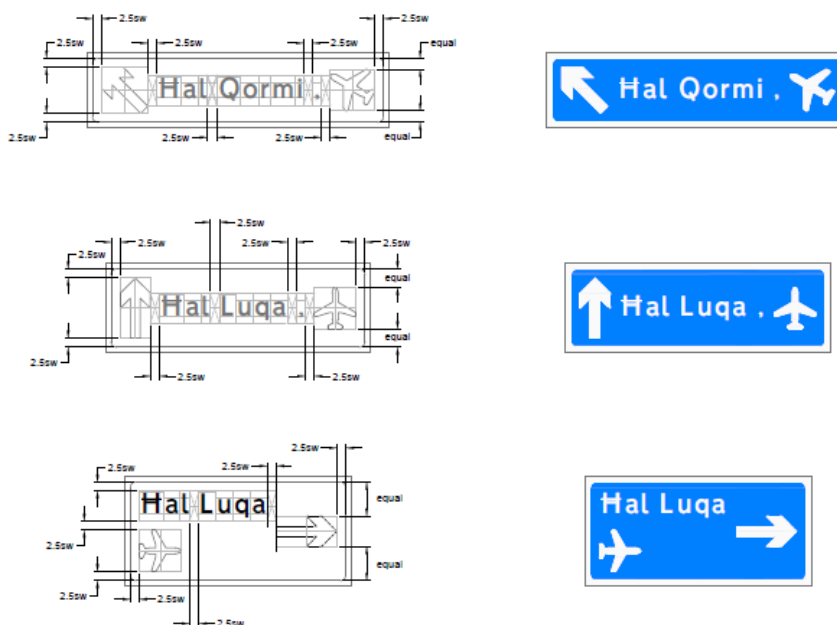


Figure 11.7

5 STACK TYPE ADVANCE DIRECTION SIGNS

Complex Stack Type Sign Design

The general order in which directions are indicated in a complex stack type sign, as shown in Figure 19, is as follows:

- Ahead destination with vertical arrow on left hand side of destination block.
- Destinations to the left with the arrow to the left of the destination block. Where more than one left turn is shown the order from top to bottom is **anti-clockwise**.
- Destinations to the right with the arrow to the right of the destination block. Where more than one right turn is shown the order from top to bottom is **clockwise**.

As a normal rule, signs are to be fitted on the left hand side of the carriageway of each driving direction. But, at certain circumstances, there may be need that signs be fitted on the right hand side of a carriageway. Therefore only the Vertical arrow is to be reversed to the side of the passing by vehicles. This can be clearly noticed in the 3rd sign of Figure 19.

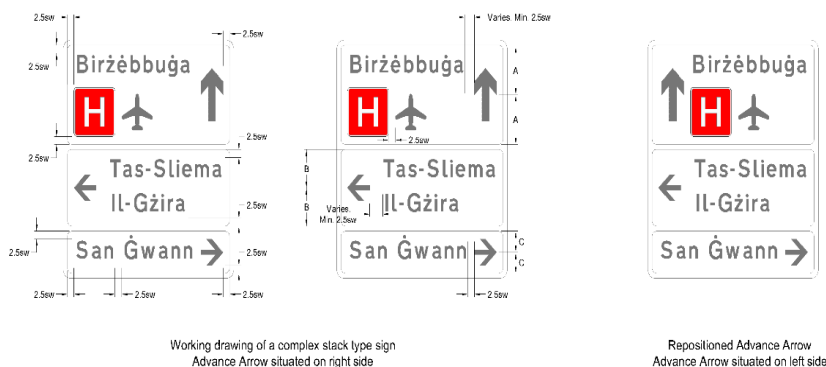


Figure 19

6 RETROREFLECTIVITY

Retroreflectivity is a Critical Factor in Road Safety

It is the measure of efficiency of a road sign. It is an optical phenomenon, whereby a surface returns light to its original source. The Unique retroreflective sheetings being used for Road Directional Signages, are only available as Prismatic Material which have the highest grade of reflective performance classified as RA3.

With a road sign, the light from a car's headlights is returned back to the source, so the driver, who is closest to the light source, experiences the sign's brightness.

This enables motorists to see road and traffic signs more clearly in conditions of low light or at night time.

There are various elements which determine how visible a retroreflective surface is. These include its Luminance, which is how much light the driver will receive from it, and the Contrast between the light from the sign and the light from its surroundings.

Retroreflection determines the Performance of a traffic sign, more than its appearance. While a sign may not have visibility deteriorated, the quality of its retroreflectivity may have degraded, making it less effective for road safety.

The signs reflectivity is measured prior installation, normally by a hand held Retroreflectometer. All colours are tested except the Black which is not a reflected colour. The most reflected colour is White, and therefore the measured readings vary accordingly for each colour, the White being the highest reading value.


The recommended time period for testing is 10 years after initial installation, then every 2 years after that.

All readings are based on standard EN12899 Part 1 2007.

Below, Figure 20, is a Typical Illustrative, Reflectivity Test Result of a normal road directional sign, provided by one of the local Accredited laboratories.

6 RETROREFLECTIVITY

Below, Figure 20, are 3 signages, implemented by 3 individually local contractors, and tested by the same local laboratory, MCCA.



MCCA
MCA LABORATORY Sdn Bhd
F22, Moss Technopark,
Moss, KST 1000
Tel: (+65) 2149016

Sample No:	224372	1
Project No:	CM11214	
Project:	IR59121	


**Fixed, Vertical Road Traffic Signs
Coefficient of Retroreflection RA
In-House Procedure SM 058 based on EN 12899 Part 1 2007**

Scheme / Site: Traffic Management and Road Safety

Client: [Redacted] Date/Time Sampled: 20/09/2022 10:30
Location: [Redacted] Date of Request: 13/06/2022

Road Sign Type: Fixed, Vertical Road Traffic Signs Sign Surface condition: New
Reflective Film Type: Class 03 Where test performed: Site
Source / Contractor: [Redacted] Weather Condition: Sunny

The above data is provided by the client, if sample is provided by the client the results apply to the sample received.
Equipment Type: Zolnirca ZRS 5060 CEV/4050/060 Deviation from standard: Nil Operator: [Redacted]
Ambient Temperature: °C 27 Air Humidity (%): 42 Illumination angle β : 5°

Date / Time Tested	Measurements Number	Observation Angle / Illumination (cd/m²)			Colour Area Tested	Road Sign Tested
		0.3°	0.8°	1.0°		
20/06/2022 09:50:50	1	17.5	615.9	100.4	White	
20/06/2022 09:51:56		92.5	247.7	81.1	White	
20/06/2022 09:51:47		912.5	541.0	75.3	White	
20/06/2022 09:51:16		45.3	16.3	2.2	Blue	
20/06/2022 09:51:21		35.7	11.5	2.6	Blue	
20/06/2022 09:51:32		52.5	45.7	9	Blue	
20/06/2022 09:51:37		197.3	117.3	25.2	Red	
20/06/2022 09:51:43		178	113.8	23.1	Red	
20/06/2022 09:51:52		170.7	108.7	24.4	Red	
					Red	


Road sign Ref No: BML-Sun Pind 02
Approximate GPS position (±1.0m)
WGS84 Datum* N/A

Remarks: * Global Positioning System.

Client Name: Infrastruckce Mulu
F.A.O. [Redacted]
Road Safety Implementation Unit
Directional Signs Section
Vial L.A.A. Corridor, Lagan
IQA 8023

MCCA - CM1 - Laboratory Services, Photo Analysis and Signatures - Digitally Signed
Date: 21/06/22

MCCA Ref: 03188 F3022704 Page 1 of 5
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MCCA
MCA LABORATORY Sdn Bhd
F22, Moss Technopark,
Moss, KST 1000
Tel: (+65) 2149016

Sample No:	225117	1
Project No:	CM11214	
Project:	IR03121	


**Fixed, Vertical Road Traffic Signs
Coefficient of Retroreflection RA
In-House Procedure SM 058 based on EN 12899 Part 1 2007**

Scheme / Site: Traffic Management and Road Safety

Client: [Redacted] Date/Time Sampled: 23/04/2022 11:30
Location: [Redacted] Date of Request: 03/08/2022

Road Sign Type: Fixed, Vertical Road Traffic Signs Sign Surface condition: New
Reflective Film Type: N/A Where test performed: Site
Source / Contractor: NKKOKK Weather Condition: Sunny

The above data is provided by the client, if sample is provided by the client the results apply to the sample received.
Equipment Type: Zolnirca ZRS 5060 CEV/4050/060 Deviation from standard: Nil Operator: [Redacted]
Ambient Temperature: °C 29 Air Humidity (%): 86 Illumination angle β : 5°

Date / Time Tested	Measurements Number	Observation Angle / Illumination (cd/m²)			Colour Area Tested	Road Sign Tested
		0.3°	0.8°	1.0°		
23/02/2022 11:30	1	379.1	349.7	57.9	White	
24/02/2022 11:34	2	615.7	561.6	101.4	White	
24/02/2022 11:31	3	360.7	355.9	99.6	White	
24/02/2022 11:31	1	35.4	39	3.1	Blue	
24/02/2022 11:31	2	55.2	52.4	5.8	Blue	
24/02/2022 11:31	3	50.5	47.5	3.5	Blue	
24/02/2022 11:32	1	23.8	22.7	10.2	Blue	
24/02/2022 11:32	2	28	21.7	10.5	Blue	
24/02/2022 11:32	3	31.2	34	6	Blue	
					Blue	


Road sign Ref No: N/A
Approximate GPS position (±1.0m)
WGS84 Datum* N/A

Remarks: * Global Positioning System.

Client Name: Infrastruckce Mulu
F.A.O. [Redacted]
Road Safety Implementation Unit
Directional Signs Section
Vial L.A.A. Corridor, Lagan
IQA 8023

MCCA - CM1 - Laboratory Services, Photo Analysis and Signatures - Digitally Signed
Date: 21/06/22

MCCA Ref: 03188 F3022704 Page 1 of 5
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MCCA
MCA LABORATORY Sdn Bhd
F22, Moss Technopark,
Moss, KST 1000
Tel: (+65) 2149016

Sample No:	231706	1
Project No:	CM11214	
Project:	IR03104065	


**Fixed, Vertical Road Traffic Signs
Coefficient of Retroreflection RA
In-House Procedure SM 058 based on EN 12899 Part 1 2007**

Scheme / Site: Road Safety Implementation Unit

Client: Infrastruckce Mulu Date/Time Sampled: 09/12/2021 09:45
Location: [Redacted] Date of Request: 03/08/2021

Road Sign Type: Fixed, Vertical Road Traffic Signs Sign Surface condition: New
Reflective Film Type: Class EA2 Where test performed: Workshop
Source / Contractor: [Redacted] Weather Condition: N/A

The above data is provided by the client, if sample is provided by the client the results apply to the sample received.
Equipment Type: Zolnirca ZRS 6050 CEV/4030/060 Deviation from standard: Nil Operator: [Redacted]
Ambient Temperature: °C 19 Air Humidity (%): 59 Illumination angle β : 5°

Date / Time Tested	Measurements Number	Observation Angle / Illumination (cd/m²)			Colour Area Tested	Road Sign Tested
		0.3°	0.8°	1.0°		
09/12/2021	1	52	47.7	19.1	Blue	
09/12/2021	1	81.7	76.7	41.2	Red	
09/12/2021	1	472	398.3	56.1	White	
					White	

Road sign Ref No: BML-IR03 PINDO-003
Approximate GPS position (±1.0m)
WGS84 Datum* N/A

Remarks: * Global Positioning System.

Client Name: Infrastruckce Mulu
F.A.O. [Redacted]
Road Safety Implementation Unit
Directional Signs Section
Vial L.A.A. Corridor, Lagan
IQA 8023

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Date: 21/06/22

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Figure 20
Typical Illustrative Test Results

7 INSTALLATION AND MOUNTING DETAILS

Post Mounted Signages

Installation of post mounted signages is to be of high quality with a solid foundation. Sign posts should be secured in the ground. Foundations are dug in ground and posts are placed in the dugged hole/s, and positioned vertically with the means of a spirit level, whilst pouring concrete mixture within the hole/s and securing the posts.

Prior installation signs on footpaths, some brief calculations are necessary to clarify that the appropriate Clear Width of Minimum 1.2m is adaptable between the 2 parallel vertical poles, for easy access of wheel chair users. To achieve this, the best recommended signplate width cannot be less than 2.2m, to which the 1.2m Clear Width can be achieved as per details below. The footpath needs to be wide enough to allow the full installation without any obstacles to drivers and pedestrians. But there may be circumstances where the posts are fitted to the far ends of the signplate edges, to achieve the most important Clear Width of 1.2m between the 2 posts.

As a Common Rule, the Clear Height for signs installed on footpaths for pedestrians use, is to be 2.4m. For signs to be installed on islands or areas where no pedestrians have access to, the Clear Heights of these signages are to be 1.2m. See Figure 21a.

POST MOUNTED SIGNAGES



Figure 21a

7 INSTALLATION AND MOUNTING DETAILS

Gantry Mounted Signages

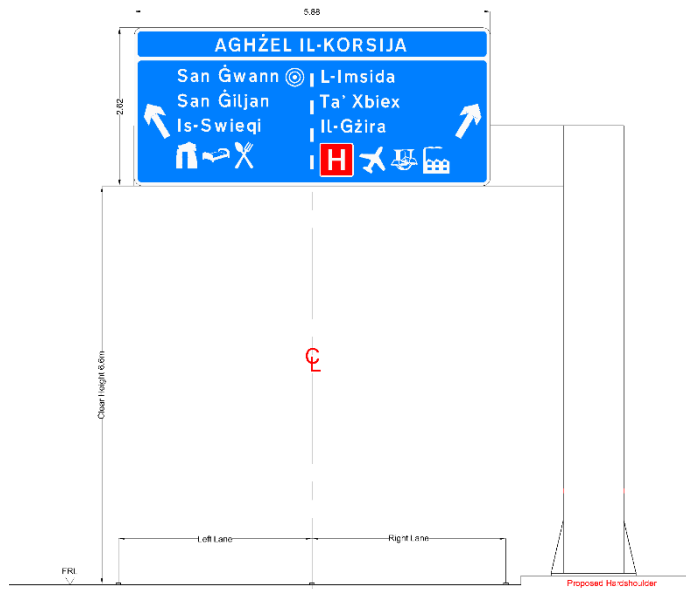
There are 2 types of Gantry Structures. Portal Structures and Cantilever Structures.

Both these structures are designed by a Perit (Architect & Civil Engineer).

These structures are designed with relation to the amount of lanes and sizes of designed signages, representing each lane, which are to be installed on these structures.

The signages are to be mounted securely to each structure, by aligning the destination characters Over each particular lane width. Normally for signplates including dedicated lane arrows, facing downwards, the arrows are positioned centrally inline with each particular lane width.

The most importance is the Clear Height from the bottom edge of the signplate to the top level of the asphalt, to be 6.6m. See Figure 22.



Sign mounted centrally over 2 lane widths

Figure 22.

Cantilever Gantry Structure

8 MAINTENANCE AND CLEANING OF SIGNAGES

All Traffic and Directional Signages should be cleaned frequently to avoid any build up of vegetation or dirt on the sign face.

The cleaning instructions of the sign face or retroreflective sheeting shall be followed to ensure that cleaning methods and materials do not cause damaged to the sign face, as these can be damaged by inappropriate cleaning with abrasive materials.

Where signs with a dew resistant overlay require cleaning, only clean water from a low-pressure hose shall be used unless alternative cleaning methods and materials are permitted by the supplier's cleaning instructions.

All Road Directional Signages, include an Anti Graffiti Film, which is the Final Sticker attached overall on all the other printed stickers. This film protects the signages' artwork from anti graffiti vandalism and helps for better cleaning of the signplate.

Normally these signages are being cleaned periodically



06/05/2024