



AZIN RAH SHARGH Engineering Co.

# A guideline to executional aspects of traffic engineering





**AZIN RAH SHARGH**

## **A guideline to executional aspects of traffic engineering**

|   | page      |
|---|-----------|
| <b>INTRODUCTION</b>                                       | <b>A</b>  |
| <b>A SHORT INTRODUCTION TO AZIN RAH SHARGH CO</b>         | <b>1</b>  |
| <b>TYPE OF RETRORFLECTIVE SHEETINGS</b>                   | <b>6</b>  |
| <b>PRODUCT LIST</b>                                       | <b>15</b> |
| 1-DISCIPLINARY, WARNING & INFORMATION SIGHNS              | 16        |
| 2-ROUTE GUIDASNCE OR INFORMATORY SIGN                     | 20        |
| 3-ROUTE GUIDANCE SIGHNS IN ROAD WORKS                     | 28        |
| 4-STREET NAME SIGNS                                       | 30        |
| 5-GUIDANCE SIGNS TO CITY ATTRACTIONS & DESTIONS           | 31        |
| 6-SIGN POST FOR DISCIPLINARY,GUIDANCE & STREET NAME SIGNS | 31        |
| <b>GUARDRAIL,POST&amp;IMPACT ABSORBER</b>                 | <b>36</b> |
| <b>MANUFACTURING &amp; ASSEMBLING LINE MACHINERIES</b>    | <b>42</b> |
| <b>SUBJECTIVE CLASSIFICATINON OF TRAFFIC SIGNS</b>        | <b>51</b> |

**AZIN RAH SHARGH**



## INTRODUCTION

The importance of safety & reduction of accident fatalities is a well known fact & moving towards this aim is a national duty to all, especially the authorities & academic people of the transport industry. Many of the safety parameters are achievable by customary & simple solutions & they are sometimes left ignored because of their mere simplicity.

In this abstract text, our company is introduced & application principles of different types of safety equipment are explained on a scientific basis so that the text bears more of a scientific value rather than business weight.

We hereby request the readers to inform us of any probable deficits in this text, so that they can be corrected in the later versions.

**AZIN RAH SHARGH Co.**  
**Mohammad mehdi kabiri**

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## A SHORT INTRODUCTION TO AZIN RAH SHARGH CO.

Azin Rah Shargh Co. was established in 2002 after much related experience in this field. The company is active in three main fields, namely:

- 1- Consultancy on preparation of documents for purchase of traffic equipment & supervision on their quality.
- 2- Engineering studies on road & urban safety
- 3- Manufacturing of traffic signs & safety equipment.

### *Details of these services are as follows:*

- *Engineering studies for road, railway, airport, parking spaces & private facilities.*
- *Safety engineering studies for roads, design of safety & traffic control equipment ( signs, informatary signs, pavement makings, intelligent control equipment, etc.)*
- *Engineering studies & design for safety & intelligent control equipment & geometrical design of roads.*
- *Environmental & air pollution control studies with respect to transportation.*
- *Engineering studies for urban furniture & design of related equipment.*
- *Consultancy on preparation of tender documents & manufacturing & execution of traffic safety related projects.*
- *Consultancy & monitoring on purchase, manufacture & installation of traffic safety equipment.*
- *Preparation of drafts for traffic safety instructions & regulations.*
- *Conduction of workshops, seminars & field tours related to traffic safety.*
- *Provision of application softwares related to traffic safety.*
- *Import of measuring & other types of equipment for traffic safety.*
- *Field studies & collection of road data & determination of deficits by using most advanced systems of GPS, CCTV & wheel measurements.*



## CURRICULUM VITAE OF COMPANY MANAGERS

Mr. Mohammad Mehdi Kabiri, managing director, holding a B,Sc. Degree in control & precision instruments (faculty of electrical engineering) from Isfahan industrial university. His work experience includes the head of project for Tehran traffic closed circuit monitoring system (phase 1 for 50 cameras), vice manager of Tehran traffic & transportation organization (one year), managing director of ORFIRAN (5 years) which is the subsidiary company to Tehran municipality for traffic safety equipment, consultant to the general directorate for road safety, ministry of transport, member of the committee for revision of regulations of road signs of Iran & some other training in the field of traffic & road safety. During his management in ORFIRAN, there happened great changes in Tehran & some other cities in the field of manufacture & installation of traffic signs & equipment, so that was echoed by the mass media during the summit of the heads of the Islamic countries in Tehran.



Making metal moulds of high quality is expertise of the company managers & it can be said that in this field, technical services of our company are the best among all Iranian companies active in the field of traffic signs.

Other managers of the company have their own expertise in the field of design of traffic signs & metal & plastic moulds.



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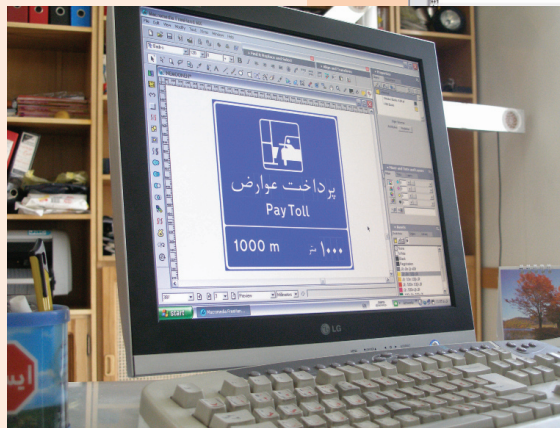
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## DESIGN OF ROUTE GUIDANCE SIGNS

Design of route informatory signs is a very specialized field. Technical personal of this company have complete mastership in this field so that many clients count on our company to execute their projects.



## ROAD DATA COLLECTION SYSTEM & TRAFFIC ENGINEERING STUDIES

Our innovation in design of a new system for road data collection has provided a stable ground for provision of new road safety measures .this system films the road & geographic coordinates & distance from the starting point is simultaneously depicted on the screen. This information is later reviewed in the office with peace of mind & related studies are done.



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## ARTICLES & CONNECTIONS WITH SCIENTIFIC CENTRES

Continuous presence in the international traffic exhibitions such as Intertraffic in the Netherlands, Traffex in the UK, exhibitions in Dubai, Turkey & China, is a fixed part of the schedule of the company's managers.

Acquiring new ideas & turning them into local experiences is a good experience of our managers. Our articles in the traffic news journal of Tehran traffic organization is a measure of our interest in the technical & scientific fields.

## COMPANY CLIENTS

Due to the diversity of our services, we have a diversity of clients as well. General directorates of roads in different provinces are among our clients for traffic studies & road signs. Municipalities of Tehran & other cities are among our constant clients for different kinds of signs & services. Contractors for road & bridge construction & maintenance are our clients for studies & safety measures. Nearly all the procedures of feasibility studies, design, monitoring & purchase of traffic equipment for these clients are done by our personnel. Fortunately our clients keep introducing our company to each other & other clients & we are proud to have such understanding clients.



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## COMPANY PRODUCTS & RAW MATERIAL USED

Company products are introduced in detail in other parts of this booklet. Different types of warning, disciplinary, route information, road works & street name signs are among our products of which over 95% of manufacturing procedures are carried out in our factories.

we also manufacture guardrails & head & tail parts & impact absorbers & accessories which are considered as new products in the Islamic Republic Of Iran.

procurement of other traffic products such as Cat Eyes, Road bumps, Traffic lights, etc., are done though our local partners or by import from abroad.



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## TYPE OF RETROFLECTIVE SHEETINGS

|  |    |
|--|----|
| Sheetings used in disciplinary & informatory signs                     | 7  |
| Classification of retroreflective sheetings as per ASTM D4956 Standard | 8  |
| 7 year Engineer Grade Sheetings(EGS)                                   | 9  |
| 10 year High Intensity Sheetings (HI)                                  | 10 |
| Diamond Grade (DI)   | 11 |
| Comparison of Engineer Grade & High Intensity Grade Sheetings          | 12 |



## Sheetings used in disciplinary & informatory signs

The main & most specific part of the sign is its retroreflective sheetings. Since some of the trips are made during dark hours, signs must be lighted to be visible by the drivers.

External lighting is expensive & sometimes impossible. Our sheetings are as per ASTM D4956 Standard for which the minimum reflection values are given later in detail.

Retroreflective sheetings are a sheet of PVC in which glass beads (spherical) are placed in a certain order. The light of the head lamps of the vehicle enter these beads which is reflected back to the driver's eye thereby enabling him to read & see the wording or message on the sign.

Retroreflective sheetings are classified as per the level of the reflected light. The value of the reflected light is given by the manufacturer & also measurable by a reflectometer.

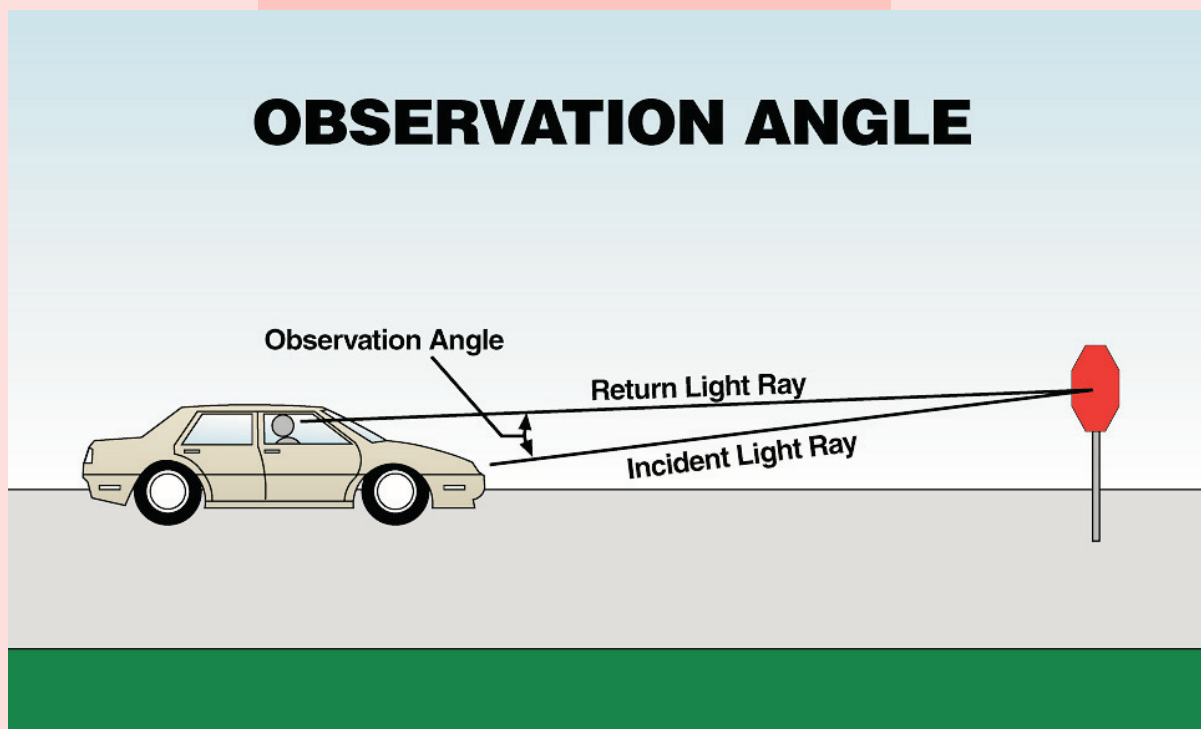
White colour has the highest value & brown the lowest value & black has no reflection at all.

As per ASTM D4956 standard, 9 classes of retroreflective sheetings exist (for more information, refer to our website in English). Three of these have a more common consumption, namely:

- 1 – 7 year Engineer Grade (EGS)
- 2 – 10 year High Intensity Grade (HI)
- 3 – Diamond Grade (DI)

At present, sheeting's manufactured by 3M, Avery, Kiwalite & Nikalite are as per ASTM & accepted by the ministry of road & transportation.

Classification of retrorefeective sheetings as per ASTM D4956



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**Classification of retroreflective sheetings as per ASTM D4956**

| Observation angle | Entrance angle | White | Yellow | Orange | Green | Red | Blue | Brown |
|-------------------|----------------|-------|--------|--------|-------|-----|------|-------|
| <b>TYPE I</b>     |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 70    | 50     | 25     | 9.0   | 14  | 4.0  | 1.0   |
| 0.2               | 30             | 30    | 22     | 7.0    | 3.5   | 6.0 | 1.7  | 0.3   |
| 0.5               | -4             | 30    | 25     | 13     | 4.5   | 7.5 | 2.0  | 0.3   |
| 0.5               | 30             | 15    | 13     | 4.0    | 2.2   | 3.0 | 0.8  | 0.2   |
| <b>TYPE II</b>    |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 30    | 100    | 60     | 30    | 30  | 10   | 5.0   |
| 0.2               | 30             | 60    | 36     | 22     | 10    | 12  | 4.0  | 5.0   |
| 0.5               | -4             | 50    | 33     | 20     | 9.0   | 10  | 3.0  | 2.0   |
| 0.5               | 30             | 28    | 20     | 12     | 6.0   | 6.0 | 2.0  | 1.0   |
| <b>TYPE III</b>   |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 250   | 170    | 100    | 45    | 15  | 20   | 12    |
| 0.2               | 30             | 150   | 100    | 60     | 25    | 25  | 11   | 8.5   |
| 0.5               | -4             | 95    | 62     | 30     | 15    | 15  | 7.5  | 3.5   |
| 0.5               | 30             | 65    | 45     | 25     | 10    | 10  | 5.0  | 3.5   |
| <b>TYPE IV</b>    |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 250   | 170    | 100    | 35    | 35  | 20   | 7.0   |
| 0.2               | 30             | 80    | 54     | 34     | 9     | 9   | 5.0  | 2.0   |
| 0.5               | -4             | 135   | 100    | 64     | 17    | 17  | 10.0 | 4.0   |
| 0.5               | 30             | 55    | 37     | 22     | 6.5   | 6.5 | 3.5  | 1.4   |
| <b>TYPE V</b>     |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 700   | 470    | 280    | 120   | 120 | 56   |       |
| 0.2               | 30             | 400   | 270    | 160    | 72    | 72  | 32   |       |
| 0.5               | -4             | 160   | 110    | 64     | 28    | 28  | 13   |       |
| 0.5               | 30             | 75    | 51     | 30     | 13    | 13  | 6.0  |       |
| <b>TYPE VI</b>    |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 250   | 170    | 70     | 30    | 35  | 20   |       |
| 0.2               | 30             | 95    | 64     | 26     | 11    | 13  | 7.6  |       |
| 0.5               | -4             | 200   | 136    | 56     | 24    | 28  | 18   |       |
| 0.5               | 30             | 60    | 40     | 17     | 7.2   | 8.4 | 4.8  |       |
| <b>TYPE VII</b>   |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 750   | 560    | 280    | 75    | 150 | 34   |       |
| 0.2               | 30             | 430   | 320    | 160    | 43    | 86  | 20   |       |
| 0.5               | -4             | 240   | 180    | 90     | 24    | 48  | 11   |       |
| 0.5               | 30             | 135   | 100    | 50     | 14    | 27  | 6    |       |
| <b>TYPE VIII</b>  |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 700   | 525    | 265    | 70    | 105 | 42   | 21    |
| 0.2               | 30             | 325   | 245    | 120    | 33    | 94  | 20   | 10    |
| 0.5               | -4             | 250   | 190    | 94     | 25    | 38  | 15   | 7.5   |
| 0.5               | 30             | 115   | 86     | 43     | 12    | 17  | 17   | 3.5   |
| <b>TYPE IX</b>    |                |       |        |        |       |     |      |       |
| 0.2               | -4             | 380   | 285    | 145    | 38    | 76  | 17   |       |
| 0.2               | 30             | 215   | 162    | 82     | 22    | 43  | 10   |       |
| 0.5               | -4             | 240   | 180    | 90     | 24    | 48  | 11   |       |
| 0.5               | 30             | 135   | 100    | 50     | 14    | 27  | 6    |       |

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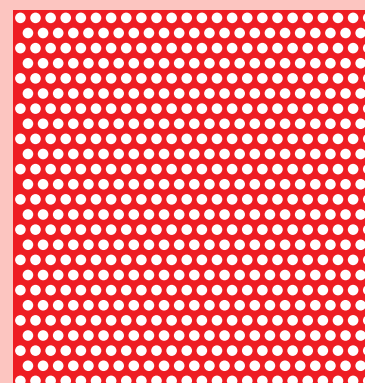
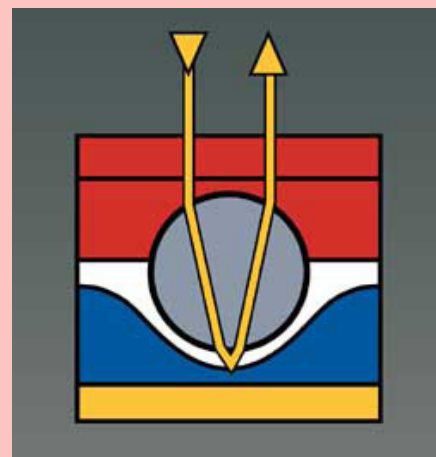
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## 7 Year Engineer Grade Sheetings

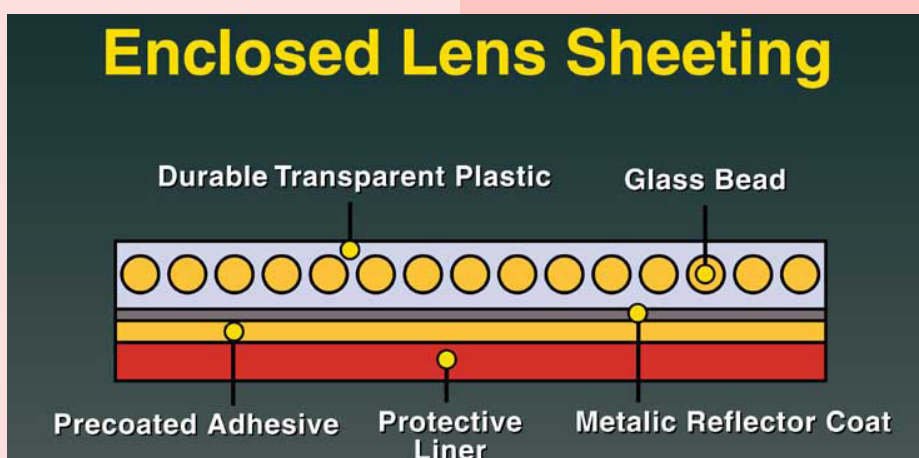
These sheetings are widely used in disciplinary & informatory signs. Minimum reflection value of white sheets are 70 candelas at start & maximum usable life is 7 years. In other words white sheetings have less than 35 candelas reflection when their usable life is finished & this statistically happens in year seven but it should be noted that in areas with high occurrence of sand storms this life decreases, sometimes up to a half. Most of the existing signs in Iran and other countries have used this type of sheetings.



**Minimum reflection values of different colours of Engineer Grade material as per ASTM D4956 TYPE I- CLASS 1- STANDARD**

| Unit (degrees)    |                | Unit (Cd/ Lux/ M <sup>2</sup> ) |        |     |       |      |       |
|-------------------|----------------|---------------------------------|--------|-----|-------|------|-------|
| Observation Angle | Entrance Angle | White                           | Yellow | Red | Green | Blue | Brown |
| 0.2               | -4             | 70                              | 50     | 14  | 9     | 4    | 1     |
| 0.2               | 30             | 30                              | 22     | 6   | 3.5   | 1.7  | 0.3   |
| 0.5               | -4             | 30                              | 25     | 7.5 | 4.5   | 2    | 0.3   |
| 0.5               | 30             | 15                              | 13     | 3   | 2     | 0.8  | 0.2   |

## Enclosed Lens Sheetting



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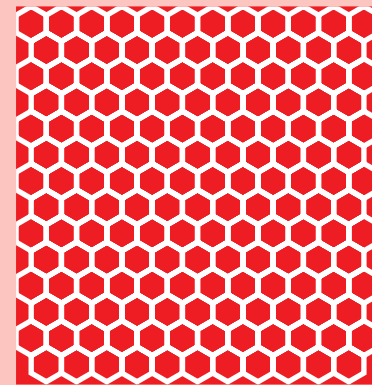
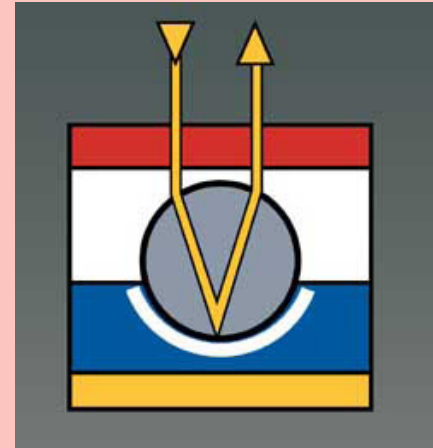
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## 10 Year High Intensity retroreflective sheetings

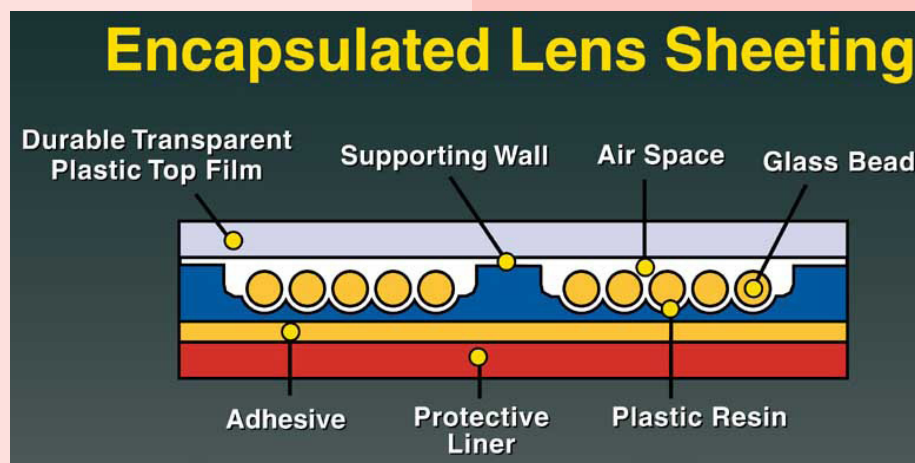
These sheetings are used in route informatory signs. Minimum reflection value is 250 candela for start & minimum useful life is ten years. Most of route informatory signs & also signs used in arterial roads, use this type of sheeting in spite of their higher prices.

Studies have proved that their longer life & efficiency causes signs to end up 30% cheaper in comparison with Engineer Grade material. In other words, for side & overhead signs in which the angle of observation from drivers eyes is large, this type of sheetings have a very desirable reflection. Therefore the use of this type of sheeting is of priority in route informatory signs.



### Minimum reflection values for different colours of High Intensity Sheetings as per ASTM D4956 TYPE III – CLASS 1 Standard

| Unit (degrees)    |                | Unit (Cd/ Lux/ M <sup>2</sup> ) |        |     |       |      |       |
|-------------------|----------------|---------------------------------|--------|-----|-------|------|-------|
| Observation Angle | Entrance Angle | Silver                          | Yellow | Red | Green | Blue | Brown |
| 0.2               | -4             | 250                             | 170    | 45  | 45    | 20   | 12    |
| 0.2               | 30             | 150                             | 100    | 25  | 25    | 11   | 8.5   |
| 0.5               | -4             | 95                              | 62     | 15  | 15    | 7.5  | 5     |
| 0.5               | 30             | 65                              | 45     | 10  | 10    | 5    | 3.5   |



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## Diamond Grade Sheetings

This type of sheeting is used in route informatory signs & road works signs & in special circumstances. Its minimum reflection value at start is 800 candela with a minimum useful life of 10 years. Internal structure of this type of sheeting is different from the other two types & is composed of glass prisms. Due to potential hazards at roadwork sites (such as asphalt, drillings, excavations, bridge construction, etc.), this type of sheeting is used to warn the drivers. Base price of signs with this type of sheeting is around 3 times more than the Engineer Grade.

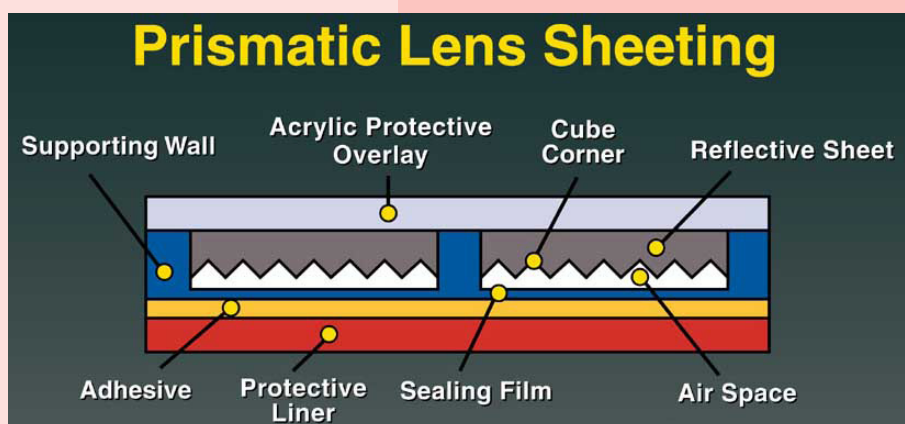
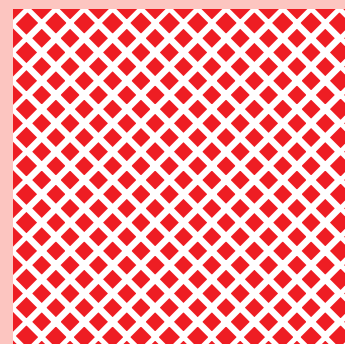
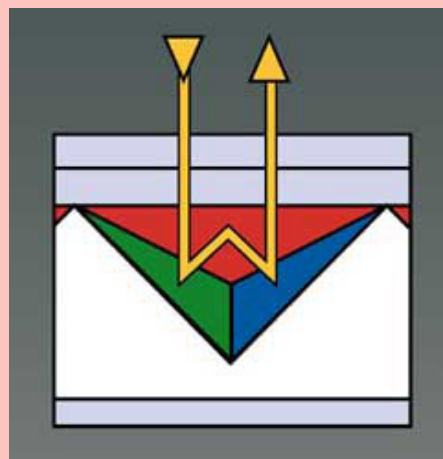
These sheets have excellent reflections which are much higher than the other two types.

**Minimum reflection values for different colours of Diamond Grade material as per ASTM D4956 TYPE \* – CLASS 1 Standard**

| Unit (degrees)    |                | Unit (Cd/ Lux/ M <sup>2</sup> ) |        |     |       |      |       |
|-------------------|----------------|---------------------------------|--------|-----|-------|------|-------|
| Observation Angle | Entrance Angle | White                           | Yellow | Red | Green | Blue | Brown |
| 0.2               | -4             | 800                             | 660    | 215 | 120   | 56   |       |
| 0.2               | 30             | 400                             | 340    | 100 | 72    | 32   |       |
| 0.5               | -4             | 200                             | 160    | 45  | 28    | 13   |       |
| 0.5               | 30             | 100                             | 85     | 26  | 13    | 6    |       |

**\* TYPE:VII, VIII, IX**

Diamond Grade material is provided in three types of 7, 8, 9 which have slight differences in reflection & entrance angle. For more information refer to the above standard.



**Fluorescent retroreflective sheeting (Yellow – Green)**

This Type of sheeting is made of a composition of prisms in the High Intensity Grade along with fluorescent paints. This paint absorbs the low wavelength ultraviolet radiation of the sun (which is invisible) & reflects them with high wavelength visible rays. This causes the sign to be more clearly visible in limited lights (such as cloudy weather & start & end of the day). This also makes the sign visible from longer distances & the drivers have more time to react to the sign message.

These sheetings are High Intensity fluorescent with minimum useful life of 10 years & minimum reflection value as per ASTM D4956 is defined for yellow color. The acceptable types are 3, 4, 7 & 8.



**Minimum reflection values for different colours of Fluorescent retroreflective sheeting (Yellow – Green)**

| Unit (degrees) |                   | Unit (Cd/ Lux/ M <sup>2</sup> ) |              |
|----------------|-------------------|---------------------------------|--------------|
| Entrance Angle | Observation Angle | yellow                          | yellow-green |
| -4             | 0.2               | 420                             | 560          |
| 30             | 0.2               | 200                             | 260          |
| -4             | 0.5               | 150                             | 200          |
| 30             | 0.5               | 69                              | 92           |



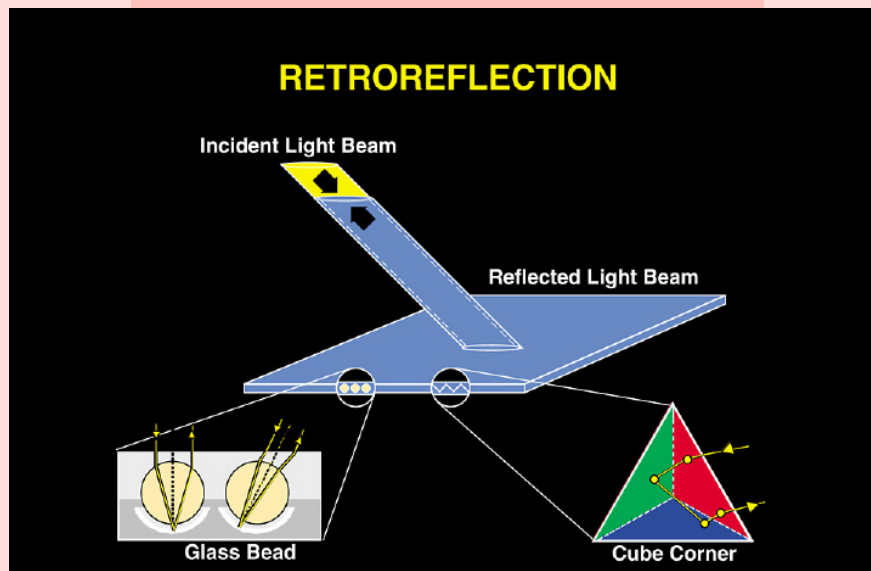
## Application comparison between Engineer Grade & High Intensity Grade material

The picture below belongs to 3M research division. The difference of 70 candela & 250 candela of the two types is clearly visible in the picture. After 7 years, the reflection value of Engineer Grade material decreases sharply but the reflection value of the High Intensity Grade after 10 years is even more than the reflection value of the Engineer Grade at start.

The conclusion is that using High Intensity Grade material is much better & more economical. It was mentioned earlier that these sheetings are composed of glass spheres. This is true for engineering & High Intensity Grade material but Diamond Grade is composed of glass prisms.

One of the differences between the engineering & High Intensity Grade material is that in the High Intensity Grade, glass spheres are confined in a multi-sided holder which causes less damage to the focal length & the back mirror, thereby increasing the life time of these sheetings.

The following diagram shows the principles of reflection in these sheetings.





## The reflectometer

This is an instrument which measures the reflection value of retroreflective sheetings & used to verify the correct condition of sheets.

The instrument has a diaphragm which is placed on the sheet surface & then the trigger button is pushed thereby emitting a light ray with an entrance angle of 0.2 degrees is sent to the surface & the reflection measured at - 4 degrees angle.

This instrument is used for the following applications:

- Monitoring the reflection of existing signs on the road to determine those which need replacement (road safety inspection).
- Monitoring the reflection of sheetings after manufacturing which shows suitability of the reflection, but for later years, other parameters must also be considered.

*This instrument is manufactured by a few European companies which have slight differences as follows:*

*1- Inclusion of GPS. For road safety inspection, a GPS is very useful.*

*2- Accuracy of reflection measurement by one or a few buttons.*

*The models which measure all the colours by one button & have the intelligence to differentiate between the colours, are simpler for use.*

*3- Memory space for recording the measurements.*

*4- Capability to be connected to a computer for data transmission.*

*5- Battery consumption & weight of the instrument.*



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**PRODUCT LIST**

|   |           |
|---|-----------|
| <b>1- Warning &amp; disciplinary signs</b>                                  | <b>16</b> |
| 1 - 1 Sing body   | 17        |
| 1 - 2 Sign cover  | 18        |
| 1 - 3 Sign joints   | 18        |
| 1 - 4 Dimensions  | 19        |
| <b>2 - Route informatory signs</b>  | <b>20</b> |
| 2 - 1 Informatory signs   | 20        |
| 2 - 2 Route selection signs   | 21        |
| 2 - 3 Exit signs  | 21        |
| 2 - 4 Route confirmation signs  | 22        |
| 2 - 5 Difference between urban & inter- city informatory signs              | 24        |
| 2 - 6 Dimensions of the signs & its wordings                                | 24        |
| 2 - 7 Color of informatory signs  | 25        |
| 2 - 8 Retroreflective sheeting of informatory signs                         | 25        |
| 2 - 9 Type of body of informatory signs                                     | 26        |
| <b>3 - Road works informatory signs</b>                                     | <b>28</b> |
| <b>4 - Street name signs</b>  | <b>30</b> |
| <b>5 - City destination &amp; guidance signs</b>                            | <b>31</b> |
| <b>6 - Sign posts for disciplinary, informatory &amp; street name signs</b> | <b>31</b> |
| 6 - 1 Sign posts for disciplinary signs                                     | 31        |
| 6 - 2 Sign posts for informatory signs                                      | 32        |
| 6 - 3 Sign posts for street name & guidance signs                           | 33        |
| 6 - 4 Posts for panel signs   | 34        |
| 6 - 5 distance of different signs to the roadside.                          | 35        |

## 1 – DISCIPLINARY, WARNING & INFORMATION SIGNS

These signs are in circle, triangle, square, rectangle & 8 - sided polygon shapes.

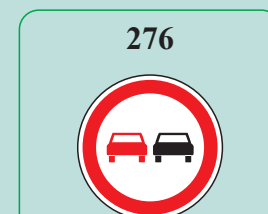
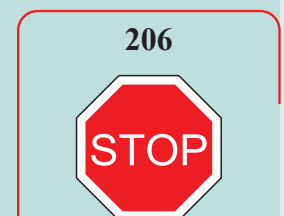
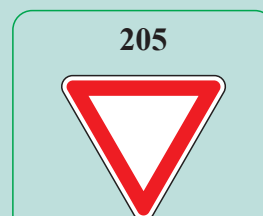
### Warning signs

These signs are used to inform of possible dangers. These are of triangular shape. Their distance to the possible hazard is 100 to 200 meters depending on the nature of the hazard.



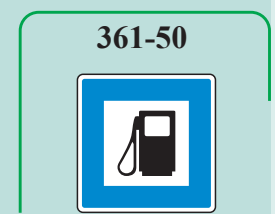
### Prohibitive & obligatory signs

These signs give orders to the road users which upon refusal, shall be subject to fines & are of a triangular shape.



### Informative signs

These are signs which convey general information to the road users such as location of parking spaces, restaurants, etc., & have square or rectangle shapes.



## 1-1 Body of the sign

### 1 - 1 - 1 Non - arterial roads.

Body of these signs are of galvanized steel with a thickness of 1.5 mm & are of circle, triangle or square shapes. Two holes are drilled on the body for mounting purposes. These sheets do not have a high resistance to folding & the edges are sharp.

### 1 - 1 - 2 Arterial (highway, freeway) & urban roads.

Body of these signs is of steel with a thickness of 1.5mm. In order to reach a higher strength, the edges are folded vertically by the mould & the sign does not have sharp edges. Connection points are fixed at the back of the sign with a suitable strength against folding.

In urban signs, normally greasy sheet with electrostatic coatings are used & in inter - city roads, normally galvanized sheet is used. The important point to bear in mind economically is to select a coating medium resistant to corrosion.

### 1 - 1 - 3 Other types of sign bodies.

It is worth noting that other materials such as aluminium & composites are also used in the sign bodies which shall be carefully considered as per the environmental conditions.



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## 1-2 Body coating

Where greasy sheets are used as sign bodies, there must be a coating of electrostatic paint with a thickness of 65 to 90 microns & this paint must be resistant to UV radiation. Before the paint spray, degreasing procedure is carried out as follows:

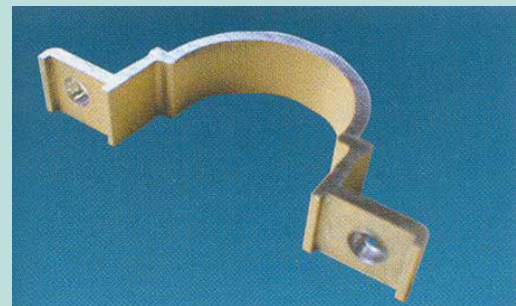
- |                           |            |
|---------------------------|------------|
| 1 – Removing              | 2 – Wash   |
| 3 – Anti rust             | 4 – Wash   |
| 5 – Phosphating           | 6 – Wash   |
| 7 – Phosphate stabilizing | 8 – Drying |

The above procedure causes stability & resistance against corrosion.



## 1-3 Sign joints

All the joints & connections to the body & the post are of 3mm thickness sheets & are connected by bolt & nuts. No holes are visible on the front part of the sign & since all the connections are made on the back of the sign, no damage is done to the retroreflective sheets.



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## 1-4 Dimension of disciplinary & warning signs

*Dimensions of the signs are directly related to the design speed of the road. The higher the design speed, the larger the dimensions of the sign. In cases where special attention must be paid to the safety issue (such as roadwork signs), signs of larger dimensions are used. It must be noted that the increase in the dimensions with respect to higher safety, is not an expense which can be ignored. The following table gives the relation between dimensions of the sign & the design speed.*

| Row | Design speed       | Type of route                          | Height of triangle(cm) | Diameter of circle (cm) |
|-----|--------------------|--|------------------------|-------------------------|
| 1   | Up to 30 km/h      | Low width routes & communities         | 45                     | 45                      |
| 2   | 30 to 60 Km/h      | Urban routes                           | 60                     | 60                      |
| 3   | 60 to 100 Km/h     | Arterials, highways & inter-city roads | 75                     | 75                      |
| 4   | More than 100 Km/h | Freeways                               | 90 (120)               | 90 (120)                |

## 2-ROUTE GUIDANCE OR INFORMATORY SIGN

Route informatory signs are horizontal signs which guide the driver to the desired destination. Such signs which are correctly designed, made & mounted, cause more safety & simplicity for the passing traffic. These signs are classified as per their mounting location as follows:

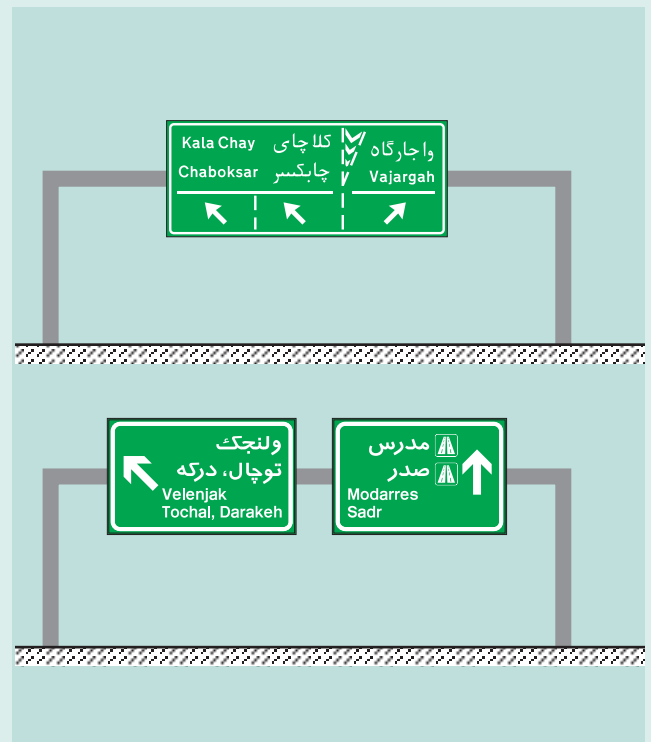
### 2-1 Pre - Informatory signs

These are signs which are mounted in advance of the destination & inform the drivers of exits & normally mounted on the right hand side of the road & if any emphasis is required, they can also be repeated on the left side.



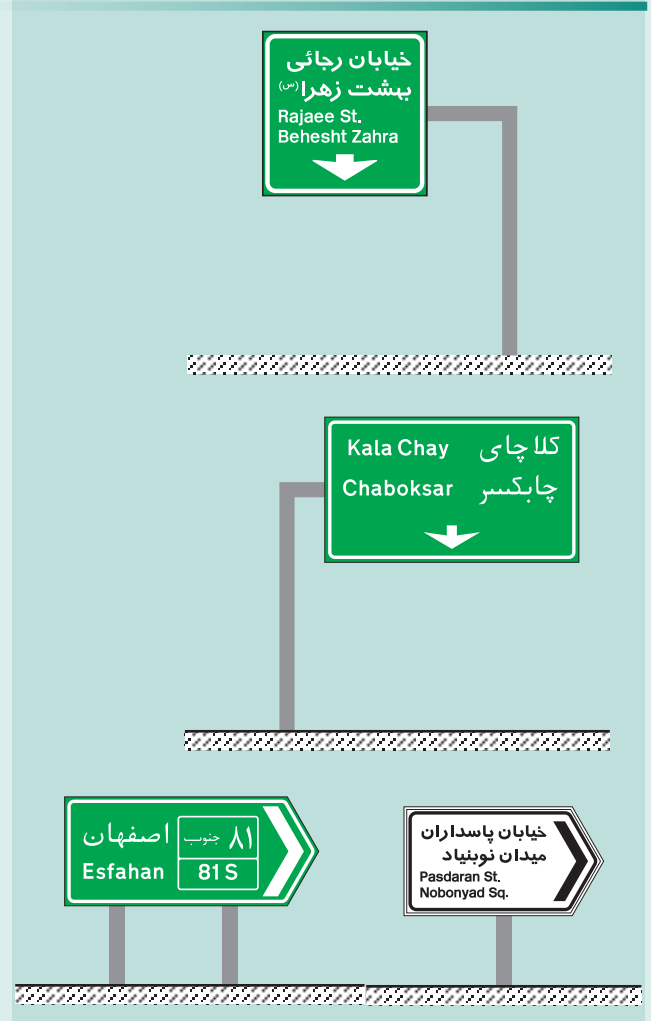
## 2-2 Route selection signs

These signs help the driver to change his lane in time. These are usually mounted after pre-informatory & before exit signs. These are usually mounted as overhead signs.



## 2-3 Exit signs

Exist signs are mounted at exits & show the exit route. These are mounted on the island between the two routes. Where the island width is less than the sign width or there is not enough visibility for the drivers, these are mounted as side - overhead or cross - post signs.





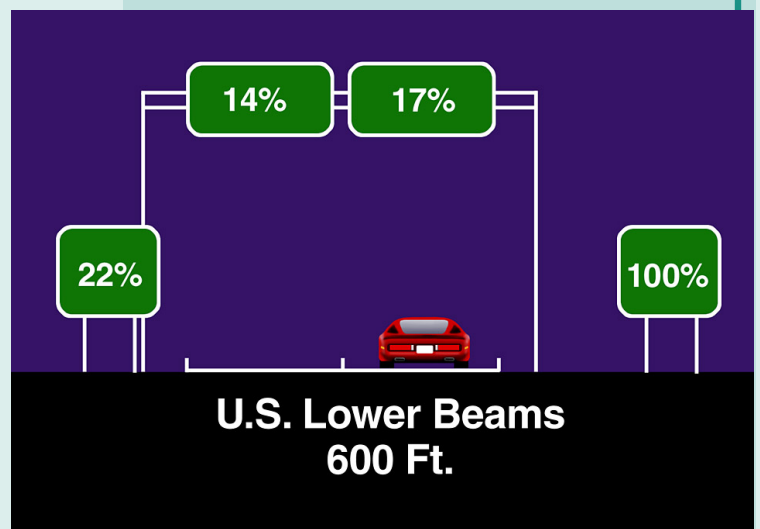
## 2-4 Route confirmation signs

These are signs which are mounted on the new selected route to ensure the driver that the right route has been selected. On the inter-city roads, information such as road number & distance to the next city is also shown on the sign. These signs are mounted on the right side of the road.



It is worth noting that mounting location of the sign, results in different light reflections. The following diagram depicts this fact.

As is clear from the diagram, in order to compensate the loss of reflectivity in overhead & right side mounted signs, larger sign dimensions & higher reflectivity sheetings must be used. Where the right side of the road provides suitable space for mounting of the sign, mounting as overhead must be avoided.





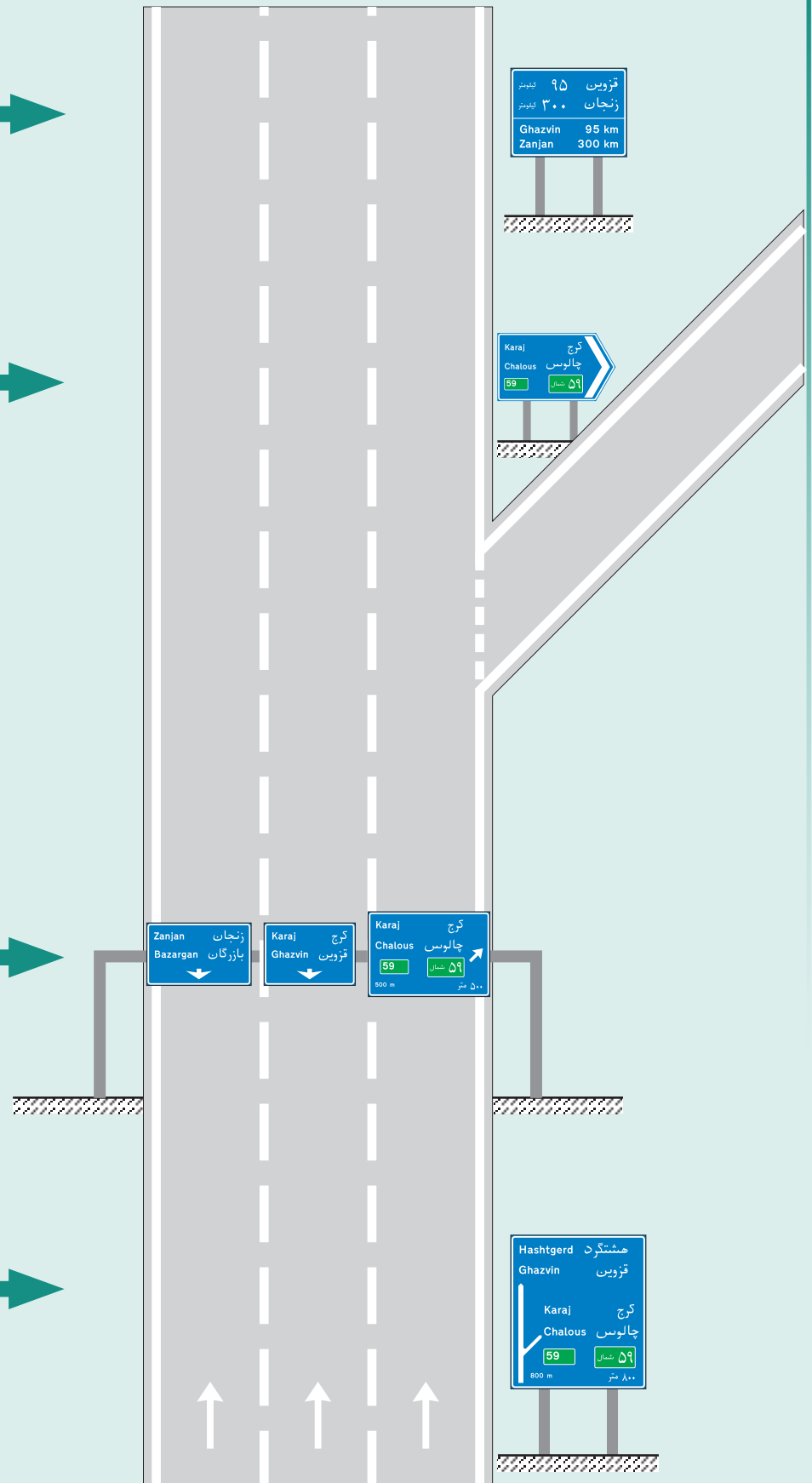
### Examples of route informatory signs on a route

Route confirmation sign

Exit sign

Route selection sign

pre-informatory sign



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## 2-5 Difference between urban & inter - city route informatory signs

Since there is a short distance between entrances & exits of urban highways, usually only two signs for route selection & exit signs are used. On the other hand, due to limitations on the sides of urban routs (green spaces, residential areas, etc.), these signs are usually mounted as overhead.

## 2-6 Dimensions & wordings of the sign

*Dimensions of route informatory signs depend on the design speed. The computerized design stage, height of local language letter for A is first selected on the basis of the design speed & dimensions of the sign are derived after completion of this design stage. SELECTION OF THE DIMENSIONS WITHOUT CONSIDERING THE DISIGN SPEED AND NUMBER OF ROUTES, IS A COMMON MISTAKE WHICH IS FREQUENTLY REPEATED. It must be noted that design of these signs needs special expertise which is out of the scope of this booklet. Selection of a suitable alphabet (font) is one of the necessities of the design stage.*

| Recommended Letter Heights (Estimate) |                                      |                     |                                |                          |  |                          |
|---------------------------------------|--------------------------------------|---------------------|--------------------------------|--------------------------|--|--------------------------|
| No.                                   | Type Of Road                         | Design Speed (km/h) | Advance Direction Signs        |                          | Direction and route confirmatory signs |                          |
|                                       |                                      |                     | xBox height,Local Language(cm) | xBox height, English(cm) | xBox height,Local Language(cm)         | xBox height, English(cm) |
| 1                                     | Free Way                             | Up to 115           | 75                             | 50                       | 65                                     | 43.33                    |
| 2                                     | High Way                             | 95-115              | 65                             | 43.33                    | 50                                     | 33.33                    |
| 3                                     | Dual carriage way                    | 80-95               | 50                             | 33.33                    | 37                                     | 24.67                    |
| 4                                     | Single carriage way                  | 65-80               | 37                             | 24.67                    | 30                                     | 20                       |
| 5                                     | Secondary rural roads and wide urban | 50-65               | 30                             | 20                       | 23                                     | 15.33                    |
| 6                                     | Other urban road and minor rural     | 30-50               | 23                             | 15.33                    | 20                                     | 13.33                    |



**Important principles in design of the signs**

- It must be readable from the desired distances (readability principle).
- It must be quickly understandable ( wording principle).
- Important & first class destinations must be mentioned (priority principle)
- A low number of destinations must be mentioned (concise principle)
- Names must be repeated on next signs (consistency principle)
- Design beauty & suitability of sign dimensions must be obeyed (beauty principle)

**2-7 Colour of route guidance signs**

On any route, the colour of the background & wording depends on the type of the route as per the following classification. Routes & destinations of higher priorities, keep their allocated colour.

| Row | Type of route                    | Colour of background | Colour of working |
|-----|----------------------------------|----------------------|-------------------|
| 1   | Freeway(motorway)                | Blue                 | White             |
| 2   | Highway(first class arterial)    | Green                | White             |
| 3   | Second & lower class arterials   | White                | Black             |
| 4   | Name of streets & arterials      | Blue                 | White             |
| 5   | Historical & tourist attractions | Brown                | White             |
| 6   | Public attractions               | Orange               | Black             |
| 7   | Road works                       | Yellow               | Black             |

**2-8 Retroreflective sheetings of route guidance signs**

It is strongly recommended that Engineer Grade material must be used for these signs. It is not an exaggeration to state that application of Engineer Grade material for this purpose is a waste of money. Three main advantages of High Intensity material, namely reflection value, suitable visibility angle (up to 60 degrees) & long life (over 15 years) confirms this statement.

## 2-9 Type of body of route guidance signs

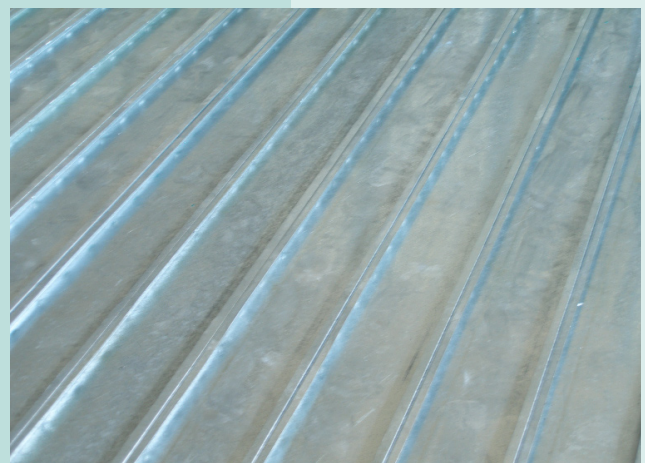
*Metal used for the body of guidance signs is usually of two types. Large signs are made of rails. These metal rails have 20cm usable width & these are assembled together on the mounting location of the sign. The sheets are galvanized & have 1.25mm thickness or aluminium of 3mm thickness. The advantage of this method is low transport cost & simpler future maintenance.*

*In smaller signs, a unified frame is made & then a galvanized sheet of 1.5mm thickness is connected on the top of the frame. This method is usually called unified sign manufacture.*

*In both methods, all necessary accessories for connection to the sign post must be prepared to reduce labour hours on welding & final mounting.*



• Unified frame (galvanized sheet of 1.5mm thickness)



• Metal rails of 20cm usable width



• aluminium rails

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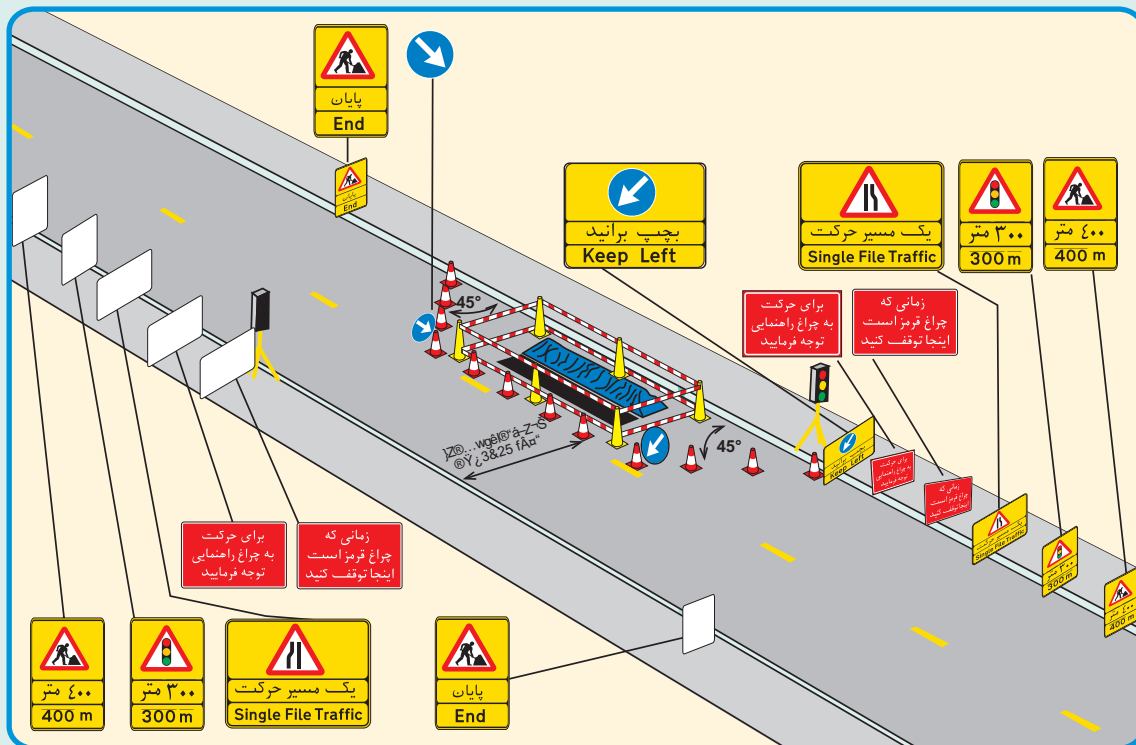
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### Samples of route guidance signs mounted in the city



### 3 – ROUTE GUIDANCE SIGNS IN ROAD WORKS

On routes which limitations exist due to road works, diversion routes are introduced & signs are used with yellow background & black wordings. The reason for this colour difference is higher visibility of yellow & better warning to the drivers to be more cautious. Regulations for route guidance signs are also applicable here & the only difference is in the colour of the wordings & background. It must be noted that even though these signs are temporary, we have no right to decrease their technical quality e.g. by not using retroreflective material, but on the contrary, the emphasis here is in the use of High Intensity & Diamond Gradematerial. It must be noted that the signs should be removed after the completion of road works & the route returned to normal condition.



Main differences between road works route guidance signs & other fixed signs are as follows:

- Yellow retroreflective material must be used.
- Sign dimensions are not only not smaller, but in hazardous conditions even larger than normal.
- Retroreflective material must not be of a lower grade than engineering but if possible higher grade reflective material must be used.

### 3-1 Portable signs for road works

Road works conducted at urban & suburban areas, are always faced with safety issues & accidents. On the other hand, maintenance of the roads is one of the necessities of preserving these national investments.

Application of traffic safety regulations during road works is the best method to prevent accidents & reduce fatalities & financial losses.

Signs mounted in such workshops must have the following specifications.

- 1- Must have a retroreflective material of 10 year High Intensity or a higher grade.
- 2- Must be light weight & resistant for easy mounting & substitution.
- 3- Must not be damaged during transport & warehousing.



#### Technical specifications of portable triangle

In order to reach the above goals, the portable triangle is made of hard plastic using foreign made samples as basis for moulds & is now available in the market.

some of the technical specifications of this sign include:

- 1- Body & accessories are made by plastic injection using first class & resistant raw material.
- 2- Complete weight of each triangle is around 7 kg.
- 3- Usable height of the triangle is 75cm & overall height of 100cm.
- 4- 10 year High Intensity material
- 5- Movable & folding base to simplify mounting & removing.
- 6- Possibility of securing the base by screwing to the ground or putting sand bags.





The following pictographs can be depicted on this triangle.



#### 4 – STREET NAME SIGNS

These signs are mounted at the beginning of each street & alley & show the name of the route. The sign is double sided with dimension of 80 x 30 or 90 x 34cm. The background is blue (blue retroreflectives or blue electrostatic paint to reduce cost) & the wording is white retroreflective material. The sign must be mounted so that its surface is perpendicular to the route & easily visible. If two signs are mounted on one post as perpendicular to each other, drivers can easily receive information on the crossing route & select their destination accordingly.



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## 5 – GUIDANCE SIGNS TO CITY ATTRACTIONS & DESTINATIONS

These signs are used to guide to city attractions such as governmental offices, banks, mosques, etc. height of signs is 30 to 75cm with a width of 80 to 200cm.

it is worth noting that due to limitations in urban routes, these signs are used as a substitute to route guidance signs & the latter normally used in highways only.



## 6 – SIGN POST FOR DISCIPLINARY, GUIDANCE & STREET NAME SIGNS

Sign post have the following dimensions depending on their type of application:

### 6-1 post for disciplinary signs

*Post mounted in urban areas:*

*Metal pipe with external diameter of 63mm with electrostatic paint coating.*

*Post mounted on roads:*

- 1- Large disciplinary & information signs have posts of 60 x 60 x 3 mm metal boxes.
- 2- Warning signs mounted at the height of 2m have posts of 40 x 40 x 2mm metal boxes.
- 3- Delineating signs have posts of 40 x 20 x 2mm metal boxes.

## Height of disciplinary sign posts

*Height of the post depends on the location of mounting & number of mounted signs. Height of the mounted sign must be so that it remains in the visibility cone of the driver's eye & also provides no obstruction for pedestrians. Average height of visibility cone of drivers of passenger cars is 120cm & for truck drivers is 210cm. This means the center of the sign must be at this height to have the best visibility for the drivers. On the other hand, limitations of space of 230cm below the sign must be considered in the urban areas.*

*For disciplinary signs, normal height of the sign is 300cm. If two or three signs are mounted on one post, a minimum height of 230cm from the bottom of the lowest sign to the ground must be provided to avoid obstructions for the pedestrians.*

*For warning, hazard identification & delineating signs which are mounted on the roads or urban areas, height of the post is 120 to 150cm & they must be so mounted to be in the visibility cone of the drivers.*

*As a conclusion, mounting the signs at higher heights without any technical justifications, Reduces the efficiency of the signs & lower heights may also cause problems for the pedestrians.*

## 6-2 sign posts for route guidance signs

*Posts for these signs are calculated as proportional to the wind surface of the sign & can not be estimated prior to the design of the sign. As an estimate, for each square meter of sign surface, 16 to 24kg weight of post is required. Posts are metal boxes or structures of metal boxes. In special circumstances, multi-sided sheets with industrial paint coatings are used for side - overhead signs.*



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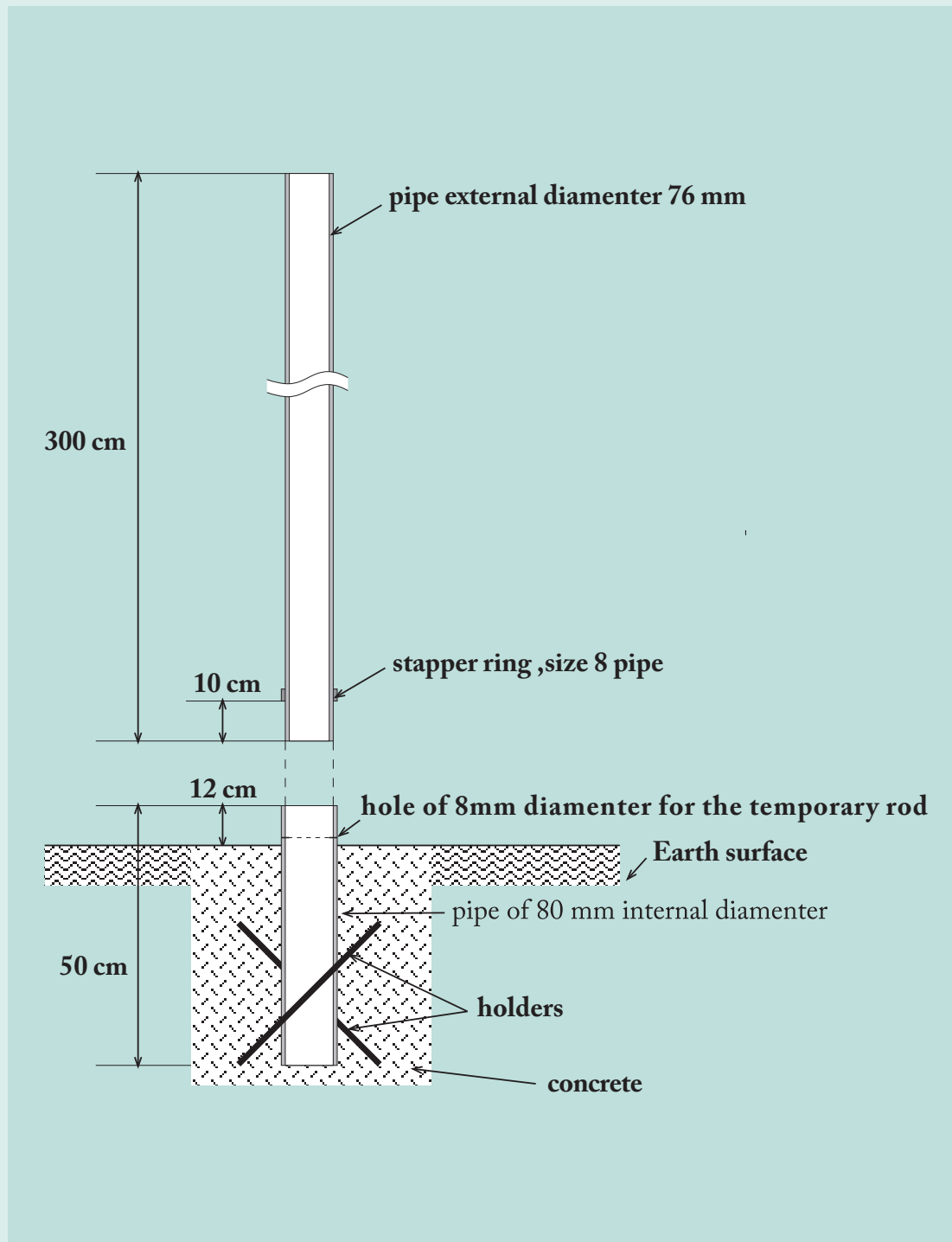
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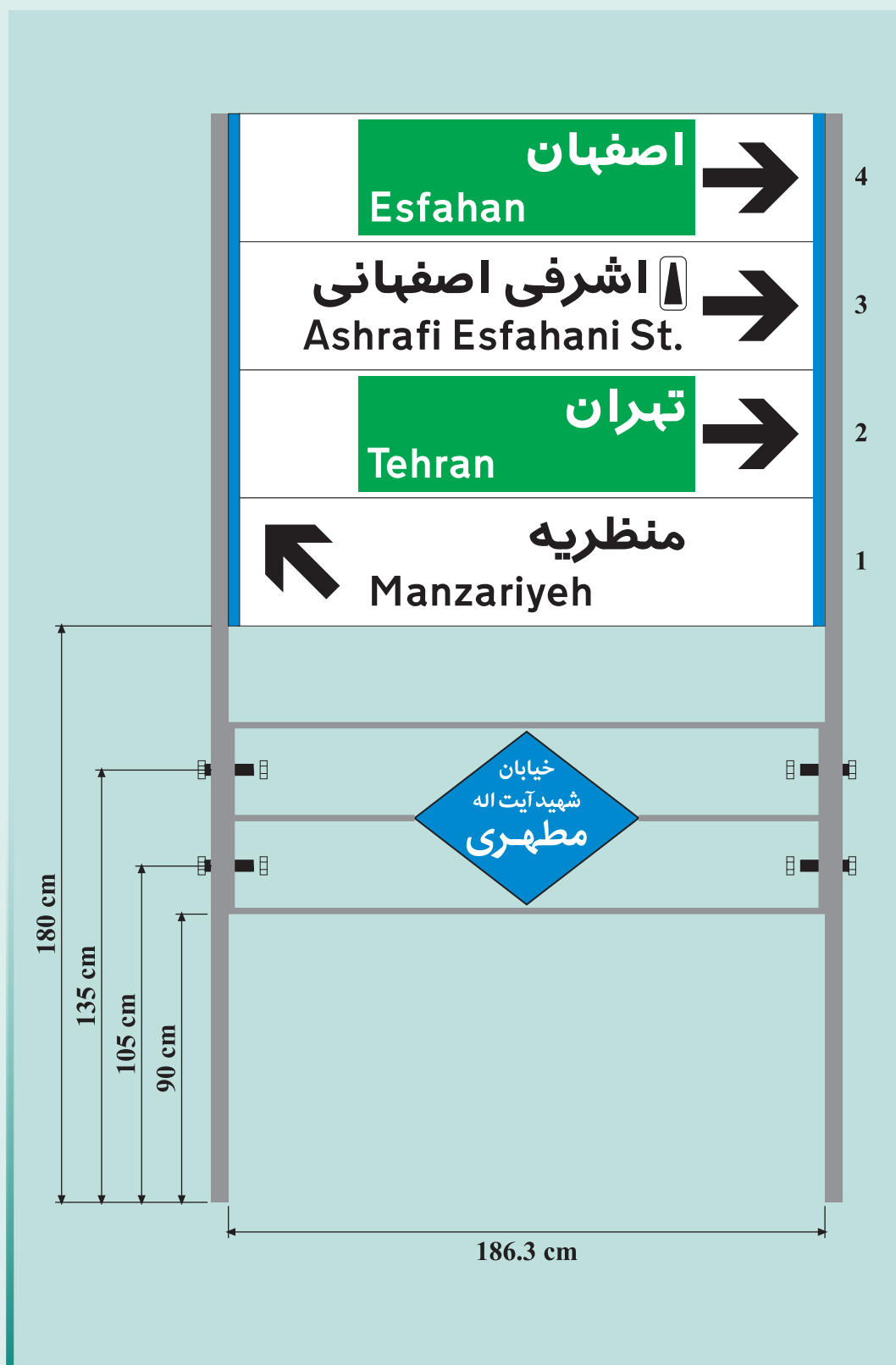
### 6-3 Post for street names & city attraction signs

These posts are pipes with external diameter of 76mm & height of 300 to 220cm. The posts are coated with electrostatic paint. In order to simplify mounting, a foundation is used with pipes of inner diameter of 80 mm & height of 40 cm on which the main post is welded.



## 6-4 Posts for panel signs

These posts are pipes of external diameter of 76mm & an electrostatic coating.



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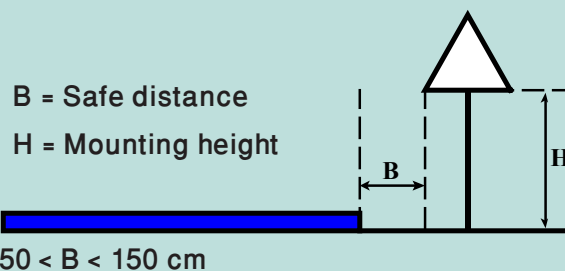
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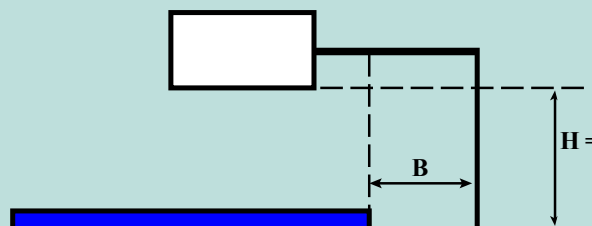
## 6-5 distance of different signs to the roadside

Signs mounted on the right or left side of the road, must have a safe distance to the edge of the driving line, in order not to obstruct the vehicles & also experience less damage on impacts. This distance is minimum of 50 to a maximum of 150 cm. if the sign is mounted far from the roadside, its efficiency is decreased & may also not be properly visible.



H= For roads, 120 to 210cm

H= For urban routes a minimum of 230 cm



(For routes with truck & heavy vehicles,

H = 600 cm is more suitable)

Min H = 450 cm

## GUARDRAIL , POST & IMPACT ABSORBER

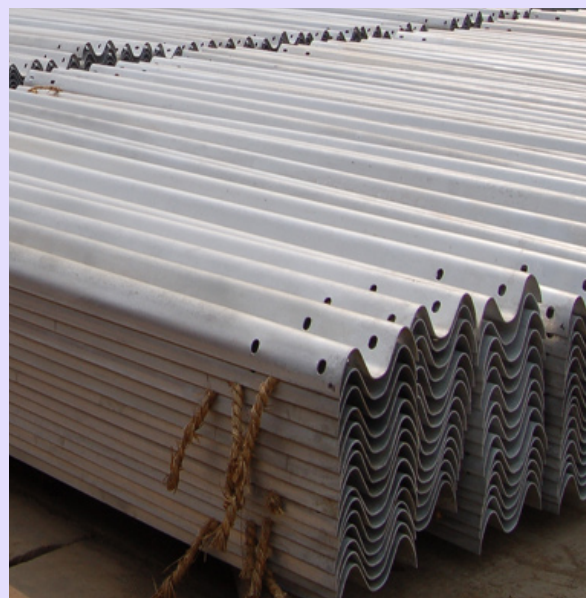
|                          |    |
|--------------------------|----|
| 7-Guardrail              | 36 |
| 8-Guardrail post         | 38 |
| 9-Simple impact absorber | 39 |
| 10-Spacer                | 40 |

### 7-Guardrail

Guardrail is an impact absorber of more flexibility compared to concrete blocks. Their use is a necessity at the roadsides leading to mountains or valleys. On roads where reverse traffic lines are next to each other, guardrails are used for separation. Guardrails, concrete blocks, metal blocks or cable absorbers must be clearly considered to be used for the right application.

The body of guardrail is composed of 3mm thickness metal sheets of ST37 type. These are coated after forming using three different methods of hot galvanized (65 to 90 microns), cold galvanized (around 20 microns) or electrostatic (around 75 microns).

Weight of each guardrail unit is  $49 \pm 1.5\text{Kg}$ .



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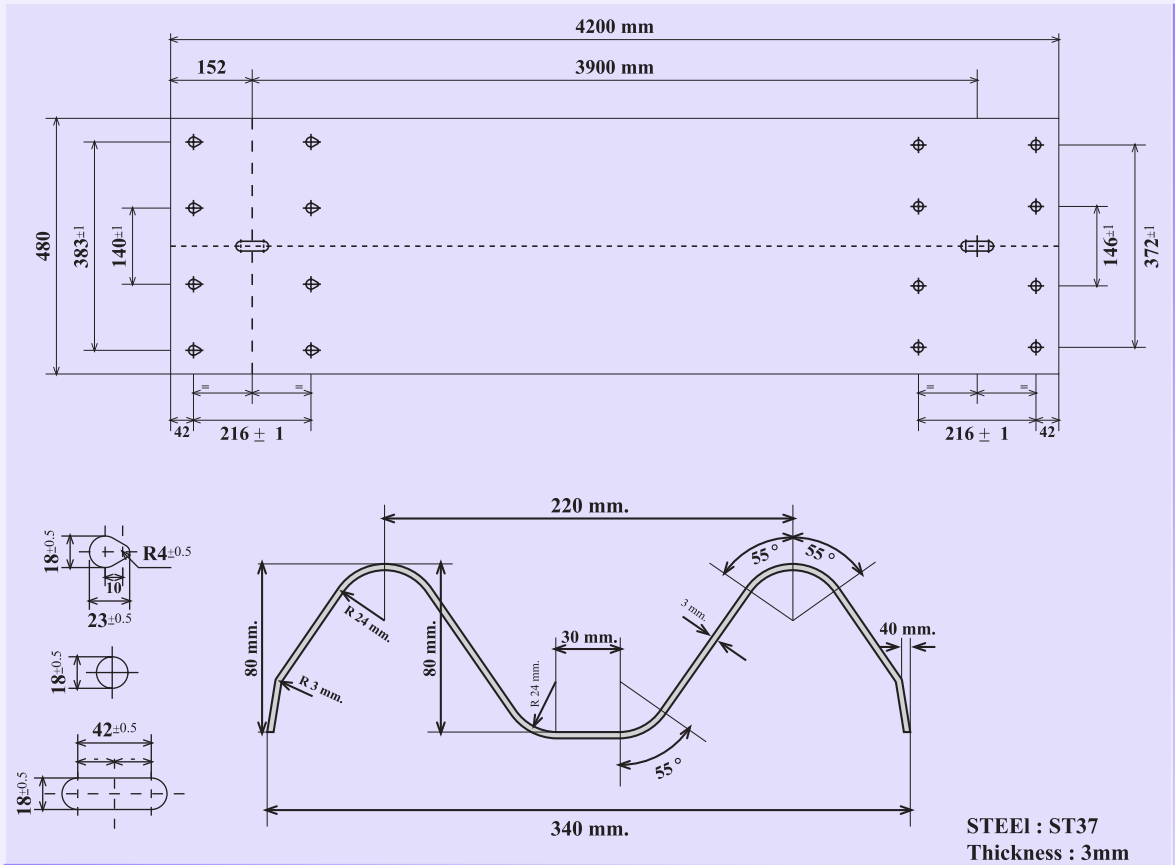
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## Guardrails specification



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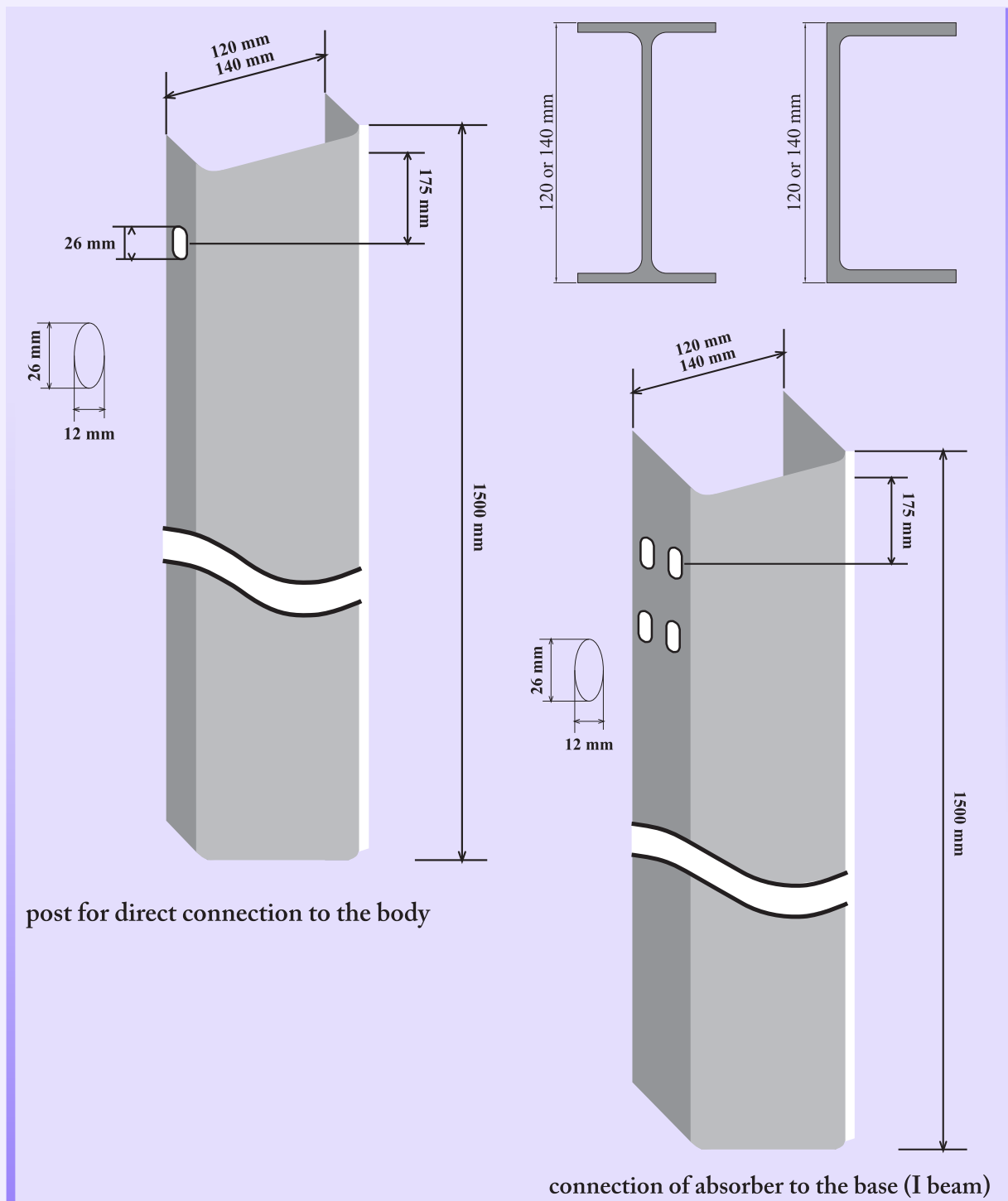
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## 8-Guardrail post

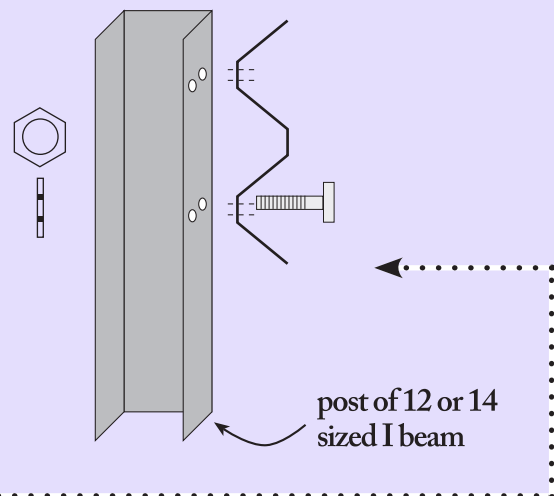
Guardrail posts are normally iron **I beams** of size 12 x 14 or 3 - sided boxes of same size. In special circumstances, size 10 can also be used. Height of the post is 150cm of which 75cm is hammered into the ground using a pile driver & the rail is connected to the top part of the remaining 15cm. posts have 2 layers of industrial paint coatings.

Post specifications for direct connection of rail( I beam or 3 - sided box).



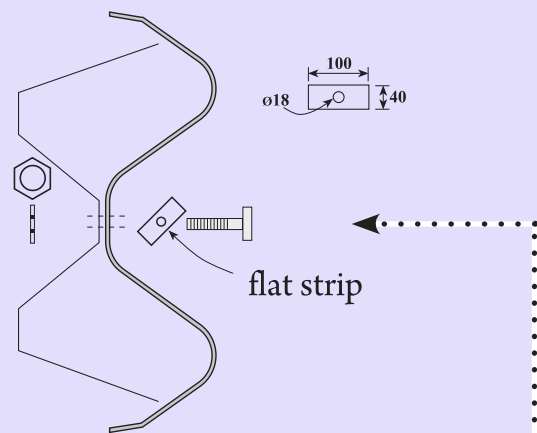
## 9-Simple impact absorber

This is a sigma shaped part which is connected between the rail & the post. This reduces the damage to vehicles on impacts. Higher efficiency absorbers are detailed in the next section. This part is made of sheets of 2mm thickness & is connected to be post by four bolts & to the rail by one bolt.



.....

Connection of impact absorber to the post,  
M10 \* 40 or  
M10 \*30 bolt & nuts, 4 pairs



.....

connection of absorber to the rail,  
M16 \* 60 bolt & nut, 1pair, plane belt  
100 \* 40 \* 3 with 018 hole, 1 piece.

## 10-Technical specifications of the spacer

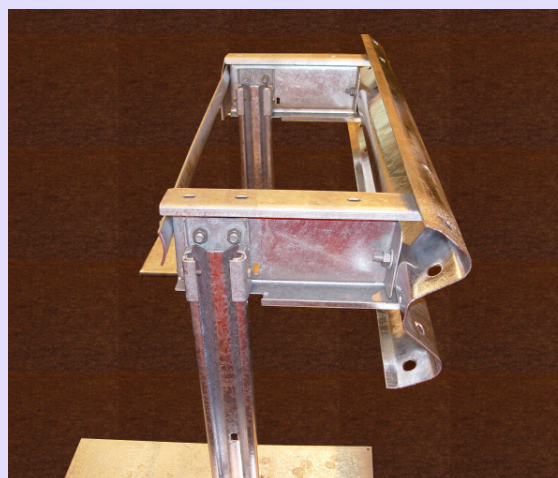
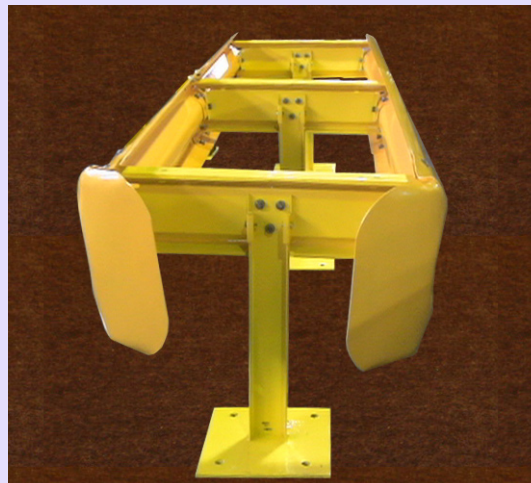
Spacer is a metal part which is connected as a medium between the rail & the post & sharply reduces the impact momentum by absorbing much of the impact energy.

### 10-1 History of application

*This part has been first manufactured by an ITALIAN company & tested by the related authorities & now widely in use throughout Europe.*

### 10-2 Types

*Spacers are made in two types of single & double sided. The latter is used in low width refuges which also reduces the number of required posts.*



### 10-3 Thickness of metal sheet

*Thickness of the sheet used is 3mm & per location of application, it is coated by cold or hot galvanized or electrostatic paint method.*

### 10-4 Advantages of using the spacer

*The following can be regarded as the advantages of using this product:*

- 1- It acts as a damper, thereby decreasing the impact energy.*
- 2- Causes less damage to the post on impacts, thereby reducing maintenance costs.*
- 3- When using double sided spacer, one post is saved per spacer.*
- 4- Regarding the distance of the post & front surface of the rail, the post can be located on more appropriate places if necessary. In the current mounting procedure, sometimes the rails are mounted before or after the proper location due to urban limitations & this disadvantage can be avoided by using the spacer.*
- 5- This product can be readily mounted on the existing guardrails. Accessories are provided for such installations & only required holes must be drilled on the posts.*





## 11 - MANUFACTURING & ASSEMBLING LINE MACHINERIES

|   |    |
|---|----|
| 11 - 1 Computerized cutting machine (cutter plotter).                                 | 43 |
| 11 - 2 Fully automatic machine for mounting of retroreflective sheets on the rails.   | 44 |
| 11 - 3 Fully automatic machine for mounting of retroreflective sheets on frame signs. | 45 |
| 11 - 4 Fully automatic machine for roll cutting of retroreflective sheets.            | 46 |
| 11 - 5 Fully automatic rolling machine.   | 47 |
| 11 - 6 packing machine  | 48 |
| 11 - 7 Airless painting machine.  | 49 |
| 11 - 8 Fully automatic pile driver for guardrail posts.                               | 50 |

## 11 - MANUFACTURING & ASSEMBLING LINE MACHINERIES

### 11-1 Cutter plotter

*This machine is used for cutting the alphabet & pictographs of the disciplinary & route guidance signs. The machine receives commands from the computer & moves the blade on the retroreflective sheets so that only the PVC part is cut but the back paper remains intact. This causes the consistency of the sheets to be preserved. Void sections are then removed by hand & main cut parts removed by a special cellophane paper & placed on the sign. Cutter plotters are of two types, namely roll or plane cutters. The roll types do not have the capability to cut High Intensity & Diamond Grade material but the plane model has two different blades & capable of cutting all kinds of sheetings.*



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**11-2 Fully automatic machine for mounting of retroreflective sheetings on the rails of route guidance signs:**

*Mounting the sheetings on the rails of route guidance signs requires high accuracy & long term experience & is a very time consuming procedure. This machine mounts the sheetings on the rails fully automatically. The rail is warmed in the front part of the machine & then the retroreflective sheet is rolled on the warmed rail & special rollers stick the edges of the sheet to the edges of the rail.*

*Azin Rah Shargh Co. is the first user of this machine in Iran & also holds the exclusive sales & after - sale services of this company.*

*Quality & speed are the two main characteristics of this machine.*





### 11-3 Fully automatic machine for mounting of retroreflective sheets on frame signs

*This fully automatic machine is used to mount the sheets on frame signs which has an adjustable pressure control & uniformly mounts the sheets on the sign surface.*

*This machine is also manufactured in Europe & has been used in the Islamic Republic Of Iran for the first time by Azin Rah Shargh Co.*



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#### 11- 4 Fully automatic machine for cutting of retroreflective sheets

*This machine is used to cut the sheet roll into the desired widths. High accuracy & suitable speed are characteristics of this machine. This machine is also manufactured in Europe & used at our factory.*



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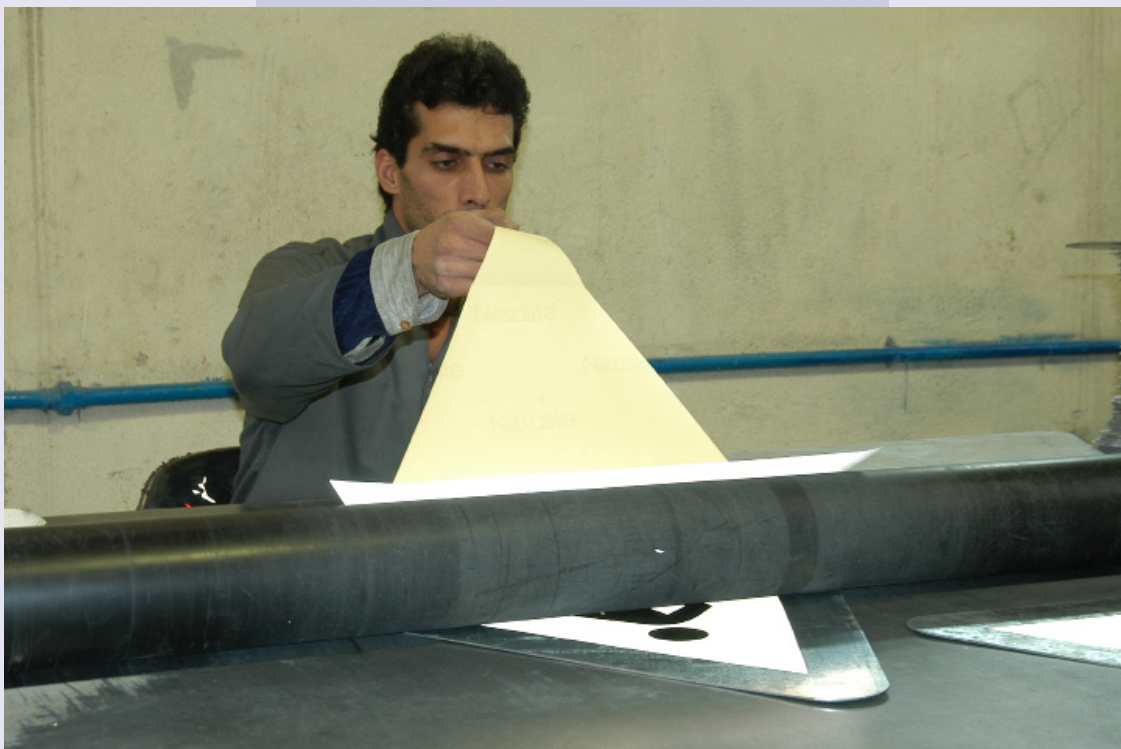
Fax:(+9821)22865453

[www.azinrah.com](http://www.azinrah.com)

Email:[info@azinrah.com](mailto:info@azinrah.com)

### 11- 5 Fully automatic rolling machine

*This roller is used for simple signs with no edges & mounts the sheets on the sign surface at high speed & good accuracy.*



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## 11- 6 Packing machine

*This machine is used for packing of our products.*



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## 11- 7 Airless painting machine

*Most parts are coated with electrostatic paints at our colleagues facility which is specially adopted for electrostatic paint treatments. For larger parts for which no electrostatic paint feasibility exists, airless painting machine is used. This machine has the advantage of high speed & accurate painting with less wasted paint. In other words, most of the paint is sprayed on the part causing less pollution of suspended paint particles.*



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## 11- 8 Fully automatic pile driver for guardrail posts

*This machine is used to hammer the guardrail posts into the ground. The machine is of hydrolic type & much more powerful than customary equipment. The machine is mounted on a truck & has a high moving & displacing capability.*

*This machine is also manufactured in Europe & Azin Rah Shargh is the first company in the Islamic Republic Of Iran to use this machine.*



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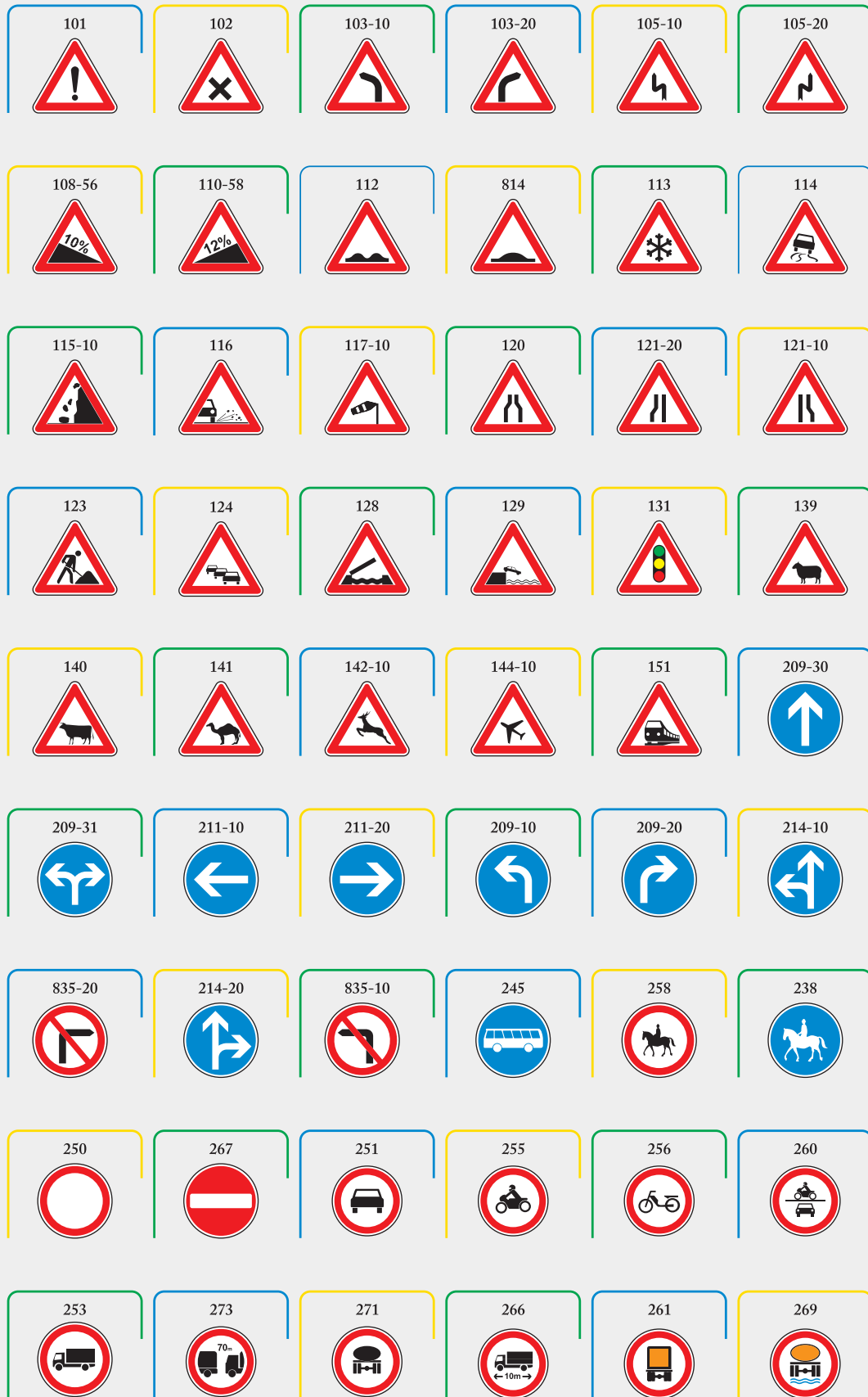
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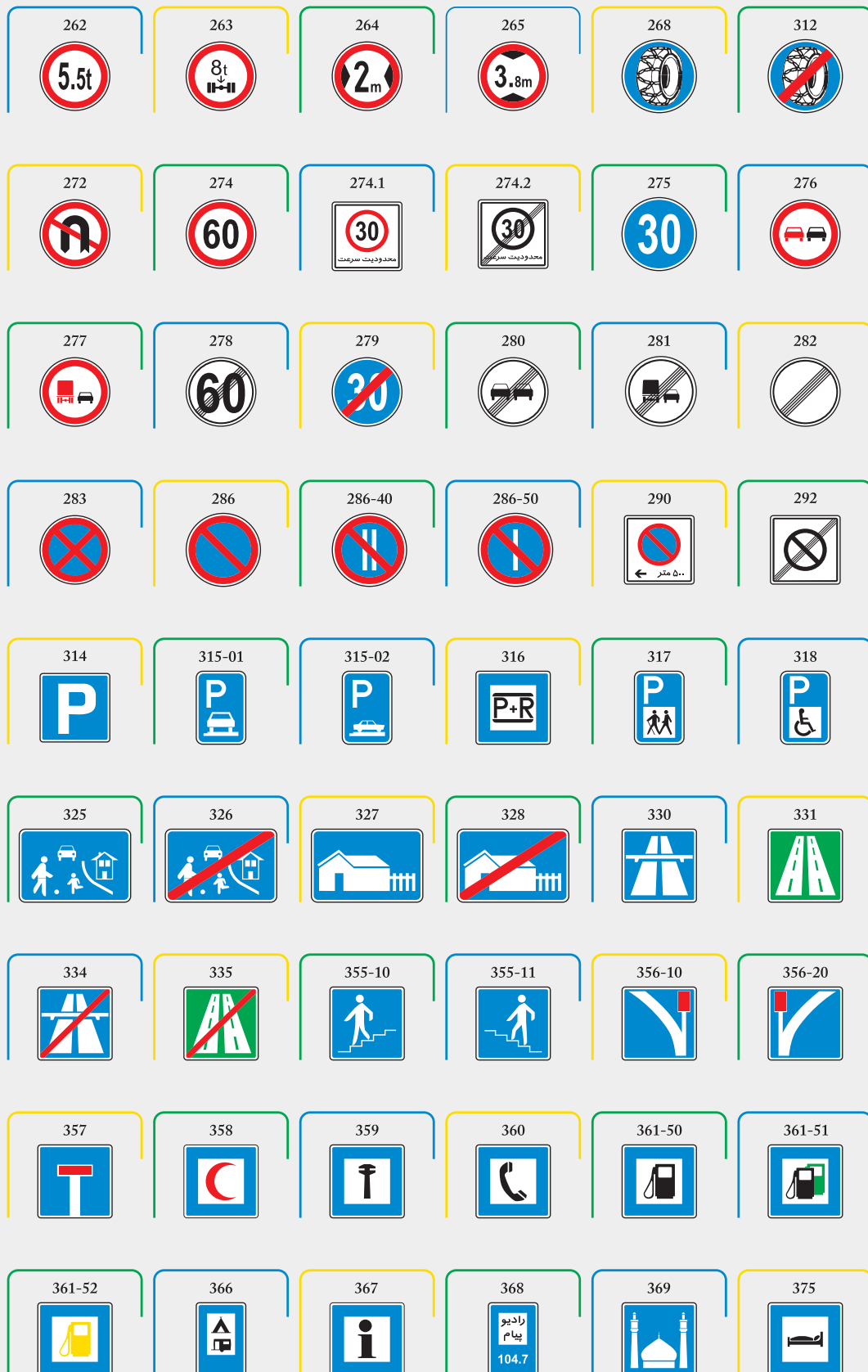
[www.azinrah.com](http://www.azinrah.com)

Email:[info@azinrah.com](mailto:info@azinrah.com)

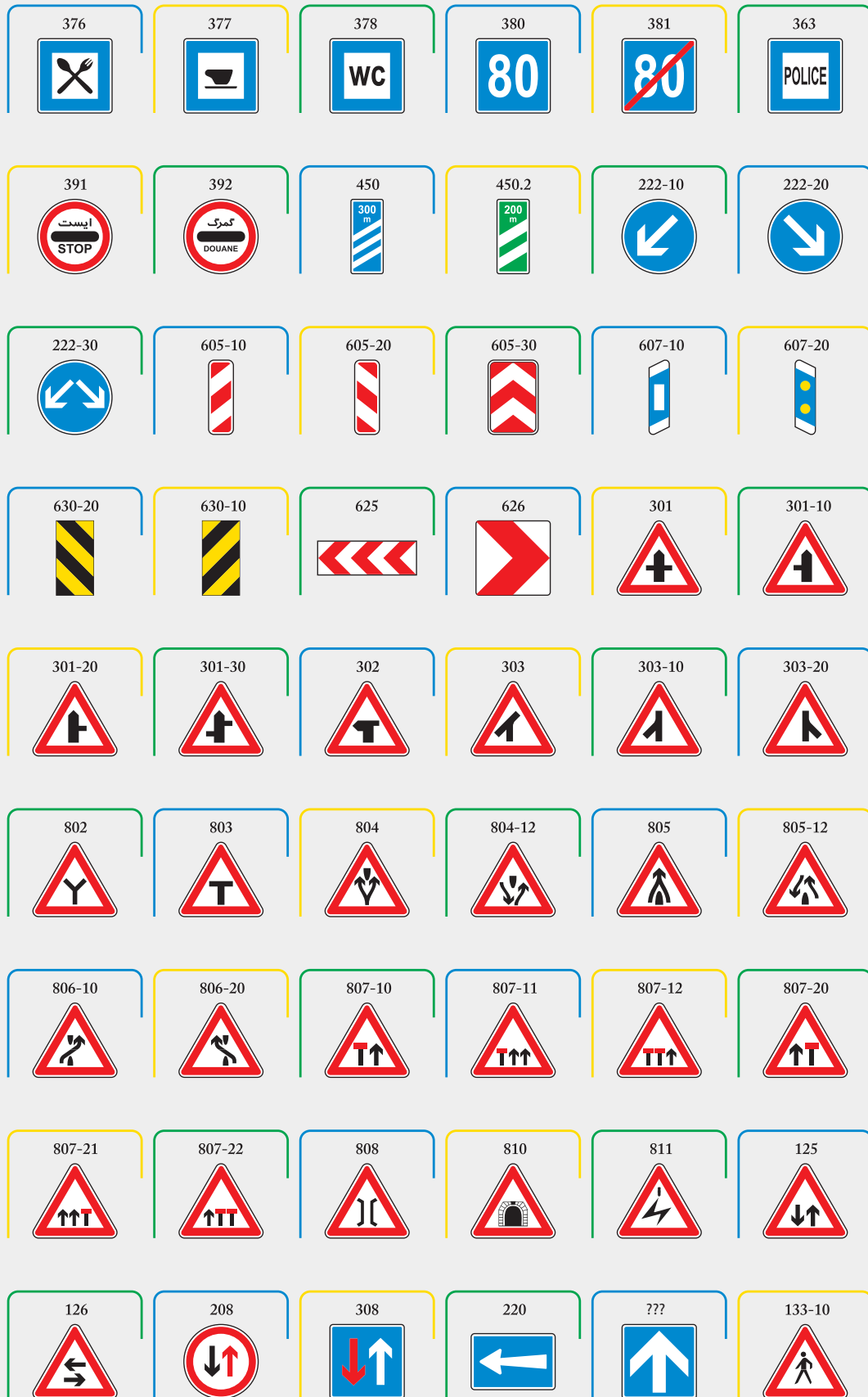
### SUBJECTIVE CLASSIFICATION OF TRAFFIC SIGNS



**SUBJECTIVE CLASSIFICATION OF TRAFFIC SIGNS**

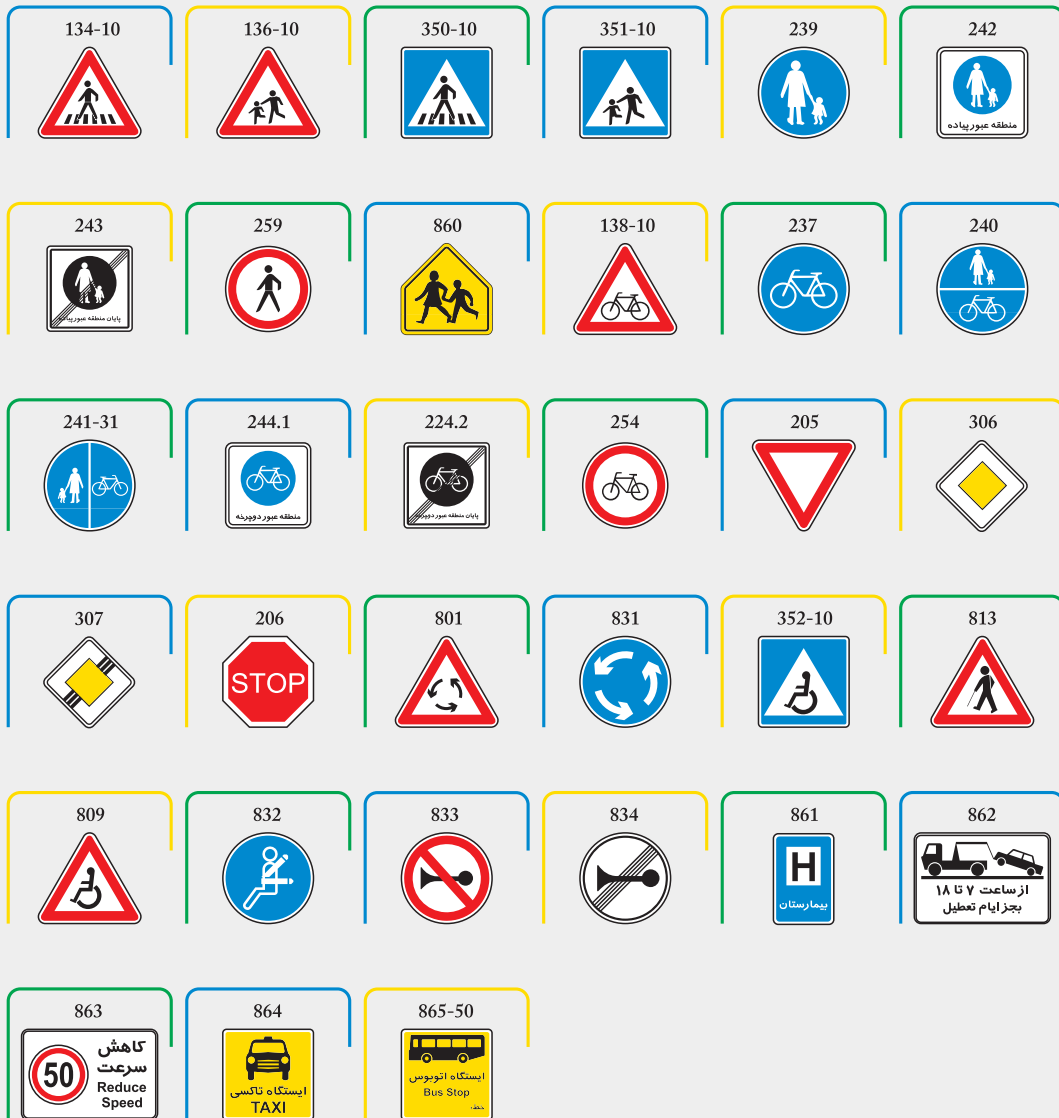


**SUBJECTIVE CLASSIFICATION OF TRAFFIC SIGNS**





**SUBJECTIVE CLASSIFICATION OF TRAFFIC SIGNS**





**ORDER FROM FOR DISCIPLINARY, WARNING & HAZARD SIGNS**

| Type of sign                     |  |                                  |  |                                  |  |
|----------------------------------|--|----------------------------------|--|----------------------------------|--|
| Circle diameter 90               |  | Circle diameter 75               |  | Circle diameter 60               |  |
| Triangle height 90               |  | Triangle height 75               |  | Triangle height 60               |  |
| Square 75 x 75                   |  | Square 60 x 60                   |  | Square 40 x 40                   |  |
| Rectangle 100 x 70               |  | Rectangle 75 x 50                |  | Rectangle 50 x 33                |  |
| Eight- sided polygon diameter 90 |  | Eight- sided polygon diameter 75 |  | Eight- sided polygon diameter 60 |  |
| Delineator 50 x 33               |  | Delineator 60 x 20               |  | Delineator 50 x 15               |  |

| Body specification |                  |                     |
|--------------------|------------------|---------------------|
| Plane galvanized   | Edged galvanized | Edged electrostatic |
| Plane Aluminium    | Edged Aluminium  | Composites          |

| Retroreflective sheeting grade |                        |                                  |                 |                          |
|--------------------------------|------------------------|----------------------------------|-----------------|--------------------------|
| 7 Year Engineer                | 10 Year High Intensity | 10 Year prismatic High Intensity | 10 Year Diamond | Flourescent Yellow-Green |

**Summary of order form**

| Row | Type of sign | Type of Body | Type of Retroreflective sheet | Sign code | Quantity |
|-----|--------------|--------------|-------------------------------|-----------|----------|
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |
|     |              |              |                               |           |          |



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تلفن: ۲۲ ۸۶ ۵۴۵۴ (+۹۸۲۱) فاکس: ۲۲ ۸۶ ۵۴۵۳ (+۹۸۲۱)

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