

## **SECTION R15**

### **Traffic signs**

#### **R15 01 Scope**

The work covered by this Section of the Specification consists in the furnishing of all labor, equipment, supplies and materials and in performing all operations in connection with traffic signs, subject to the terms and conditions of the Contract and in strict accordance with this Section of the Specification, the applicable drawings and the directions of the Engineer's Representative.

#### **R15 02 General**

1. The term "Traffic Signs" refers to the complete structure of all kinds of traffic signs including foundations, posts, sign plates and all fittings as shown on the Drawings or detailed by the manufacturer. The type of traffic sign to be used at any given location shall be as indicated on the Drawings or as directed by the Engineer's Representative.
2. Traffic signs shall be either externally or internally illuminated, reflectorized or non-reflecting as described on the Drawings or in the Special Specification of Particular Application and shall comply with Part II Chapter II of 'European Rules concerning Road Traffic, Signs and Signals' agreed by the European Conference of Ministers of Transport and dated February 1974 and any amendments and extension thereof or any Regulation, Direction and Rules of Design issued by the Government of Iraq. Inscriptions on traffic signs shall be in the Arabic and English languages, with the Arabic inscription located either above or on the right of the English inscription.
3. The quality of traffic signs shall in general comply with BS 873 Part I (1970).
4. All sign faces shall be of the type, color, design and size shown on the Drawings.

Direction signs for expressways shall be in white lettering on a blue background and for Primary Routes in white lettering on a green background and for other roads black lettering on a white background with a blue border. All in accordance with the latest edition of "The Traffic Signs Regulations and General Directions" published by H.M.S.O. London. All other signs shall be in the colors shown in the 'European Rules' document quoted in sub-clause 2 above.
5. The Contractor shall determine the actual size of the sign for fabrication in accordance with the Contract and submit to the Engineer's Representative for approval drawings of all special sign faces and all sign faces bearing legends, showing the design and/or arrangement and spacing in both languages. The edges of signs shall follow the shape of the border and not be squared off.
6. Existing signs and posts which are taken up shall be disposed of as directed by the Engineer's Representative. Posts shall be removed or cut off at ground level, leaving a level surface with no projections above ground level.

### **R15 03 Positioning**

1. Signs shall be positioned laterally at the mounting height, shown on the Drawings or as directed by the Engineer's Representative.
2. The Contractor shall stake out the location of the sign support in accordance with the Drawings and shall be responsible for the proper elevation, off-set, level and orientation of all signs he erects, which will be subject to the approval of the Engineer's Representative. He shall exercise due care in the preservation of stakes for his and the Engineer's Representative's use and if any stakes are lost, damaged, displaced or removed, the Contractor shall have them reset at his expense.
3. Signs shall normally be set as least 45cm from the edge of the carriageway. This shall be increased to 60cm where there is a severe camber or cross fall and where signs are mounted on the central reserve of dual carriageways. On Class AA dual carriageway roads the clearances should be at least 120cm and where there is a hardened verge, the nearest edge of the sign should not be less than 60cm behind the edge of the hardening.
4. Where possible the lower edge of traffic signs shall be between 90cm and 150cm above the highest point of the carriageway alongside. The higher mounting shall be used where excessive spray or dust is likely to soil the signs. In built-up areas where the signs are erected over footways the mounting height shall be at least 210cm to allow sufficient headroom for pedestrians.
5. In rural areas to avoid seculars reflection from headlamp beams, signs which face along the carriageway shall be set 95° away from the line of the carriageway where it is straight or on right-hand curves. On left-hand curves, signs shall be set 95° away from a line joining the edge of the carriageway at the sign with a point on the carriageway edge 200m in advance of the sign.

### **R15 04 Sign plates**

1. Sign plates for externally illuminated and non-illuminated signs shall be manufactured from the following materials and the grade of material proposed shall be subject to the approval of the Engineer. Signs over 3m<sup>2</sup> in area shall be manufactured from sheet aluminum or extruded aluminum sections unless otherwise agreed by the Engineer.
  - (a) Sheet aluminum of not less than 3mm thickness to BS 1470 (1972) or to ASTM B 209-74 grade 6061-T6 degreased.
  - (b) Extruded Aluminum Planks to BS1474 (1972). These may be either self-locking or bolted together.
  - (c) Cast Aluminum Alloy to BSI490 (1970).
  - (d) Steel Sheet or Strip of not less than 1.25mm to BS1449 Part 1 (1972), BS2989 (1975) or ASTM A366-72.
  - (e) Cold Formed Steel Sections to BS1449 Part I (1972) or BS2989 (1975). These should be plank-type steel sections bolted together through flanges.
  - (f) Cast Iron of not less than 4.75mm thickness to BS 1452 (1961). Due to its weight this is suitable only for smaller signs.
2. In constructing Signs from sheet aluminum it will not be acceptable to have a large number of small plates riveted together and the largest size sheets available shall be

used in all cases. Where more than one sheet is used to make up a sign face, separate sheets shall be of rectangular shape and of approximately the same shape and size. Care must also be taken to ensure against electrolytic corrosion where dissimilar metals are in contact. All sign plates shall have clean cut edges, be free from warp, and shall have a smooth, even finish.

The temporary signs and sign plates shown on the Drawings and in the Schedules shall be made either from the same materials as for the permanent signs or from hardboard or plywood. Plywood shall be to BSI455 (1972) Grade I with WBP (weather and boil proof) adhesive. Hardboard shall be of high quality and suitably treated to prevent deterioration by weathering.

3. Non-reflective Sign plates shall be covered with non-reflective plastic sheeting, of a type approved by the Engineer's Representative and in accordance with BS873 Part 1 (1970), over the whole front surface to the specified colors, and with grey non-reflective plastic sheeting or plastic coating over the back surface or such other material to the approval of the Engineer's Representative.
4. Rectangular Sign plates shall be covered with the appropriate combination of reflective and non-reflective plastic sheeting, in accordance with BS873 Part 1(1970), over the whole front surface to the specified colors, and with grey non-reflective plastic sheeting or plastic coating, or such other material as the Engineer may approve, over the whole back surface. The front faces of traffic signs may require to be reflectorized even if they are illuminated.
5. Internally illuminated sign faces shall be in accordance with BS873 Part 1(1970). They shall be fabricated from a strong material such as GRP (glass reinforced plastic) or other material approved by the Engineer.
6. All plastic sheeting shall be affixed to the sign plate with heat activated or pressure sensitive adhesive properly applied in accordance with the sheeting manufacturer's specification and instructions. All joints in the sheeting shall be overlapped and in the case of horizontal joints the lap shall be from the top - no butt joints will be permitted. Overlaps shall not be less than 6mm and sheeting applied to extruded sections shall extend over top and bottom edges and down side edges for at least 3mm. Vertical joints shall be avoided. The Contractor shall submit samples of each color of plastic sheeting to the Engineer's Representative for approval, prior to ordering materials.

The faces and edges of each sign plate shall have a coat of clear lacquer applied at the time of fabrication of the sign. The lacquer shall be of a type specified by the manufacturer of the sheeting material for use on that particular material. Full adhesion of all materials including letters, symbols and borders is essential. There shall be no air bubbles, creases or other blemishes. All sign faces, wherever practicable shall be formed from a single sheet of film. Edge sealing with the appropriate clear lacquer shall be continuous along all letters, symbols and border edges. Clear lacquer coating shall be uniform and continuous. All surfaces shall be hard and free from blemishes such as runs, drips and crazing. All bolt holes shall be edge sealed with the appropriate clear lacquer to prevent ingress of moisture to the sign face.

7. On all signs the stiffening and framing shall be constructed in accordance with BS873 part 1(1970). The Contractor shall submit details of the type of framing and

stiffening for the approval of the Engineer.

8. Where brackets are used in the construction of signs, they may be manufactured from stainless steel, strip aluminum alloy, extruded aluminum alloy sections, cast aluminum alloy, or mild steel plastic coated or nylon dipped after shot blasting.
9. Screws, bolts, nuts and washers shall be of stainless steel to ASTM A 276-73 except that washers in contact with surfaces, which may be permanently damaged by over tightening of nuts or bolts, shall be of Neoprene, nylon, or other approved soft and weather resisting material.
10. Rivets or other devices used for fixing signs to their framework shall be of stainless steel, aluminum or other approved material and be of sufficient size to prevent failure due to differential expansion or wind pressure.

Where sign plates are drilled or riveted, clear lacquer as previously specified shall be applied to the perforations to prevent the ingress of moisture to the sign face.

The spacing of rivets shall be uniform on the outside edge of any plate or section of plate and shall not exceed 15cm. On cross braces the spacing shall not exceed 30cm.

Rivets brought through to the sign face shall not detract from the legend. Their heads shall be colored to match the appropriate part of the sign face.

11. Holes in sign plates, framing or posts shall be drilled before painting and they shall be accurately located.
12. The finish of all signs shall be capable of passing the test described in the appropriate appendices of BS 873 Part 1 (1970).
13. At all stages of production, delivery and erection, signs shall be protected to avoid damage.

### **R15 05 Sign posts**

1. The Contractor shall furnish posts to support the signs as shown on the Drawings. The load on the sign plate due to wind pressure may be taken as equivalent of 15 mill bars ( $153\text{kg/m}^2$ ).
2. All tubular or rolled hollow sections shall be complete with cap and base plate, which should incorporate an anti rotational device for signs on a single post.
3. The posts may be of the following types or finish:
  - (i) Tubular or rolled hollow section steel posts or British Standard Beams complying with ASTM A 53-73, BS4 Part 2 (1969) or BSI775 (1964) rust proofed and finished before delivery by one of the following methods:
    - (a) An approved self-color plastics coating material of a thickness not less than 0.08mm. All posts shall be shot-blasted prior to the application of plastic coating in accordance with BS 873.
    - (b) Galvanized to BS729 (197 I), degreased with an approved solution, and painted one coat metallic lead, one undercoat, and finished with one coat grey alkyd paint.
    - (c) Zinc sprayed-which is to include grit blasting, zinc spraying to 0.08mm

thickness, etch primed and once coated with zinc chromate primer, one under-coat and finished one coat grey alkyd paint; each complete with matching cap and base-plates (where appropriate). Base-plates shall have a minimum area of  $0.05\text{m}^2$

- (ii) Reinforced or pre-stressed reinforced concrete-complying with BS 1308 (1970) and Sections B8 and B9.

- 4. The length of posts below ground level shall be in accordance with the Drawings.
- 5. Where specified on the Drawings, or required by the Engineer, traffic sign posts in the verges, but not in the central reserve of dual carriageways, shall be of tubular steel fitted with breakaway (or frangible) joints which will break upon impact by a colliding vehicle. The breakaway joint shall be fitted 7.5cm above ground level and consist of a break in the tubular steel post joined with bolts through notches in flanges and a steel retaining gasket, as developed by the British Transport and Road Research Laboratory, or other form of joint approved by the Engineer.

#### **R15 06 Housing of electrical equipment**

- 1. All illuminated sign assemblies shall be provided with one large-base post to accommodate the necessary electrical equipment.

The Base Housing compartment may be circular or rectangular in section and shall be fitted with an earthing stud. If circular, the compartment shall be not less than 16.5cm internal diameter. If rectangular, the sides shall be not less than 13cm in width and a depth from front to rear (measured from front of switchboard) of not less than 10cm. The compartment shall have an aperture not less than 30cm x 13cm fitted with a weather-proof metal access door having a tamper-proof lock with key. A hard wood panel of a size not less than that of the aperture, 12mm thick, shall be securely fixed to the back of the compartment for mounting the electrical equipment. The post shall be provided with holes for the cable entry below ground level and also at the top of the post to suit the lighting units.

- 2. Side-slung Service Boxes to house the electrical equipment may be attached to a standard post as an alternative, except adjacent to footpaths. The Boxes shall be of approved design constructed of materials of adequate strength to withstand all normal conditions and usage and fitted with an earthing stud. Each Box shall be provided with an aperture not less than 30cm x 13cm fitted with a weather-proof metal access door having a tamper-proof lock with key. A hardwood panel of a size not less than the access door. 12mm thick, shall be securely fixed to the back of the box for mounting the electrical equipment. The dimensions of the Box shall be such that the overall width shall be at least 6cm greater than the width of the post to which it is attached. The depth of the box shall not be less than 11cm and the height should not be less than 30cm.

The Box shall be secured to the post by means of not less than two stainless steel "U" bolts of a suitable size. The "U" bolts shall pass completely round the post and shall be secured by stainless steel nuts and washers within the Box. The Box and all bolt holes shall be weather-proof and a drain hole shall be provided in the base of the Box. Any external cable shall be fitted in conduit or alternatively the cable may be SWA and securely clipped to the post. All cable access holes shall be weather-proofed. The exterior and interior of the Boxes and all holes for cables, bolts, access, etc., shall have a smooth finish without any sharp edges. If the Contractor wishes to

use any other method for securing the Box to the post, full details shall be provided and the Engineer's prior approval obtained.

3. Base Housings and Service Boxes or side slung boxes shall be rust-proofed by one of the methods detailed in Clause R 15 05-3 (i) above.
4. Posts which incorporate lighting cables shall be fitted with a pull-out device designed to isolate the post electrically in the event of a collision.

### **R15 07 Fixings**

1. Clips used for fixing signs to posts shall be manufactured from stainless steel, strip or extruded aluminum alloy sections, cast aluminum, or mild steel treated as specified below.

Instead of standard type clips, the use of one of the proprietary type stainless steel banding systems is acceptable, providing the strength requirements specified below are provided.

All clips up to and including 7.5cm shall be in stainless steel. Half clips and brackets shall be bolted to the sign framework. Clips for larger posts, if made of mild steel, shall be plastic coated or nylon dipped after shot blasting.

Each clip assembly shall be of sufficient size to prevent failure due to expansion or a wind pressure of 15 mill bars (153 kgf/m<sup>2</sup>) on either side of the sign. The Contractor shall submit for the Engineer's Representative's approval samples of each type of clip, stating, in the case of clips for steel posts, the maximum surface area of sign per clip to be used.

The Contractor shall state in the case of plate signs the method whereby the sign plate will be fixed to purlins and the purlins fixed to the post, and detail on the working drawings called for as part of the Contract the type of fixing clips to be used. A connection shall be made at every point where a purlin crosses a post.

The minimum number of clips required for each supporting post shall be as Table R15/1.

**TABLE R15/1  
MINIMUM NUMBER OF CLIPS**

Depth of Sign(meters)	No.
0-1.5	2
1.5 - 3.0	3
3.0 - 4.5	4
4.5 - 6.0	5
Over 6.0	6

On plank signs, every plank shall be fixed to each post by at least one clip. The above table does not apply to plank signs which shall be erected strictly in accordance with the manufacturer's instructions.

2. Where signs are supported on concrete posts, purlins made from 5cm O/D 4mm thick with ends sealed, shall be furnished. The purlins shall be attached to each vertical member of the sign frame and shall be complete with clips for attachment to

the posts. The distance of the top and bottom purlins from the sign edges shall not exceed 45cm. The intermediate purlins shall be spaced equally and the distance vertically from centre to centre shall not exceed 1.5m. The purlins shall be rust-proofed by one of the methods detailed in Clause R 15 05-3(i) above. A neoprene strip or similar approved insulating material shall be provided to prevent contact between purlins and aluminum framing.

#### **R15 08 Lighting**

1. Where the lighting of signs is specified, the manufacture and performance of the units supplied shall be to the requirements of BS873 Part 1(1970). Internally illuminated signs shall be provided only where so specified.
2. Where the illumination of signs is required, the units supplied shall be suitable for illumination of the signs concerned as shown on the Drawings.
3. All lighting units shall be fitted for either fluorescent lighting and be complete with switch gear, starters, ballasts, capacitors, etc. and all ancillary electrical cells, or Mercury Vapor, or Quartz Halogen, or Tungsten Halogen.

When Mercury Vapor, or Quartz Halogen, or Tungsten Halogen lighting is furnished such units shall be complete with the necessary control switch gear and shall meet with the approval of the local electricity authority.

All units shall be complete with wiring to accept a simple supply connection via a fused cut-out located in the base housing or service box, the cut-out to be supplied and fixed with the lighting unit. The wiring and connections shall be to the standards and satisfaction of the electricity authority.

4. In the case of signs illuminated with top-mounted lighting units, the signs shall be extended vertically to be level with the top of the lighting fitting to avoid extraneous light being observed from the rear of the signs. This extended section of the sign shall be finished to conform with that for the back of the sign of which it forms part.
5. Where photo-electric control units are required they shall be designed to switch on and off at the light levels specified by the electricity authority. No control unit will be required on lighting units that are to be operated on a 24-hour basis.

#### **R15 09 Storage**

In order to ensure that sign components do not suffer damage, deterioration from weather or theft, the Contractor shall arrange for adequate storage facilities, off ground and under cover, to the satisfaction of the Engineer's Representative. Any sign or sign component that is damaged, discolored or defaced during transportation, storage or erection will be rejected.

#### **R15 10 Erection**

1. During the erection traffic signs on any section of road already in use, the Contractor shall ensure the free and safe passage of vehicular traffic and pedestrians and the Contractor where directed by the Engineer's Representative shall furnish and erect all necessary warning signs, traffic cones, etc. All signs, cones, etc., shall be

removed clear of the road by the Contractor immediately on completion of the work.

2. The Contractor shall be responsible for the furnishing, erection and removal of any temporary staging and ladders, use of lifting gear and other plant.
3. Posts shall be erected vertical and where two or more are used for one sign their tops shall be at the same level and below the top of the sign, except where they are required to support overhead lighting units. Signs shall be correctly aligned and attached to their posts in a vertical plane with the tops and bottoms of the rectangular and triangular signs horizontal. Circular signs shall be erected so that the legend is at the correct inclination.
4. In the case of illuminated signs, particular attention shall be given to the sitting of the posts. Wherever practicable, the post having the control base housing or Service Box should be that one furthest from the edge of the carriageway. Where this is not possible, the control access opening should always face away from the carriageway.
5. The Contractor shall include for the erection and installation of the whole of the foregoing equipment, together with any materials and work which may not be expressly specified but which is implied and necessary for the satisfactory completion of the installation. Only workmen who have been trained or already have had experience in the erection of traffic signs shall be employed on this work.
6. When signs occur on embankments or in cuttings, the posts will vary in length and the Contractor will be required to provide posts of appropriate lengths to suit this variation. Post centers will be shown on the Drawings.
7. Signs erected before the opening of the new sections of road will in certain cases need masking. The prices quoted must include for masking by Hessian securely fixed to obliterate the legend or part of the legend. The use of masking tape stuck on any part of the sign will not be allowed. Where instructed, the masking shall be hardboard on 4cm x 2cm timber battens or equal approved. Hardboard shall be weatherproofed with one coat grey undercoat.

#### **R15 11 Foundations**

1. The posts other than those for which a reinforced concrete foundation is detailed shall be set in mass concrete Class E which shall fill completely the cavity for the post foundation.
2. Reinforced concrete foundations shall be constructed as detailed on the Drawings in concrete Class 150 and shall conform to Section B8.
3. All excavations for foundations for signs in excess of 10m<sup>2</sup>, for sign posts with a diameter in excess of 10cm and for reinforced concrete foundations shall be subject to the approval of the Engineer's Representative before the sign is erected and immediately prior to the placement of the concrete.
4. Concrete shall be placed in post foundations immediately after mixing, well tamped down and leveled off, and where applicable, a chase or duct to receive an electricity cable shall be formed in wet concrete below the position for a Service Box to facilitate connection to electricity service.
5. The top level of mass and reinforced concrete foundations shall be 20cm below ground level. This last 20cm shall be reinstated to the original levels and fall in such



a manner as to match the adjacent areas.

6. Excavation of foundations for steel posts shall include for taking out any material including breaking out concrete obstructions where necessary and disposal of the surplus excavated material off site. For all foundations reinstatement of grass verges shall be carried out by replacing top soil and seeding with approved grass seed, where applicable.
7. The Contractor shall protect and support during the progress of the Works all pipes, mains, cables, overhead lines and apparatus which might be endangered by his operations and will be responsible for making good any damage.
8. The Contractor shall reinstate trenches and excavations. The surface of the ground around posts shall be reinstated to levels and falls, and with material to the satisfaction of the Engineer's Representative, and the site shall be left in a safe and tidy condition.

### **R15 12 Test and defects**

Before dispatch to the site, the signs shall be assembled and erected at the manufacturer's works and tested there for general operation. At this stage the complete signs may also be inspected for general finish, workmanship, and to ensure that all details satisfactorily comply with the Specification.

All tests will be witnessed by the Engineer's Representative and shall only be carried out at times agreed in advance. The Manufacturer shall provide all plant, instruments, and labor in connection with tests.

Subsequent to the works test the signs shall not be installed until written permission is given.

The Contractor shall on completion take earth resistance, insulation resistance and continuity tests, the accuracy of which shall be demonstrated to the satisfaction of the Engineer's Representative. A record of all tests specified above shall be made for each length and duplicate copies shall be supplied to the Engineer's Representative within 14 days of the completion of the installation.

### **R15 13 Bollards**

Internally illuminated traffic bollards shall be in accordance with BS873 Part 3 (1970).

### **R15 14 Delineators or marker posts**

Delineators and marker posts shall be fixed at the locations, spacing and offset from the carriageway as shown on the Drawings, or as directed by the Engineer's Representative. They shall either be made of steel as specified in Clause B10 03 or of approved moulded plastic. They shall be painted or colored in the manner shown on the drawings and be complete with any reflectors and numerals, which shall be fixed in an approved method.

### **R15 15 Overhead traffic signs**

Overhead Traffic Signs shall be located where shown on the Drawings and mounted on

## *Traffic Signs*

gantries constructed in accordance with Sections B3, B10 and B12.

### **R15 16 Measurements**

Traffic signs shall be measured by the unit for each type as installed and accepted by the Engineer's Representative, and shall include all excavations and backfilling, concrete, reinforcement, anchor bolts and plates, posts, plates and all fittings according to the Drawings.

### **R15 17 Payments**

Payment of traffic sign will be made per number in accordance with the unit prices of the various items stated in the Bill of Quantities, and shall constitute full compensation for the furnishing of all equipment and labor and for performing all operations necessary to complete the work in accordance with this Section of the Specification.