0-17.13 DPWH
11-10-03

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
MANILA

NOV 10 2003

DEPARTMENT ORDER)
No. 278)
Series of 2003 Grang 11-10-03
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SUBJECT : **DPWH Standard Specifications for Drainage Steel Grating with Frame**

For the guidance and compliance of all concerned, the standard specifications for Drainage Steel Grating with Frame are hereby prescribed which shall form part of the DPWH Standard Specifications, Volume II- Highways, Bridges and Airports.

This supersedes all existing specifications and related issuances issued contrary hereto.

This Order shall take effect immediately.

FLORANTE SORIQUEZ
Acting Secretary

Item 511 – Specification for Drainage Steel Grating with Frame

511.1 Description

This item shall consist of furnishing all materials, tools, and equipment including labor required in undertaking the proper application of steel grating with frame as shown on the plans and in accordance with this specification.

511.2 Classes and Uses of Road Grates and Frames

Classes of grates that are commonly use in drainage work are sump, trench and box.

Sump grates shall be used to create a trafficable ground level entry area for surface rainwater to flow into the underground stormwater drainage system. Sump grates shall be used in paved or grassed areas that are graded to direct the surface water to a single pit or to a series of pits. Sump grates shall be plain or hinged.

Trench grates shall be used to collect surface rainwater run off from areas that cannot be graded to direct flow into a single pit.

Box grates or road drainage shall be used to transfer road surface storm water into an underground drainage system. Normally used in conjunction with kerb entry, the addition of the grate significantly increases the hydraulic capacity of the inlet, particularly on steep slopes.

511.3 Strength Classifications and the loading conditions for Sump, Trench and Box grates

Class A – Test Load 10kN

For locations trafficked only by pedestrians, wheelchairs and cyclists – inaccessible to motor vehicles by virtue of barriers, narrow passages or stepped or unpaved approaches.

Class B – Test Load 80kN

For locations normally trafficked by pedestrians and slow moving passenger cars or light agricultural tractors. These locations include areas accessible to infrequent slow moving heavy trucks. Typical locations include footpaths, ground level and multistoried car parks, suburban driveways and back yards.

Class C – Test Load 150kN

For locations trafficked by slow moving fully laden trucks such as pedestrians, malls and industrial or commercial areas.

Class D – Test Load 210kN

For locations trafficked by fast moving fully laden trucks and forklifts with wheel loads to 5.0T. This includes all public roads from residential to freeway.

Class E, F or G – Test Load 400kN, 600kN or 900kN

For locations subject to vehicles such as large forklifts, earthmoving or container handling equipment and aircraft. Typical locations include wharves, container storage areas, heavy industry or construction sites and domestic or international airports.

All loading conditions specified above are applicable to the three classes of grates depending on their specific uses and locations.

511.4 Materials Requirement

511.4.1 Steel Grating

The steel grating shall be made of fabricated mild steel provided with hot dip galvanized in accordance with ASTM A153/AASHTO M 232 for superior corrosion protection. Steel grating shall be machine-made grating comprised of steel flat bars standing on edge equispaced from each other. To prevent them from falling over and to provide restraint in buckling, a twisted cross rod (6mm) is forge-welded* into the top of the flat bars.

511.4.2 Steel Frame

The steel frame clear openings of drainage grates shall be 15mm larger than nominal sizes of industry standard sized pits. These pits increase in size in increments of 150mm. This shall be done to allow frames to be placed over standard panel formwork and cast in while pouring the pit walls, to speeds up installation and ensure the frame is fully embedded in the concrete.

511.4.3 Drainage Grate Sizes

The drainage grates shall be identified by their internal clear opening dimensions of the frame. For square and rectangular grates, the normal convention shall be the width x length. Metal units shall conform to the approved plan dimensions and specifications requirement for the designated materials.

*Forge-welding is a process of metal fusion using a combination of high temperature and high pressure.

Grates shall consist of 25mm to 65mm x 3mm, 4.5mm or 5mm thick flat bars with length of not more than 6.1m spaced at 30mm o.c. with 6mm twisted rod spaced at 100mm o.c.. Angular frame (L 75mm x 75mm x 9mm thick) shall be coated with hot dipped galvanized for superior corrosion protection finish and extended life. If required, I-Beam support shall be provided in the grates in accordance with the approved plan. It shall also conform to the requirements of ASTM A 153 or its equivalents AASHTO M 232.

511.4.4 The metal unit shall conform to ASTM A 36 / AASHTO M 183.

Dimension Tolerances:

Thickness	=	+/- 0.20mm
Width	=	+/- 0.80mm
Length	=	+ 50mm/NIL mm
Straightness	=	6mm in each 1.5m length

511.4.5 Joint Mortar

Unless otherwise indicated on the Plans, joint mortar shall be composed of one part Portland Cement and two parts fine aggregate by volume to which hydrated lime has been added in an amount equal to 10 percent of the cement by weight. All materials for mortar shall meet the requirements of Item 405, Structural Concrete. Structural concrete used shall attain a minimum 28-day compressive strength of 20.682 MPa (3000 psi).

511.5 Construction Requirements

Concrete construction shall conform to the requirements for Item 405, Structural Concrete.

Metal gratings which are to rest on frames shall bear on them evenly. They shall be assembled before shipment and so marked that the same pieces may be reassembled readily in the same position when installed. Inaccuracy of bearings shall be corrected by machining, if necessary. The steel grating and its corresponding frame shall constitute one pair.

When grade adjustment or existing drainage grates is specified, the frames and steel gratings shall be removed and the walls shall be reconstructed as required. The cleaned frames shall be reset at the required elevation. Upon completion, each drainage grates shall be cleaned of any accumulations of silt, debris, or foreign matter of any kind and shall be kept clear of such accumulation until final acceptance of the work.

Excavation and backfill shall be done in accordance with Item 102, Excavation.

511.6 Acceptance Requirement

A sufficient number of cylinders for concrete construction shall be cast from the concrete for each unit for compression tests at 7, 14 and 28 days, and to allow for at least 3 cylinders for each test. If the strength requirement is met at 7 or 14 days, the units shall be certified for use 14 days from the date of casting. If the strength is not met at 28 days, all units made from that batch or load will be rejected.

The steel grating plants will be inspected periodically for compliance with specified manufacturing and fabricating methods and bars samples will be obtained for laboratory testing for compliance with material quality requirements.

All draining grates materials shall be subjected to inspection for acceptance as to condition at the latest practicable time the Engineer has the opportunity to check for compliance prior to or during incorporation of materials into the work.

511.7 Method of Measurement

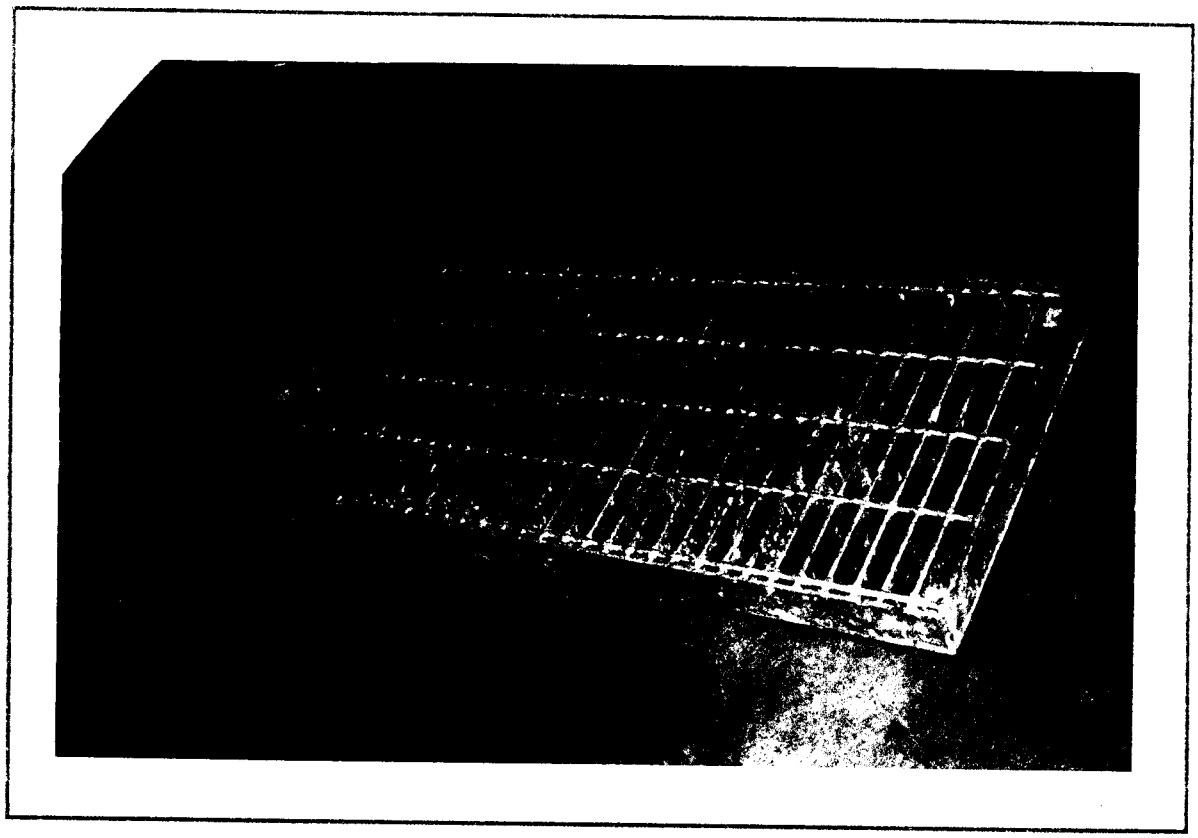
The quantity to be measured and paid for will be the number of pairs of metal frames and gratings completed and accepted. Concrete and reinforcing steel (AASHTO M 31) will be measured and paid for under Item 405, Structural Concrete and Item 404, Reinforcing Steel, respectively.

Excavation and backfill will be measured and paid for as provided in Item 102, Excavation.

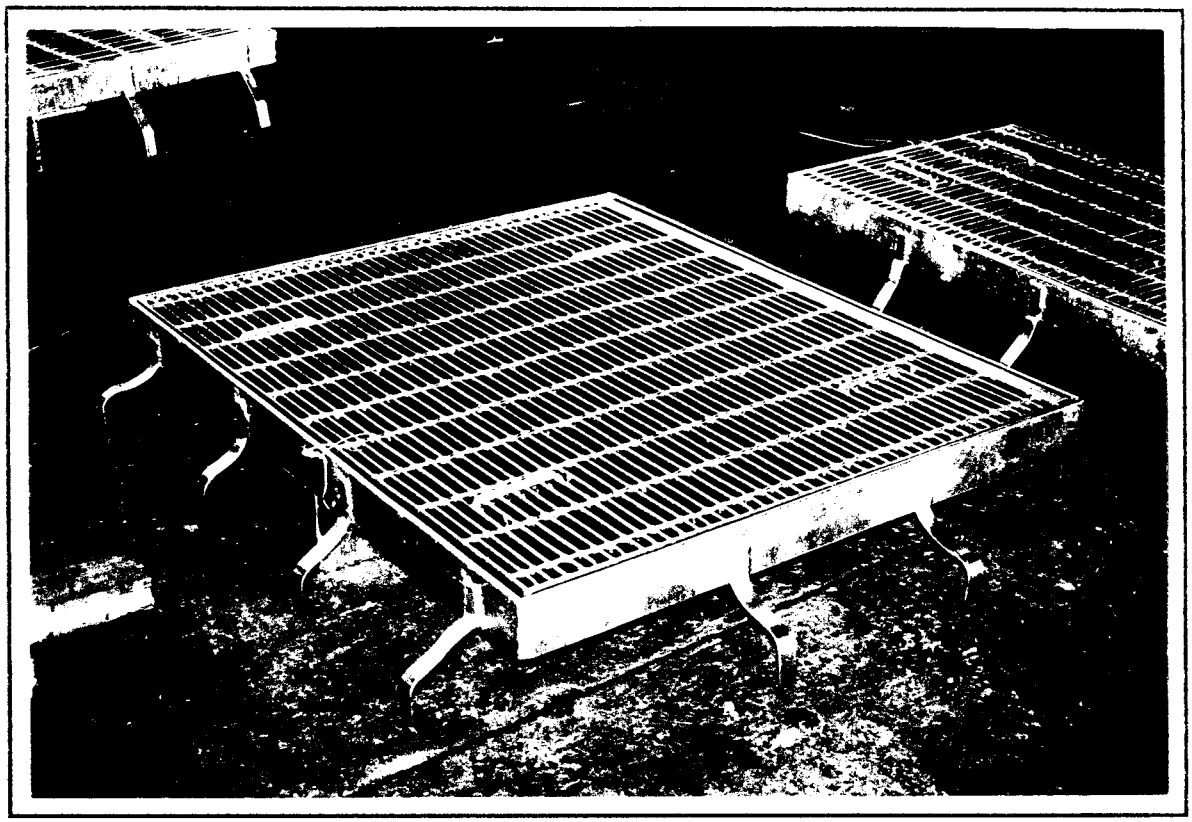
511.8Basis of Payment

The accepted quantities, determined as provided in Section 511.7, Method of Measurement of the Pay Items in the Bill of Quantities will be paid for at the contract unit prices, which shall constitute full compensation for furnishing and placing all materials and for all labor, equipment, tools and incidentals necessary to complete the item.

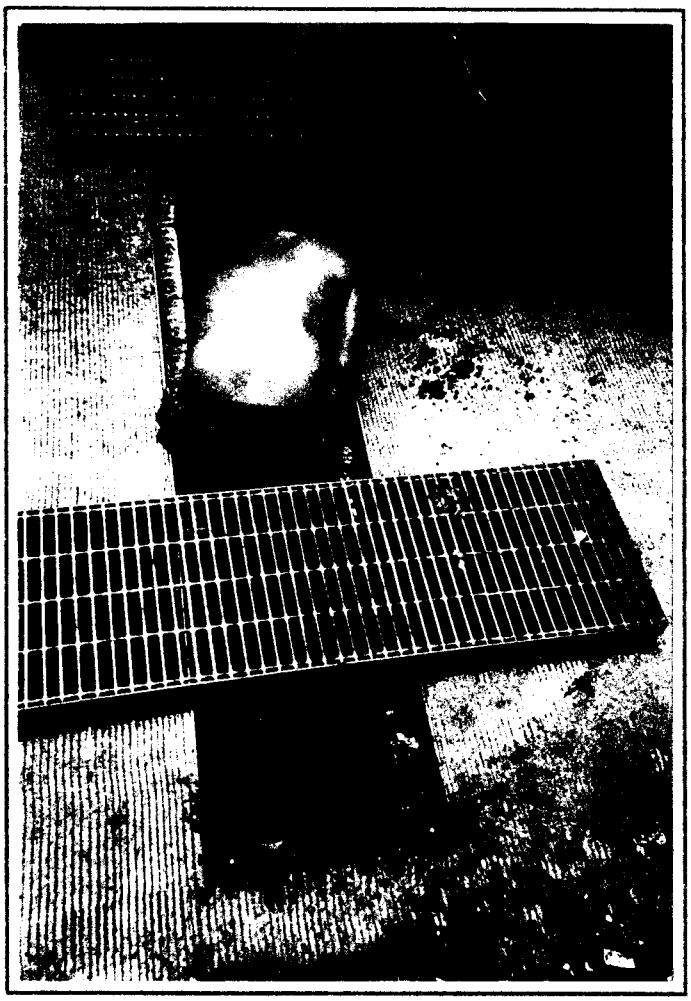
Pay Item No.	Description	Unit of Measurement
511	Metal frames and grating	Pair



Steel grating with provisions of slots on corners and sides for holding down bolts.

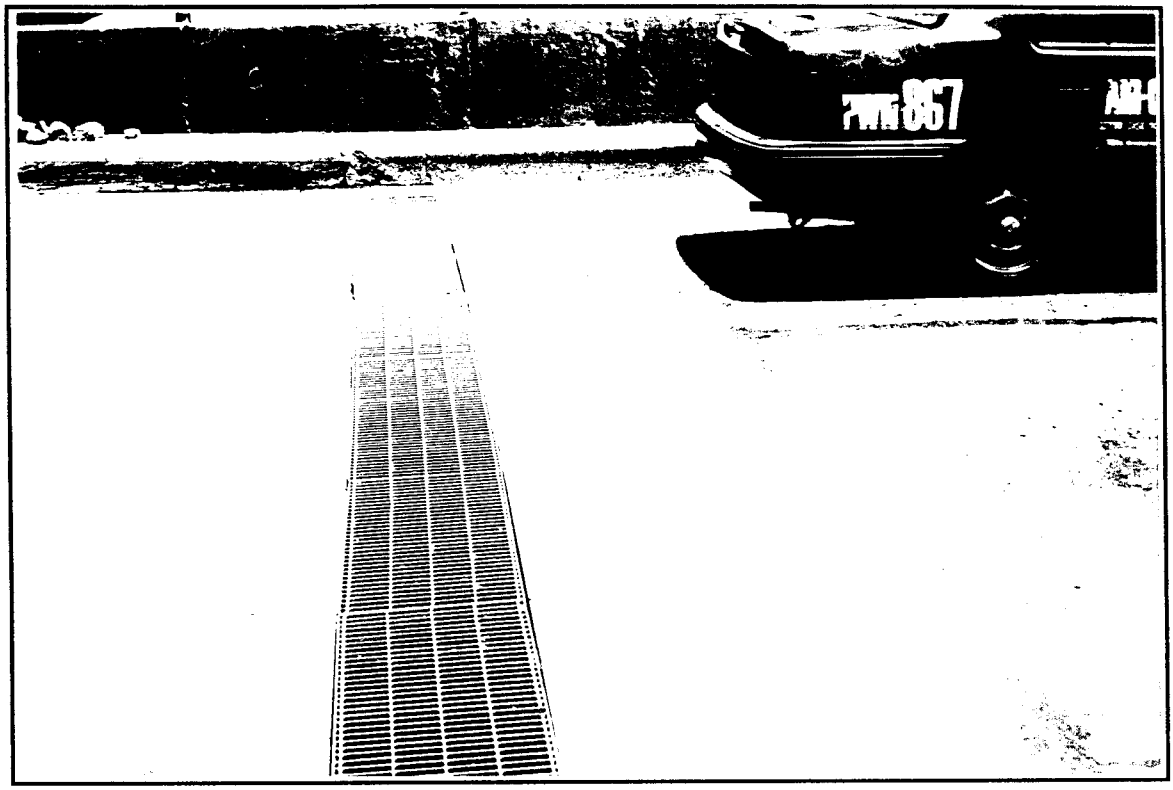


Frames shall be placed over standard panel formwork and cast in while pouring the pit walls. This method of installation ensures the frame to be fully embedded in the concrete.

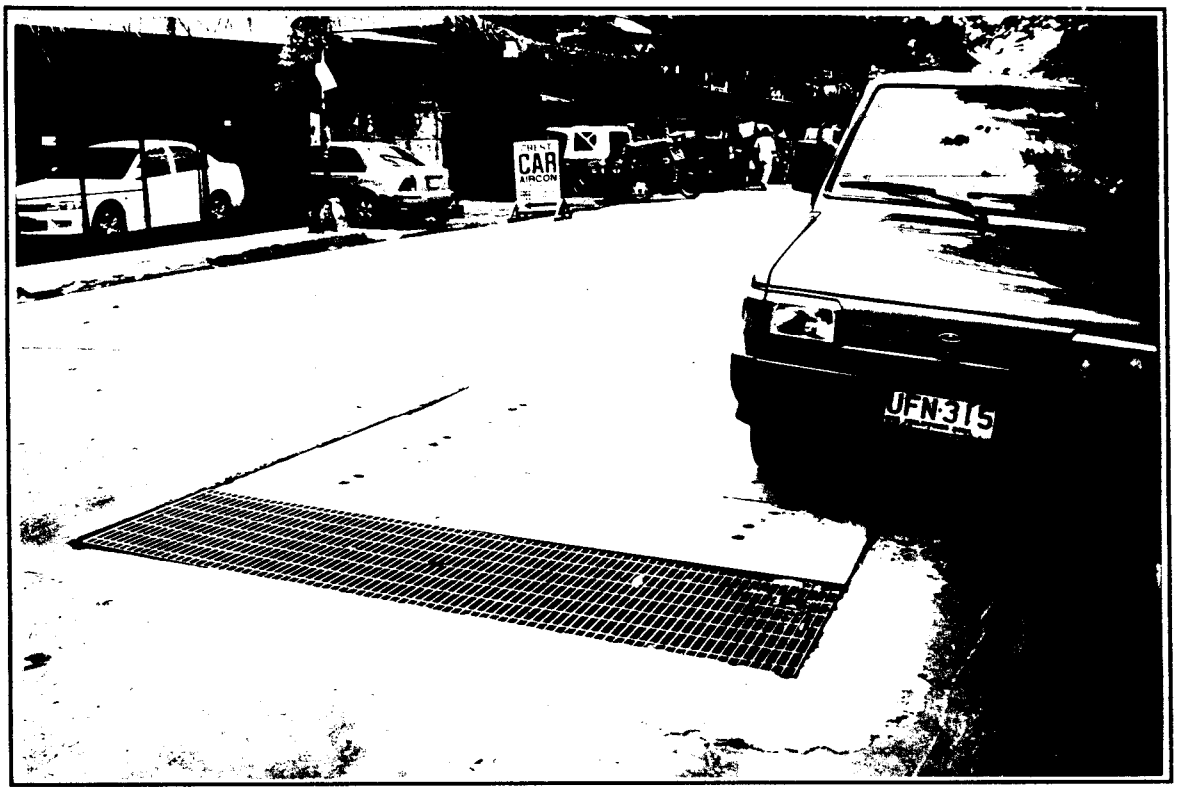


Steel grating shall be fitted in its frame by providing holding down bolts made of stainless steel or spot welded on corners and sides to provide resistance to unauthorized opening.

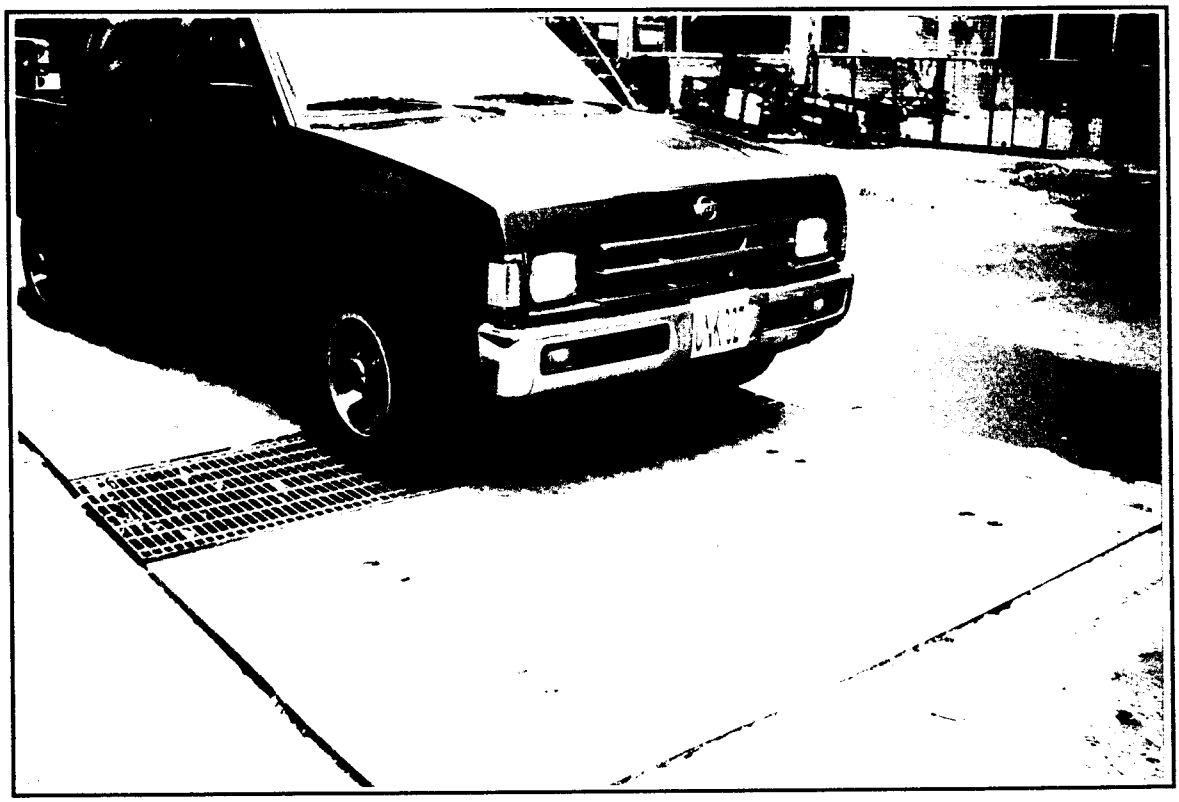
Installed steel grating (Trench) at Quiapo-Quezon Blvd. Underpass.
Spot welding method was used in this particular project.



Project: **DPWH – Quezon Blvd. underpass**
Product: Webdrain Trench Grates – WA655/1/P/G
Consists of FB 65 x 5 mm thk spaced @ 30mm o.c.
With 6mm twisted rod spaced @ 100 mm o.c.
With angular frame (L75 x 75 x 9mm thk)
Hot Dipped Galvanized with BS EN ISO 1461



Project: **DPWH - Blumentritt**
Product: Webdrain Sump Grates – WA655/1/P/G
Consists of FB 65 x 5 mm thk spaced @ 30mm o.c.
With 6mm twisted rod spaced @ 100 mm o.c.
With angular frame (L75 x 75 x 9mm thk) & with I-Beam Support
Hot Dipped Galvanized with BS EN ISO 1461



Project: **DPWH – España Corner Morayta**
Product: Webdrain Sump Grates – WA655/1/P/G
Consists of FB 65 x 5 mm thk spaced @ 30mm o.c.
With 6mm twisted rod spaced @ 100 mm o.c.
With angular frame (L75 x 75 x 9mm thk) & with I-Beam Support
Hot Dipped Galvanized with BS EN ISO 1461

Project: **DPWH - España**
Product: Webdrain Sump Grates – WA655/1/P/G
Consists of FB 65 x 5 mm thk spaced @ 30mm o.c.
With 6mm twisted rod spaced @ 100 mm o.c.
With angular frame (L75 x 75 x 9mm thk) & with I-Beam Support
Hot Dipped Galvanized with BS EN ISO 1461