

STANDARDS FOR CNG FILLING STATIONS

GE – 1-118

BUENOS AIRES, September 1st, 1992

BY VIRTUE OF the information submitted by the Legal Issues Management Department on folios 174/5 and 177/8, the Operating Technical General Under Management on folios 175 and 176, the General Secretariat Management Department, and

CONSIDERING:

That as of the beginning of the National Plan for Liquid Fuels Substitution by Compressed Natural Gas, Gas del Estado, a state-owned company, has been the main fosterer, concerning its activities, as for example laying down safety and control regulations for the equipping and operation of CNG filling stations,

That up to date, steps taken before Gas del Estado as regards the installation of CNG filling stations were not implemented in any normative,

That there are increasingly more parties interested in installing filling stations, thus, requiring specific standards regulating the procedure.

That from the experience acquired as regards CNG filling stations, the rules in force have been enriched and optimized,

That in this respect, it is necessary to gather such regulations in a normative,

That Internal Provision number 2773 grants authority in this respect,

Therefore,

THE ALTERNATE CONTROLLER

PROVIDES

1^o) The approval of the "Regulation governing the approval procedure of installations in CNG filling stations", attached hereto as Annex I.

2^o) The approval of the Regulatory Manual "Regulation for Compressed Natural Gas Filling Stations", attached hereto as Annex II.

3^o) Be it disclosed by Internal Provision.

4^o) Be it delivered to the Operating Technical General Under Management and to the Legal Issues Management Department with copies for both and for the General Secretariat Management Department.

(Signed by the Alternate controller and by the general secretary)

Provision number 054775

CIRCULAR GUSC (Fuel Substitution and Utilization Management) Nr. 26
BUENOS AIRES,

Sirs

COMPRESSED NATURAL GAS FILLING STATIONS
TECHNICAL REPRESENTATIVES

It is hereby informed to you that as of October 14th, 1995, the updated regulatory text governing the regulations for CNG Filling Stations across the country (GE N 1-118) have been approved by Provision Nr. 54.775.

It is also stated that on August 5th, 1992, the Municipality of the City of Buenos Aires, passed Decree number 2015 with its annex 1, incorporating said regulation for covering safety issues in those installations. It is worth mentioning that for the location of the compression enclosure, distances established by the municipality for the city of Buenos Aires must be taken into account.

Best regards,

(Signed by the Under Manager)

REGULATION FOR CNG FILLING STATION INSTALLATION APPROVAL

Procedure to be followed for obtaining the installation approval of a CNG Filling Station in the national territory shall be subject to the following guidelines:

ONE: Before taking steps at Gas del Estado for the authorization to erect a CNG Filling Station, the interested party shall count with the “Land use Permit” (or equivalent documentation) granted by the pertinent Municipal or Provincial Entities, specifying that construction of a CNG Filling Station is authorized in a specific location (according to the Urban Planning Code, Municipal Codes or Planned District Codes).

TWO: Once the interested party counts with the documentation previously stated, he or his attorney-in-fact shall carry out the pertinent processing at Gas del Estado.

THREE: In case the interested party is the land owner in which the filling station will be located, he shall submit the title deed certified by Notary Public evidencing that condition. If the land owner assigns a third party to act on his name and behalf, he shall also submit a Power-of-Attorney granted before a Notary Public empowering him to act as such.

In case it is a Company, the Company By-laws or Agreement certified by Public Notary and documentation enabling the applicant shall also be submitted.

FOUR: NATURAL GAS SUPPLY FEASIBILITY

For applying Natural Gas Supply Feasibility before Gas del Estado, the interested party shall:

- Pay the corresponding fee, according to what is stated in the Instructions Manual.
- Complete the document “Natural Gas Supply Feasibility Application”
- Submit a note before Gas del Estado, Fuels Utilization and Substitution Management, located at Don Bosco 3672 – 2º or before Regional Managements, together with:
 - “Land use Permit” granted by the corresponding Municipal or Provincial Entities (Provision number 1)
 - Title deed of the site in which the station shall be located, certified before Notary Public.
 - Power-of-Attorney for representing the owner, granted by him, if corresponds.
 - Land plan
 - Payment certificate of the fee

At this stage, the interested party will receive the Instructions Manual with the applicable regulation, terms for documentation submittal, forms, etc.

FIVE: The Fuels Utilization and Substitution Management or the Regional Managements, as may correspond, shall process the “Natural Gas Feasibility” before Gas del Estado specific Departments, and shall commit to deliver Feasibility in a term of fifteen business days as of the date application is submitted, stating the flow rate required and the optimum point for connection to the existing network.

Natural Gas Supply Feasibility granted by Gas del Estado shall be valid for sixty running days.

SIX: FEED LINE PROJECT APPLICATION

Within the period in which the “Natural Gas Supply Feasibility” is valid, the interested party shall request the “Feed Line Project” to Gas del Estado. To this effect, he shall:

- a) Pay the corresponding fee, stated in the Instructions Manual.
- b) Submit a note before the Fuels Utilization and Substitution Management or the Regional Managements, signed by the interested party or his attorney-in-fact, as may correspond, together with the following documentation:
 - Natural Gas Supply Feasibility Form in effect
 - Scheme of plot location with service specification
 - Payment certification of the corresponding fee

SEVEN: Gas del Estado, through its Fuels Utilization and Substitution Management or its Regional Managements shall process before the Gas del Estado specific departments, the design of the Feed Line Project for the pertinent filling station, indicating layout, pipeline diameter and pertinent service.

In a maximum term of fifteen business days as of the “Feed Line Project” application date, Gas del Estado shall deliver said project to the interested party, which shall be valid for a term of 90 (ninety) running days.

EIGHT: Once the Line Project is received and before works start, the interested party shall submit a note before the regional Managements or Metropolitan Area, as may correspond, stating the contractor company registered in Gas del Estado that will be in charge of the feed line construction.

NINE: Works related to the feed line shall be technically supervised by a Gas del Estado inspector, assigned to that effect.

TEN: Once the line works has been finished and enabled, according to the guidelines provided in the Instructions Manual and GE 1-113 Standard, the works shall be automatically incorporated to Gas del Estado estate for its maintenance and exploitation for the sake of public safety and for safekeeping the normal and efficient service level, without granting the interested party the right for any judicial or extrajudicial claim whatsoever.

ELEVEN: INSTALLER

Before starting the aforementioned processing related to the on-site works, the interested party shall submit a note before the Fuels Utilization and Substitution Management appointing the installer, who shall be a professional of a related specialty, according to the qualifications of his degree, registered in Gas del Estado as first class category installer.

The installer shall be the responsible person before Gas del Estado for the project and construction of the filling station as regards civil, mechanical, electrical and safety aspects, according to GE 1-118 Standard.

TWELVE: CNG FILLING STATION PROJECT

Within the valid term stated in provision number seven for the Feed Line Project, the installer shall submit before the Fuels Utilization and Substitution Management or Regional Managements, the CNG Filling Station Project, which shall include all the issues related to safety standards, according to the Instructions Manual guidelines and its GE 1-118 Standard.

Plans shall be submitted together with the payment certificate of the fee determined by Gas del Estado for the approval of the filling station project.

THIRTEEN: By his Fuels Utilization and Substitution Management, Gas del Estado shall assess the plans and shall approve them in a maximum term of fifteen days or, if corresponds, it shall indicate the corrections to be made.

Plans approval enables the installer to start internal works construction according to the guidelines included in the Instructions Manual, its specifications and the pertinent construction plan.

FOURTEEN: Gas del Estado shall not approve the filling station project if the economic and commercial capacity referred to in paragraph number fifteen has not been evidenced to Gas del Estado fulfillment

FIFTEEN: ECONOMIC AND COMMERCIAL CAPACITY

Before submitting the "Filling station Project", the interested party shall submit the evidence of its registration at the Registry of Fuel Dispensing Outlets of the Fuels Under Secretariat (Resolution number 6/91) and the documentation evidencing his economic and commercial capacity.

Such documentation shall be assessed by Gas del Estado through its Finance – Economic Research Management Department in a maximum term of fifteen business days.

SIXTEEN: For evidencing the economic and commercial capacity, the following shall be considered:

a) Companies introduced by Oil Companies and CNG companies duly authorized by the Energy Under Secretariat shall be automatically acknowledged, submitting, in all cases, the Agreement signed between them, duly certified by Notary Public.

b) Companies desiring to take part in this market with their own flag according to Resolution 6/91 of the Fuels Under Secretariat and Decree number 1212/89, shall evidence their economic capacity for guaranteeing approximately four months of consumption. Whenever necessary, Gas del Estado shall require the guarantees it deems convenient or else, supply bimonthly payment in advance. Apart from it, the following documents shall also be submitted:

- Company's constitution deed, certified by Notary Public.
- Affidavit evidencing the lack of commitment with any flag, duly certified by Notary Public.
- Affidavit, Law 17.250, Section 4, duly certified by Notary Public

c) Companies willing to take part in this market with the identification logotype of Gas del Estado shall evidence their financial standing for the undertaking and shall be reliable enough for using the Gas del Estado brand. To this effect, they shall submit:

1. The two last balance sheets, signed by a Certified Accountant whose signature shall be certified by the pertinent Professional Association.

2. In case of new companies and/or companies with little or unissued capital, the following shall be submitted:

2.1 Company's updated statement of financial position signed by a National Certified Accountant whose signature shall be certified by the corresponding Professional Association.

2.2 Partners personal assets demonstration signed by a National Certified Accountant whose signature shall be certified by the corresponding Professional Association, stating if the real property included therein is registered as homestead or not.

2.3 Additionally, if necessary, the undertaking financing scheme, including the financing sources foreseen.

SEVENTEEN: INTERNAL WORKS SUPERVISION

Fuels Utilization and Substitution Management may delegate works supervision related to the on-site works (specific installations) to Regional Managements, for works carried out in the Provinces and to the Metropolitan Area Works Management, for works carried out in the Capital City and Greater Buenos Aires.

Supervisions shall consist in the inspection of the following tasks, not limiting Gas del Estado's power to inspect at any time and exclusively at its own criteria, any other type of job:

- Approval of materials and quality control
- Compressors enclosure concrete pouring
- Welding
- Mounting of equipment, supplementary works and safety systems
- Tests

Each inspection approval shall be essential for works continuation.

EIGHTEEN: COMMISSIONING

Once the filling station construction stage has been completed and performance tests are complied with satisfactorily, the installer shall submit the works approval plans and shall request supply of natural gas for the installation start up and calibration, before submitting the Municipal Works Approval plans duly registered.

NINETEEN: During a maximum of ten running days, as a trial, Gas del Estado shall provide natural gas. After this term, supply shall be interrupted.

TWENTY: Once installations' good operation is verified and works approval plans are accepted by Gas del Estado, it shall issue a "Certificate of Installations Approval" which will be used by the interested party for being granted the "Permit" by the pertinent municipal or provincial entity.

TWENTY ONE: The interested party shall take the "Permit" granted by the pertinent municipal or provincial entities to Gas del Estado, so as to request the release of natural gas supply. A certificate of "Natural Gas Supply Commencement" shall be issued.

TWENTY TWO: BILLING

Gas del Estado shall bill the natural gas volumes supplied for the filling station to the station owner twice a month, at the rate stipulated by the competent authority, in force at billing time, plus the applicable national, provincial and/or municipal taxes.

Applicable VAT aliquot shall be applied on this rate.

In case of gas industry market deregulation, the parties shall agree on the price and, if applicable, it shall be approved by the competent governmental agency.

Bills shall be paid within fifteen running days as of the measurement date of the corresponding service and Gas del Estado shall deliver invoices five days before the expiration date.

TWENTY THREE: If the term stipulated for bills payment has elapsed and the station owner has not paid them, Gas del Estado shall apply a rate for compensatory interests equal to the one charged by Banco Nación for thirty days factoring plus a default interest equal to a fourth part of the compensatory interest agreed upon, which shall be capitalized with any rate fluctuation.

Furthermore, Gas del Estado shall be empowered to interrupt natural gas supply for the station owner, without any previous notice, and the station owner waives to start proceedings that may affect this measure; notwithstanding the legal actions granted to Gas del Estado by right, when default exceeds one billing period.

Consulted Background and Standards

- a) Installation of compressed natural gas fuel system and containers on highway vehicles and requirements for filling stations (1982, Canada)*
- b) Safety criteria for the installation and operation of methane gas compression stations (1978, Italy)*
- c) New Zealand Standard – CNG Compressor and Filling stations*

Purpose:

These Standards and Technical and Safety Specifications specify the characteristics and location of CNG containers for storage and compression plants, compressors installations, dispensing installations, piping, fittings and other supplementary elements.

Furthermore, they are intended for regulating the distribution and size of the dispensing outlet, for stipulating the guidelines for vehicle maneuvering yard and for specifying methods of re-qualification as well as regularity in their implementation on CNG vehicle Filling Stations once enabled and started up.

Scope:

Provisions included in these Standards and Specifications apply to the project, construction and installation of CNG compression, storage and dispensing stations for vehicles refueling, which may be located at:

- a) Sites without any other installation
- b) Sites with previously existing installations for liquid hydrocarbons dispensing
- c) Sites with industrial installations and for own use (captive stations).

TABLE OF CONTENTS

REQUIREMENTS FOR DESIGN AND INSTALLATION

1. LOCATION

1 - Installations site	15
2 - Minimum safety distances	16

2. INSTALLATION COMPONENTS AND EQUIPMENT 17

1 - General aspects.....	17
2 - Equipment - Compressors and/or storage enclosures and dispensers	18
3 - Designs for maneuvering area of CNG filling stations	21
4 - Piping	26
5 - Pressure relief and shut-off devices	29
6 - Valves and fittings	29
7 - Installations testing	33
8 - Inspections	34

INSTALLATIONS SAFETY

1. SAFETY MEASURES 92

1 - Inerting	92
2 - Lighting and electrical installations	93
3 - Grounding	93
4 - Extinguishers	94
5 - Safety signs	96
6 - Emergency shutdown	97
7 - Lightning arresters	97
8 - Miscellaneous	98

ESSENTIAL DOCUMENTATION PROCESSING 68

1. GENERAL ASPECTS 69

1 - Municipal permit for land use	69
2 - Natural gas supply feasibility and feed line project application	69
3 - Choice of company identification flag	69
4 - Installations	70
5 - Electric power supply	70
6 - Installer appointment	70

2. PROJECT SUBMITTAL	70
1 - General aspects	70
2 - Specifications report	71
3 - Civil project	71
4 - Safety project	71
5 - Electrical project	71
6 - Mechanical project	72
7 - Standard plans	73
8 - Compressor sheet	73
9 - Works control	74
10 - Approval of CNG installations	75
11 - Public dispensing permits	76

GE Nr. 1-141 STANDARD – COMPRESSION EQUIPMENT FOR CNG FILLING STATIONS

SPECIFICATION FOR CNG FILLING STATIONS WITH GAS DEL ESTADO FLAG IDENTIFICATION

SPECIFICATIONS FOR PERIODIC RE-QUALIFICATION OF CNG FILLING STATIONS

1. DEFINITIONS

1 - Servo valve	81
2 - Excess flow control systems	81
3 - Overpressure relief valve	81
4 - Holder	81
5 - Owner and operator	81
6 - Installer	81
7 - Maintenance Responsibility	81

2. DOCUMENTATION

1 - General aspects	82
2 - Book of Notices	82

3. PERIODICAL CONTROLS	82
1 - Monthly controls	82
2 - Half-yearly controls	84
3 - Annual controls	88
4 - Five-yearly controls	90
5 - Ten-yearly controls	90
6 – Compressors	90
SATELLITE STATIONS (Mother and Daughter)	79
1. GENERAL ASPECTS	79
1 - Standards	79
2 - Load and discharge site	79
3 - Location in clear open sites	80

REQUIREMENTS FOR DESIGN AND INSTALLATION

1 - LOCATION

1 -1 INSTALLATIONS SITE

a) For CNG filling stations, the corresponding safety distances shall be taken into account.

b) Basements are prohibited.

Higher floors shall only be allowed for vehicle parking purposes.

c) In the case of open to the public service stations, permitted vehicle accesses and direction of flow of traffic shall be taken into account.

d) It shall count with the approval of the national, provincial or municipal authority having jurisdiction, as may correspond.

e) It shall comply with the Industrial Hygiene and Safety Law Nr. 19587 and P.E.N. (National Executive Power) Decree Nr. 2407/83 "Safety standards for Service Stations and other Fuel Dispensing Outlets".

f) Elements not related to the business activity shall not be stored in the service station facilities.

g) Service station party walls shall be of solid masonry with at least 3 m. height and 0.30 m. thickness. Rural service stations located at not populated areas may not require those walls (near buildings located as of 100 m from service station perimeter), provided there is no regulation in force in that respect.

h) A CNG dispensing outlet may be added to a typical service station, only if the site dimensions allow the compliance with the minimum safety distances stated in 1-2

1 -2 MINIMUM SAFETY DISTANCES

Installations shall be located within safety distances according to the following minimum distances table.

References	Distances (in meters)		
	Storage Volume (water liters)		
	Up to 4,000	From 4,000 up to 10,000	From 10,001 on
STORAGE AND COMPRESSORS ENCLOSURE			
Site party walls and own facilities	5	5	10
Ground Floor Front Property Line	3	3	3
Upper Floor Front Property Line	0	0	0
* 4 or more storey buildings for more than 150 persons	10	10	15
- Dispensers	5	5	5
- Open flames	3	3	3
DISPENSERS			
Front Property Line	4	4	4
Highway and roads side (rural areas)	6	6	6
Own premises	3	3	3
Site party walls and own premises entrance	5	5	5
Open flames	5	5	5
LIQUID FUELS STORAGE (LOADING AND / OR DISCHARGE OUTLETS)			
	5	5	5

* According to the maximum allowed height for building constructions in the district of the premises but, if the building next to it is higher, then the latter case applies.

Note: Masonry or concrete wall, 0.50 m. higher than compressor and/or storage and more than 1.00 m. length exceeding each end, with a minimum 3-hour resistance shall be constructed. It shall count with labyrinthine accesses. Distances shall be measured from the outer border of its perimeter wall.

2 - INSTALLATION COMPONENTS AND EQUIPMENT

2 -1 GENERAL ASPECTS

- a) CNG storage shall be installed within the compressors enclosure or in a similar enclosure.
- b) Equipment installation for avoiding hydrates formation in very cold areas shall be analyzed.
- c) CNG storage tanks shall be capable of operating at a working pressure of 250 bar and shall comply with the requirements of A.S.M.E. Code, SECTION VIII, Div. I (American Society of Mechanical Engineers Code) or any other code accepted by Gas del Estado.

They shall be approved by a certification entity recognized by the authorities having jurisdiction. They shall include a safety valve which pressure is set to discharge at 15% to 20% above maximum working pressure. Safety valves shall have the capacity of releasing the maximum flow rate supply, either from the suction regulator valve or from the compressor, as the case may be.

Connection unions and flanges shall be suitable for the tank operating pressure and their installation shall be fitted to the requirements of the construction standard or Code applied.

The tank exposed to internal pressure shall neither be welded nor altered. Only support plates or brackets may be welded.

Interconnections between tanks and compressors shall have differential movement and vibration compensation.

d) Mounting of CNG tanks

Tanks mounting shall be such as to avoid concentration of excessive loads on the supports.

Tank supports shall be made of reinforced concrete, steel or solid masonry. Metal supports may be used only if they are adequately fire protected; thus, being capable of resisting the action of direct fire during not less than 3 hours, without tank collapse.

Mounting on supports shall allow free expansion and contraction of the tank and piping connected thereto.

Adequate means for avoiding corrosion of tank parts in contact with the supports shall be provided.

Once the tanks are mounted, they shall be adequately cleaned and then, protected with two coats of anticorrosive paint and two of white synthetic enamel.

During these operations, special care should be taken for not covering the identification plate that shall be readily visible and permanently affixed on every approved tank.

When used tanks or tanks unused for one year or more are utilized, the following shall be previously considered:

As a general rule, it is stipulated that a new tank shall be used in any new installation or expansion thereof. Utilization of a used tank or tanks unused for one year or more shall only be

allowed if a new permit is obtained by the review procedures according to the respective manufacturing standard which shall be certified by a certifying entity recognized by Gas del Estado.

e) Cylinders Storage Unit

Provisions included in point 7.4 of GE 1-141 standard for compressors apply to this storage type.

It shall be considered that the support structure of each storage unit will be constructed with corrosion resistant materials or treated adequately for corrosion prevention. Its construction shall allow a fixed and non-displaceable way of mounting of the cylinders, in order to preserve the connections; however, they shall be able to be easily disassembled for maintenance purposes.

All the operating valves shall always allow their operation from the storage unit perimeter.

Each storage level shall have its corresponding pressure gauge with a valve and purge.

The design pressure of cylinders used in the storage unit shall depend upon the operating pressure that shall not exceed 250 bar.

2 -2 EQUIPMENT:

COMPRESSORS AND/OR STORAGE ENCLOSURES AND GAS DISPENSERS.

a) Compressors, storage units and gas dispensers shall comply with GE Nr. 1-141 Standards and its Annex Nr. 1.

b) Compressor and storage unit shall be installed in appropriate enclosures.

Enclosures used to house a compressor and/or storage facility shall not be used for any other purpose.

c) Compressors and storage equipment shall be surrounded by a perimeter wall at least 50 cm. higher than the highest component subject to high pressure and shall have a minimum height of 3 m.

d) It shall have two labyrinthine accesses diagonally opposed, with free circulation width of at least 1.10 m. If those accesses have doors, they shall open outwards and shall have iron fittings and non-panic latching and devices admitted by Gas del Estado.

e) Labyrinthine accesses previously defined in 2-2-d) shall lead to corridors or common alleys that will be used for exiting in case of emergency. Minimum widths of these means of exit shall

be of 1.10 m, unobstructed or reduced in any case. Free circulation path shall extend up to the refueling area or street and it shall not be obstructed by convenience stores or other shops. If needed, exit signs shall be posted.

f) Perimeter wall defined in 2-2-c) shall be made of at least 3-hour fire resistance rating, 15 cm. thickness reinforced concrete, H13 quality (130 kg/cm^2) or higher according to CIRSOC. Two meshes with 10 mm-diameter steel bars per each 15 cm, 4200 kg/cm^2 steel equivalent quality, one at each face, shall be the reinforcement of the wall. For ensuring higher safety against wall fragmentation in case of explosion or impact, mesh reinforcement phase out is convenient. Original poured concrete surface shall be kept and plastering is not allowed.

g) Ground floor walls shall be erected on reinforced concrete wall footings, according to calculations based on the pertinent soil bearing analysis.

h) The storage and/or compressor enclosure shall have an easily ejectable light-fastened roof. It must not be joined to party walls.

i) Non-packaged compressors enclosure shall be roofed, except when the equipment is weather-proof and when noise attenuation is guaranteed.

j) Storage and/or compressor enclosures shall be perfectly ventilated under roof level and 50 cm above the last pressurized element, and the openings shall be correctly distributed with surfaces that shall not be less than 100 cm^2 per m^3 of enclosure volume. In case lower openings are needed, the construction criteria to be applied shall consider prevention of outwards fire projection or blunt objects ejection in an emergency situation.

k) An adequate flow of cooling air shall be provided. It is advisable that the enclosure temperature shall not exceed more than 10°C above the outside temperature.

l) Inside the compressors enclosure, a circulation corridor of at least 0.90 m clearance among compressors and among them and the enclosure walls shall be foreseen. Such corridor shall be free from obstacles and its clearance shall be measured from the compressors bases or projected parts. If for maintenance, a wider corridor is needed for the equipment housed in the enclosure, such corridor and entries to the enclosure shall be widened.

m) Soundproof systems required in accordance to National Law Nr. 19587 or municipal codes, as may correspond, shall be implemented.

n) Vibration damper systems required for avoiding transmission of unacceptable vibration levels to neighbor constructions shall be implemented. To this effect, there shall be no attachments to party walls transmitting unacceptable vibration or noises to them.

Non-combustible or self-extinguishing soundproof material is required.

o) For construction of storage and/or compressors located at upper floor enclosures, the following guidelines shall be considered:

- If vehicle traffic flow is allowed under the elevated floor enclosure, at least it shall be 5 m free height from the ground floor level,
- Main staircase shall be readily accessible through common passages, leading to means of exit, completely in accordance with the stipulations of 2-2-e). It shall have rigid guardrails or handrails well secured at each side. Minimum free width shall be of 1.10 m. measured between baseboards. If the handrail projects more than 7.5 cm beyond the baseboard projection, it shall be taken into account when measuring free width. Passage height shall be at least 2.30 m. measured from the paving of a landing or from the step to the ceiling or any other lower roof projection. It shall be constructed of non-combustible, fire-resistant material, in straight sections, preferably without landing direction changes. Staircase sections shall not have more than 21 subsequent treads between landings. In each section, all steps shall be of the same size and shall comply with the following formula:

$$2t + r = 0.60 \text{ m. to } 0.63$$

where: t = (riser), shall not be higher than 0.18 m

r = (tread), shall not be lower than 0.26 m

- Landings shall not be less than $\frac{3}{4}$ of the staircase width, and need not exceed 1.10 m. and an equal width of the staircase.

There shall be a secondary staircase from the storage and/or compressor enclosure to the exits located at the ground floor, to be used in case fire reaches the higher floor exits or main staircase. Access to the secondary staircase shall be independent from the main one. It shall be constructed of non-combustible materials and it may be a vertical or cat ladder, and, in this case, distance from the wall face shall not be less than 0.15 m. It shall be practical and safe.

p) If the site is located in non-urban areas, concrete wall is not necessary for the compressors and/or storage enclosure.

In this case, the enclosure shall be fenced with wire mesh, with two access gates diagonally opposed. Wire fence shall be at least 3 m high. When related to compressors and/or storage enclosure, twice the minimum distance included in the table shall be considered.

Should the neighborhood area become urbanized, the enclosure shall be adapted according to specific guidelines to that effect.

2 -3 DESIGN FOR MANEUVERING AREA OF CNG FILLING STATIONS.

a) Definitions

- Maneuvering and refueling area: It is the Area of the Filling station reserved for vehicles maneuvering for refueling. It includes entry, refueling and exit lanes.
- Area limits: means the physical elements for limiting the space reserve for maneuvers and circulation in the refueling area. To these effects, borders shall be the site party walls and/or the property lines, if any, all existing constructions within the service station site and the front property line.
- CNG Dispensing Island: area above ground level adequately protected from maneuvering area, on which vehicle circulation shall not be allowed. There, CNG dispenser, its shut-off valves and, if necessary, support columns of dispensers, refueling area canopies and compressors enclosure shall be located.
- Entry lane: it is the maneuvering area strip that extends from the street or internal driveway up to the refueling lane in case of indirect access to it. On this lane, vehicles shall maneuver for entering the station and approaching the refueling zone.
- Refueling lane: It is the area strip located at each side and aligned to the dispensing island. On it, vehicles shall make the minimum essential maneuvers for approaching the dispensing island and shall stop for refueling.
- Exit lane: It is the maneuvering area strip extending from the refueling lane up to the street or internal driveway, in case of indirect exit. On it, vehicles shall maneuver for exiting the station. It is considered as the exit path in case of emergency.
- Internal driveway: It is the corridor that communicates the street with the refueling and maneuvering area, for entering and exiting the station. Its minimum value shall be of 4 m. for up to 6 hoses and 6 m. for more than 6 hoses.
- Dispensing island direction angles: they are the αE or αEx formed by longitudinal axis of entry and exit lanes, respectively, based on the corresponding angle of the refueling lane (See Fig. 1, 2, 3, page 27).
- Minimum turning radiuses are the minimum radiuses that the vehicle may perform. Guidelines applied in US and United Kingdom may be taken as reference (See Graphs. Turning Radiuses, page 41 to 45).
- The inner urban space (common space between buildings) shall in no case, be occupied by the driveway area; if there is no municipal permit expressly authorizing it.

b) Fast-fill station.

- General aspects:

- Distribution of dispensing islands on the area shall enable a fast entry and exit of vehicles. When they are parked for refueling, they shall not hinder the entry or exit of other vehicles free maneuvers, nor occupy public streets.
- For refueling, vehicles shall preferably be oriented towards the street.
- For refueling, vehicles shall be parked parallel to the dispensing island. Their positioning against it shall not be allowed.
- Vehicles shall not be allowed to drive in reverse for approaching or exiting the refueling position.
- If two or more dispensing islands are to be installed, they shall preferably be parallel, as this distribution is the best one for a faster evacuation in case of emergency. Up to four single or double-hose dispensers shall be installed aligned.
- Entry and exit direction angles values αE or αEx to dispensers islands as well as the angle formed by the entry and exit lanes with the street shall favor vehicle movement.
- Turning angles greater than 90° shall not be allowed as the vehicle initial position shall be based on the highway/road traffic direction, except in those cases in which greater turning radiuses are required.

b1) Pavement for Vehicle Circulation:

- Entry, refueling and exit lanes pavement shall be made of materials that cannot be altered by the action of atmospheric agents (heat, cold, rain) and hydrocarbons (fuels and lubricants spills). Their surface shall be solid and non-skidding. Exposed natural soil pavement utilization shall not be allowed.
- Refueling lanes shall be horizontal. Slopes for favoring rain drainage shall be gradual enough so as to prevent vehicles involuntary skidding during refueling.

b2) Sizes and distances:

- Dispensing island dimensions shall comply with the ones specified in Table # 1 and its pertinent figure number 4, page 36.
- Entry lane width shall be at least 6.5 m. Furthermore, compliance of distance D, referred to the dispenser medium point shall be complied with (See figure 5 – page 37).
- Exit lane width shall be the one stated in figure 6, page 38.
- Refueling lanes width for parallel dispensing island shall be stated in 3 m. Therefore, minimum distance between two parallel dispensing islands shall be 6 m.
- Distance between two dispensing island ends, longitudinally aligned, shall be at least 7 m.
- Minimum width of refueling lane between two parallel dispensing islands shall be 6 m. measured perpendicularly to that lane. In case of more than two dispensers, an additional access lane of at least 3 m. width as of the second dispenser shall be provided, numbering them increasingly, following the direction of traffic (figures 7 and 8, pages 39 and 40, respectively).

- Distance between dispensers and premises dividing lines where there are no walls, or else openings allowing gas inlet to own premises, shall be at least of 5 m. For dividing lines of wall-partitioned sites, island and wall distance may be reduced to 3 m.

Minimum distance from dispensers to front property lines shall be 4 m. (figures 10 and 11, page 42).

b3) Dispensing Island:

- Distribution of aligned dispensers (on one or more dispensing islands) shall not prevent simultaneous use of all the filling hoses. Minimum distance among them shall be 10 m. Installation of two dispensers at 0.5 to 1 m. distance between them, provided they only contain one filling hose (figure 9, page 41) shall be allowed.

Dispensers shall be located in the open air. Refueling area canopy shall be at least 5 m. height from the floor.

Columns from which dispensers are suspended are considered as dispenser components.

- Dispensing island shall bear a built-in manhole for housing the dispenser's shut-off valves. It shall have a removable or hinged lid, with embedding handles and without cutting edges and its weight shall not be higher than 5 kg. Shut-off valves depth according to the island level shall not exceed 0.40 m. manhole dimensions shall allow easy activation of those valves.

Finishing of their internal surfaces shall comply with art rules.

In the case of underground manhole, it shall optionally have:

- Its bottom connected to the piping ditch so as to enable drainage through them.
- A permeable bottom

Mechanical protections at both ends of dispensing island shall be installed when their height related to the refueling lane level is lower than 0.20 m. They shall be designed to withstand impacts at a speed of up to 10 km/h. Their height shall not be lower than the user's vehicle bumpers.

Connections to dispensers shall be flexible so as to absorb vibrations and potential impacts.

Dispensers external cover may be metal or self-extinguishing plastic material, as well as for the area of dispensing indicators.

b4) Annexes and ancillary areas

When the filling station counts with parking areas and/or car wash, greasing, tire shop services and/or sale of vehicle elements, convenience stores, etc., they shall be located in such a way that vehicles using them shall not maneuver or park on refueling or exit lanes.

If the station provides other services apart from fuel dispensing (as for example: sale of food, entertainment area, etc. or meeting places), they shall be directly accessed from the street. Pedestrians shall not circulate along the refueling and maneuvering area.

b5) Special distribution of refueling and maneuvering area

Quadric dispensing island

When the dispensing islands are squarely distributed, that is to say, groups of two parallel and aligned dispensing islands, the following minimum distances shall be applied: between parallel dispensing islands, 10 m.; between ends of aligned dispensing islands, when corresponds: 7 m. and between dispensers, 10 m. (see figure 12, page 43).

A 4 m. central strip for vehicle movement along other vehicles parked in refueling position has been included in the 10 m. width refueling lane; therefore, parked vehicles shall not occupy such central strip. For this layout, a group of more than (4) four dispensing islands is not recommended.

- Other layouts:

When dispensing islands distribution is a combination between aligned, parallel and other non-regulated layouts, space for vehicle circulation and maneuvers shall be analyzed, isolating some parts of the area or dispensing island groups, and applying specific provisions that may correspond to GAS DEL ESTADO criteria.

c) Slow-fill stations

- Slow Fill is the process for CNG refueling in which the fill-up time is so long that it prevents permanent presence of dispensing operators and and/or vehicle drivers next to the vehicle.

This refueling mode shall be used only for refueling captive or own fleets.

c1) General aspects:

- For refueling effectiveness, vehicles may be placed against the dispensing island. Therefore, driving in reverse for approaching or exiting refueling position shall be allowed. Nevertheless, a fast evacuation from the installations in case of emergency shall be foreseen.

- Vehicles in refueling position shall not impair maneuvers of other station users.

- During refueling, vehicles shall remain with their doors unlocked and keys in the ignition switch.

- If a slow-fill station has installations for open to the public dispensing, refueling and maneuvering areas in each of them shall be clearly separated.

c2) Circulation and maneuvering areas:

The areas of refueling lanes, when vehicles are parked opposite the dispensing island, shall be the sectors occupied by the vehicle in its refueling normal position and their sizes, compared to the vehicle shall be such that::

- Their length is at least 1 m. greater than the user vehicles.
- Their width is at least 1 m. greater than the user vehicles.

The area corresponding to the entry and/or exit lane shall have the minimum width, resulting from:

$$G = A + L \sin \alpha + B \cos \alpha$$

$$A = 5 \text{ m.}$$

$$L = \text{Vehicle length}$$

$$W = \text{Vehicle width}$$

$$\alpha = \text{Entry or exit angle related to the island longitudinal axis.}$$

(See figures 13 and 14, page 44 and 45, respectively)

Width of entry and/or exit lanes allowing two-way circulation shall be increased by, at least, 5 m. (see figure 15, page 46).

Refueling lanes must be perfectly leveled.

c3) Dispensing Island

- For mechanical protection of CNG dispensers, guardrails not lower than user vehicle bumpers shall be installed. Rails shall be located opposite the dispenser with at least, 0.30 m. clearance.

- Minimum distance between CNG dispensers and openings through which gas can accidentally enter into own premises, constructions or buildings are set at 5 m.

Minimum distance between dispensers and own premises walls, site lines or party walls shall be 5 m.

c4) Safety devices and fire extinguishers:

- 10 kg capacity pressurized tri-class chemical powder fire extinguishers (IRAM 3569/75 standard), with IRAM seal of approval, shall be installed. They shall be loaded with 50 g. of such product per each surface square meter of refueling and parking area. At least 2 fire extinguishers adequately distributed in the refueling area shall be installed such that the operator does not have to walk more than 15 m.

- Furthermore, wheeled fire extinguishers with pressurized tri-class chemical powder, according to what is set forth in point 5.3, with IRAM seal of approval, shall be installed. They shall be loaded with 50 g. of such product per each surface square meter of refueling and parking area. At least 1 fire extinguisher shall be installed in the refueling area.

- Safety signs shall be posted in the refueling area according to the stipulations of Part 2 – Item 1-5 of these standards, at one set of signs per each 10 filling hoses. The installation of the sign with the legend “Warning for drivers: _____” may be omitted.

- Emergency shutdown palm buttons shall be installed on the dispensing island or dock, on one out of five filling hoses. They shall be identified with a sign stating “EMERGENCY SHUTDOWN”.

Likewise, emergency shutdown buttons shall be installed with the same requirements, in the sector of the shift or night personnel and general access to the filling station.

- Emergency shutdown shall automatically interrupt compressor, servo valves and dispensers.

- When the refueling area is located indoors, zenithal ventilation with natural damper for enabling adequate air renewal shall be foreseen.

- Vehicles shall not be refueled with people aboard.

2-4 PIPING

Low pressure piping shall comply with the applicable recommendations and Standards for industrial installations, such as API, ASME and Gas del Estado and IRAM IAS.

High pressure piping shall be capable of operating at a maximum working pressure of 250 bar.

Welders working with low and high pressure shall be approved by Gas del Estado. Their credentials shall be valid and comply with the specifications of the procedure to be used, according to the governing standards.

To this effect, the stipulations set forth by modifications introduced to GE-N1-105 and IRAM-IAS U500-96 as well as IRAM-IAS U500-164, Part III standards apply.

Recommended procedure for piping joint is as follows:

a) Low pressure welding

- Butt welding, generally using ASTM A53 – grade A or B
- Based on diameters and thicknesses of piping used, joints design and pass sequences are recommended (see figures 16 and 17, page 47).
- An external clamp shall be acting until at least 50% of the first pass (whenever it corresponds) is completed.
- 1.6 mm root opening is the appropriate one for performing the first downward pass, with cellulose-covered electrode (AW-6010), for ensuring better penetration, without much material used in the operation and, therefore temperature, considering used thicknesses. Nevertheless, it must also be performed upwards, with basic or cellulose-covered electrodes.
- In the latter case, root opening shall be greater. Remaining passes shall be performed upwards with basic-covered electrodes.
- For standardizing criteria, save special cases, first pass electrodes diameter shall be 3 mm and passes shall be determined based on thickness, considering 1 pass per 3 mm of thickness, plus one root pass and one reinforcement pass.

- For 3.68 mm and 3.91 thicknesses, 3 passes shall be carried out and over 4 mm thickness, a total of 4 passes.
- 3 mm minimum diameter for first pass is specified as cleaning shall be performed through grinding, thus reducing its thickness, favoring a fast heat dissipation, potentially resulting in micro cracks. Hence, the second pass must be carried out immediately after the first one.
- The remaining passes shall be cleaned with a high speed rotating brush, including the last pass.
- Overlap indicated in the figure is useful not only for reinforcing but also for heat treating the previous pass, producing grain refinement and, therefore greater ductility. This implies that the material thickening the piping shall be of better quality.
- Preheating is not necessary under normal conditions, given the low carbon content of used piping. (ASTM A 53 A or B).
- Anyway, its correspondence or not should be conveniently determined by calculation using the equivalent Carbon formula.
- X-ray photography shall be subjected to what is determined by the inspection. In case of using this test type, the corresponding procedure shall be prepared.
- If the project includes slip-on flanges, joint design shall be provided according to figure 18, page 47. 3 passes shall be applied with basic electrode of 0 3 mm. and shall be cleaned with high speed rotating brush.
- Current voltage and intensity to be used according to what is set forth by the electrode manufacturers shall be indicated, attaching only once, the booklets with the required data.

- Summing up, the following data shall be included in the piping welding procedures specification that will be used:

- Process, pipes and accessories material, groups by diameters and groups by wall thickness, joint design, metal to be used and number of passes, electrical properties, position, welding direction, lapse between passes, inspector type, clamping withdrawal, cleaning, pre-heating, non-destructive examinations.

- Last, in case of essential changes in the approved procedure, it shall be modified or redone and submitted for new approval.

b) High pressure welding (SOCKET-WELD) (see figures 19 and 20, page 47):

- In general, for this welding type the previous statements shall apply.

- Of course, inspector is not required, and all passes shall be cleaned with rotating brush at high speed.

- Except in some special cases, individually determined, usually 3 (three) passes with AWS – 7015 or 7018 of 0.3 mm shall be carried out, always preheating at 100° C. Thicknesses used in accessories and piping result in a fast heat dissipation, with the consequences previously mentioned. It is recommended to avoid hitting the accessory once it has been presented and spotted, for its correct alignment.

c) They may be aerial installations, adequately supported and such as to allow free expansion, contraction, avoiding vibrations and any other anomaly in this type of installations applying the art rules.

This installation type shall be protected with anticorrosive paint and finishing shall be made with yellow paint (synthetic enamel). It shall also be installed in ditches prepared in the ground, perfectly identified and with the adequate supports. Furthermore, all the items stated for the previous case shall also be foreseen.

- Underground piping installation or installations at not readily accessible areas shall be coated according to group E (double Epoxi-coating). Coating procedure shall be attached to the project and it shall indicate type and brand of the paint to be used.

- In the case of underground piping, the pertinent cathodic protection procedure shall be submitted together with the project.

- They shall be installed in the dispenser zone such as not to impair maneuvers.

2 -5 INSTALLATIONS RELIEF AND SHUT-OFF DEVICES

The gas supply line to the compressor shall bear a readily accessible manual shut-off valve, located outside the compressors enclosure same as that of the power switch.

In the suction pressure area of the regulation bridge, a high pressure shut-off system must be installed, instead of the relief system. This system shall operate at 10% of the suction maximum allowed operating pressure.

A check valve shall be installed between the compressor and CNG storage, as technically near as possible.

A shutdown pressure switch of the compressor equipment with light and sound indicator and manual restart shall be added on storage. Its activation pressure shall be 10% higher than the maximum storage service pressure.

When the station is designed for CNG storage with capacity exceeding 4000 liter (water volume), automatic systems for fire detection shall be installed. These systems shall cut off fuel flow and trigger the operation of fixed extinguishing devices: with water, CO₂ or dry powder.

Furthermore, a two-level explosive mixture detector shall be added. The first level will trigger the alarm and the second one, the installations automatic shut off.

Likewise, competent local authority codes shall be complied with.

2 -6 VALVES AND FITTINGS

a) General aspects

- Valves and fittings shall be type approved by Gas del Estado or they shall comply with recognized international Standards and/or Specifications, accepted by Gas del Estado.

- Cast-iron shall not be allowed. Only steel and brass (forged) are acceptable only when materials surrounding the installation electrochemically withstand it.

- Coupling, threading and flanged systems shall be compatible with high pressure and shall be in accordance with Standards requirements for the equipment in which they are installed.

- Shut-off valves shall be located as nearer as it is technically possible to storage units, compressors, etc. and readily accessible.

b) Safety valves

- They shall be installed in storage tanks, cylinder storage units, at the discharge of every compressor stage, compressors, after regulation, piping and any other part of the installation in which they are necessary for overpressure protection.

- Safety valves shall be calibrated between 10 and 15% over operating or working pressure, except for the storage relief valve which shall operate at 20% over storage container maximum allowed operating pressure.

- Every pressure relief safety valve installed shall be protected from rain and foreign matter such as dust, debris, etc.

For that purpose, only air inlet regulators, located such as to avoid gas leaks to the vicinity shall be used. Their design shall be reliable and they shall be made of non-sparking material. They shall be located such as to reduce to the minimum, those disturbances produced by an eventual venting.

- Safety valves shall indelibly bear the following data:
 - o Manufacturer's name and trade name
 - o Adjustment pressure in bar
 - o Air flow rate in m³/min at 15° C and atmospheric pressure
 - o Calibration month and year

c) Characteristics of installations

- Relief devices shall be connected to unions, flanges, nozzles, venting discharge piping, etc. which internal dimensions shall not reduce relief net area.

- Outlet diameter of the relief device connection shall be greater than the valve inlet diameter so as not to restrict outlet flow of this device.

They shall be installed between the shut-off device and the component to be protected and their flow rate shall be at least 110% of the maximum working flow rate.

- Discharge piping of two or more relief devices may be connected on one manifold, as long as such manifold section area is at least equal to the addition of the areas of the individual connection discharges, provided their relief devices adjustment is the same.

- The venting end shall be at least 6 m. above the floor level and at least, 2.5 m. above the compressor enclosure.

Furthermore, as regards own and neighboring constructions, it shall comply with the following formula:

$$h > H - D + 2.5$$

where: h = venting height [m]

H = neighboring or own construction height [m] (the highest one)

D = neighboring construction horizontal distance [m]

- Venting piping shall have a noise dampener system that shall be activated when noise exceeds the admissible levels.
- Discharge of all relief systems inside the compressor enclosure shall be delivered into a shock absorber tank which design and construction shall be approved by Gas del Estado or of any other system enabling a safe and clean operation.
- Service venting normally closed with manual valves and plugs shall be admitted to be located in suitable pipe runs.
- Permanent or periodical venting of gas either due to operation, lack of maintenance of installations or others shall not be accepted except in case force majeure or during maintenance operations. In the last case, personnel shall take care of not alarming the vicinity.

d) **Excess flow valves**

- All storage tanks and cylinders groups' outlet connections, except safety valves, shall be protected by an excess flow valve or similar.
- Excess flow shut-off valve shall prevent risks coming from CNG leakages to the atmosphere.

In case of ruptures or other difficulties in piping, accessories, hoses, etc, they shall block the fluid when flow is higher than the flow under normal operating conditions.

e) **Markings**

- Excess flow valves shall bear indelibly the following data:
 - o Manufacturer's name or trade name
 - o Model
 - o Maximum flow
 - o Flow rate for the design fluid
 - o Manufacturing month and year

f) Remote control and fast automatic shut-off valves

- Regardless of check valves and /or excess flow valves of installations, shut-off valves with electrical or pneumatic actuators, or a combination of both, such as to allow their remote activation from the emergency shutdown shall be installed
- These valves shall at least be installed inside the measurement cabin, downstream of measurement and at the outlet of high pressure gas storage feeding the dispensers. For gas engine driving the compressor, a valve with the same characteristics as the previous one shall be provided between the measurement and the engine.
- Its activation system shall be of the positive safe type which shall shut-off the valve in case the operating power fails.
- When electrical systems are used, they shall be explosion proof within hazardous areas

g) **Pressure gauges**

- They shall be designed such as to withstand a pressure equal to the working pressure plus 20% at least, equipped with a readily visible quadrant, at least 100 mm diameter. An excess flow valve or an outlet reduction with a 1.4 mm diameter opening and shut-off and vent valve shall be installed.

h) **Dispenser hoses**

- The hose with its nozzle assembly and its operation valve shall be of a make and type approved by Gas del Estado or else imported from a technologically developed country, experienced in the use of CNG and their specifications shall be approved by Gas del Estado.
- They shall be capable of operating at normal pressure of 200 bar and shall be hydrocarbon resistant in their interior and to atmospheric conditions (humidity, ozone, electrical discharges, etc) on their outer surface.
- Besides the issue of resistance, one of the specifications requirements is that they shall be hydrostatically tested for approval at twice the working pressure.
- The design and size of the nozzle assembly that couples to the vehicle fueling system shall respond to Fig 21, page 40.
- The maximum length of the hose and nozzle assembly shall not exceed 5 meters.

- The hose safety device shall allow its immediate breakaway without producing gas leakages, in case of being dragged by a vehicle.
- They must be provided with the manufacturer's certificate indicating conditions of use, tests performed and standards according to which they were constructed and the approval seal of Gas del Estado.

2 -7 INSTALLATIONS TESTING

a) Storage compressors and dispensers must comply with standards GE N° 1-141 and its annex N°1

Operation tests shall be performed on compressors according to their manufacturer's specifications and in compliance with a foreign or international standard recognized by Gas del Estado which reserves the right to require qualifications guaranteeing the construction and smooth operation of the equipment under normal working conditions, according to what is set forth in standard GE N°1-141

b) Hydrostatic testing

Gas del Estado may request a hydrostatic or re-qualification test of all the installation components, at 1.5 times the normal working pressure.

The installer shall submit the hydrostatic test procedure to Gas del Estado.

He shall inform:

- o Fluid properties
- o Pressure gauge characteristics
- o Cycles, amount, pressure variation and time, tightness, testing pressure and duration.

Minimum conditions required:

- o Resistance: duration: 1 hour; pressure: 1.5 times the working pressure
- o Gas tightness: duration: 8 hours; pressure 1.4 times the working pressure

The use of fluids that do not form hydrates is highly recommended

After performing the hydrostatic test and treating the pipes with rust removers and / or passivating agents, if the installation or the equipment provider so requires it, a dry air or inert gas (N₂, CO₂) scavenging process shall be performed to guarantee drying.

2 -8 INSPECTIONS

a) Before starting up, the installations shall be inspected and approved by Gas del Estado and the installer and a representative of the commercializing company, when it corresponds, shall be present.

b) Gas del Estado shall inspect all the installations with CNG dispensing outlets whenever it deems it necessary so as to verify their safety and correct operation.

It shall shut down all the installations where anomalies or unsafe practices are detected. In the case of open to the public dispensing installations, their anomalies shall be reported to the commercializing company as may correspond.

This procedure shall apply until pertinent governmental control entities are structured.

c) For provisional technical approval of CNG filling stations, the following issues shall be complied with.

Count with the approval of authority having jurisdiction at national, provincial or municipal level.

Carry out all the test sequence and procedures according to Gas del Estado requirements.

Verify the filling station's equipment good operation and safety systems control.

Verify dispensers' calibration according to the values set by Gas del Estado.

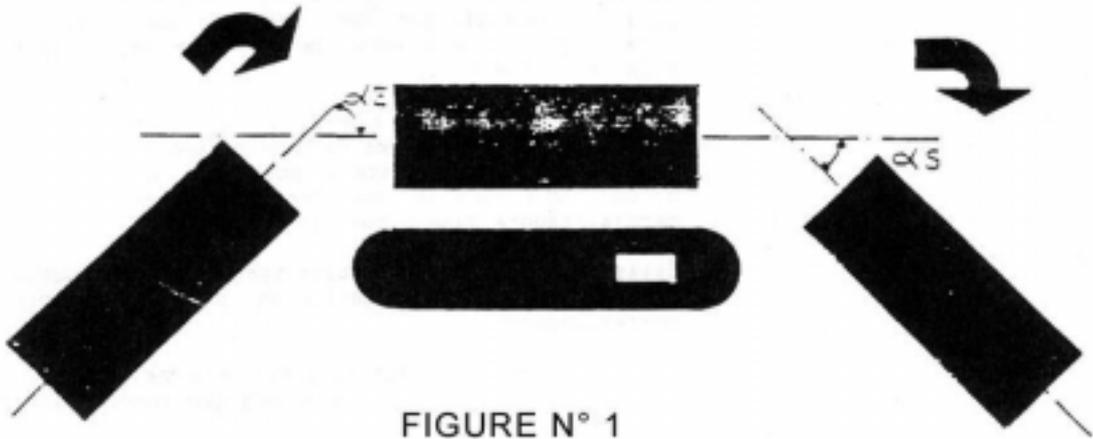


FIGURE N° 1

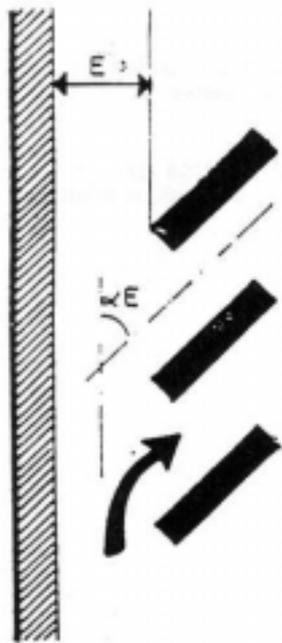


FIGURE N° 2



FIGURE N° 3

FIGURE 4

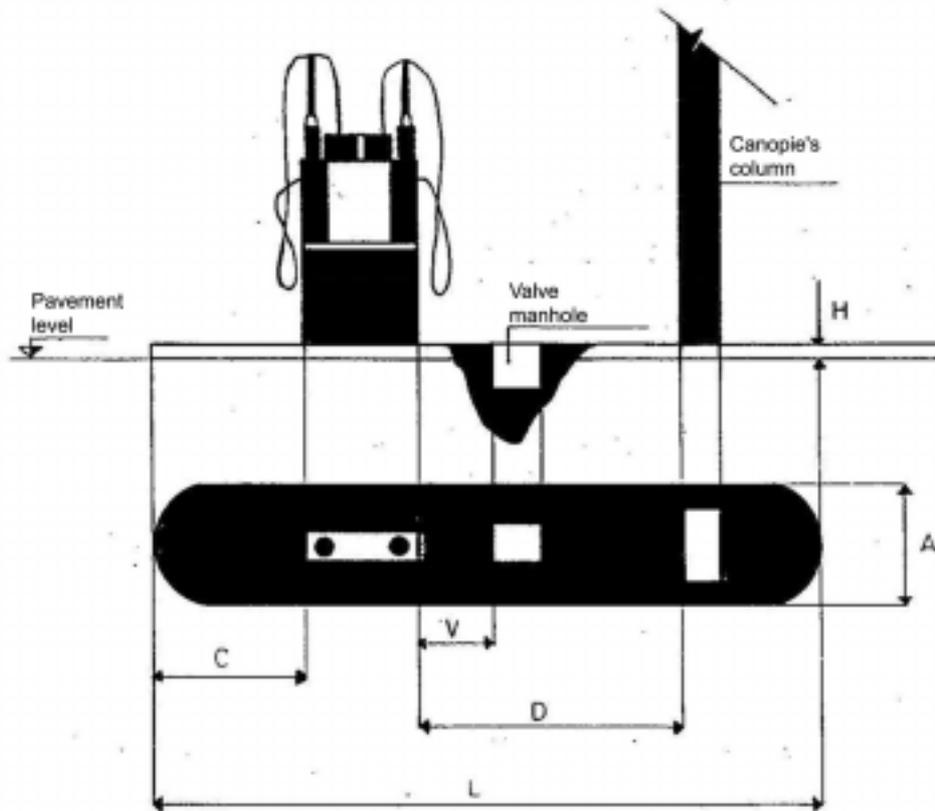


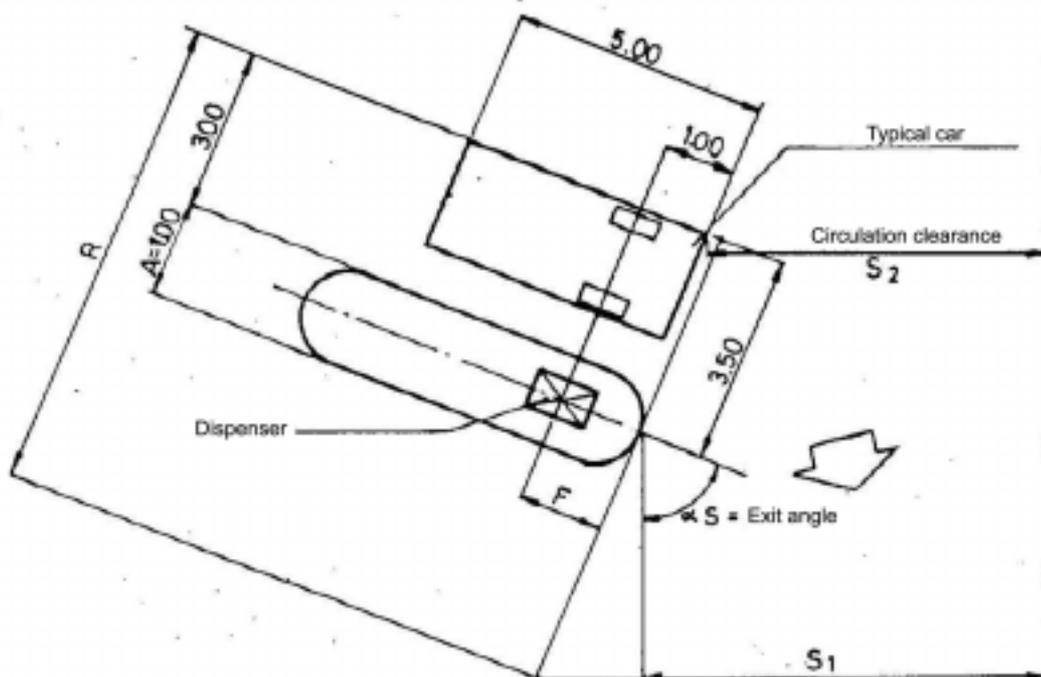
TABLE 1

	Minimum	Maximum
A	1	---
B	0.30	---
C	0.60	---
D	0.50	---
H	0.20	---
L	2.00	17
V	---	0.50

References

- A: island width
- B: distance from island side to dispenser
- C: distance from island end to dispenser
- D: distance from column to dispenser
- H: island height
- L: island length
- V: distance from valve manhole to dispenser

FIGURE 6



S minimum value shall be the highest one between S_1 and S_2

$$S_1 = R - (R - 3,5) \cdot \cos \alpha_s$$

$$S_2 = P + 1m \sin \alpha_s - F \sin \alpha_s + 3,5 \cos \alpha_s$$

$$R = 8 \text{ y } P = 4 \text{ (Up to 6 hoses)}$$

$$R = 10 \text{ y } P = 6 \text{ (More than 6 hoses)}$$

VALUES S_1 y S_2
($A=1$ y $F=1$)

α_s	S_1 $R=8$	S_2 $P=4$	S_1 $R=10$	S_2 $P=6$
0°	3,5	7,5	3,5	9,5
15°	3,65	7,34	3,72	9,34
30°	3,79	7,03	4,37	9,03
45°	4,81	6,47	5,40	8,47
60°	5,75	5,75	6,75	7,75
75°	6,83	4,90	8,31	6,90
90°	8,00	4,00	10,00	6,00

FIGURE 9

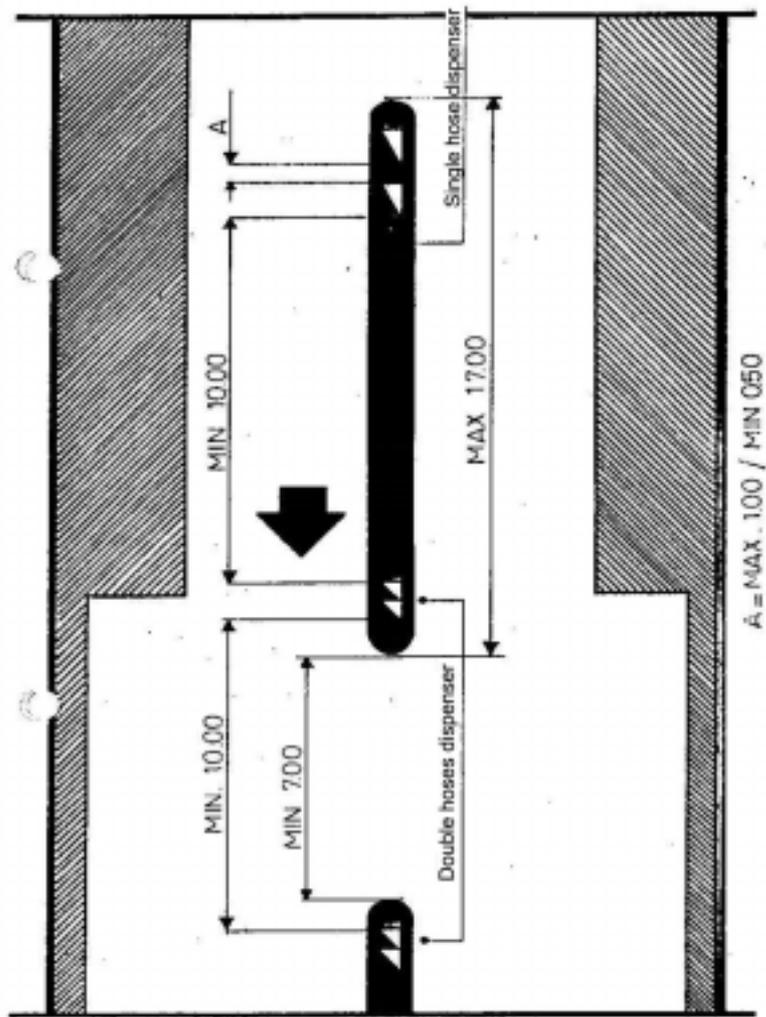


FIGURE 10

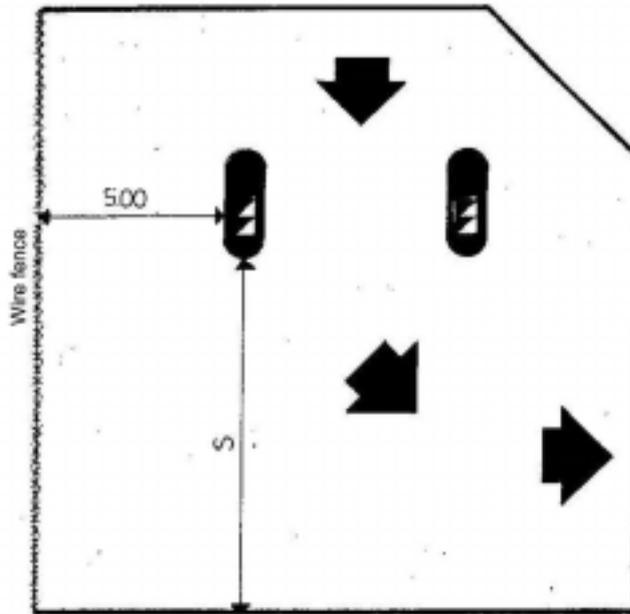
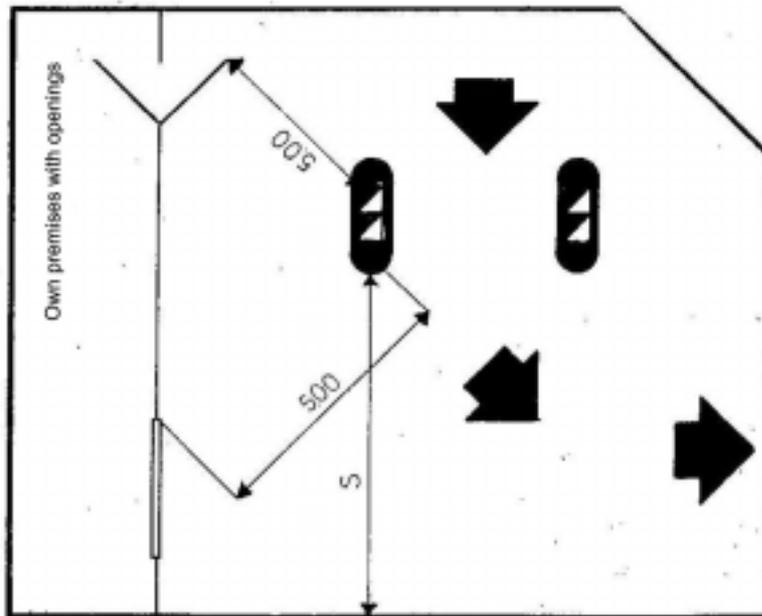


FIGURE 11



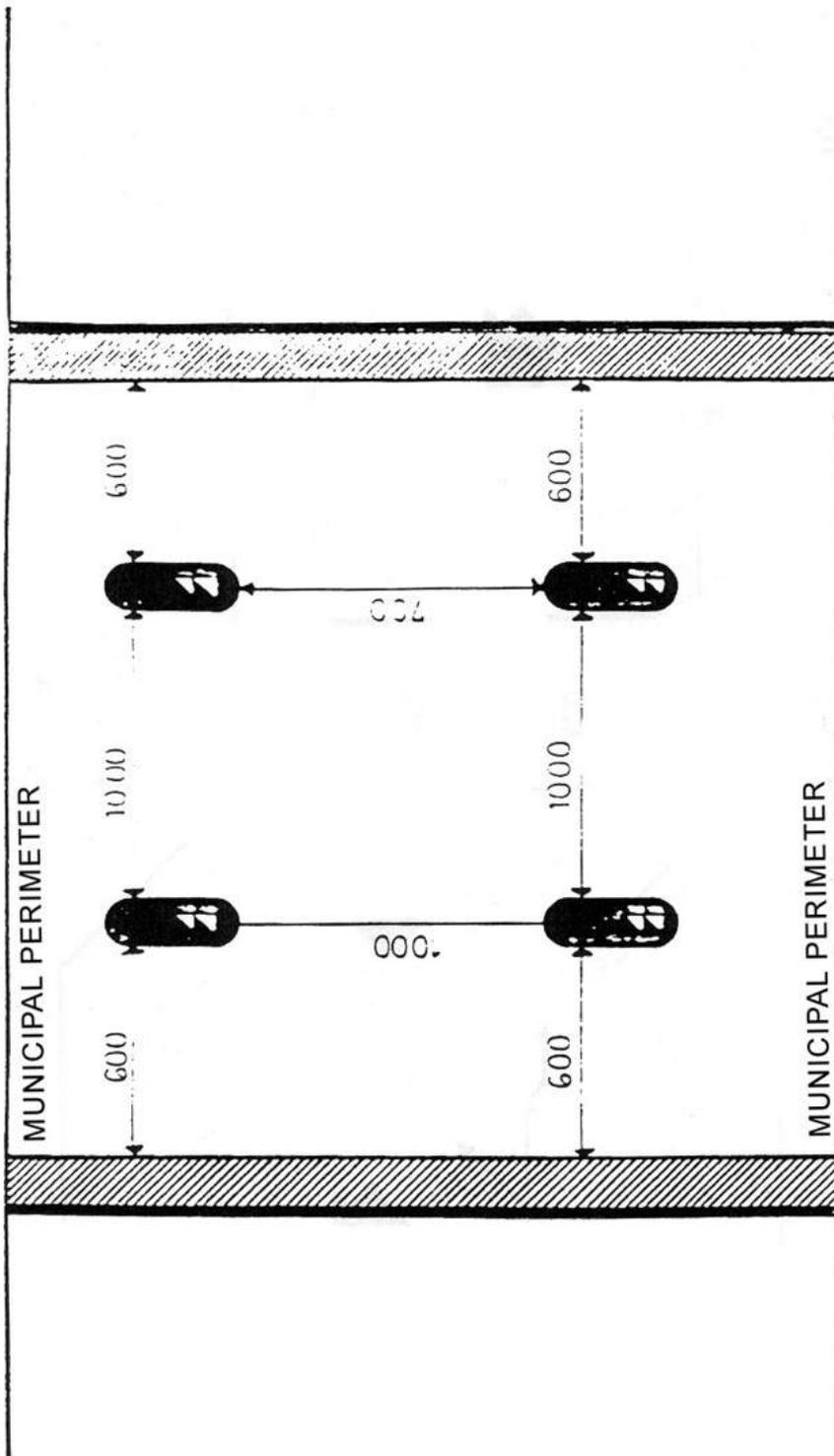


FIG. N° 12

FIGURE 13

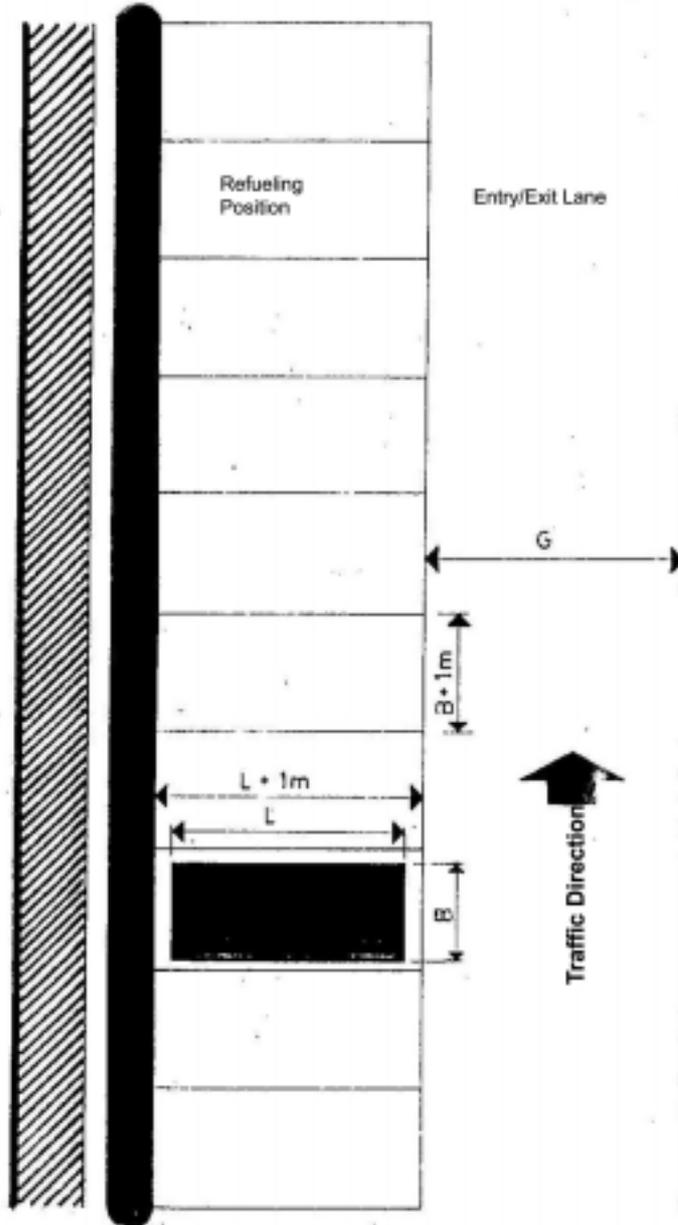


FIGURE 14

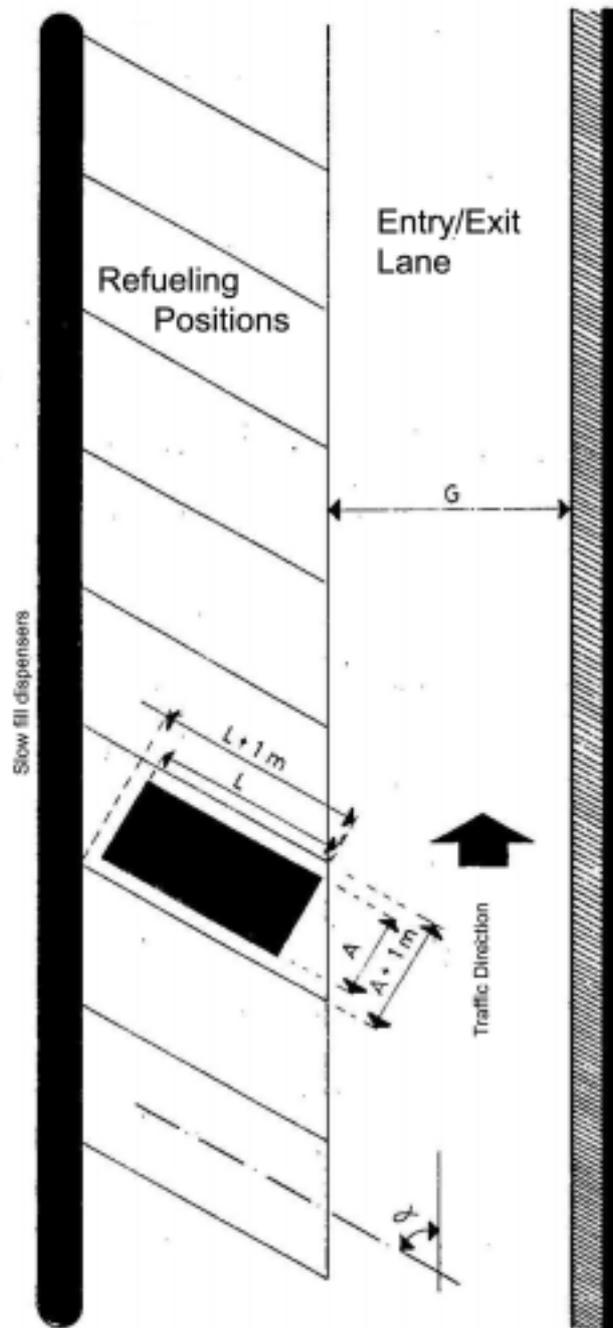
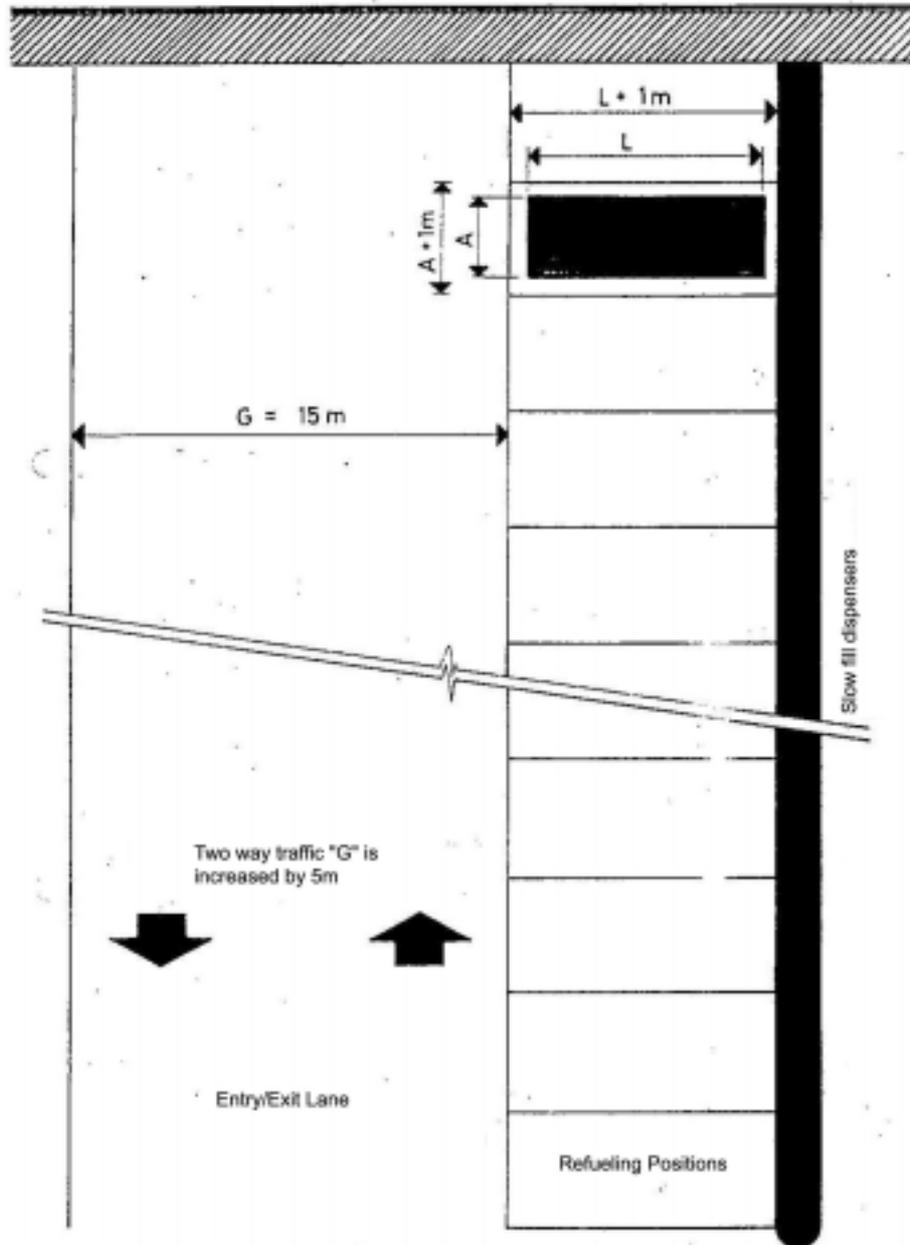


FIGURE 15



BUTT WELDING

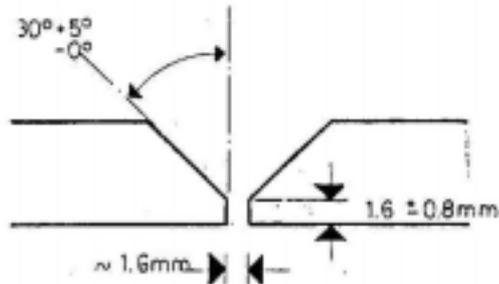


FIGURE 16

Joint Design

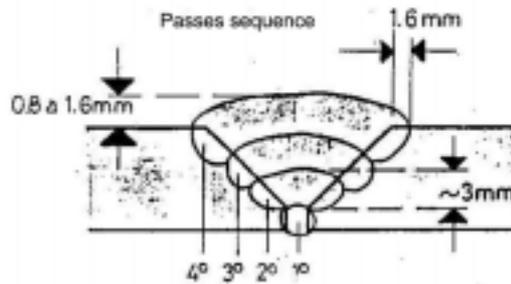


FIGURE 17

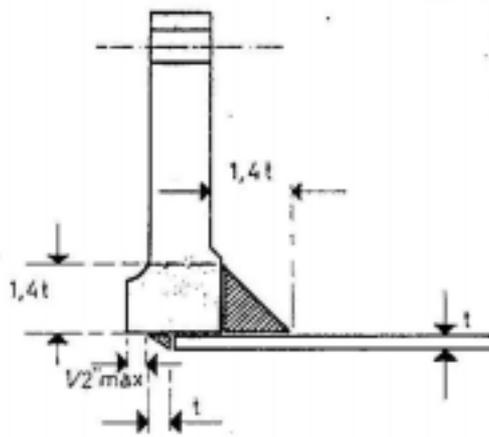
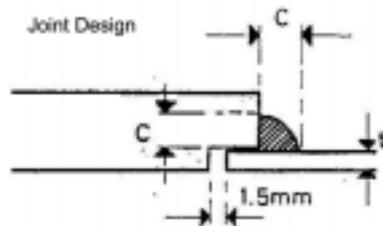


FIGURE 18

SOCKET WELDING



Minimum C equal 1 1/4 t, but not less than 4 mm

FIGURE 19

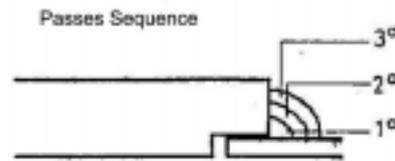
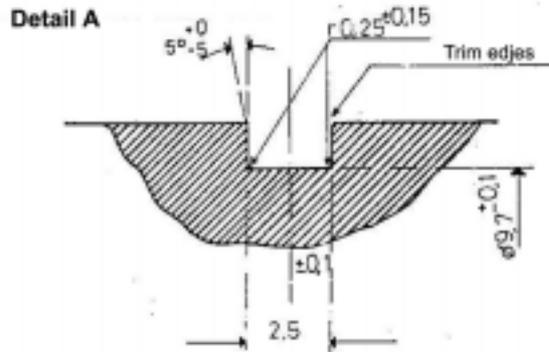
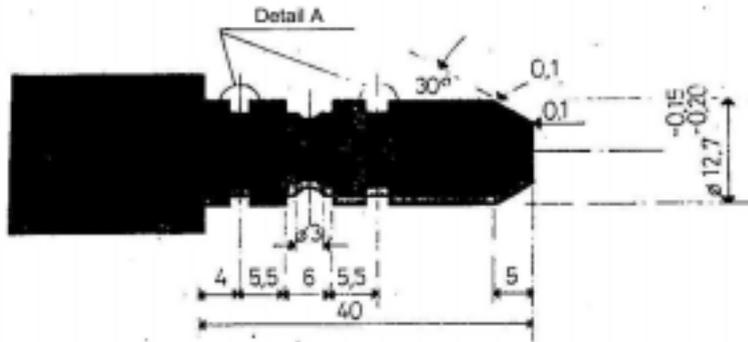


FIGURE 20

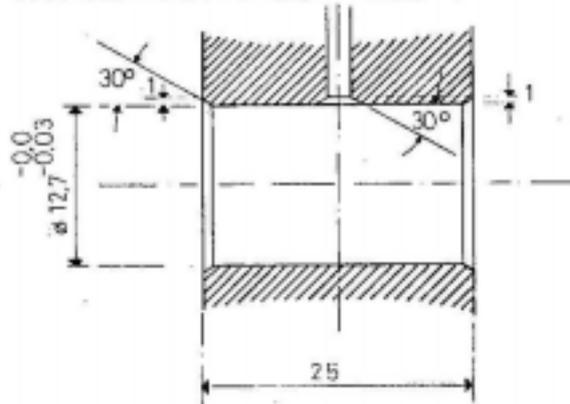
FIGURE 21

CNG FILL COUPLING SYSTEM

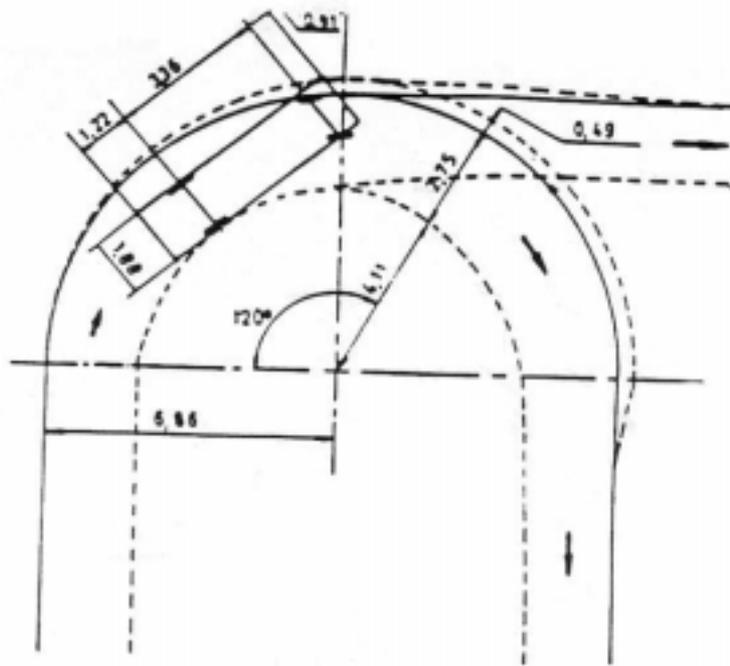
FILL NOZZLE



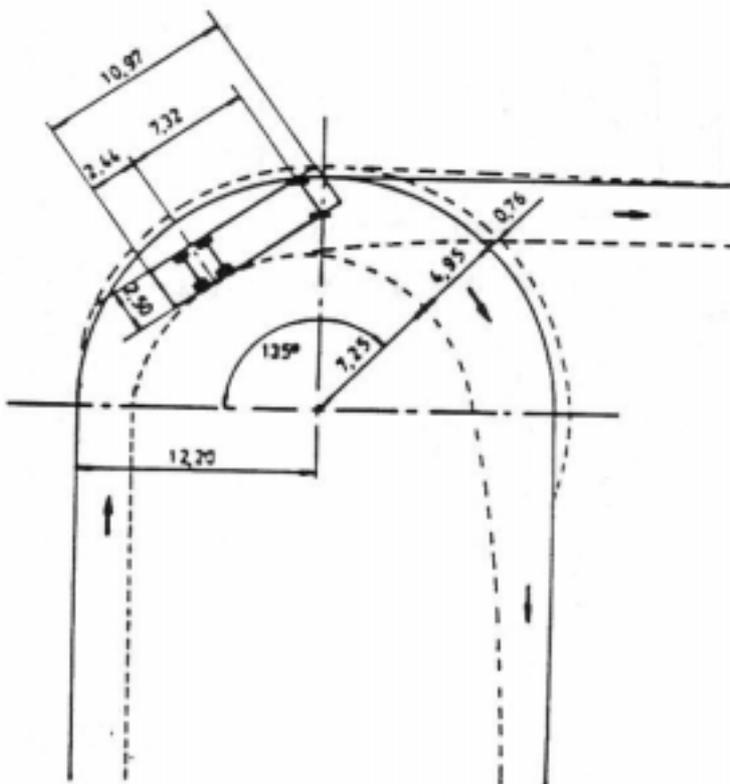
DETAIL OF VEHICLE FILL CONNECTION



TURNING RADIUS GRAPHS ACCORDING TO US AND UK STANDARDS

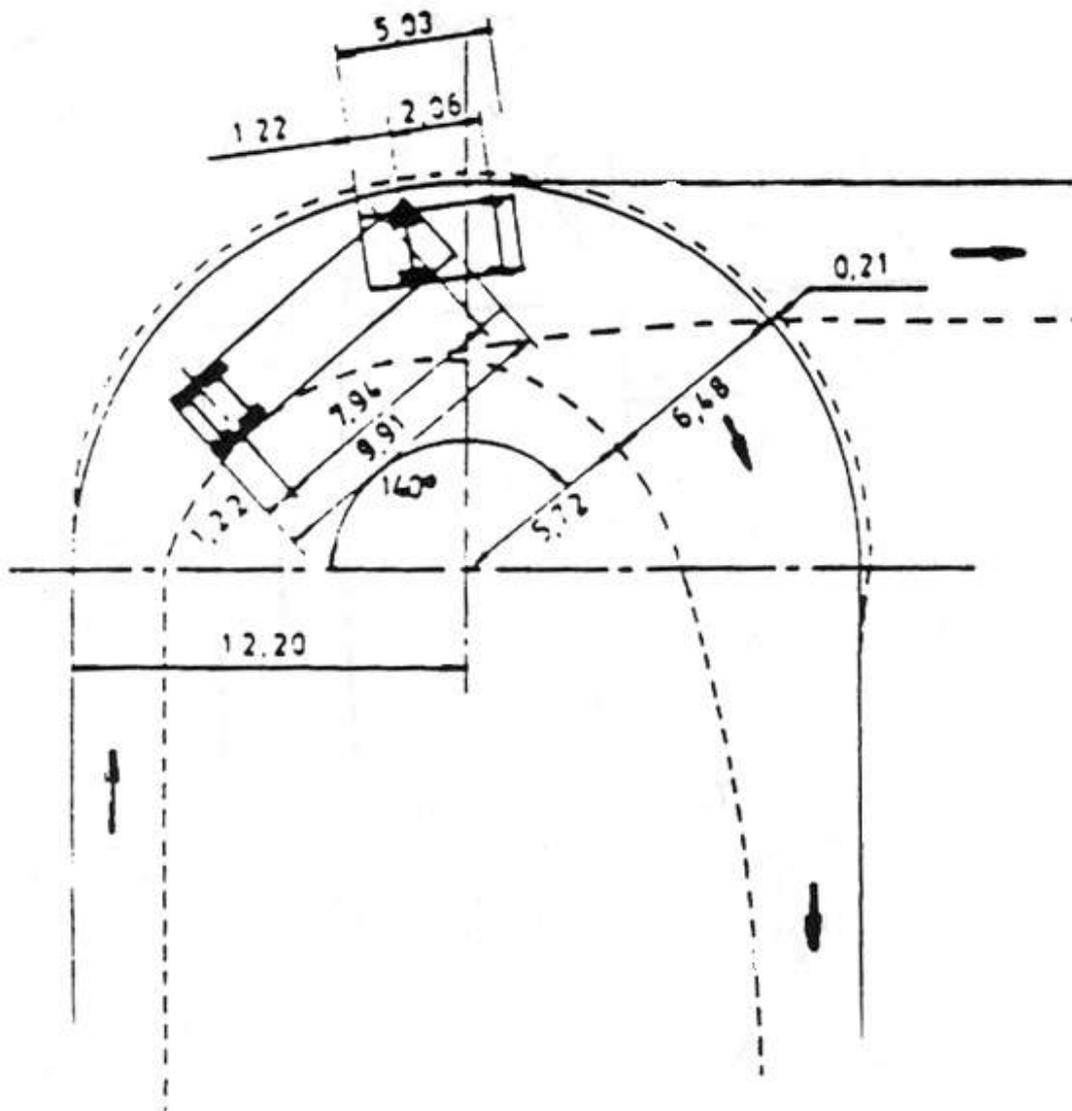


a) MODEL CAR

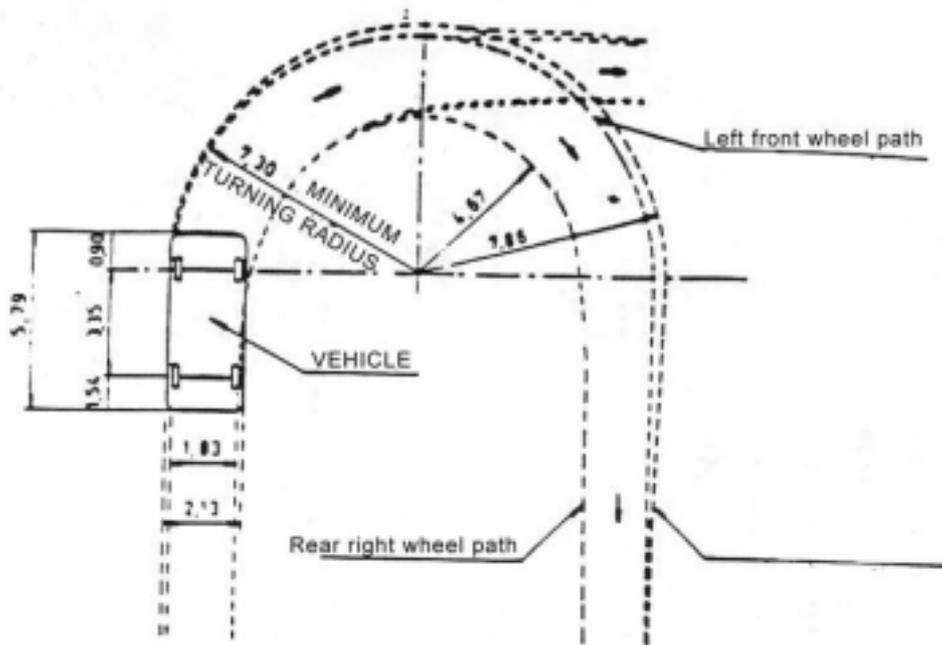


b) MODEL BUS OR TRUCK

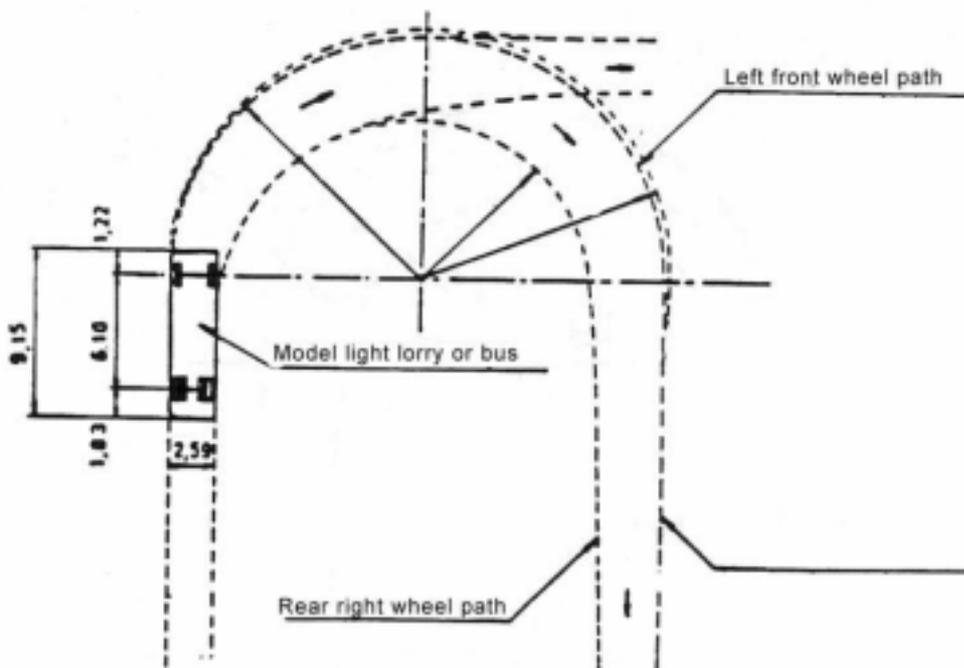
MINIMUM TURNING RADIUS (UK)



c) MODEL SEMI TRAILERS
 MINIMUM TURNING RADIUS (UK)

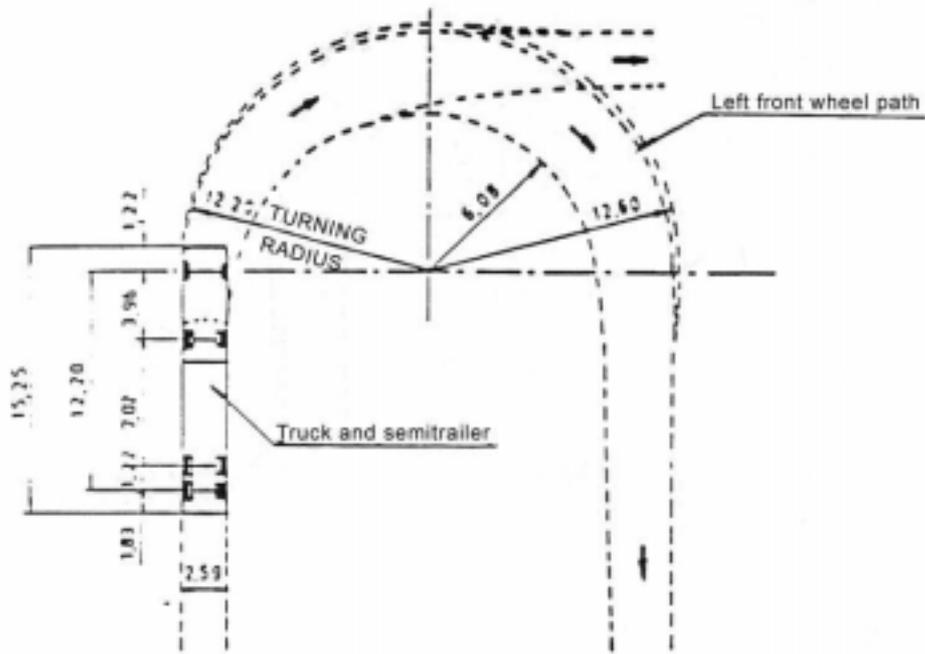


a) MODEL CAR

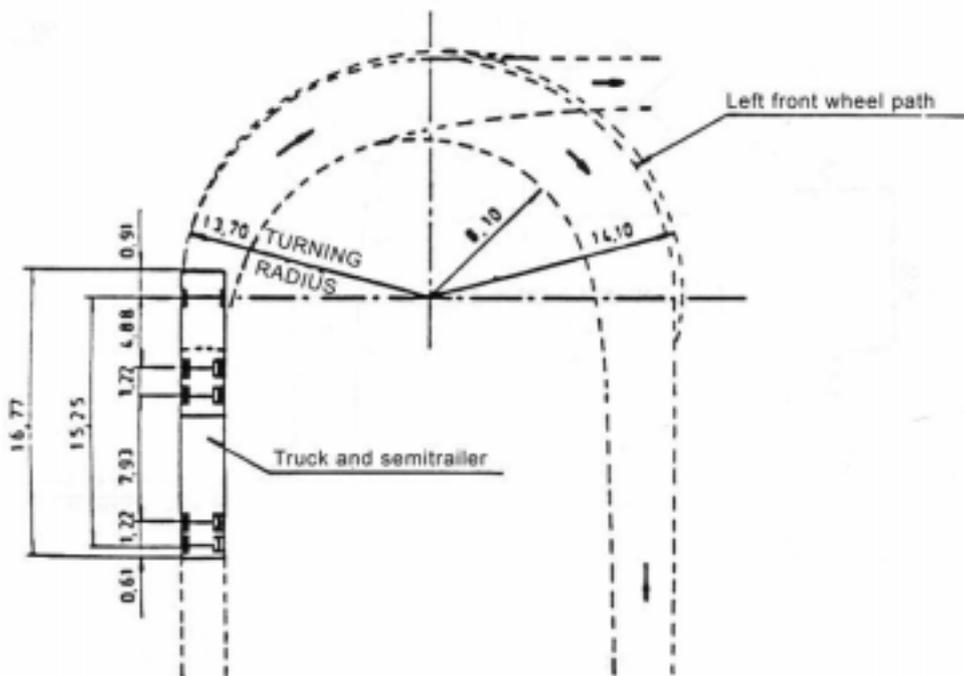


b) MODEL TRUCK

MINIMUM TURNING RADIUS FOR DIFFERENT MODEL CARS (US)



c) MODEL SEMITRAILER (15.25)



d) MODEL SEMITRAILER (16.77)

MINIMUM TURNING RADIUS FOR DIFFERENT MODEL CARS (US)

IDENTIFICATION STANDARDS FOR CNG FILLING STATIONS WITH GAS DEL ESTADO FLAG

1 - GENERAL ASPECTS

The following standards shall be applicable for CNG filling stations bearing the flag of GAS DEL ESTADO, so that the image responds to Gas del Estado identification.

The following elements and their characteristics that are considered mandatory issues at Gas del Estado filling stations are detailed below to this effect:

2 - COLOR CHART

The colors used in all identification signs, friezes, dispensers, etc, shall be detailed in graphic N° , page N°

3 - SIGNS

Signs shall be acrylic on both sides with built-in lighting system so as to be readily visible by night. Their structure shall be of a rectangular iron tube according to calculations; their finish shall be opaque black.

All the stations must be equipped with at least 1 (one) institutional sign (with one or two supports, see graphics N° 2 and 3 and pages N° 58 and 59 respectively). Signs placed on dispensers and friezes shall be mandatory (see graphics N° 5 Page N° 61, respectively)

4 - SAFETY AND SERVICE SIGNS

Safety signs shall be of colored acrylic and white background and the letters or figures shall be painted black

Their trims or borders, shall be red, 40 mm width, and their words in Helvetica Medium font.

The same system shall apply to service signs, white background and blue legends and figures. They shall bear a 15 mm width blue double trim (same as flag) and 7.5 mm. separation.

5 – FRIEZE

It shall be acrylic, lighted from its inside, and shall bear the institutional colors around the whole cover perimeter. The logo shall be placed on the left of each side and readily visible from outside the service station.

Its height must not be less than 1.00 or above 1.20 m. (see picture N° 8 page N° 64)

The transparency of the acrylic and its illumination must ensure it is perfectly visible by night.

6 – ROOF COVER

It shall be constructed of brilliant white metal planks, Luxacom Camesi type, FR 150 Model or one with similar design, quality and color.

7 – COLUMNS

Columns shall be painted opaque black regardless of whether they are iron or concrete.

8 – ISLANDS

Dispensing island floor shall be of smoothed concrete rolled with smoke black. It shall be equipped with safety guard rails painted orange, same as the flag. (See picture N° 6 page N° 62)

9 – DISPENSERS

Both faces of the dispensers shall be painted with the colors of Gas del Estado up to their mid height. This shall be done on their mid lower part (see picture N° page N° , respectively)

10 – FLOORS

- a) STATION AREA: inter-block concrete pavement
- b) PERIMETER SIDE WALKS: “gris punilla” (a type of grey) 40 x 60 cm tiles (see brochure of SAPONARA tiles), or equivalent quality.
- c) RESTROOMS AND LOCKER ROOMS: VAO 0/00, 30 X 30 cm granite type mosaic (see brochure of SAPONARA tiles), or equivalent quality.
Thresholds, fine polished “La Rioja” black granite, 25 mm thickness
- d) OFFICES AND CONVENIENCE STORE: 30 x 30 cm or 40 x 40 cm granite mosaic lead grey color (see brochure of SAPONARA tiles), or equivalent quality.

Thresholds same as RESTROOMS AND LOCKER ROOMS.

e) WAREHOUSES AND MACHINERY ROOM, COMPRESSOR ENCLOSURE AND OTHER ENCLOSURES OF RESTRICTED PUBLIC ACCESS: 30 x 30 cm Inca grey, granite like mosaic (see brochure of SAPONARA tiles), or equivalent quality.

NOTE: Service station stores baseboards shall be the same as floor c= 10 cm

11 - STRUCTURAL CARPENTRY

All the structural carpentry shall be painted with opaque black synthetic paint.

12 - WALLS

INTERIOR WALLS: Restrooms and locker rooms shall have 15 x 15 white tiles San Lorenzo type or similar one, with narrow pasted joints, placed straight up to the ceiling.

Compressor enclosure: exposed concrete.

The other stores shall bear lacquered or plaster coated finishes, and white latex paint.

EXTERIOR WALLS: The party walls dividing sites shall have 15 x 15 white tiles San Lorenzo type or similar ones, not lower than 2.40 meters height. There shall be a 2 cm wide and 1 cm deep cleavage or cleft every 1.50 meters

In rooms (such as offices, restrooms, etc), finishes shall be Super Iggam, white felts, with cleavages forming a 1.00 m x 1.00 m grid.

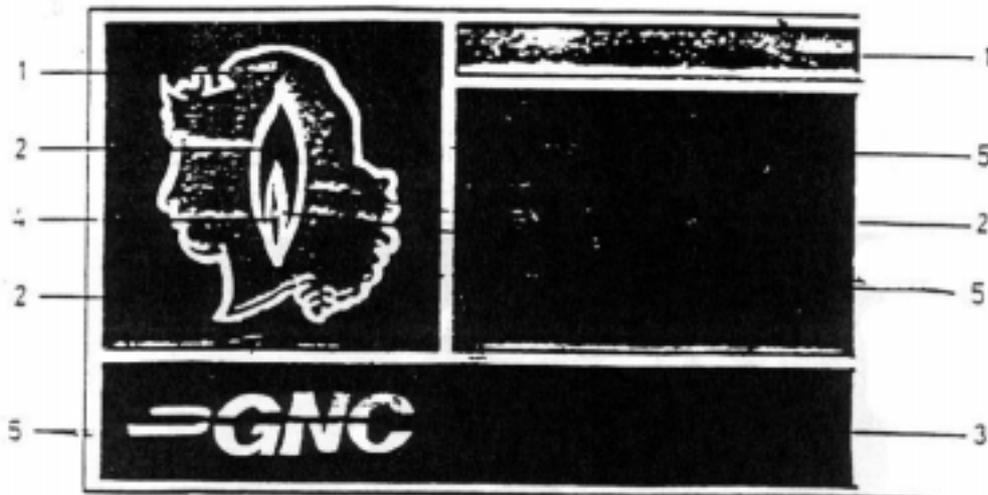
The compressor enclosure shall be treated in the same way as the rooms previously mentioned.

13 – CEILINGS

All the rooms shall be fitted with an applied or hanging ceiling (according to the project). Finishes shall be lime, plaster coated, white latex paint.

NOTE: GAS DEL ESTADO RESERVES THE RIGHT TO CONSIDER POSSIBLE MODIFICATIONS OF THE PRESENT STANDARDS OF IDENTIFICATION AND APPROVAL SHALL REMAIN AT ITS SOLE DISCRETION.

COLOR CHART



LOGO

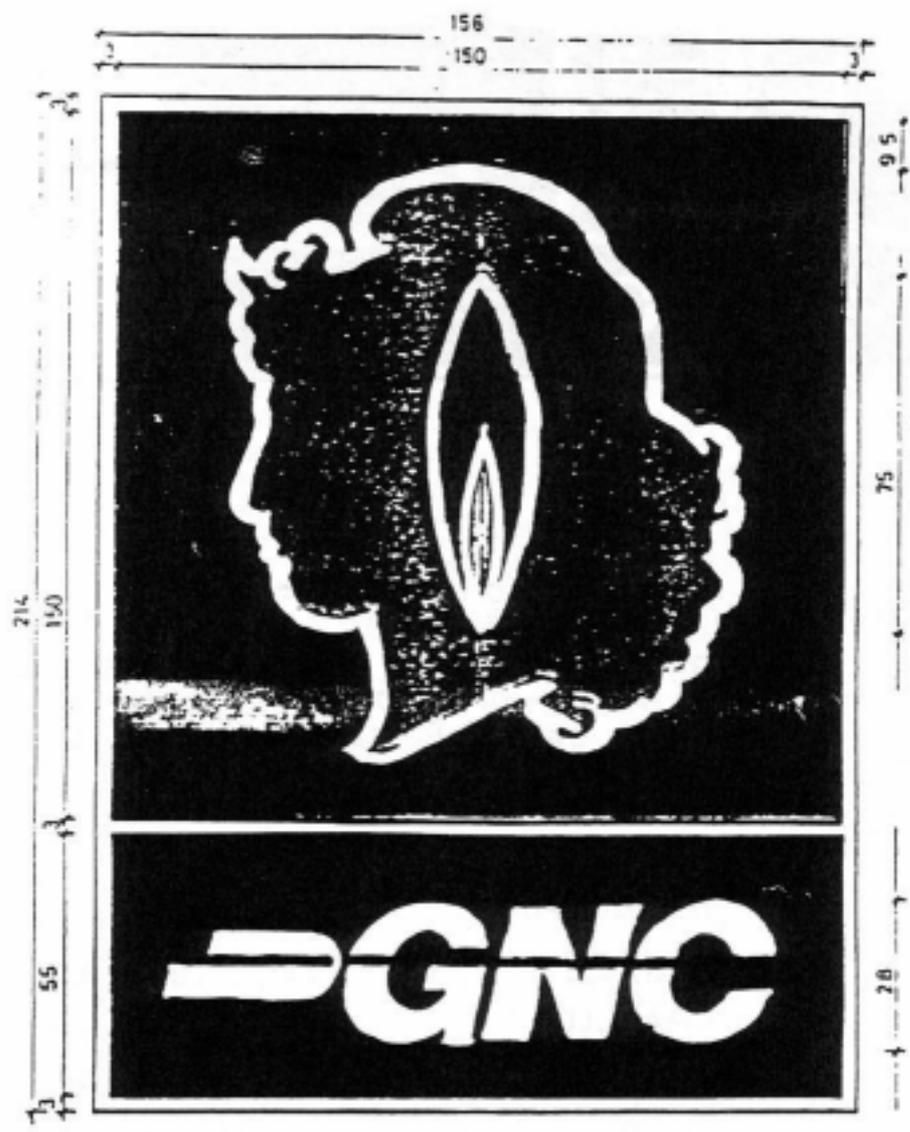
HELVETICA BOLD ITALIC TYPE FONT (LETRASET SYSTEM) WITH A LONGITUDINAL CUT AT THE UPPER EDGE OF THE HORIZONTAL BAR OF LETTER "G" OF 1/3 WIDTH OF THE LETTER THICKNESS

COLORS

1- PURE TRAFUL	(ALBALUX	041)
2- ORANGE	(ALBALUX	003) 1
YELLOW	(ALBALUX	004) 1 1/2
3- NAVY BLUE	(ALBALUX	043) 3
WHITE	(ALBALUX	000) 1
4- PURE YELLOW	(ALBALUX	004)
5- WHITE	(ALBALUX	000)

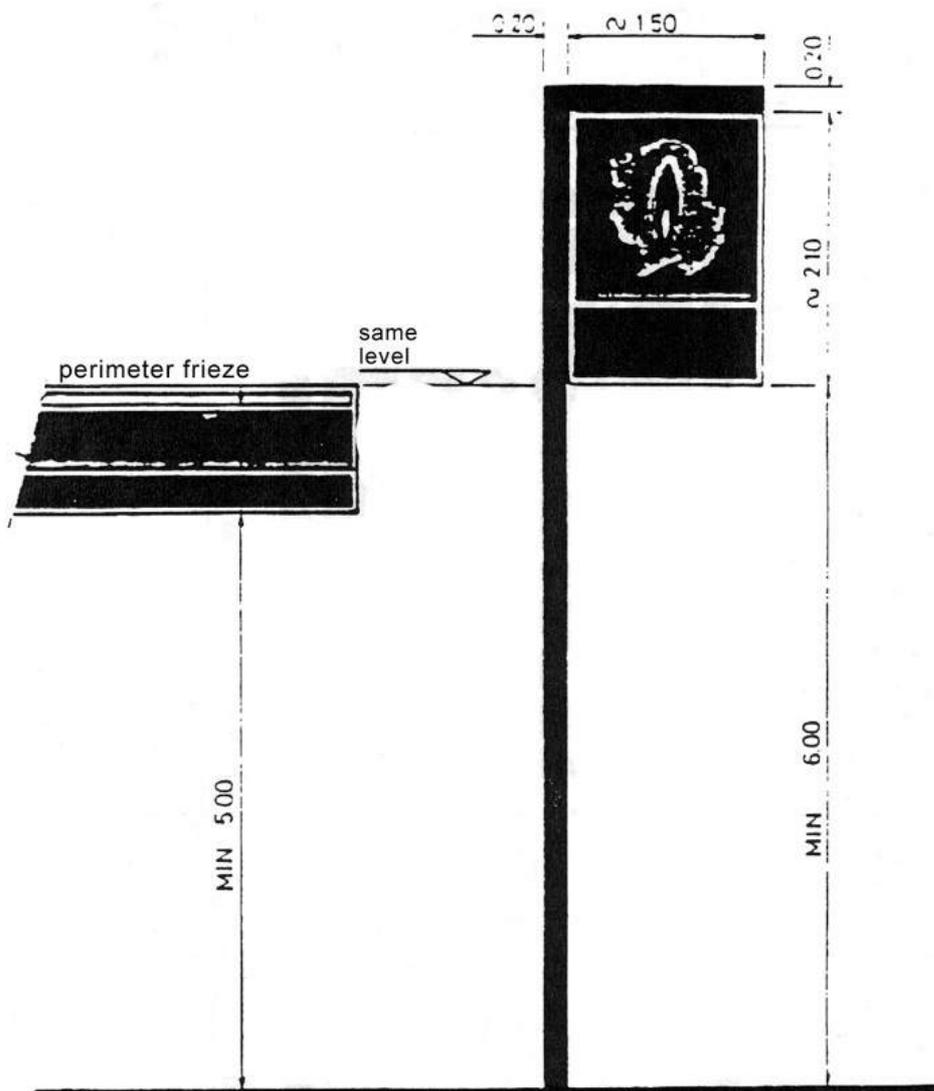
GRAPH N° 1

INSTITUTIONAL BOARD (SIZES)



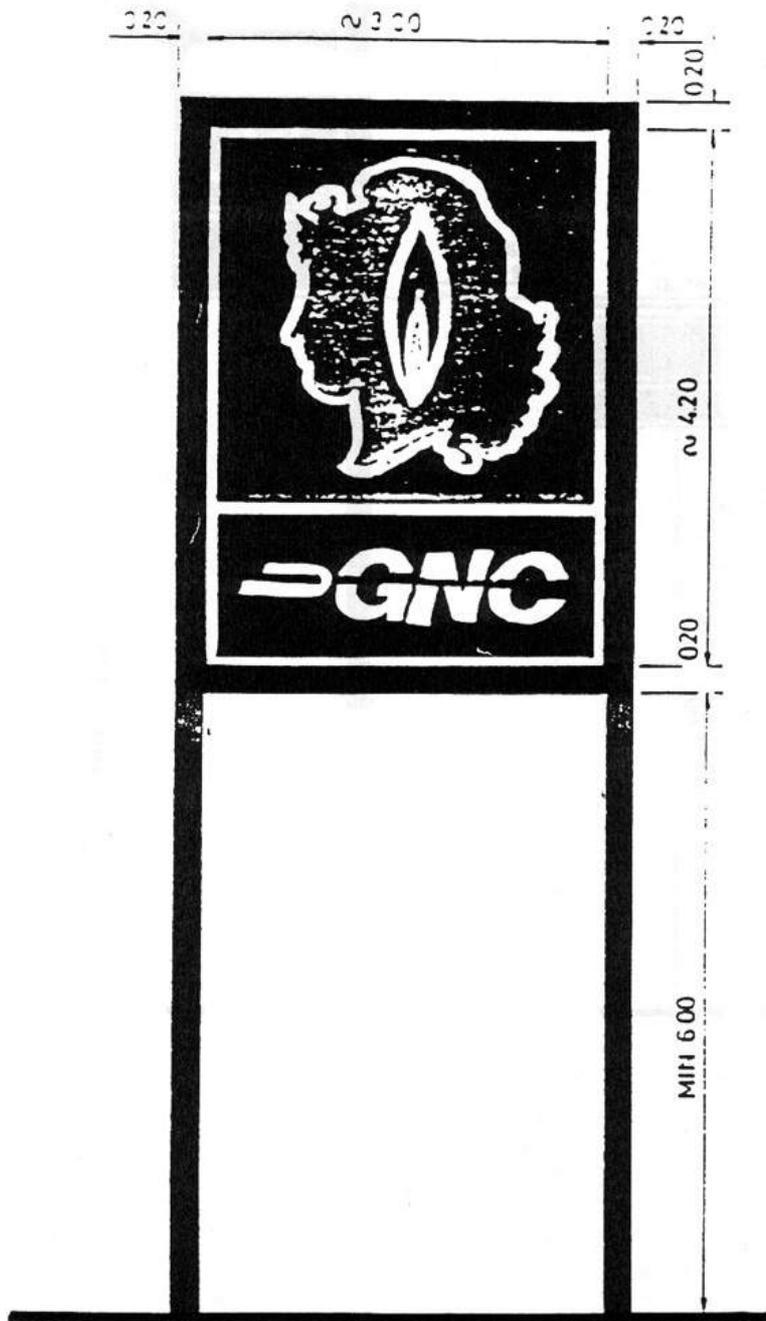
GRAPH N° 2

SIGNBOARD WITH SUPPORTS

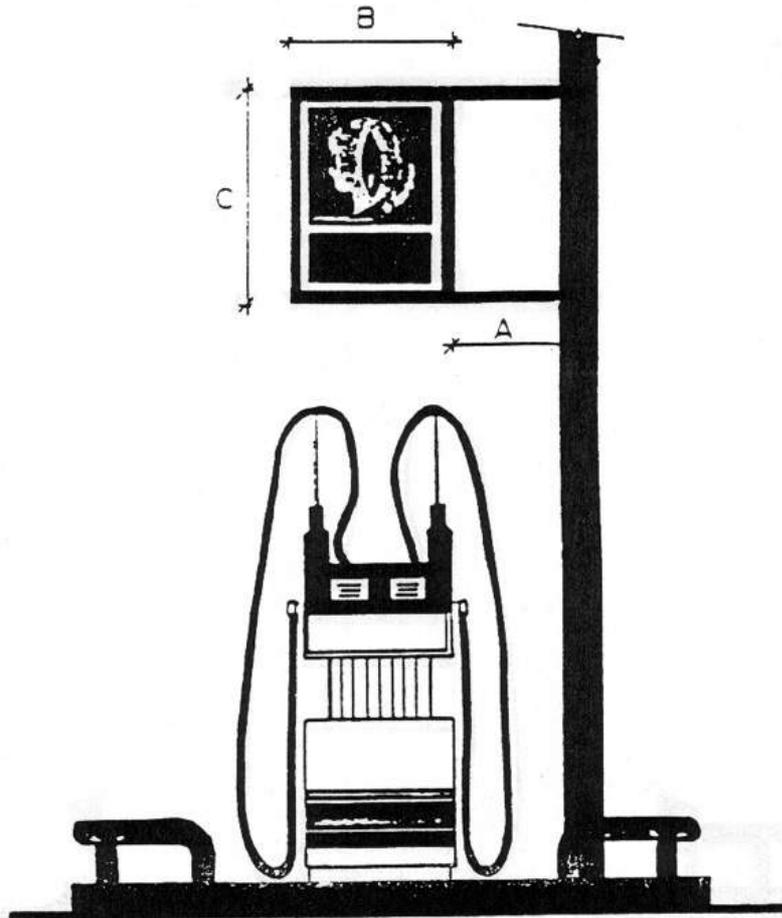


GRAPH N° 3

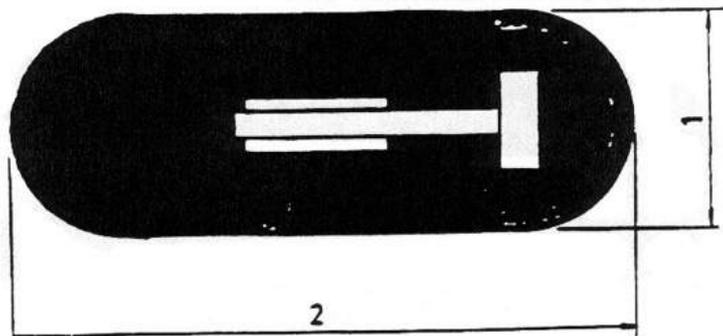
BOARD WITH DOUBLE SUPPORT



GRAPH N° 4



ISLAND PLANT WITH COLUMN

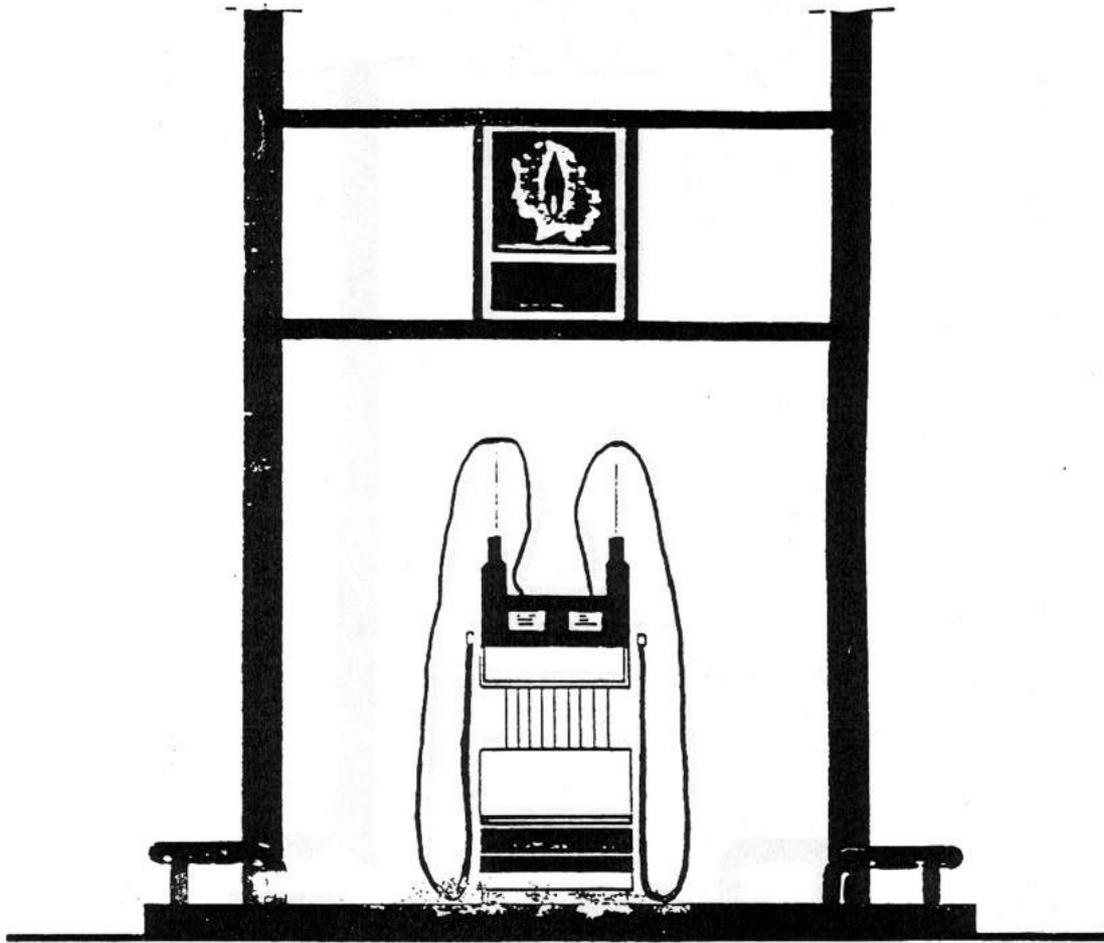


A = Separation between columns and pump

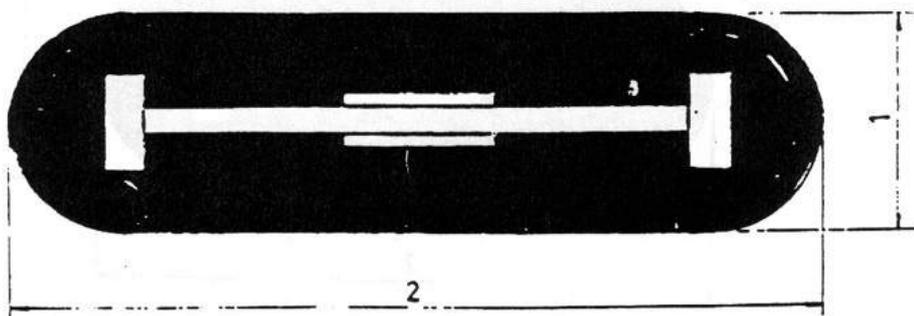
B = Pump's width

$C = B \cdot 1.4$

GRAPH N° 5

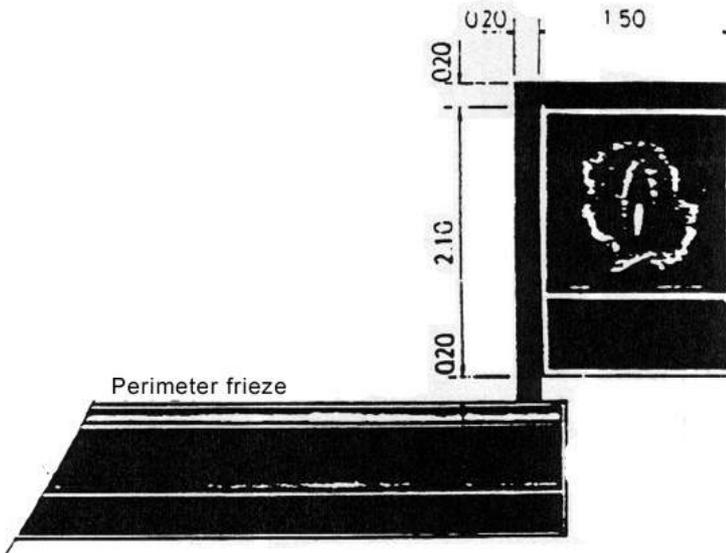


ISLAND PLANT WITH TWO COLUMNS



GRAPH N° 6

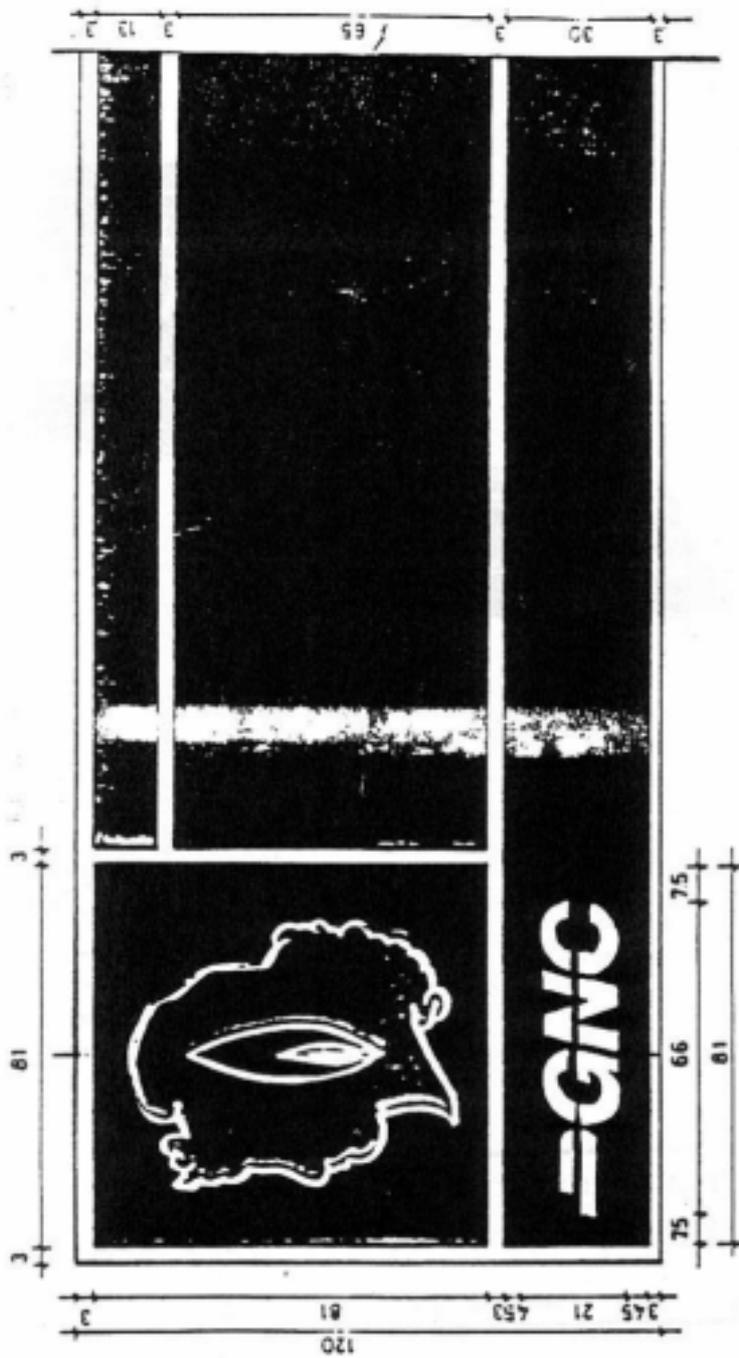
BOARD OVER FRIEZE



ENTE NACIONAL REGULADOR DEL GAS
CENTRO DE DOCUMENTACION E INFORMACION
SUITE ACHA 605, 107, CIRCULO BARRIO CENTRAL (1003)
TEL. 360-0511 HASTA 0519
DIRECTOR: 343-0519

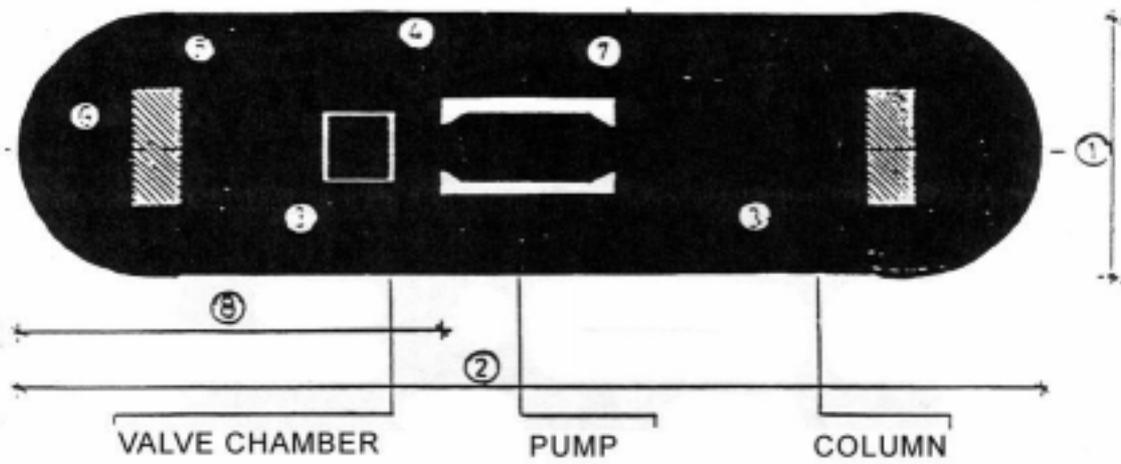
GRAPH N° 7

FRIEZE



GRAPH N° 8

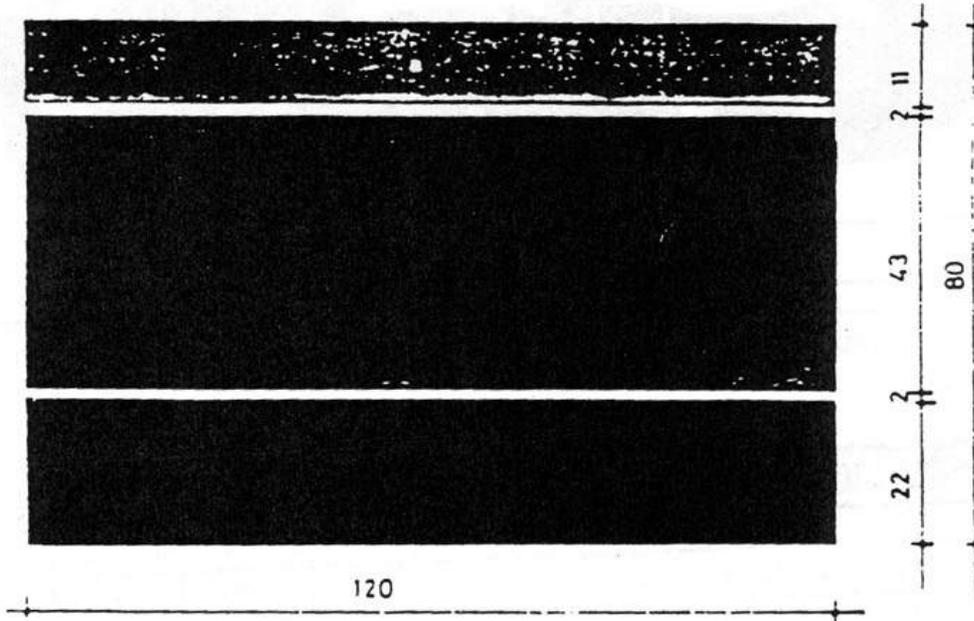
ISLANDS



ISLAND DISTANCES AND DIMENSIONS			
		MINIMUM	MAXIMUM
①	ISLAND WIDTH	1.00	-
②	ISLAND LENGTH	2.00	17.00
③	DISTANCE FROM COLUMN TO PUMP	0.50	-
④	DISTANCE FROM VALVE CHAMBER TO PUMP	-	0.50
⑤	COLUMN THICKNESS		
⑥	COLUMN WIDTH		
⑦	DISTANCE FROM ISLAND SIDE TO PUMP	0.30	-
⑧	DISTANCE FROM END TO PUMP	0.60	-

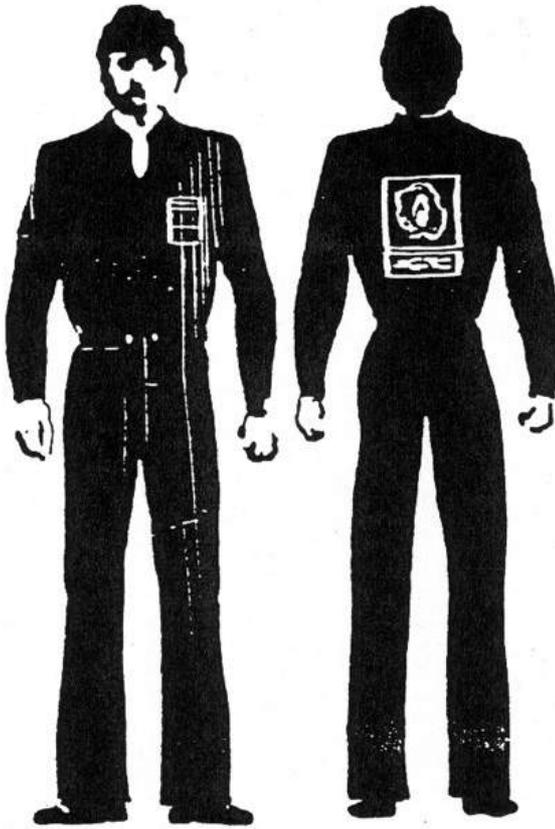
GRAPH N° 9

FLAG



GRAPH N° 10

WORK OUTFIT



THE WORK OUTFIT FOR THE STATION OPERATORS SHALL CONSIST OF A NAVY BLUE OVERALL OR T-SHIRT AND PANTS. THE FRONT LEFT POCKET (UPPER PART OF THE SHIRT OR OVERALL) SHALL BEAR THE COLORS OF GAS DEL ESTADO FLAG AND THE BACK SHALL BEAR THE CNG LOGO, BOTH ELEMENTS MAY BE APPLIED OR STAMPED. THE ORIGINAL DIMENSIONS AND COLORS MUST BE RESPECTED (APPROX. SIZE OF POCKET FLAG: 16 X 12 CM., CNG LOGO ON BACK: 15.6 X 21.4 CM) THIS OUTFIT SHALL BE COMPLETED BY A TEXTILE, ORANGE BELT

THE COLOR OF SAFETY SHOES SHALL BE DIFFERENT.

GRAPH N° 11

ESSENTIAL PROCEEDINGS AND DOCUMENTATION

1 - GENERAL ASPECTS

1 - 1 MUNICIPAL PERMIT FOR LAND USE

The interested party shall obtain the necessary permits to construct a CNG filling station in the chosen site according to land use regulated by the local municipality

1 - 2 NATURAL GAS SUPPLY FEASIBILITY AND FEED LINE PROJECT REQUEST

A copy of supply feasibility must be delivered to Gas del Estado before submitting the plans.

This shall be requested to Gas del Estado or to the corresponding Natural Gas Distribution Entities.

In the case of Gas del Estado, this application shall be requested at:

Gerencia Utilización y Sustitución de Combustibles (GUSC) (*Fuel Substitution and Utilization Management*), Don Bosco 3276, 2°, Capital or at the corresponding regional Management.

1 - 3 CHOICE OF FLAG

The interested party may define his sales image identification according to the following variants:

- Oil or Commercialization Companies such as: YPF; ESSO; SHELL; DAPSA; PUMA; ASTRA; ISAURA AGIP; GNV; ASPRO; ANSI; etc, authorized by the Under Secretariat of Energy
- Own flag (according to R.SSC 6/91 and Doc. 1212/89)

The following is required:

Company's constitution deed

Document of title of the site or lease contract

Affidavit showing there is no commitment to any flag

Affidavit, law N° 17.250, Section 4°

Electric Power feasibility

Municipal Permit

Economic and commercial capacity

- Gas del Estado

An agreement with the owner of the filling Station is signed.

1 - 4 INSTALLATIONS

- Selection of main equipment (compressors and dispensers)

The equipment chosen must be homologated by Gas del Estado and shall be based on the gas supply characteristics and filling station design.

1 - 5 ELECTRIC POWER SUPPLY

The interested party shall carry out all the necessary proceedings at the corresponding power distribution companies.

Likewise, he must apply the normative indicated by these companies for electric power supply.

1 - 6 INSTALLER APPOINTMENT

The interested party must appoint an installer to make the necessary arrangements with Gas del Estado for the approval of the station.

The installer shall be a university certified professional, licensed in Gas del Estado as a first class installer.

The appointment shall be signed by the station owner and by the acting professional.

Should the installer be replaced, the new appointment shall bear the signature of both professionals, and the new installer shall evidence acceptance of what the previous installer has done or else, make any necessary modification.

2 - SUBMITTAL OF THE PROJECT TO GAS DEL ESTADO

2 - 1 GENERAL ASPECTS

The project plans shall be performed according to IRAM standards for technical drawing.

The following information shall be clearly displayed in 80 mm lettering:

- Oil Company (Holder)
- Station location
- Plan name
- Drawing scale
- Installer, Owner and Holder's representative signature.

Above the lettering, a blank space of the size of an A-4 page shall be left for the approval seals and observations.

The documents to be submitted shall be endorsed by the installer and shall include:

2 -2 SPECIFICATIONS REPORT

It shall consist of a brief description of the works to be performed, general technical features, probable dates for work initiation and authorization.

2 -3 CIVIL PROJECT

It includes: view of the plant at each different level: front view, longitudinal and transversal cuts (including the compressor enclosure)

Ventilation details.

2 -4 SAFETY PROJECT

There shall be a plant view schematically indicating the exact location of the following safety devices for each level or floor:

Emergency shut down buttons and panels, or devices related to them, safety signs, fire extinguishers and other fire fighting elements, if any, such as sprinklers in the above ground compressor enclosure, etc.

2 -5 ELECTRICAL PROJECT

It shall present a plant view with a sketch of unifilar conduits and the details of bifilar connections to the equipment and unifilar diagram of the power circuit. The lighting layout of the whole hazardous area shall be clearly indicated. The typical assemblies shall be included in a single plan. A unifilar diagram shall indicate the interconnection of the emergency shut downs and safety devices they activate. This project shall also include a protection system against atmospheric discharges, indicating calculations and details of constructive elements.

2 -6 MECHANICAL PROJECT

It shall include:

- Worksheet stating the compressor and storage characteristics, signed by the equipment supplier or by his technical representative, station owner, holder and station installer.
- Flow diagram of compressors and storage, indicating all the safety and control devices, shut-off valves, pressure regulator, relief valve discharges, etc., with their operation rate.

A table with the references to the symbols used and approved by Gas del Estado shall be included.

Diagrams provided by the equipment manufacturer may be supplied if they comply with these requirements. Like the descriptive worksheet, they shall be signed by the equipment provider or his technical representative.

- Station flow diagram: it shall include the diameters of the main gas lines, maximum pressures, minimum pressures and flow rates; it shall also include the relief valve opening and venting pressure values and regulation values of pressure reducers and respective maximum flow rates.

The flow diagram shall also include the compressors and dispensers makes and types and their characteristics.

- The location of the different safety devices shall be clearly indicated (emergency shut down buttons and related elements, vent valves, remote controls, etc.) and cathodic protection.
- General piping plan: indicating the list of materials used.

It shall include a plant view of the station with the general drawings of the piping and necessary views and cuts above ground level. This plan shall also include cathodic protection devices.

- General piping isometrics: High and low pressure lines and drainages and vents, if any, shall be included in unifilar diagram. The pipe levels and general dimensions shall be recorded. The regulator and relief valves settings pressure shall also be indicated.

The same coding of the previously indicated list of materials shall be used.

- General details: bifilar diagrams shall include: plant view and elevation of all the connections of the equipment (pulse dampener tank, compressors, storage area and dispensers)

In the case of type mounting (pipe support details, cuts in ditches, passes through slabs, devices for remote activation of manual vent valves, etc.) the criteria indicated below may be followed, otherwise, they shall be included with the general details in a single plan.

- Measurement Bridge: according to GAS DEL ESTADO specifications.
- Ancillary installations: collecting purge and vent tanks, pulse dampener, etc. The plan shall include its corresponding calculations report and welding procedure.
- Piping calculation report: ASME code IIX or ANSI standard B 31.1 shall be used.
- Welding procedure: For the different piping widths and diameters, according to ASME IX
- Specifications report of piping tests including procedures, methods of piping testing and duration and further cleaning.
- The criteria described for type plans may be used for calculation and specifications reports and for welding procedures, as the case may be.

2 -7 STANDARD PLANS

All those designs that are repeated in several works, may count with a single approval. To this effect, they shall be submitted to Gas del Estado only once, together with the original type plan and five copies while their validity period is in effect. For extensions, the original plan and the copies with the original approval seal of the installer need to be submitted.

Work inspectors will be provided with a copy of the approved plan for each work.

2 - 8 COMPRESSOR AND STORAGE SHEETS

The documents of the project shall include the station characteristics and compressor sheet. They shall be submitted together with the plans and completed any time additional information is required.

In case of installing compressors above ground, as regards the refueling area level, the project of the corresponding slab shall be included, following the guidelines below:

a) Detailed calculation report. It shall be developed in an orderly way and shall consist of the following:

- Information about the equipment to install: weight, RPM, plant surface, type of equipment, type of supports (anti-vibration supports, if any), equipment maximum resistance and imbalance points and how they affect the structure.
- Dynamic analysis
- Load and overload analysis
- Calculation of the whole structure
- Type of steel and concrete to be used.
- Specification of the type of soil and bearing capacity. The contractor shall perform the on site verification of the soil bearing capacity adopted for the foundation level
- Noise and vibration able to reach the perimeters of the filling station according to IRAM standard N#4062 and codes in force, shall be analyzed.
- The calculation report must be submitted in typing.

b) Plan with details of reinforced concrete structure indicating geometric dimensions, thicknesses and diameters of steel bars.

- IMPORTANT NOTE:

The works execution and calculation shall be based on CIRSOC Regulation.

GAS DEL ESTADO shall always keep three copies of the Approved project documentation.

Should part of the calculation report not be covered by the duties and responsibilities of the installer, it shall require the approval of a competent professional.

2 - 9 WORKS CONTROL

During the construction and approval period, Gas del Estado shall verify that the standard in force is being complied with.

The internal installation is directly controlled by the Fuel Substitution and Utilization Management and the collaboration of the Department of Works and Gas del Estado Regional Managements.

Supervisions shall consist in the inspection of the following tasks, without this limiting the powers of Gas del Estado to inspect any other type of task whenever convenient:

- Material Approval and Quality Control
- Compressor enclosures concrete pouring
- Welding
- Mounting of equipment, fittings and safety system
- Testing

The approval of each inspection shall be essential for tasks' continuity.

Three letter size books (N #3) in triplicate shall be used and their titles shall be the following:

- Book of Service Orders: there shall be one per work
- Book of Request Notes to GAS DEL ESTADO
- Book of Communications to the Installer

These two last books shall be the means of communication between the Installer and GAS DEL ESTADO, and shall be used for its entire works.

The Metropolitan Area management or Gas del Estado Regional Management, as the case may be, shall supervise the feed line works.

2 - 10 APPROVAL OF CNG INSTALLATIONS

Once the filling station construction stage has been completed and the corresponding tests have been satisfactorily performed, the Installer shall submit the working plans and request the supply of natural gas for starting with the operation and calibration of the equipment after submitting "Approved for Municipal works" working plans, duly recorded.

Gas del Estado shall deliver the fuel during a test period of ten running days maximum. Once this period expires, supply shall be interrupted.

Once the installations correct operation has been verified and the working plans have been approved by Gas del Estado, the latter shall issue a "Certificate of Installations Approval" that shall be used by the interested party for obtaining the "Dispensing Permit" from the corresponding municipal or provincial entity.

2 - 11 PUBLIC DISPENSING PERMIT

Previous to dispensing, the station owner shall be in charge of completing all the pertinent proceedings or formalities before the national, provincial or municipal authorities having jurisdiction.

Once the corresponding Municipal or Provincial entity has granted him the "Dispensing Permit", he shall request the supply of natural gas at Gas del Estado and, at that point, a document of "Natural Gas Supply Initiation" shall be drafted.

PROJECT OR FEASIBILITY REQUEST

1º Typed note as detailed below

2º Plan with the corresponding location and dimensions, also indicating the connection points.

3º Copy of the document of title with the corresponding bill of sale or lease contract authenticated by a notary public.

4º Municipal Permit (Approval of site use)

5º Fee payment

6º In case the Holder fails to submit the note; he must authorize on it a person to do it.

*** Sirs

GAS DEL ESTADO

GUSC/ commercialization/ CNG

Don Bosco 3672- 2º piso

Capital Federal.

We hereby request the supply of natural gas for the site located at

Province of.....

The required flow rate shall be..... m3/ hour

Yours sincerely,

.....
OWNER'S SIGNATURE

GUSC/ COMMERCIALIZATION/CNG

PBX

87-6681/89 – extension: 1271 – 9 am to 3 pm.

GAS DEL ESTADO

COMMERCIALIZATION DEPARTMENT MANAGEMENT
METROPOLITAN MANAGEMENT
ENGINEERING - TECHNICAL AREA

CNG

SUPPLY FEASIBILITY APPLICATION

APPLICANT'S DATA:

Company's name:

Address:

Locality: Telephone number:

Location of the plot:

Street: (between) and

Locality: Maximum estimated flow rate m3/hour

.....
APPLICANT'S SIGNATURE

SUPPLY ALTERNATIVES:

Alternative 1:

a. It is necessary to provide an extension from the high pressure network located at and approximate length m, maximum operation range Kg/cm2 and minimum Kg/cm2 diameter service mm. MAXIMUM FLOW RATE m3/hour

b. a mm. diameter service is needed. MAXIMUM FLOW RATE m3/hour

maximum operation ranges Kg. / cm2 and minimum Kg/cm2

Alternative 2:

a. It is necessary to provide an extension from the high pressure network located at and approximate length m., maximum operation range Kg/cm2 and minimum Kg/cm2

Diameter Service mm. MAXIMUM FLOW RATE m3 / hour

b. a mm. diameter service is needed. MAXIMUM FLOW RATE m3/hour
maximum operation ranges Kg. / cm2 and minimum Kg/cm2

WARNING: THIS NOTE DOES NOT IMPLY THE PLOT'S FITNESS FOR THE INSTALLATION OF A CNG DISPENSING OUTLET.

Place and date Signature and seal

EXPIRATION DATE:

Received and accepted:

NAME:

ADDRESS:

LOCALITY:

STATION:

CODE	ACCOUNT CHARGE	UNITS	AMOUNT	TYPE OF FEE (1)
1	460-E-0-50	"U"		Approval and advice duties
2	460-E-C-49	"Z"		Project making and updating
3	464-E-0-60	"Z"		Internal project making and/or bids review
4	460-E-0-45	"Z"		Administrative expenses
5	460-E-0-54	"Z"		Combustion efficiency and anticorrosive protection control
6	460-E-0-63	"Z"		Service connections to great consumers
7	460-E-0-41	"Z"		Authorization duties
8	460-E-0-83	"Z"		Service rehabilitation.
				Unfulfilled payment of great consumers
		(2).....	"U"	("U" value in force)

(2)....."Z"

- (1) To be printed in the receipt
- (2) Corresponding VAT must be added

DATE: / /

GAS DEL ESTADO
SGTO/ GUSC/ COMMERCIALIZATION/ CNG
Don Bosco 3672 - 2° piso - Cap. Fed.

SATELLITE STATIONS

(Mother and daughter)

1 - GENERAL ASPECTS

1 - 1 STANDARDS

Mother/ daughter stations shall comply with the requirements set forth in this standard and in the provisional standards GE- N°1-142 and GE-N°1-143 (in- bulk CNG transport and in-bulk CNG loading and unloading Plant Project), respectively.

1 - 2 FILLING AND DISCHARGE SITE

The site for semi trailer's filling and discharge must comply with the following requirements.

There shall be a reinforced concrete wall on both sides, parallel to the semi trailer, of the same characteristics as the ones indicated in PART 1- ITEM-2-2-f

The minimum wall height shall be such that it exceeds that of the semi trailer by 50 cm.

The site shall comply with the requirements of PART 1 - ITEM 2-2-h. Ventilation shall comply with the requirements stated in PART 1 - ITEM 2-2-j.

The filling and discharge site shall be at least six (6) meters wide.

There shall be a metal gate on its ends which shall withstand:

- a) Exposure to fire during 3 hours
- b) Expansive wave in case of explosion

c) Impact of elements

1 - 3 LOCATION IN CLEAR OPEN SITES

When stations are installed in clear open sites (with the nearest urbanized area 100 meters away from the station site), the concrete wall shall not be required. The distances to be considered in those cases shall be the ones indicated in part 1-ITEM 2-2-p except for the distance to station's perimeter that shall be of at least 25 m.

SPECIFICATIONS FOR PERIODIC RE-QUALIFICATION AND TESTING OF CNG FILLING STATIONS

1- DEFINITIONS

1 - 1 SERVO VALVE

It completely blocks the fluid flow through the line it has been mounted on. It is remotely activated by a pneumatic and/or electrical signal.

1 - 2 EXCESS FLOW CONTROL SYSTEMS

Electrical, electronic or mechanical system that automatically cuts off fluid flow circulating at a higher speed than the settled one.

1 - 3 OVERPRESSURE RELIEF VALVE

Produces gas automatic venting from the line or container it has been placed on maintaining inner pressure within settled values when this pressure is higher than the settled limit. It shuts off automatically when the pressure decays to a settled value.

1 - 4 HOLDER (BRAND NAME HOLDER)

Legal entity or individual owning the brand that identifies the Dispensing Outlet.

1- 5 OWNER OR OPERATOR

Owner of the service station real property or dispensing outlet, by virtue of a service rendering agreement undertaken with the Holder.

1- 6 INSTALLER

A university certified professional, licensed in Gas del Estado as a first class installer.

He shall be in charge of preparing and executing project plans, calculations and worksheets for the dispensing outlet structure and installation as well as the corresponding construction, installation, equipment and / or materials supply and service station start up.

The installer shall issue together with the maintenance operator, the first periodical review certificate, before obtaining the final approval of the filling station.

1-7 MAINTENANCE MANAGEMENT

The owner shall be in charge of maintenance assisted by a university certified professional, licensed in Gas del Estado as a first class installer. The person defined as installer in point (1-6) may assist him. He shall control and certify the operative features of the different components of the CNG Dispensing Outlet, and ensure that the current safety standards are complied with, as of their start up with the operation and periodic maintenance, according to the present standard. He must report the changes or relevant modifications affecting their operation to Gas del Estado

and / or to the Municipality as the case may be, and prepare and ensure that the due maintenance plan is complied with. Certify the operative features of the different station components, as well as supervise their periodic maintenance in compliance with the terms and methodology herein stated, reporting the HOLDER and GAS DEL ESTADO, as the case may be, the news and / or anomalies detected, so as to implement the corresponding corrective actions when necessary helped by competent personnel.

2 - DOCUMENTATION

2 - 1 GENERAL

After authorized and within a maximum term of 30 running days as of dispensing commencement, the Commercializing Company must count with a set of documents of the works approval plan (plans and specifications worksheets) and a "Book of News", letter or foolscap size, paged and numbered, with the original affixed and two removable copies, which cover shall be as described in the present standard.

It shall also count with the original authorization certificate issued by Gas del Estado.

A copy of the detailed documents and the Book of News shall be always available at the CNG dispensing point for control and inspection.

2 - 2 BOOK OF NOTICES

The book of notices shall be used:

- To register the periodic certification records issued by the Owner, Commercializing Company or Gas del Estado.
- To record minor modifications to the installations outside hazardous areas.
- By the owner to register notices according to the inspection schedule and the results obtained. He shall also record the name of competent personnel performing each task.

3 - PERIODICAL CONTROLS

3 - 1 MONTHLY CONTROLS

They shall be carried out by the owner who shall record in the Book of Notices, the methods used and the conclusions obtained, reporting any detected anomaly to the Commercializing Company.

The owner shall also record the monthly controls as an affidavit in the Book of Notices, and shall provide a copy to the Holder. The Holder shall in turn send a copy to Gas del Estado within a term of seven (7) working days.

The elements to be controlled shall be the following:

a) FIRE EXTINGUISHERS

The existence, distribution and accessibility to fire extinguishers and their weather protection shall be verified according to the works approval plans.

The fueling status and deadline date shall be controlled.

The exterior maintenance condition shall be controlled: paint, sprinkling hose, flexibility control and absence of cracks, nozzle assembly and seals availability.

b) FILLING PRESSURE

It must be checked that the filling nozzle pressure does not exceed 200 bar \pm 2.5%.

- For this, a standard measuring unit (a 4 inch quadrant pressure gage, 350 BAR CLASS 05 minimum range) shall be installed in series with the filling nozzle and three vehicles shall be completely refueled until supply is automatically interrupted. The average of the pressures resulting from the refueling process shall constitute the filling pressure.
- Difference between them and the calculated average shall not exceed 2%.
- If a hose pressure exceeds 7.5% of the maximum filling pressure (200 bar); the maintenance operator and competent personnel shall seal the hose at normal filling pressure. This procedure shall be recorded in the book of news and reported to Gas del Estado for reauthorization of use.
- If during 6 months, a filling pressure exceeding 7.5% is noted on more than three occasions, gas supply shall be interrupted upon notification to the Municipality or corresponding authority.

c) HOSES

Hoses to be used, must have non reusable clamped nozzle assemblies.

Hoses shall be marked with the date of assembly (month and year) and with an exclusive number referring to the manufacturing period.

When used at a CNG filling station, every hose and nozzle assembly shall count with an original certification issued by the supplier guaranteeing that resistance and tightness tests were carried out on every hose, at least at 150% of the maximum working pressure during a time interval of one to five minutes.

This certification must be attached to the request for technical authorization of the filling station.

Whenever any of the hoses at the filling station is replaced, the owner shall record in a document and in the Book of Notices the assembly date, manufacturing date and serial number of each hose (the replaced and the new one).

The hoses shall be assigned a shelf life according to the term guaranteed by the supplier in the certificate.

The following shall constitute enough reasons for considering a hose useless:

- Shelf life expiration, according to the specifications of the corresponding certificate.
- Alterations of the external cover (cuts, ruptures or abrasion)
- Blistering
- Choking or permanent distortions
- Nozzle assembly rust

d) HYGIENE

Hygiene shall be supervised at ditch bottoms, valve manholes, canopies and flat roofs in hazardous areas and other safety areas and also pedestrian and/or vehicle circulation areas. These spaces shall not be used for other purposes.

3 - 2 HALF-YEARLY CONTROLS

a) ORIGINAL INSTALLATION

Based on the works approval plans and previous certifications, verifications shall be performed to ensure that the following installations have not been altered:

- MECHANICAL

Gas piping (vents, relief valve discharges, suction and high pressure) and their fittings (valves and related mechanisms), tanks and containers, regulators and other related elements.

Soundproof and vibration proof elements.

- CIVIL

The design of accesses and ventilation areas of measuring and compressors enclosures as well as their surrounding areas, perimeter aisles and emergency exits shall be verified to ensure that they have not been altered.

- SAFETY

Distribution of the identification and / or warning signs, fire extinguishers, automatic sprinklers and hoses, fire nozzles and the whole automatic detection systems of the installation shall be verified.

- ELECTRICAL AND LIGHTING INSTALLATIONS

Distribution of the electrical installation in hazardous areas and the existence and characteristics of lighting devices shall be evaluated.

b) SURROUNDINGS

The owner must inform Gas del Estado about any modification to the buildings surrounding the CNG dispensing outlet that may affect the safety distance standards.

c) ENVIRONMENTAL POLLUTION

The performance of drainage and venting systems must be analyzed. The effluents of the filling station must comply with the local codes in force.

The levels of noise and vibrations at the filling station shall be controlled, certifying that they do not exceed, at any time, the levels set forth in the Municipal codes and / or application standards.

d) ELECTRICAL INSTALLATION

Controls shall be performed to check the correct condition and operation of electrical systems. The condition of sealing paste of each explosion-proof seal shall be verified; the lighting levels in all the hazardous areas of the filling station, measuring and compressors enclosures, corridors, access and refueling areas shall be controlled.

Perfect sealing and adjustment of the explosion-proof components of the compressors, dispensers and installation in general as well as their condition shall be verified.

e) PIPING GAS TIGHTNESS

All piping threaded or flanged joints and their fittings as well as all those elements that may cause gas leaks shall be controlled.

To these effects, a soapy water solution applied on the controlled joint with an atomizer or a brush shall be used. The parts of the joint that are not visible at first sight shall be controlled with a mirror.

The line must be loaded at maximum working pressure to perform this control.

f) EMERGENCY SHUTDOWNS

Correct operation of all and each of the buttons of the safety chain activated by emergency shutdowns shall be controlled.

Compressors interruption, blocking of servo valves of the measuring system, storage outlet and dispenser internal valves shall be verified.

Controls shall be performed to check that the previous elements are turned-on exclusively from the switch panels (they shall not restart automatically if buttons are not activated).

In case of system failure, the operations at the station shall be interrupted until the problem is solved.

g) EXCESS FLOW BLOCKING SYSTEMS

The operation of excess flow valves in the storage area and dispensing point shall be controlled according to the following procedures:

- STORAGE

Storage outlet valves shall be blocked. Gas shall be vented from delivery lines through dispensers.

Once the valves are depressurized, each storage outlet shut off valve shall be enabled while the dispenser may continue operating from the shut off valves located at its base, verifying that each excess flow valve has been blocked.

- DISPENSERS

The shut-off valve of each dispenser shall be blocked. Dispensing shall be enabled and venting of the dispenser circuits shall be done.

The shut-off valve shall be quickly opened with the dispenser enabled for delivery.

Thus, blocking of the excess flow shut off system must be verified.

h) SERVO VALVES

For control, normal supply of pneumatic and / or electrical signal, total blocking of the shut off element and time required for its operation and replacement shall be checked.

i) CONTROL OF PIPING PAINT

For control, general paint conditions of piping, fittings and valves installed overhead or in ditches and their corresponding supports shall be checked.

Corrosion protection condition under piping supports shall be verified, disassembling supports and dielectric protection devices.

In case epoxy repaint is required, the surface shall be prepared according to the manufacturer's instructions.

j) DISPENSERS CALIBRATION

The calibration condition of each dispenser shall be controlled. In case the calibration error is higher than 2%, re-calibration shall be performed.

Dispenser calibration shall be performed according to the zone calibration factors periodically issued by Gas del Estado.

k) MANUAL VENTING

The activation of manual vent valves shall be controlled by performing three (3) successive opening and closing operations. The tests shall be performed with storage at maximum pressure. The following shall be verified:

- A perpendicular stress exceeding 49 N (5 Kg) applied on the end of the activation lever is not required.
- Complete valve opening and blocking is produced.
- Vibrations or anomalous movements are not detected in venting pipes
- THE HOLDER AND THE MAINTENANCE OPERATOR shall verify the existence of the fire plan and the effectiveness of training provided to the persons involved in it.

3 - 3 ANNUAL CONTROLS

a) REINFORCED CONCRETE STRUCTURES

The Maintenance operator shall annually control the reinforced concrete structures condition, visually inspecting the presence of cracks and / or fissures. In case of detecting any, a specialist's report shall be required so as to guarantee that its physical properties have remained unaltered. This report shall be attached to the document issued by the owner.

b) WATER OUTLETS AND SPRINKLERS

The maintenance conditions of fire extinction hoses and valves operation shall be controlled.

The availability of fire nozzles and adjustable wrenches in each hose compartment shall be verified.

Sprinklers conditions and correct orientation shall be verified.

c) RECALIBRATION OF OVERPRESSURE RELIEF VALVES

Calibration of relief valves shall be controlled to verify the opening and venting pressure at a testing bench. After their disassembly, cleaning and verification of seat conditions, they shall be reassembled and calibrated based on the ranges settled by the INSTALLER.

Then, the adjustment device cap and the nozzle fixing screw shall be sealed and the identification plate shall be engraved.

When a third party (supplier of the valve, of the equipment on which the valve has been assembled, valve manufacturer or a recognized institute) recalibrates the valves, the record of the original document issued by the owner shall be attached.

For this, a certified professional shall be present.

d) ANTICORROSIVE PROTECTION OF UNDERGROUND PIPING

- Identifying the pipe-soil potential.

This shall be done by means of a class 0.5, high resistance voltmeter (150,000 Ohms/ Volts sensitivity).

The following procedure shall be followed:

A benchmark electrode shall be placed on the soil (saturated copper sulfate), close to the pipe, considering that the closer the electrode is to the pipe, the more accurate and representative the measurement will be.

The chosen place must be wetted so as to guarantee a good electrical electrode - soil contact.

Once the electrode is placed on the soil, it is connected to the positive terminal of the instrument.

The cable used to make contact with the piping or Permanent Measurement Box (PMB), maintaining the bridge between terminal A (anode) and C (piping), is connected to the negative terminal.

The scale selector is set at its highest range for the first measurement. When the reading falls below the value of the subsequent scale, the scale selector must be set at the immediately lower range, and the measurement shall be done in the scale's last quarter.

The measurement may fail due to a high resistance in the measuring circuit, generally caused by a high contact resistance of the benchmark electrode, especially when this electrode is directly placed on the pavement, in frozen lands, etc. The verification shall be done as follows:

Determine the potential according to the previous indications.

Repeat the measuring with the selector switch at a higher range.

If there is a notorious difference between both measurements (more than 50 mV), the contact shall not be considered effective.

In this case, measuring at the highest ranges (for example 10 V) so as to minimize errors produced by a bad contact is convenient.

If potential measuring is lower than 850 mV at the furthest piping point (ends) of the anticorrosion protection, it shall be considered correct (if the absolute value is considered, potential measuring result must be higher than 850 mV).

Otherwise, causes shall be investigated and the current transmission tests shall be performed according to the technical specification PA. N° 265, September 1986.

If cathodic protection is necessary, Mg AZ63A anodes of at least 1.350 Kg shall be used. Drainage of each anode shall not exceed 25 m A; an initial pipe - soil potential with an absolute value lower than 1100 mV at the furthest piping point shall be obtained.

3 - 4 FIVE-YEARLY CONTROLS

a) STORAGE CYLINDERS

Storage cylinders shall be retested according to standards GE- N° 1-144.

When cylinders are dismantled, its support structure shall be checked and if necessary, maintenance shall be performed.

Cylinders re-qualification may be carried out in stages, foreseeing the plugging of connections to dismantled cylinders, in order to reduce to the minimum any potential loss to the owner or operator.

All re-qualifications foreseen for that period shall have been complied with when the conformance certificate is issued.

3 - 5 TEN-YEARLY CONTROLS

a) HYDROSTATIC RE-QUALIFICATION OF PIPING

It shall be carried out at a minimum pressure 1.5 times the maximum working pressure during at least 6 hours.

b) RE-QUALIFICATION OF TANKS

It shall be performed on pulsation damper, drainage and shock tanks.

Tests shall be: hydrostatic tests at a minimum pressure 1.5 times the design pressure, and thicknesses verification by ultrasonic method.

After this, the identification plate shall be re-engraved.

3 - 6 COMPRESSORS

It shall be the owner's responsibility to comply with the different compressor's control items, in accordance with the Equipment Supplier's instructions and with the specifications included herein, to be done by qualified and competent personnel as indicated below.

a) MONTHLY

- Preservation and hygiene according to what is set forth in the pertinent item of this standard.
- Fittings and seal leaks

b) HALF-YEARLY

- Same condition as the original installation
- Environmental pollution (noise emission, vibration and effluents)
- Electrical installation
- Conduit tightness
- Emergency shut down sequence

- Equipment internal excess flow blocking valves

- Equipment internal servo valves

- Vents operating mode

c) ANNUAL

- Equipment internal pressure relief safety valves.

d) FIVE-YEARLY

- Storage cylinders packaged with the compressor equipment.

- Specific control items certification of compressors in accordance to the procedures set forth in this standard.

INSTALLATIONS SAFETY

1- SAFETY MEASURES

1 - 1 INERTING

Once installations are enabled, before initial delivery of the product it must be inerted. This operation shall be performed by eliminating the air inside them with an inert gas current such as carbon dioxide. Carbon dioxide needed is estimated at 1 Kg per m³ of the installation volume. The operation shall be completed by injecting NATURAL GAS through one connection and discharging carbon dioxide to the atmosphere through another one.

1 - 2 LIGHTING AND ELECTRICAL INSTALLATIONS

Electrical installations located in CNG operation areas shall be classified according to the figures indicated in these standards (see figures 1 to 5 – Pages 99 to 103).

Electrical installations located within areas classified as NEC Class I Division 1 and 2 shall comply with the specifications of applicable standards NFPA N° 70, sections 500 and 501 and standards IAP.CA 4.05, IEC 79.10 and applicable IRAM ones (see figures 6 to 13 - Pages 104 to 109)

Within areas classified as Division 1, the following shall be installed:

- a) Explosion-proof electric motors (Ex d) or pressurized with air or inert gas, either purged or not – (Ex.p)
- b) Explosion-proof conduits, flexible cords, their fittings and explosion-proof line breakers
- c) Lighting installations, circuit breakers and contactors, junction boxes for branching, couplings, change of conduits direction and path, terminal connection and fuse boxes, etc, all explosion-proof.
- d) Installations and electric equipment, pressurized with air or inert gas, complying with the requirements of standard NFPA N° 496
- e) Mineral insulation type MI cables, with their approved corresponding connectors

Within the areas classified as Division 2, the following shall be installed:

- a) Materials, fittings and electrical equipment accepted for Division 1.
- b) Increased safety type motors (Ex a)
- c) Rain and gas tight conduits and flexible cords, with their corresponding approved connectors.
- d) Tight boxes and connectors for coupling, change of conduits direction, branching.
- e) The elements and fittings containing spark or electric arc generating equipment, such as breakers or contactors, fuse boxes, etc., shall be fit and approved for division 1 equipment placing the corresponding seals.
- f) Oil switches with simple cover, according to specifications of standard UL N° 698.

- g) Metal protected and flame proof sheathed cables, fit for intensive work, with their corresponding approved connectors.

In Divisions 1 and 2 areas, signaling, instrumentation and control electrical installations may be built with intrinsic safe circuits, according to standards NFPA N° 493.

All these intrinsic safe circuits located in gas areas, shall count with safety barriers installed in non classified areas, or else in boxes fit for hazardous areas. The risk level may also be reduced by means of positive pressure ventilation, using a clean air source and effective devices against ventilation deficiencies (standard NFPA N° 496/ 1972)

The materials of all the installations indicated shall comply with the specifications required by Underwriters Laboratories Standards (U.L) and/ or applicable IRAM Standards and shall meet the technical requirements and corresponding tests in the area where they shall be used.

It is convenient, whenever possible, to locate the electric equipment to be installed in division 1 areas, such as general switchboards, breakers, starters, etc., in less dangerous areas of division 2 or not classified, thus allowing the use of conventional elements.

Electric installations located outside hazardous areas shall comply with the rules established by the Argentine Electro Technical Association (*Asociación Electrotécnica Argentina*) and authority having jurisdiction.

The type of protection of electric devices within this area shall be at least IP 44 according to IEC 144 or DIN 400500.

1 - 3 GROUNDING

All the installations in a CNG station, such as metal structures, lighting posts, switchboards, motors, machines, intrinsic safety barriers, etc, must be effectively grounded so as to eliminate static currents or other type of electrical problems and eventually, atmospheric discharges.

The system may be made up of an underground mesh or ring, javelin type conductor or a combination of those.

In all cases, the resistance of the system to earth shall be of 5 ohm and 1 ohm maximum for intrinsic safety installations.

Joints must be preferably welded through copper-aluminothermy, and in case of using clamps they shall be brass and protected by a plastic self adherent tape.

In the loose ends of the cables that are connected to multiple apparatuses or structures, deep indentation terminals shall be used.

For the different parameters that must be calculated in a grounded system, standard VDE 0141 shall be applied. Pull and contact tensions must not exceed 125 V.

No less than one second shall be considered for the calculation of thermal effects caused on the system elements by a short circuit current.

An automatic circuit breaker, sensitive to defect current (differential breaker) shall be installed to protect the electrical installations at offices and workshops from contact risks.

The minimum lighting levels required by law 19.587, shall be applied to lighting of operations and transit areas.

1 - 4 EXTINGUISHERS

a) Compression, storage and CNG filling stations shall be equipped with portable, wheeled and / or fixed extinguishers.

The amount, type and location of this equipment shall be determined according to Law 19.587 on Occupational Safety and Hygiene and IRAM 3.517 standard about Distribution and Installation of fire extinguishers.

They shall be signaled according to IRAM 10.005 Part II.

Their characteristics shall be the following:

- Chemical powder pressurized fire extinguisher, with 10 Kg capacity, according to IRAM 3523
- CO₂ fire extinguisher (carbon dioxide), 7 Kg capacity, according to IRAM 3509
- Chemical powder fire extinguishing cart, 70 Kg capacity, pressurized according to IRAM 3550, with a 10 m hose.
- 10 liters water fire extinguisher according to IRAM 3525.

b) The minimum amount of extinguishers to be installed and their location shall be the following:

- One tri class chemical powder equipment at each CNG dispensing island.
- Four chemical powder extinguishers, at the compressor and storage areas, two at the accesses and two inside the room, diagonally opposed to one another.
- One chemical powder extinguisher at the Regulation and Measurement Bridge.
- One CO₂ (carbon dioxide) extinguisher at switchboards, switch panels, electric power source, etc.
- One water extinguisher in offices

c) The stations with more than 4 dispensing points shall have a chemical powder fire extinguishing cart.

In case of multi-fuel stations, CNG dispensing points shall be considered independently from those delivering liquid fuels.

Fire extinguishers located in open air shall be protected by means of masonry or metal structure.

Wheeled extinguishers shall not be placed on natural soil. Likewise, access paths to eventual fire spots shall not be of this type.

Chemical powder is tri-class according to IRAM 3569/ 75 Standard.

All the extinguishers shall be IRAM quality approval seal and shall also comply with the national and provincial codes in force.

NOTE: CNG responsible persons must bear in mind that extinguishers maintenance and its loading shall be done according to the governance of IRAM seal of approval and in compliance with IRAM 3517 standard, part II for Services, maintenance and refueling, or else IRAM certification of the fire extinguisher batch, in compliance with the previously mentioned IRAM standard.

All the extinguishers shall count with the corresponding IRAM approval seal. This is an essential condition for the approval of the installations.

d) Fixed extinguishing system

Automatic extinguishing systems activated by flame detectors, smoke, temperature, etc., and manual pushbuttons may be used in compressor protection enclosures or in other places where their use is considered necessary.

Carbon dioxide (CO₂) shall be used as extinguishing agent

The concentration in air volume for a reference temperature of 20°C shall be appropriate for the flammable product, for CO₂; the minimum concentration shall be 34%.

Cylinders shall be fit for the working pressure of gas used, and shall be constructed according to the corresponding IRAM standards.

e) Water sprinkling fixed system

CNG compression and storage equipment installed in enclosures formed by a reinforced concrete protection wall and located 3 m above floor level, must count with water sprinkling fixed system externally fed by a firefighter connection. A combination between this water supply and another supply source may be opted for (municipal network, elevated deposit, dispensers, pressure deposit, etc.), placing the valves and check valves on the pipes deemed necessary.

The water flow rate to be used shall be the one required to ensure adequate cooling and protection of all the elements inside the enclosure, in the event of a fire, with a minimum 10 liter/minute per square meter of the enclosure.

The location and amount of sprinklers shall be adequate to cover all the area to be protected, including the protection wall.

The sprinklers shall be made of anti corrosive, heat resistant material and must be adequately distributed so as to sprinkle the upper part of the equipment, storage and enclosures without any inconvenience.

The firefighter connection must be of the type approved by competent organizations, placed on the ground floor, readily accessible and well signaled. They shall be brass connections and must have an adequate joint system protection cap.

Piping shall be fit for pressure operation and their diameter must be adequate to the flow rate. They shall be constructed of fire resistant and anti corrosive material or especially protected from corrosion.

Joints may be welded or threaded using the corresponding fittings for each case.

The whole system shall be painted with two coats of anti rust paint and two coats of red enamel. A sign shall be placed at the firefighter service area with the legend "Firefighter connection".

1 - 5 SAFETY SIGNS

Each island shall count with at least a set of safety signs visible from every refueling point. These signs shall bear the following text:

NO SMOKING (or an equivalent picture)

STOP THE ENGINE

FILLING IS FORBIDDEN IF THE DISPENSING OPERATOR IS ABSENT

- WITH PEOPLE ABOARD
- WITHOUT PREVIOUSLY SHOWING THE CNG CONVERSION CREDENTIAL

The following signs shall be placed in the compression and storage readily visible:

NO SMOKING

HIGH PRESSURE GAS

ONLY EMPLOYEES ADMITTED

A sign with the following text shall be placed at the storage venting remote activation system:

TO BE ACTIVATED IN CASE OF EMERGENCY ONLY BY SKILLED PERSONNEL

The Signs shall be made of weather resistant material (rain and sun proof, etc)

Colors used shall contrast, Helvetica medium font and shall be visible from a minimum distance of 15 m.

A sign made with the described materials, with white background and red borders of 40 mm width, black Helvetica medium letters shall be provided at the dispensing area visible from the dispensing points. It shall bear the following legend:

“DRIVER, FOR YOUR OWN SAFETY YOU ARE REMINDED THAT FILLING PRESSURE
MUST NEVER EXCEED 200 BAR.
GAS DEL ESTADO”

1 - 6 EMERGENCY SHUT DOWN

CNG installations shall be equipped with emergency stop palm button switches distributed throughout the station. Besides shutting down the compressors, dispensers and shut-off valves, they shall cause the power cut off of any other equipment or element related to the CNG installations except for the lighting and detection system, if any.

The shutdown palm button switches shall be located at least in the following areas:

- At each dispensing island
- In office areas with permanent daytime and nighttime personnel.
- One at each room access and two inside it, diagonally opposed.

The emergency Stop Palm Button shall be large, fungi type, fist clench, installed at 1.80m height from the ground, adequately identified.

Those one located close to the compression area and dispensing island shall be explosion-proof same as their electrical installation and related elements.

Gas del Estado may request the installation of more emergency stop palm button switches than the ones indicated, based on safety considerations depending on the size of the station, location of equipment, etc.

1 - 7 LIGHTNING ARRESTER

The station shall be equipped with a system able to avoid electric discharges on metal structures that may transport or vent gas.

1 - 8 MISCELLANEOUS

- a) Natural gas delivered to the station must be odorized before being compressed.
- b) Gas leakage into the atmosphere shall be prevented in case of an accident in the installation, so as to avoid eventual explosions; taking the following measures::

- Fighting fire with the available extinguishers and at the same time:
- CNG refueling shall be immediately stopped.
- Shutting off valves activation blocking natural gas supply to the area of the accident or fire.
- Immediate evacuation of all the parked vehicles or waiting to be serviced and any person who is not part of the fire plan.

Should the fire aggravate, the firefighters of the area will be called to the scene.

In case the fire reaches the CNG storage area of the station, competent personnel shall have to depressurize it through the corresponding venting, controlling the possible effects of venting.

Once the fire is put out, the elements affected by it shall be inspected, and necessary replacements and adjustments shall be performed for starting up the installation operation.

The installations must comply with the safety colors code GE N° 1-123.

c) Safety during CNG vehicle refueling

- The filling operation shall be performed by experienced personnel, aware of CNG risks and on how to act in case of emergency.
- Refueling CNG motor vehicles with people aboard and without previously exhibiting the pertinent updated permit credential for CNG fueling, is forbidden

d) Additional safety personnel

Permanent presence of skilled personnel for fire fighting and other maneuvers and necessary operations in case of fire may be required based on the size of installations.

FIGURE 1

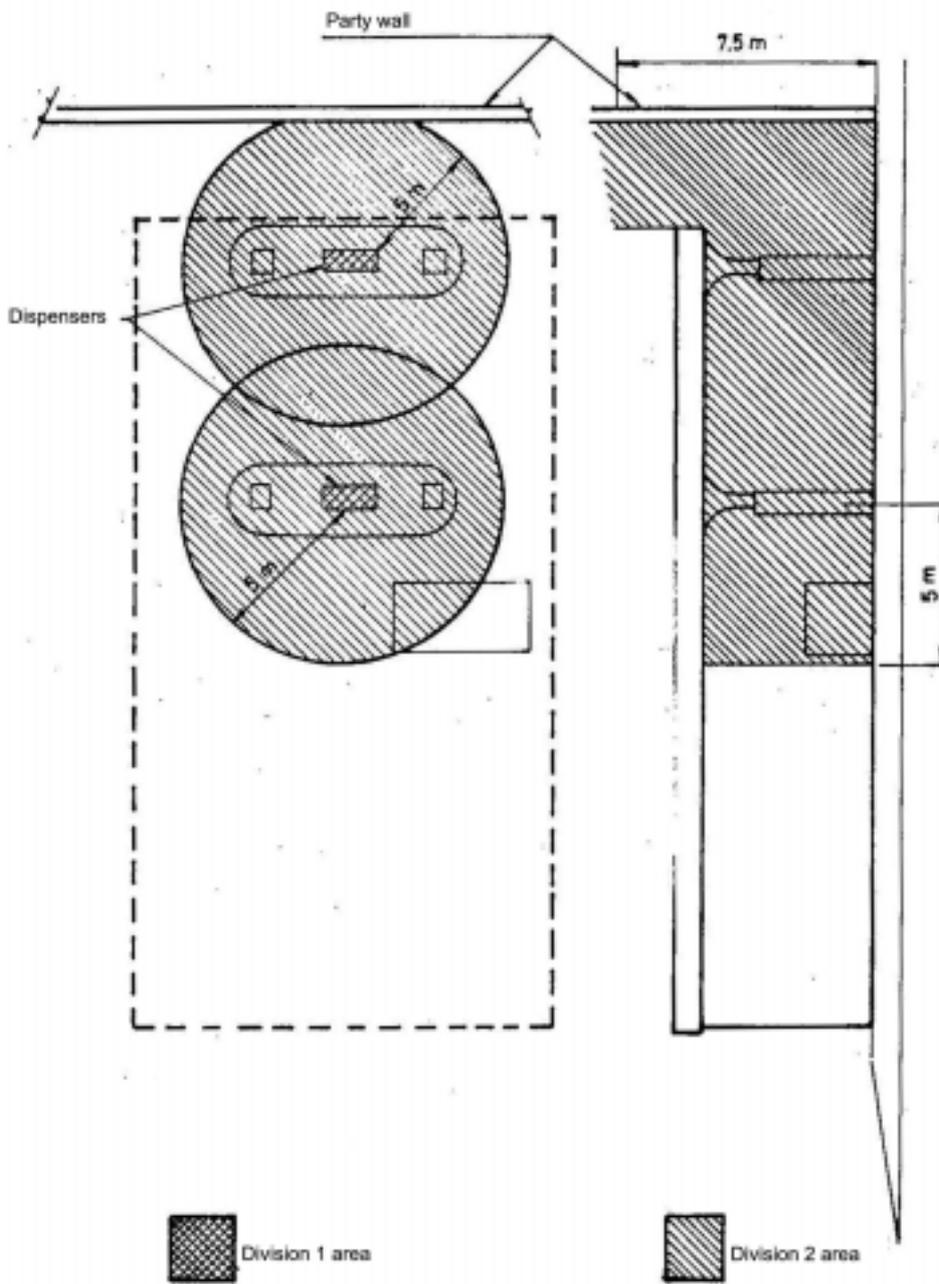


FIGURE 2

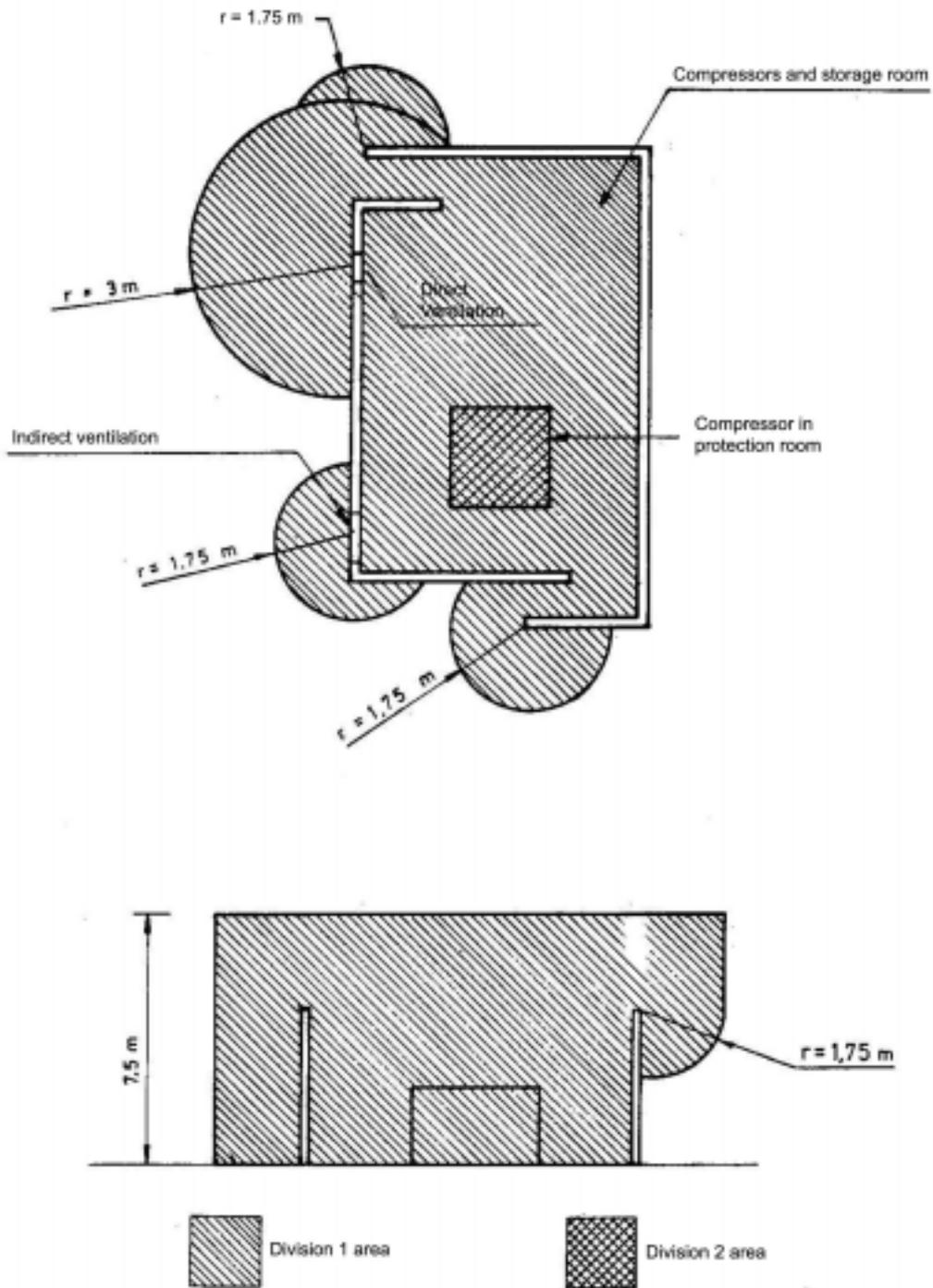


FIGURE 3

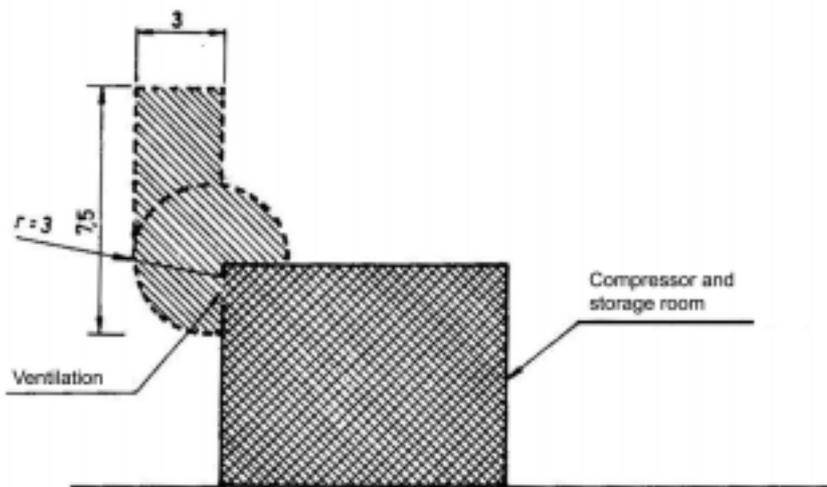
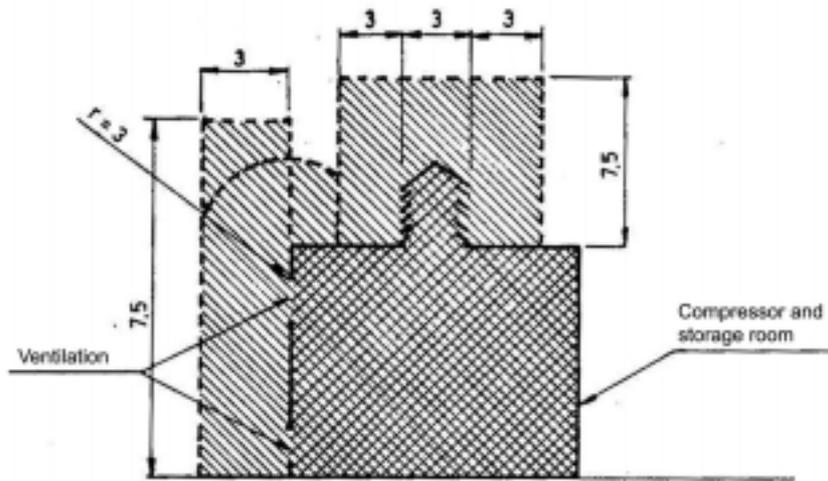
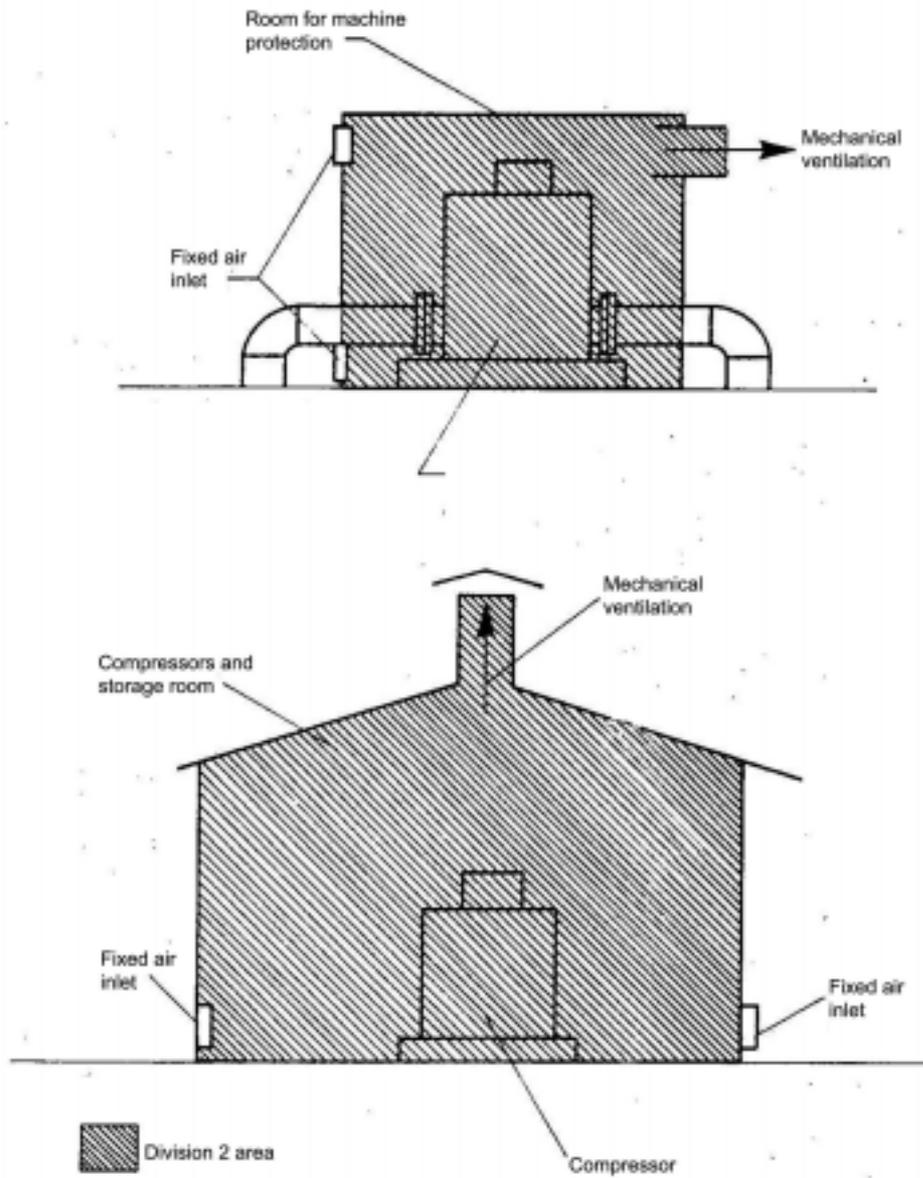


FIGURE 4



Note: the mechanical ventilation shall be able to ten renewals per hour.
In case of ventilation failure the system shall activate alarms and interlockings cutting off the power in the whole area.

FIGURE 5
REGULATION AND MEASUREMENT ROOM

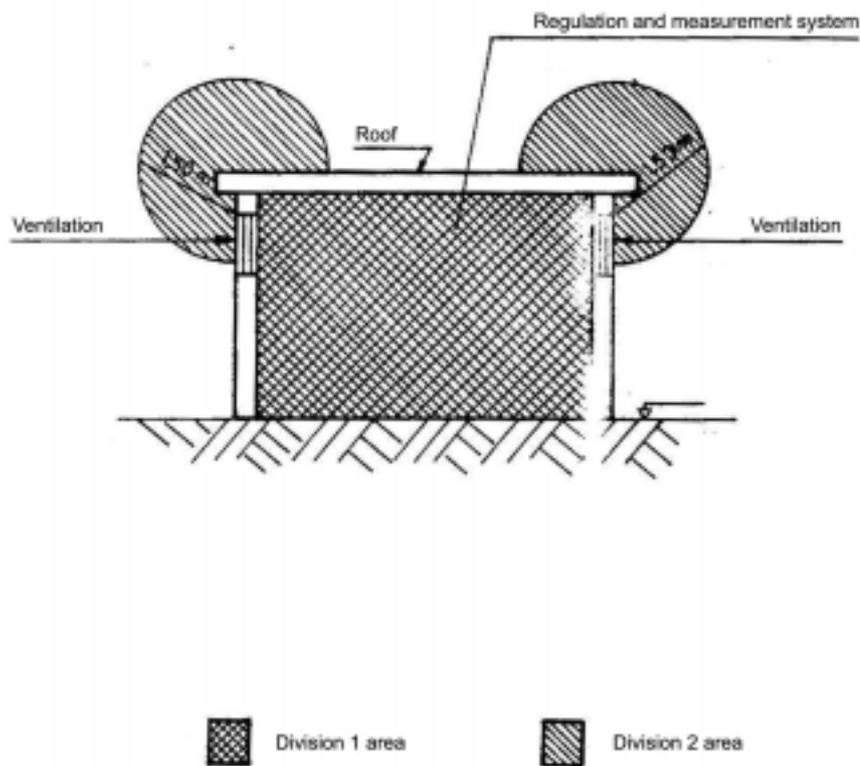


FIGURE 6
TYPICAL LIGHTING FIXTURE CONNECTIONS FOR CLASS 1, DIVISION 1 AND 2 AREAS

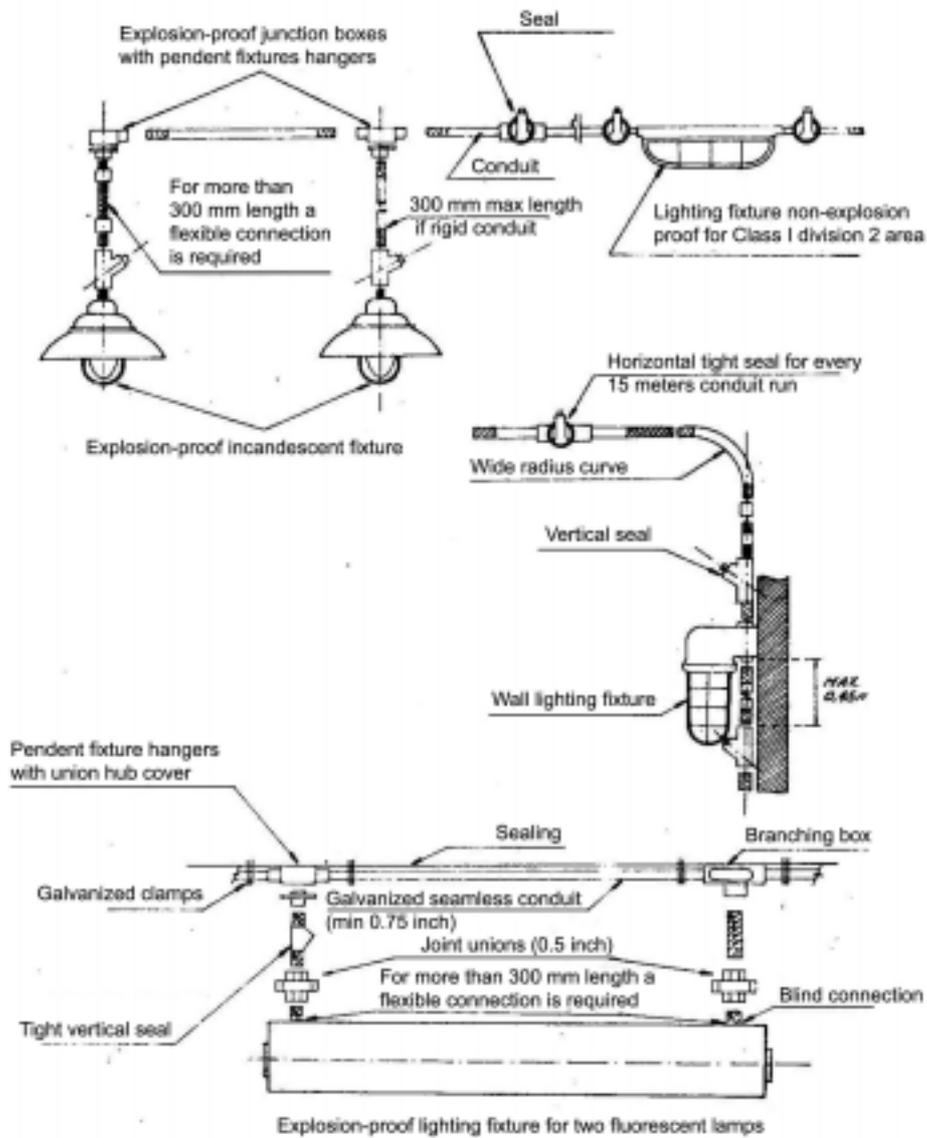
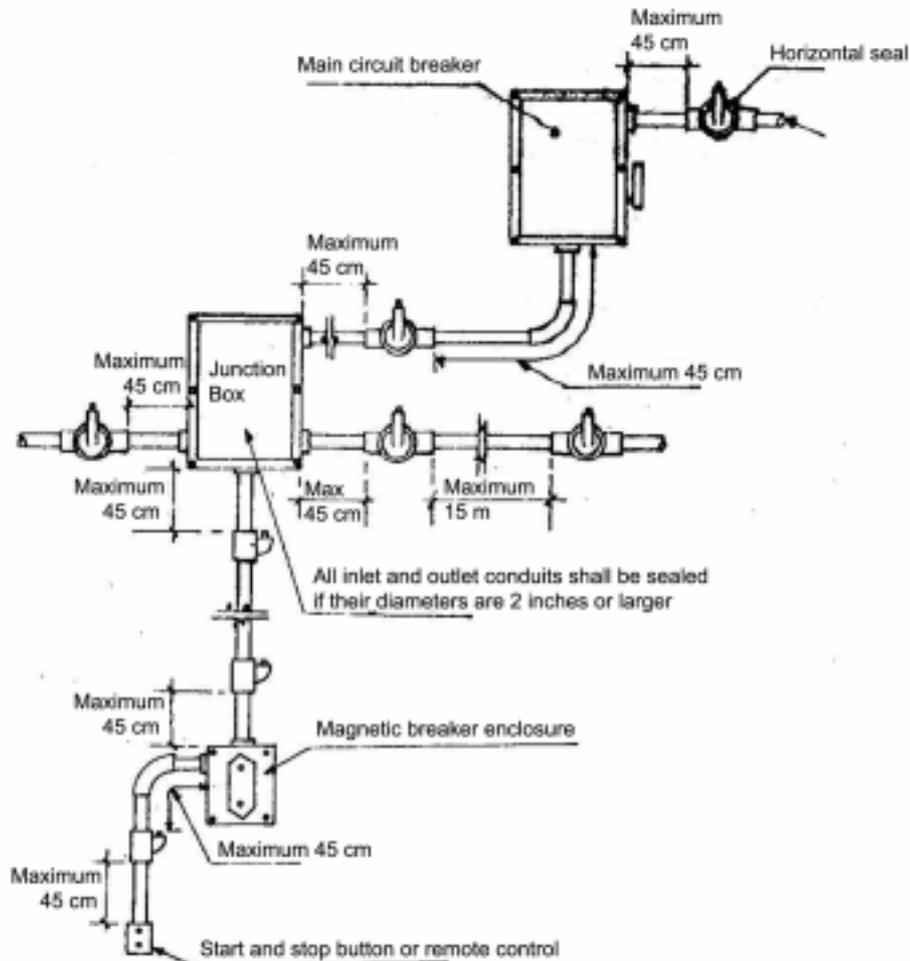


FIGURE 7

POWER
Explosion-Proof Installation

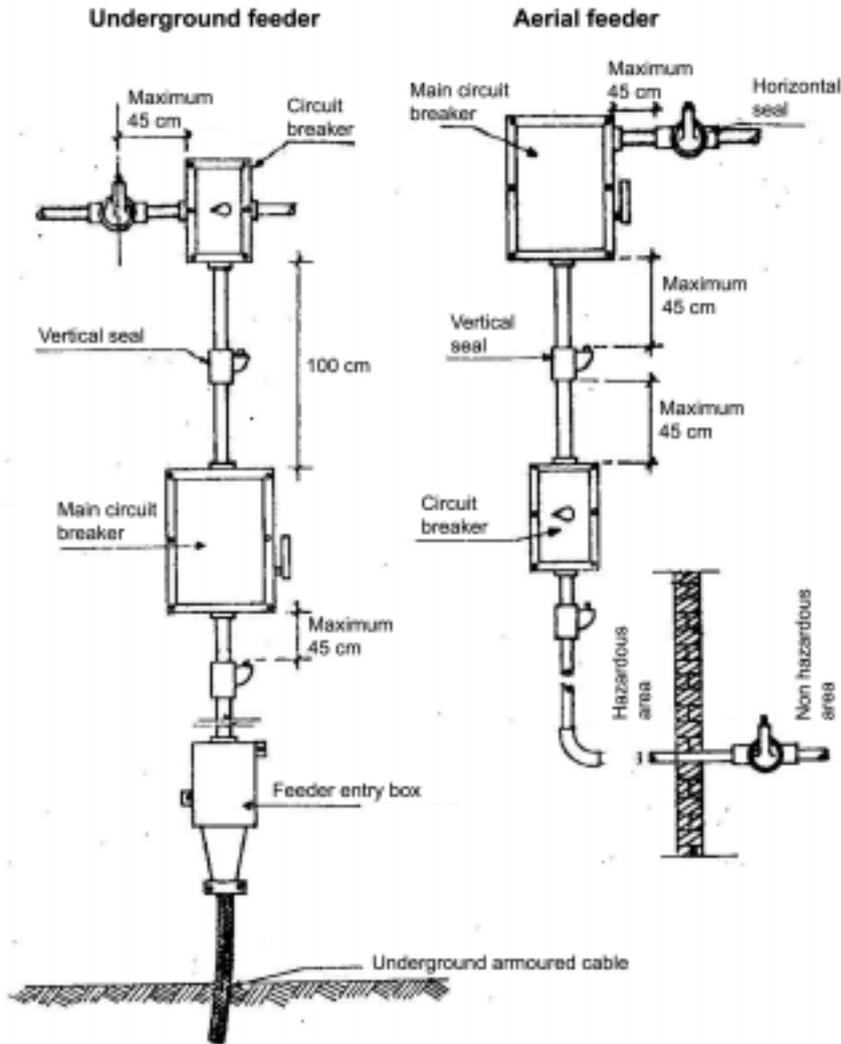


Tight seals require sealing compound approved for the purpose, shall not be affected by the surrounding atmosphere (propane, butane, water vapor, etc) and shall not have a melting point of less than 93°C (200°F). In the completed seal, the minimum thickness of the sealing compound shall be not less than the trade size of the conduit, and in no case less than 16 mm (5/8 inch).

All boards shall be grounded.

FIGURE 8

POWER
Explosion proof installation

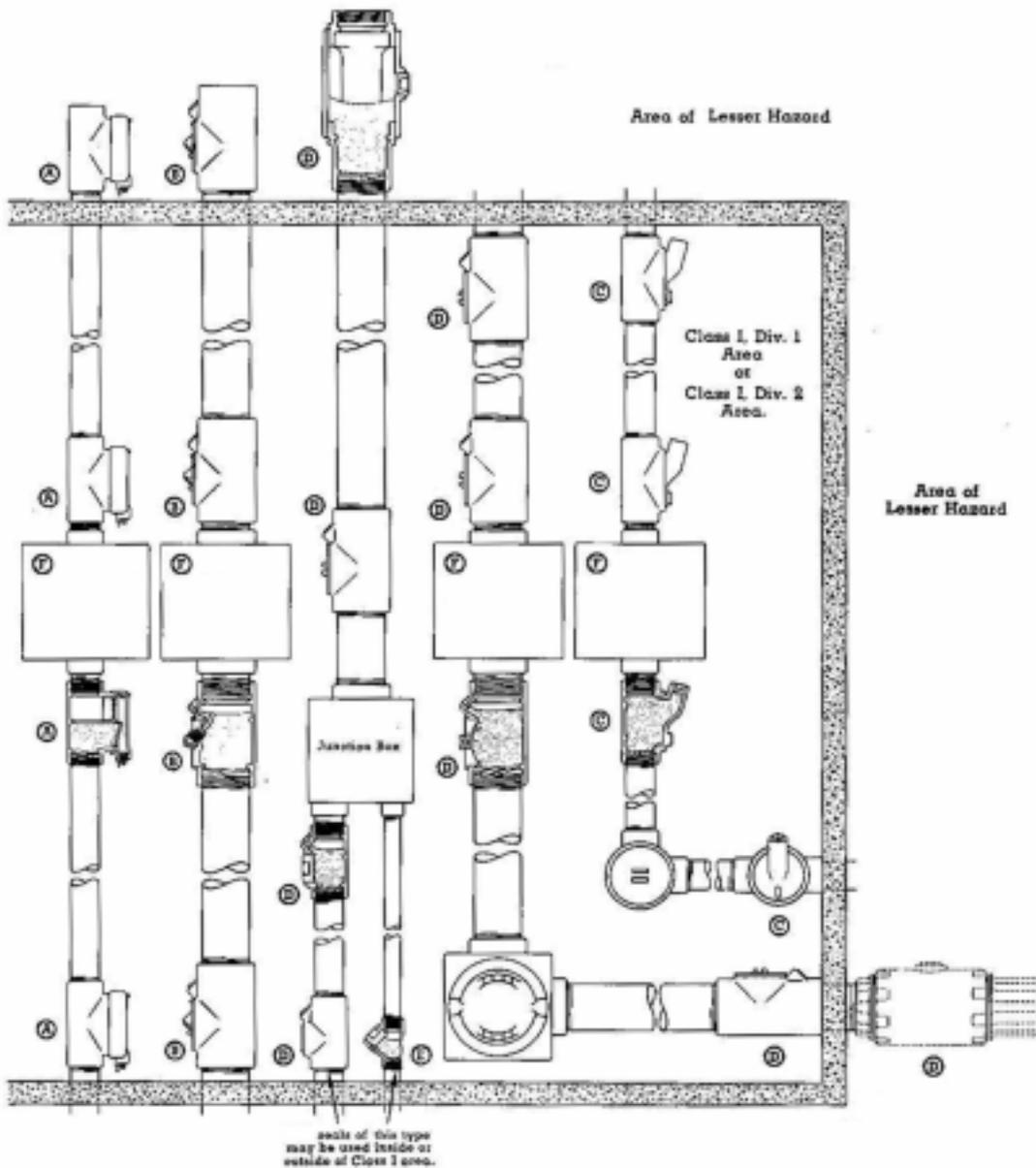


Seals are required at the inlet or outlet of every device able to produce arcs, sparks or high temperatures.

Tight seals require sealing compound approved for the purpose, shall not be affected by the surrounding atmosphere (propane, butane, water vapor, etc) and shall not have a melting point of less than 93°C (200°F). In the completed seal, the minimum thickness of the sealing compound shall be not less than the trade size of the conduit, and in no case less than 16 mm (5/8 inch).

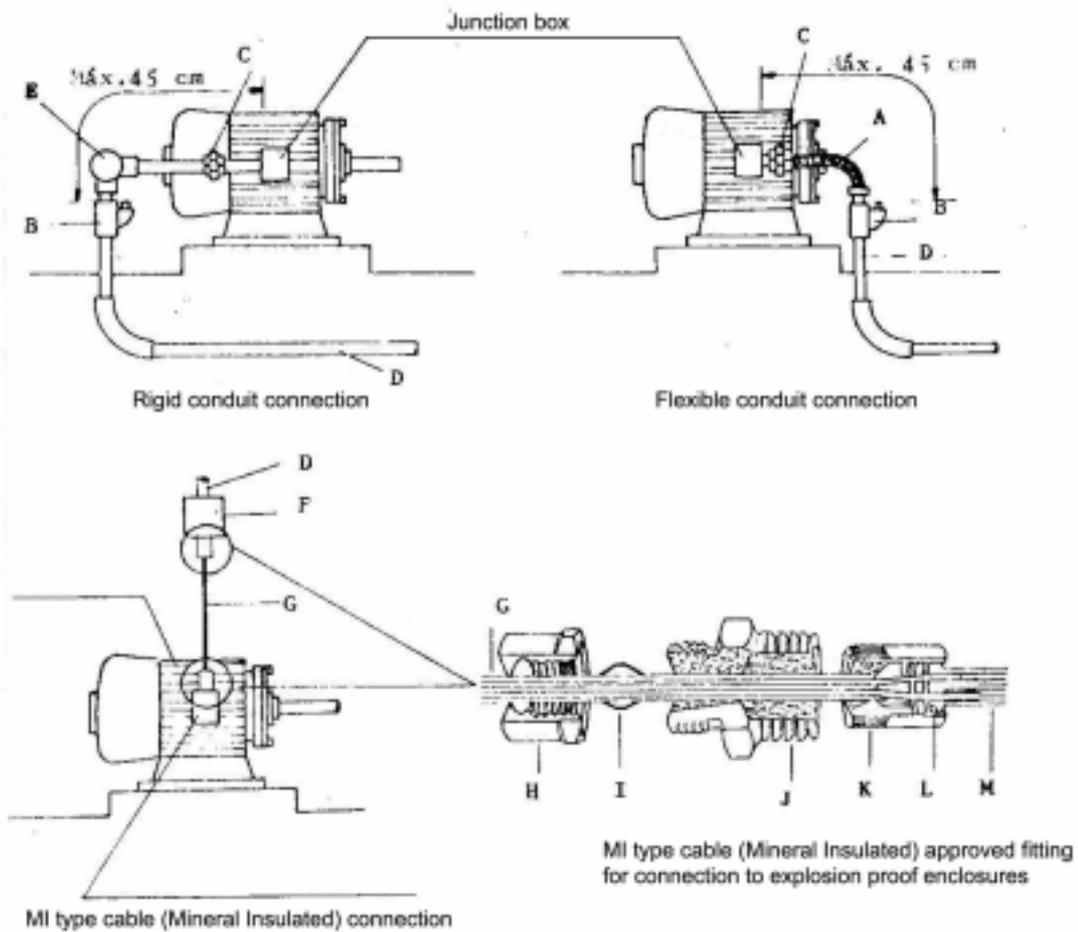
All boards shall be grounded.

**FIGURE 9
INSTALLATION DIAGRAM FOR SEALING EXPLOSION-PROOF ENCLOSURES**



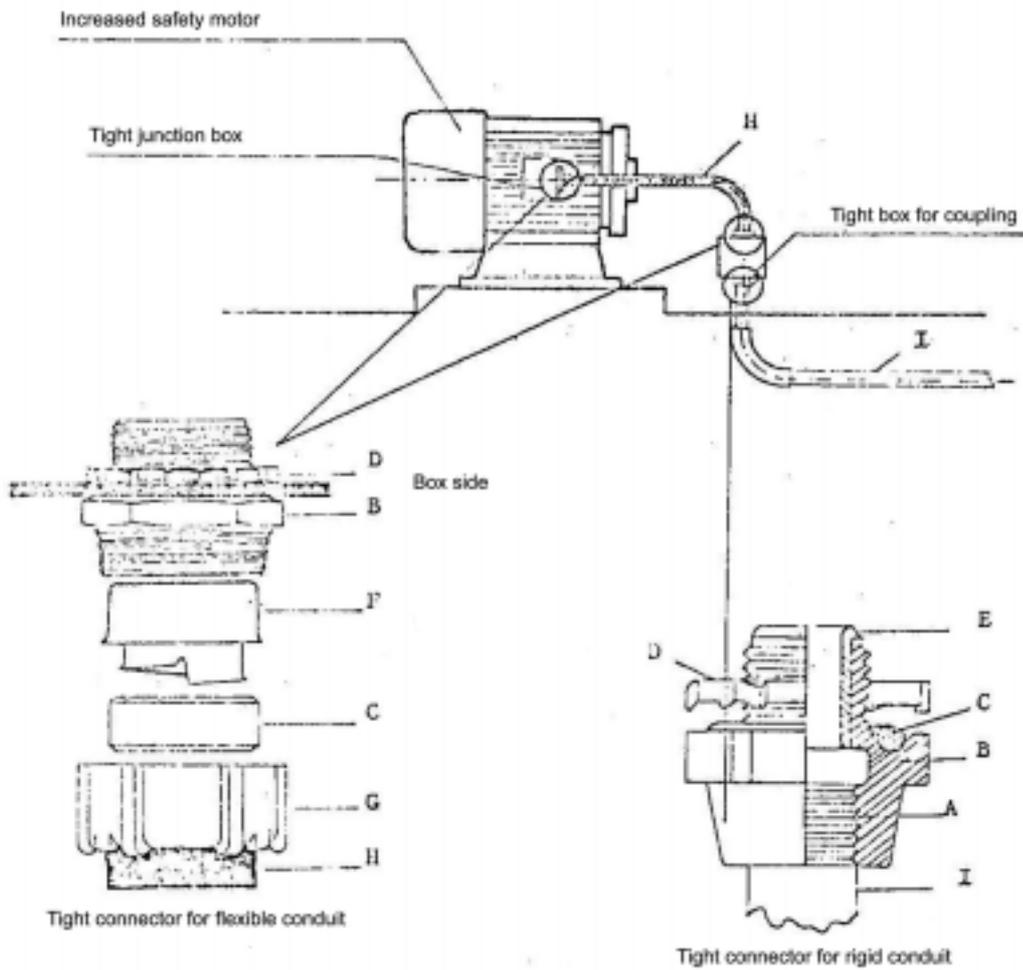
- A - Drain seal in this position shall be installed outside Class 1 area.
- B - Seal in this position shall be installed outside Class 1 area.
- C - This type of seal may be used inside or outside Class 1 area (vertical or horizontal).
- D - Seal that may be installed in vertical or horizontal position.
- E - Seal to be installed in vertical position.
- F - Explosion-Proof enclosure which must be sealed.
- G - Junction box (50.8 mm diameter pipes or larger ones that exit the box shall be sealed)

FIGURE 10
EXPLOSION-PROOF DIAGRAM - POWER CLASS I, DIV. 1 OR DIV. 2 AREA



- A - Explosion-proof flexible conduit
- B - Seal for vertical or horizontal position
- C - Explosion-proof joint union
- D - Rigid pipe
- E - Explosion-proof box
- F - Explosion-proof junction box
- G - MI type mineral insulated cable
- H - MI type cable clamp nut
- I - MI type cable compression ring
- J - MI type cable clamp nipple
- K - MI type threaded branching couple
- L - Sealing system with sealing compound
- M - Insulating sleeve

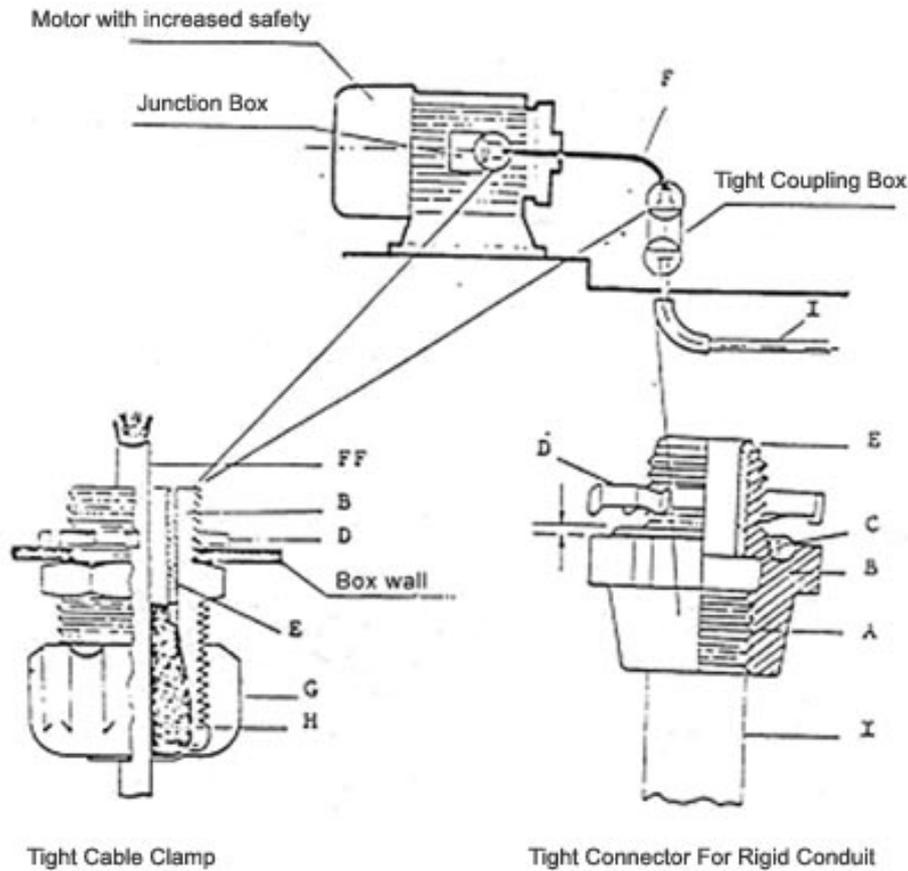
**FIGURE 11
TYPICAL MOTOR CONNECTION BY TIGHT FLEXIBLE CONDUIT
FOR CLASS I, DIVISION 2 AREA**



- A - Conic internal thread (NPT or W-GAS) 5 threads minimum
- B - Steel or ductile cast iron zinc or galvanized coated body
- C - Tight seal ring
- D - Steel or ductile cast iron zinc or galvanized coated locknut
- E - Internal insulation for cable protection
- F - Coupling (between flexible conduit and connector body)
- G - Nut (steel or ductile cast iron zinc or galvanized)
- H - Galvanized steel PVC covered flexible conduit
- I - Rigid metallic conduit diameter less than 51 mm

Note: All materials and termination fittings shall be approved for Class I division 2

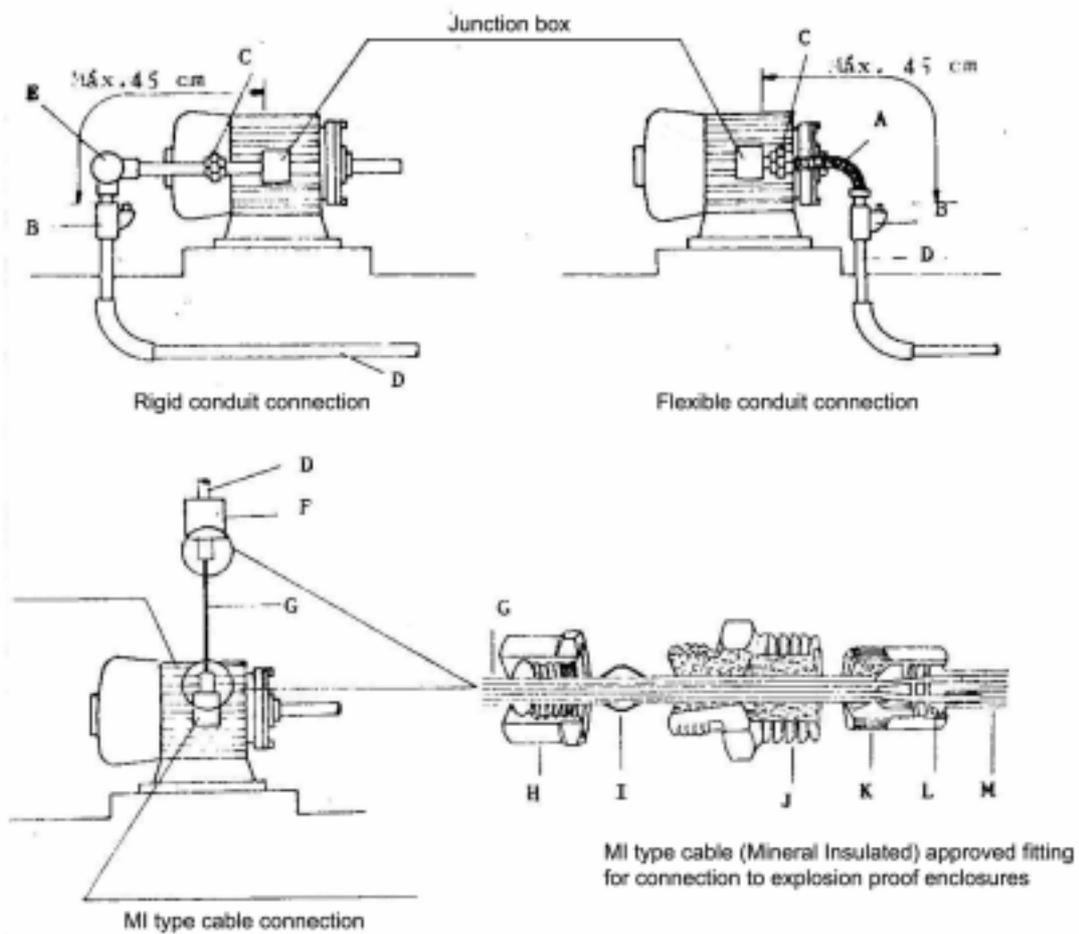
FIGURE 12
 TYPICAL MOTOR CONNECTION WITH FLEXIBLE CABLE FOR
 INTENSIVE SERVICE, CLASS 1, DIVISION 2 AREA



- A - Conic internal thread (NPT or W-GAS) 5 threads minimum
- B - Steel or ductile cast iron zinc or galvanized coated body
- C - Tight seal ring - Rubber or Plastic
- D - Steel or ductile cast iron zinc or galvanized coated locknut
- E - Internal insulation for cable protection
- F - Metallic armoured cable with ant flame sheath for intensive service
- G - Nut (steel or ductile cast iron zinc or galvanized)
- H - Synthetic rubber or plastic cable clamp
- I - Rigid metallic conduit diameter less than 51 mm

Note: All elements and connection fittings shall comply with Class I Division 2 Area

FIGURE 13
TYPICAL EXPLOSION-PROOF MOTOR CONNECTION
FOR CLASS I, DIVISION 1 OR DIVISION 2 AREAS



- A - Explosion-proof flexible conduit
- B - Seal for vertical or horizontal position
- C - Explosion-proof joint union
- D - Rigid conduit
- E - Explosion-proof box
- F - Explosion-proof junction box
- G - MI type mineral insulated cable
- H - MI type cable clamp nut
- I - MI type cable compression ring
- J - MI type cable clamp nipple
- K - MI type threaded branching couple
- L - Sealing system with sealing compound
- M - Insulating sleeve