

## CONTENTS

<b>SECTION</b>		<b>PAGE</b>
1	Introduction	1
2	Scope	3
3	Health, safety and the environment	4
4	Storage of methanol	8
4	Transportation of methanol by road	12
5	Applications of methanol	14
<b>APPENDICES</b>		
1	References	19
2	Transportable methanol injection unit	21

*Safety Recommendations*  
*IGE/SR/12 Edition 2*  
*Communication 1661*

*Founded 1863*  
*Royal Charter 1929*  
*Patron*  
*Her Majesty The Queen*

# ***Handling of Methanol***

*Price Code: TA*  
© *The Institution of Gas Engineers*  
*21 Portland Place*  
*London W1N 3AF*  
*Tel: 0207 636 6603*  
*Fax: 0207 636 6602*



*President: J. Hinchliffe, B.Sc., C.Eng., M.I. Gas E.*

## SECTION 1 : INTRODUCTION

- 1.1 These Recommendations have been prepared by a Panel selected by the Institution's Safety and Environment Committee, and approved for publication by the Council of the IGE.
- 1.2 Methanol is used within the gas industry to reduce residual water in the system and to prevent the formation of solid hydrates when commissioning pipelines and above-ground installations, for example pipework assemblies, regulator stations, LPG storage systems, etc. Other techniques are available to prevent hydrate formation, but methanol swabbing provides a combined drying and commissioning to gas operation, hence it is the quickest technique.
- 1.3 These Recommendations cover the storage and handling of methanol, and transportation by road, for commissioning and other operations employed in the gas industry.
- 1.4 Recommendations are made on health, safety, environment and fire precautions when using methanol.
- 1.5 It is now widely accepted that the majority of accidents in industry generally are in some measure attributable to human as well as technical factors in the sense that actions by people initiated or contributed to the accidents, or people might have acted more appropriately to avert them. It is therefore necessary to give proper consideration to the management of these human factors and the control of risk. The Management of Health and Safety at Work Regulations require a risk assessment to be made and appropriate action to be taken on the basis of the assessment. In addition, the Health and Safety Executive publication HS(G)65 Successful Health and Safety Management should be consulted.
- 1.6 The primary responsibility for compliance with legal duties rests with the employer. The fact that certain employees, for example "responsible engineers", are allowed to exercise their professional judgement does not allow employers to abrogate their primary responsibilities. Employers must:
  - (a) have done everything to ensure, so far as is reasonably practicable, that there are no better protective measures that can be taken other than relying on the exercise of professional judgement by "responsible engineers".
  - (b) have done everything to ensure, so far as is reasonably practicable, that "responsible engineers" have the skills, training, experience and personal qualities necessary for the proper exercise of professional judgement.
  - (c) have systems and procedures in place to ensure that the exercise of professional judgement by "responsible engineers" is subject to appropriate monitoring and review.
  - (d) not require "responsible engineers" to undertake tasks which would necessitate the exercise of professional judgement that is outwith their competence. There should be written procedures defining the extent to which "responsible engineers" can exercise their professional judgement. When "responsible engineers" are asked to undertake tasks which deviate from this they should refer the matter for higher review.

- 1.7 Notwithstanding Sub-Section 1.6, these Recommendations do not make the use of any method or specification obligatory against the judgement of the responsible engineer. New and improved practices may be adopted prior to these Recommendations being updated. Amendments to these Recommendations will be issued when necessary and their publication will be announced in the Journal of the Institution and elsewhere as appropriate.
- 1.8 Requests for interpretation of these Recommendations in relation to matters within their scope, but not precisely covered by the current text, should be addressed to the Secretary, The Institution of Gas Engineers, 21 Portland Place, London W1N 3AF. Such requests will be considered by the relevant committee. Any advice given by, or on behalf of, the Institution of Gas Engineers does not imply acceptance of any liability, nor does it relieve any party of their statutory obligations.

## **SECTION 2 : SCOPE**

- 2.1            These Recommendations cover methanol used in gas industry operations with respect to:
- handling
  - storage
  - transportation (by road)
  - application.
- 2.2            These Recommendations do not cover the procedures for the drying operation of pipelines using methanol or the commissioning to gas for which guidance is given in IGE/TD/1 Edition 3.
- 2.3            Although no licence is required under the Petroleum (Consolidation) Act 1928 for the storage of methanol, a number of statutory requirements affecting its handling and transportation are listed in Appendix 1.

## SECTION 3 : HEALTH, SAFETY AND THE ENVIRONMENT

### 3.1 PROPERTIES OF METHANOL

#### 3.1.1 Appearance and weight

- distinctive smell
- colourless liquid
- completely miscible with water
- SG of vapour = 1.11 (air = 1.0)
- SG of liquid = 0.79 (water = 1.0).

#### 3.1.2 Flammability

- burns with a translucent flame
- volatile
- highly flammable in both liquid and vapour state

Methanol % by volume	Specific gravity at 15.5°C	Flashpoint (Closed cup) (°C)
20	0.97	41
40	0.94	33
60	0.90	24
80	0.86	16
100	0.79	9

**Table 1 – Specific gravity and flashpoint of methanol**

- Lower flammability limit 6% by volume in air
- Upper flammability limit 36.5% by volume in air.

#### 3.1.3 Toxicity

Reference should also be made to the Material Safety Data Sheet.

- narcotic
- toxic in both liquid and vapour state
- can cause permanent blindness
- can enter the body by:
  - inhalation of the vapour
  - through the mouth
  - through the skin via cuts, abrasions etc.

### 3.1.4 **Potential effects of inhalation**

- drowsiness/impaired alertness
- effects may be cumulative due to low rate of elimination from the body
- intoxication
- concentration in air breathed not to exceed the following occupational exposure standards
  - short term exposure limit of 250 ppm by volume over a 15 minute period
  - long term exposure limit of 200 ppm by volume over an 8 hour period.

### 3.1.5 **Effects of pure methanol on pipe and installation materials at normal ambient temperatures**

- on iron, steel, copper, bronze, nickel, brass – none
- on aluminium and tin – very little
- on zinc under warm conditions by water – diluted methanol – considerable
- on organic materials, for example synthetic resins, wood, leather – softening and discoloration
- on cellulose finishes and most paints – softening
- on certain ‘sealing’ materials such as for regulator seats, pig trap seals, O-rings etc, and possibly time related – adverse effect on material properties which may be time related.

*Note: Impure methanol can have greater adverse effects on materials.*

### 3.1.6 **Use of methanol**

The above properties indicate that methanol needs to be used in a controlled manner i.e. in compliance with all relevant legislation and these Recommendations.

## 3.2 **LEGAL AND ALLIED CONSIDERATIONS**

These Recommendations are set out against a background of legislation in force in Great Britain at the time of publication. Similar considerations are likely to apply in other countries and reference to the appropriate national legislation will be necessary.

### 3.2.1 **Legal requirements affecting the storage, transport and use of methanol**

Appendix 1 lists legislation that must be taken into account, which includes the requirements for risk assessment.

### 3.2.2 **Allied considerations**

Appendix 1 lists standards that are quoted in these Recommendations. Equivalent standards equally may be used.

## 3.3 **SAFETY EQUIPMENT**

The following safety equipment should be provided for any operation involving handling of methanol for swabbing operations:

- safety barriers and fencing stakes
- lifting harnesses and ropes

- breathing apparatus (see IGE/SR/13\*)
- intrinsically safe handlamps
- combustible/flammable gas detector, calibrated and suitable for the detection of methanol
- sufficient dry powder fire extinguishers to cover the operations
- chemically absorbent granules, matting etc.
- fire hose to the nearest hydrant or a suitable water supply and pump
- diffuser branch pipes
- hydrant standpipe, key and bar, if applicable
- empty buckets, 10 and 15 litre capacity.

### 3.4 OCCUPATIONAL HEALTH AND HYGIENE

#### 3.4.1 Material Safety Data Sheet

All personnel involved in the handling of methanol should have access to the Material Safety Data Sheet prior to using methanol and should be familiar with advice provided by the supplier.

#### 3.4.2 First aid

The following should be available on site:

- a trained first aider
- first aid kit
- fresh water and equipment for eye washing.

#### 3.4.3 Protective clothing

The following items should be worn when handling methanol:

- non-absorbent all-in-one overall suits with attached hood
- eye protection – chemical goggles or faceshields
- PVC gloves
- rubber boots
- acoustic ear protection to be worn when carrying out methanol swabbing on pipelines
- safety helmets.

Consideration should be given to the issue of adequate protective clothing to prevent hypothermia when methanol swabbing is taking place under cold weather conditions and in exposed places.

\* Safety Recommendations IGE/SR/13 Use of breathing apparatus and associated respiratory protective equipment in gas transmission and distribution



#### 3.4.4 **Welfare**

Fixed storage installations are, normally, associated with permanent establishments where adequate welfare facilities are available. These should be located in a safe area. However, the following should be provided where methanol swabbing is to be undertaken in the field:

- shelter for personnel and equipment
- food and beverages
- toilet facilities.

## SECTION 4 : STORAGE OF METHANOL

### 4.1 PERMANENT BULK STORAGE INSTALLATIONS

#### 4.1.1 Construction

4.1.1.1 Fire Authorities, the HSE and/or local Authorities, as appropriate, should be consulted before the planning of any storage installation. Relevant national and local legislation must be taken into account (see Appendix 1).

4.1.1.2 Construction of the tanks should be in accordance with HS(G)176 and/or IGE/SR/7\*.

4.1.1.3 Tanks should be sited in open locations and be at least 15 m from the tanker off-loading point.

4.1.1.4 Tanks should be fitted with a relief valve and anti-vacuum valve.

Where possible, tanks should be vented by connecting to a positive pressure gas system. Vents should be designed in accordance with HS(G)176.

4.1.1.5 A sealed bund wall or embankment should be provided and be of sufficient height and adequate construction to contain 110% of the volume of the full tank in the event of leakage.

Provision should be made for the removal of rain water. Preferably, this should be achieved by pumping. However, any drain pipe through the compound wall should be valved and capped at the outer end.

4.1.1.6 Any inlet or return pipe should be taken down to the bottom of the tank to prevent the free-fall of liquid (which may result in the generation of static electricity).

Dip pipes should be taken down to below the suction pipe (tank discharge pipe) to ensure a liquid seal. Where the suction is taken from a sump in the base of the tank, a separate sealing pot for the dip pipe may be necessary.

If a dip tube is fitted, it should be sufficiently long as to contain the head of liquid pushed up by the vapour pressure in the tank.

4.1.1.7 The tank and associated pipework should be electrically bonded and connected to an effective earth with a resistance of not more than 10 ohms.

4.1.1.8 Lightning protection should be installed on large above-ground tanks in accordance with BS 6651.

4.1.1.9 Liquid level measurement should, preferably, be of an automatic depth indicator type.

*Note: Tank dipping devices may also be used.*

4.1.1.10 Sources of ignition should not be permitted within 15 m of the tanks or within a bunded area.

\* Safety Recommendations IGE/SR/7 Bulk storage and handling of highly flammable liquids

#### 4.1.2 **Pipework and fittings**

4.1.2.1 Any methanol pipeline should be continuously bonded and earthed. Lines should have a slight gradient to enable easy draining and have sufficient purge points which should be fitted so that any section of pipe or item of equipment may be flushed and/or purged with inert gas.

4.1.2.2 The pipeline should be constructed to an appropriate standard, for example BS 8010. Joints should, wherever possible, be butt-welded and should not be screwed.

Gaskets on screwed flanges should be suitable for methanol at the operating pressure and temperature.

4.1.2.3 Any valve or other fitting should be in cast or forged steel.

4.1.2.4 All pipework and fittings should be hydraulically tested to a minimum of 1.5 times the design pressure which should take into account the safety device lift pressure.

#### 4.1.3 **Electrical equipment**

4.1.3.1 All electrical equipment within 15 m of a methanol installation should be explosion protected to Zone 1 in accordance with IGE/SR/3\* or BS 5345.

4.1.3.2 Electrical equipment should not be located in the immediate vicinity of tank vents or filling points.

#### 4.1.4 **Tanker loading and offloading areas**

4.1.4.1 The standing position for the tanker should be outside the storage tank bund and should be constructed such that, in the event of a burst flexible pipe, the methanol will flow into a separate bunded area or slop tank or interceptor tank of sufficient size to contain the contents of the tanker.

4.1.4.2 The standing area should have a flat hard surface which is capable of taking the maximum loaded weight of the tanker.

*Note: Adequate headroom is essential.*

4.1.4.3 Before the tanker is admitted, the collecting tank should be drained of any water which may have accumulated and drainage valves should be proved closed.

4.1.4.4 "No smoking" and "No naked lights" warning notices should be displayed at least 15 m from the tanker when loading or unloading.

4.1.4.5 Fire fighting equipment should be permanently sited adjacent to the loading and unloading area and placed so as not to be in the probable area of any fire.

4.1.4.6 A suitable earthing point must be provided.

4.1.4.7 Adequate lighting should be provided for the tanker loading and offloading area.

4.1.4.8 Normally, bulk deliveries to permanent bulk installations will be made by an approved haulier or by the supplier's own road tanker. As such, they should be responsible for the safe operation of the vehicle during the delivery journey and for the safe connection of any delivery hoses between the tanker and the tank inlet connection point.

\* **Safety Recommendations IGE/SR/3 Electrical equipment in gas production, transmission, storage and distribution.**

#### 4.1.5 **Fire precautions**

4.1.5.1 Adequate cooling water from fire hydrants (with standpipe, key and bar) or water storage tanks should be available, together with fire hose and diffuser branch pipes.

4.1.5.2 An adequate number of dry powder fire extinguishers should be available around the offloading points.

In addition, consideration should be given to the provision of a suitable permanent alcohol resistant foam system for tank installations and an atomised spray system for the tanker loading/offloading areas. The type of foam in fixed installations should be clearly marked. Guidance on foam systems is provided in the IP Model Code of Practice Part 19.

Alternatively, water deluge systems may be employed.

4.1.5.3 Smoking and the carrying of matches, or any other devices or clothing liable to cause a spark, should be forbidden throughout the area and notices to this effect should be displayed prominently.

4.1.5.4 Footpaths, roadways, stairways and all plant areas should be kept clean and free from permanent and temporary obstruction and from oil spillage.

The ground within the restricted area should be kept clear of any vegetation or other materials likely to cause a fire hazard. Only approved non-flammable weed killers should be used.

4.1.5.5 Flammable materials should not be used within the restricted area.

#### 4.2 **TEMPORARY FACILITIES FOR STORAGE OF METHANOL**

4.2.1 Small quantities of methanol should be stored only in suitable sealed drums of 10 litre (safety-type), 25 litre, 205 litre, or other suitable, capacity. Methanol can be stored in other tanks or containers on a temporary basis (see Appendix 2). Adequate ullage space should be left in each container.

4.2.2 Methanol drums, or other temporary containers, should be stored in a suitable containment area which should accommodate 110% of the capacity of the largest drum. HS(G)51 provides guidance.

4.2.3 A temporary storage facility should be located in a well ventilated location away from sources of ignition etc.

4.2.4 If a container is to be filled from bulk storage, a flexible hose should be inserted into the bottom of the container and the flow controlled by a suitable valve. HS(G)140 provides further guidance.

Earth bonding straps should be used between the bulk storage tank and the container.

For emptying a larger container, a semi-rotary hand pump and flexible hose should be used.

Where tools are required, they should be of the spark-reducing type.

4.2.5 Containers should be labelled suitably and marked with the appropriate flammable materials sign.

4.2.6 Containers should be handled carefully and not bumped or dropped.

- 4.2.7 Any incoming container should be examined carefully for leaks.
- If any leak is found, the container should be segregated with the leaking position uppermost and the contents transferred to a sound container as soon as possible.
- 4.2.8 Containers should be stored away from the direct rays of the sun or any other source of heat and contained in a fenced and locked compound with appropriate warning notices displayed.
- 4.2.9 Containers should be opened carefully to ensure that any pressure built up during transit or storage is released under control before the plug or cap is removed.
- 4.2.10 Any accidental spillage or leakage of methanol should be absorbed then the remainder dispersed with copious supplies of water. Adequate water should be available for such dispersal and for washing of controlled containers.
- 4.2.11 Containers should not be discharged using forcing gas pressure unless the container has been specifically designed for this purpose (for example, see Appendix 2).
- 4.2.12 When a drum is not in use, whether empty or partly full, its plug or cap should be secured tightly.
- Any empty drum should be returned to the supplier or licensed waste disposal company.
- 4.2.13 An adequate number of dry powder fire extinguishers should be on site.
- 4.2.14 Any drum should be stored in accordance with the above recommendations, irrespective of whether it is full, part full or empty.

## **SECTION 5 : TRANSPORTATION OF METHANOL BY ROAD**

### **5.1 GENERAL**

5.1.1 Methanol can be carried both in bulk and in small quantities and the conditions will be different in each case. The person responsible for such operations must ensure compliance with relevant legislation (see Sub-Section 1.6 and Appendix 1).

5.1.2 In order for the necessary transportation arrangements to be made, the person responsible should receive prior notice of:

- quantity required
- date and time of delivery
- location of delivery.

### **5.2 BULK TRANSPORTATION**

5.2.1 Road tankers used for transporting methanol in bulk should be purpose built and must conform to all the applicable legislation (see Sub Section 1.6 and Appendix 1).

5.2.2 The tanker driver must comply with all relevant legislation and standards pertaining to such special operations as he or she may be called upon to perform (see Sub-Section 1.6 and Appendix 1).

Unauthorised equipment or persons should not be carried on the vehicle.

5.2.3 Smoking and the carrying of matches or any means of ignition should be prohibited on the vehicle.

5.2.4 The driver must be a competent person and be over 21 years of age.

5.2.5 At the delivery site, the tanker should be parked only at an authorised place and be secured adequately before the vehicle is left unattended.

Should it be necessary for a driver temporarily to leave the vehicle during the journey, he or she should, as far as is practicable, keep the vehicle in sight.

5.2.6 The tanker unit should not be used to tow any other vehicle or equipment.

5.2.7 The cover on the fuel tank of the prime mover should be fixed securely. The tank should be locked at all times when not refuelling.

5.2.8 Damage or wear to couplings or fittings should be reported immediately and action taken to repair or replace any defective components.

5.2.9 Tanker compartments should be closed securely and locked to prevent leakage.

5.2.10 Dip pipes should be kept closed and locked except when filling, emptying or testing the tank.

5.2.11 Only hoses supplied with the tanker should be used for loading and offloading methanol, except at specially designed loading or unloading points where suitable alternative equipment is available.

5.2.12 In the event of vehicle breakdown, accident or fire, the driver should take any immediate action necessary and then report the incident to appropriate parties.

5.2.13 Before offloading methanol, the reception tanks should be dipped to ensure that adequate capacity is available to receive the load.

5.3 **TRANSPORTATION OF SMALL QUANTITIES**

5.3.1 Where drums are to be used for transporting methanol, they should be 10 litre (safety type), 25 litre or 105 litre or other suitable capacity.

5.3.2 Drums should be checked for leakage before loading.

5.3.3 Each type of drum should be secured adequately in such a manner that stability is ensured.

## SECTION 6 : APPLICATIONS OF METHANOL

This section deals with the use of methanol as an aid to removing water from pipelines and associated installations to prevent the formation of solid hydrate. As well as its use on Natural gas equipment, methanol is used on LPG storage installations.

### 6.1 SAFETY

6.1.1 Provision should be made, on site, for vehicles carrying methanol to be parked overnight in a safe area. Such vehicles should not be left unattended at any time if methanol remains on board.

6.1.2 Where drums are used, they should be stored in a safe area which is fenced adequately and locked.

Appropriate warning signs should be installed on the fence.

Account must be taken of relevant legislation dealing with the site storage of flammable liquids (see Appendix 1).

6.1.3 Electrical equipment associated with methanol injection pumps should be explosion protected to Zone 1 standard, in accordance with IGE/SR/3 or BS 5345.

6.1.4 If generators are used as a source of electrical power, these should be sited at least 15 m from any source of methanol, for example drums, tankers, pig traps and interconnecting pipework.

Diesel generators should, as a minimum, have spark arrestors and inlet manifold shut-off valves fitted to them. They should be suitable for use in Zone 2 hazardous areas or be used only in safe areas.

6.1.5 Smoking and the carrying of matches, or any other devices or clothing liable to cause a spark, should be forbidden throughout the area and notices to this effect should be displayed prominently.

6.1.6 All other work should be suspended during the period when bulk methanol injection or reception is taking place.

Personnel that are not involved in the work should be kept at least 20 m from the activity.

Access roads should be barriered off to prevent unauthorised access.

6.1.7 Reception tanks and associated pipework should be electrically bonded to the fixed installation pipework and connected to an effective earth with a resistance of not more than 10 ohms.

6.1.8 All personnel engaged in operations associated with the use of methanol should wear protective clothing to prevent any form of methanol contamination to the person (see clause 3.4.3).

6.1.9 Adequate supplies of clean, potable, water should be readily available for the possible decontamination of personnel.

6.1.10 All personnel engaged in an operation using methanol should have their protective clothing hosed down before removal, to avoid subsequent contamination.



- 6.1.11 An adequate number of dry power fire extinguishers should be on site.
- 6.1.12 Accidental spillage or leakage should be dealt with in accordance with clause 4.2.10.
- 6.2 **COMMISSIONING PIPELINES**
- 6.2.1 **General**
- 6.2.1.1 While methanol is on site, continuous site manning should be maintained. If security personnel who are not competent in methanol activities are employed, they should be instructed properly as to their duties and their attention drawn to the hazards associated with methanol.
- 6.2.1.2 The hazardous area should be defined with barrier tape and appropriate warning signs should be displayed.
- 6.2.1.3 Adequate supplies of water either from the mains or from mobile water tankers should be on site and hoses, fitted with diffuser branch nozzles, should be connected to the source of water and run out prior to the start of the operation.
- 6.2.2 **Site access**
- 6.2.2.1 Access to the site and the internal site roads along which a bulk tanker will be required to travel should be constructed to permit the safe entry and exit of heavy vehicles.
- 6.2.2.2 The tanker offloading area should be level and consolidated properly and should be sited so that interference with the free flow of site traffic is avoided.
- 6.2.3 **Pipework**
- Interconnecting pipework between the methanol delivery pumps and the injection point, and from the installation discharge point to the reception tanks, should be constructed of rigid pipe and hydraulically tested to 1.5 times the maximum operating pressure prior to the operation. Under no circumstances should flexible hose be used for the delivery of methanol from the pumps to the injection point.
- Non-return valves should be fitted at the pipeline "injection Christmas tree" so that, should there be a rupture in the pump outlet pipework, methanol flow from the pipework will be restricted and the pump can be stopped and the break repaired.
- 6.2.4 **Offloading**
- 6.2.4.1 The tanker should be sited on a hardstanding and the wheels chocked.
- 6.2.4.2 The tanker should be electrically bonded to the fixed installation earth point prior to connecting up the electrically conductive hose. All hose connections should be tight.
- 6.2.4.3 The tanker driver should operate the necessary valves on the tanker to allow methanol to be transferred via the pump to the pipeline being commissioned.
- 6.2.4.4 On completion of methanol transfer, all valves should be closed prior to the disconnection of the interconnecting pipework.
- 6.2.4.5 The electrical earth connections should be maintained until all the operations in clauses 6.2.4.1 to 6.2.4.4 have been completed.

- 6.2.4.6 All the interconnecting pipework and hoses should be washed out (see also clause 4.2.10).
- 6.2.4.7 Tanker access covers should be fastened securely at all times except when access is required, for example to enable dipping.
- 6.2.5 **Reception**
- 6.2.5.1 Methanol/water mixtures should be discharged into properly designed and sited tanks (see HS(G)176) through rigid interconnecting pipework, which have been prepared such that they cannot be overpressurised.
- 6.2.5.2 Consideration should be given to surrounding temporary storage tanks by a temporary bund to contain accidental spillage. During swabbing operations, a careful check should be made on contents gauges to avoid overfilling the reception tanks.
- 6.2.5.3 Each tank should be fitted with an inlet and outlet valve and the whole installation constructed in accordance with an appropriate standard. Prior to filling with methanol/water mixture, the reception tanks, connecting pipework and equipment should be purged with an inert gas.
- 6.2.5.4 The pig trap door should be opened to remove pigs after each methanol slug has been discharged into the tanks.
- Prior to opening the pig trap door, water should be made available and hoses run out.
- When the door is fully opened, the residual methanol/water mixture should be diluted with water and passed to a collection area before the pigs are removed.
- Each pig should be hosed down on removal.
- Accidental spillage or leakage should be dealt with in accordance with clause 4.2.10.
- 6.2.5.5 On completion of the commissioning procedure, the interconnecting (bund) pipework shall be flushed into the reception tank and the tank valve closed. The pipework between the isolation valves should then be removed.
- 6.2.5.6 On completion of the operation, the methanol/water mixture should be transferred from the reception tanks to the road tankers, using suitable pump and flexible hose connections, and removed from site for reclamation at a licensed recovery site.
- 6.2.5.7 Reception tanks should be hosed out thoroughly and the water/sludge transferred to a road tanker for disposal under the conditions laid down in the Control of Pollution Act (Special Wastes) Regulations.
- 6.2.5.8 The reception tanks should be purged completely with an inert gas and all vents blanked prior to removal from site.
- 6.3 **COMMISSIONING ABOVE-GROUND INSTALLATIONS**
- 6.3.1 The choice of location for the injection or discharge of methanol should take into account the need for adequate ventilation and the avoidance of ignition sources during discharge. In particular, confined areas are problematic with respect to accumulation of vapour and allowance of suitable means of escape.

6.3.2 On completion of the testing programme, but prior to commissioning, as much residual water as possible should be removed. To prevent the subsequent formation of solid hydrate, methanol may be introduced into the various sections of the pipework prior to commissioning, as follows:

- each section of pipework should be isolated between valves
- a predetermined quantity of methanol should be pumped into the pipework at its highest point so that the methanol/water mixture will drain to the lowest point from which it can be removed through a drain valve

*Note: It is recommended that 205 litre drums of methanol are used since accessibility to the various sections of pipework may be restricted.*

- the methanol should be transferred from the drum using a semi-rotary hand pump and suitable flexible hose securely fixed to the injection point
- the methanol/water mixture should be discharged from the drain point directly into 205 litre drums which should be sealed when full
- if there is not a drain point where one is needed the methanol/water mixture should be removed by inserting a dip pipe, attached to the semi-rotary hand pump, through a convenient top entry connection and discharging into 205 litre drums
- any residual liquid left in temporary pipework, due to the pipework configuration, should be diluted with water and pumped through to a suitable reception drum. All personnel engaged in this operation should wear protective clothing and goggles
- the methanol/water mixture should be despatched for reclamation, or disposed of under the conditions laid down in the Control of Pollution Act (Special Wastes) Regulations.

#### 6.4 OPERATIONAL PIPELINES – METHANOL INJECTION

Under certain circumstances, it is not possible to incorporate methanol swabbing in a commissioning procedure either for diverted pipelines or above ground installations.

In these cases, it is recommended that a system of methanol injection is adopted which allows methanol to be introduced into the gas stream at a pre-determined rate.

A typical method of methanol injection suitable for this purpose is given in Appendix 2.

- 6.4.1 On completion of any methanol injection operation, the tank and associated pipework should be depressurised before disconnection (see also clause 4.2.10).
- 6.4.2 The tank should be emptied of methanol, hosed out and purged with an inert gas before removal from site.
- 6.4.3 Connecting pipework should be flushed out with water (see also clause 4.2.10).
- 6.4.4 After commissioning, regular dewpoint tests on the gas should be carried out to determine whether further methanol injection is required.

**6.5 OPERATIONAL PIPELINES – METHANOL SLUG**

If dewpoint tests indicate that methane hydrate formation could occur, a methanol conditioning programme can be undertaken. This should be carried out in accordance with Sub-Sections 6.1 to 6.4.

## APPENDIX 1 : REFERENCES

These Recommendations are set out against a background of legislation in force in the United Kingdom at the time of publication. Similar considerations are likely to apply in other countries and reference to the appropriate national legislation will be necessary.

This Appendix lists all legislation, Codes of Practice, Guidance Notes, Standards and related Recommendations mentioned in this document as well as others that may be applicable. Care should be taken to ensure that the current edition of the document is used.

### A1.1 LEGISLATION

- Control of Substances Hazardous to Health Regulations 1994
- Environmental Protection Act 1990
  - Special Waste Regulations 1990
- Health and Safety at Work etc. Act 1974
  - Carriage of Dangerous Goods by Road Regulations 1996
  - Carriage of Dangerous Goods (Classification of Packaging and Labelling) and use of Transportable Pressure Receptacles Regulations 1996
  - Chemicals (Hazard Information and Packaging for Supply) Regulations 1994
  - Construction (Design and Management) Regulations 1994
  - Health and Safety (Safety Signs and Signals) Regulations 1996
  - Pipelines Safety Regulations 1996
  - Pressure Systems and Transportable Gas Containers Regulations 1989
  - Provision and Use of Work Equipment Regulations 1989
  - Reporting of Injuries, Diseases & Dangerous Occurrences Regulations 1995
  - Workplace (Health and Safety) Regulations 1992
- Inflammable Substances (Conveyance by Road) (Labelling) Regulations 1971
- Petroleum (Consolidation) Act 1928

*Note: Relevant amendments, modifications etc. are contained in:*

- *Fire Precautions Act 1971*
- *Health and Safety (Explosives and Petroleum Fees) (Modification) Regulations 1987*
- *Petroleum (Consolidations) Act 1928 (Enforcement) Regulations*
- *Petroleum (Flammable Liquids) Order 1971*
- *Petroleum (Regulations) Action 1928 & 1936 (Repeals and Modifications) Regulations 1974*
- *Petroleum (Transfer of Licenses) Act 1936*
- *Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995*
- *Road Traffic (Carriage of Dangerous Substances in Packages etc. Regulations 1986*
- *Town and Country Planning Act 1947.*

### A1.2 HEALTH AND SAFETY EXECUTIVE GUIDANCE

- (G) 51 Storage of Flammable Liquids in Containers
- (G) 65 Successful Health and Safety Management
- (G) 140 Safe Use and Handling of Flammable Liquids
- (G) 176 Storage of Flammable Liquids in Tanks
- (EH) 40 Occupational Exposure Limits
- L 76 Approved Supply List
- L 90 Approved Carriage List
- L 93 Approved Tanker Requirements.

**A1.3 DIRECTIVES**

- Council Directive 96/82/EC of 9<sup>th</sup> December 1996 on the control of major-accident hazards involving dangerous substances.

**A1.4 THE INSTITUTION OF GAS ENGINEERS**

- IGE/SR/3 Electrical equipment in gas production, transmission, storage, and distribution
- IGE/SR/7 Bulk storage and handling of highly flammable liquids
- IGE/SR/13 Use of breathing apparatus and associated respiratory protective equipment in gas transmission and distribution
- IGE/TD/1 Steel pipelines for high pressure gas transmission. Edition 3.

**A1.5 BRITISH STANDARDS (ABBREVIATED TITLES)**

- BS 2594 Specification for carbon steel welded horizontal cylinder tanks
- BS 5345 Selection etc. of electrical apparatus for use in potentially explosive atmospheres
- BS 5500 Specification for unfired fusion welded pressure vessels
- BS 6651 Code of practice for protection of structures against lightning
- BS 8010 Code of practice for pipelines.

**A1.6 INSTITUTE OF PETROLEUM**

- Model Code of Practice Part 19 Fire Precautions in Oil Refineries and Bulk Storage Installations.

## **APPENDIX 2 : TRANSPORTABLE METHANOL INJECTION UNIT**

Figure 1 illustrates a typical transportable methanol injection unit for injection of a controlled quantity of methanol into the gas stream to prevent the formation of solid hydrate in conditions where methanol swabbing cannot be carried out.

The following features and procedures apply:

- the pressure vessel to be constructed to BS 5500 and protected against over-pressurisation by a suitable relief valve
- the unit to be connected in a position where a sufficient differential pressure or head of liquid is available for injection of methanol
- methanol to be transferred to the vessel from 205 litre drums by means of a rotary hand pump. The vessel to be isolated from the pipeline and vented to atmosphere during this operation
- the unit then to be pressurised with gas and a flow of methanol adjusted by the needle valve and measured by a flow meter.

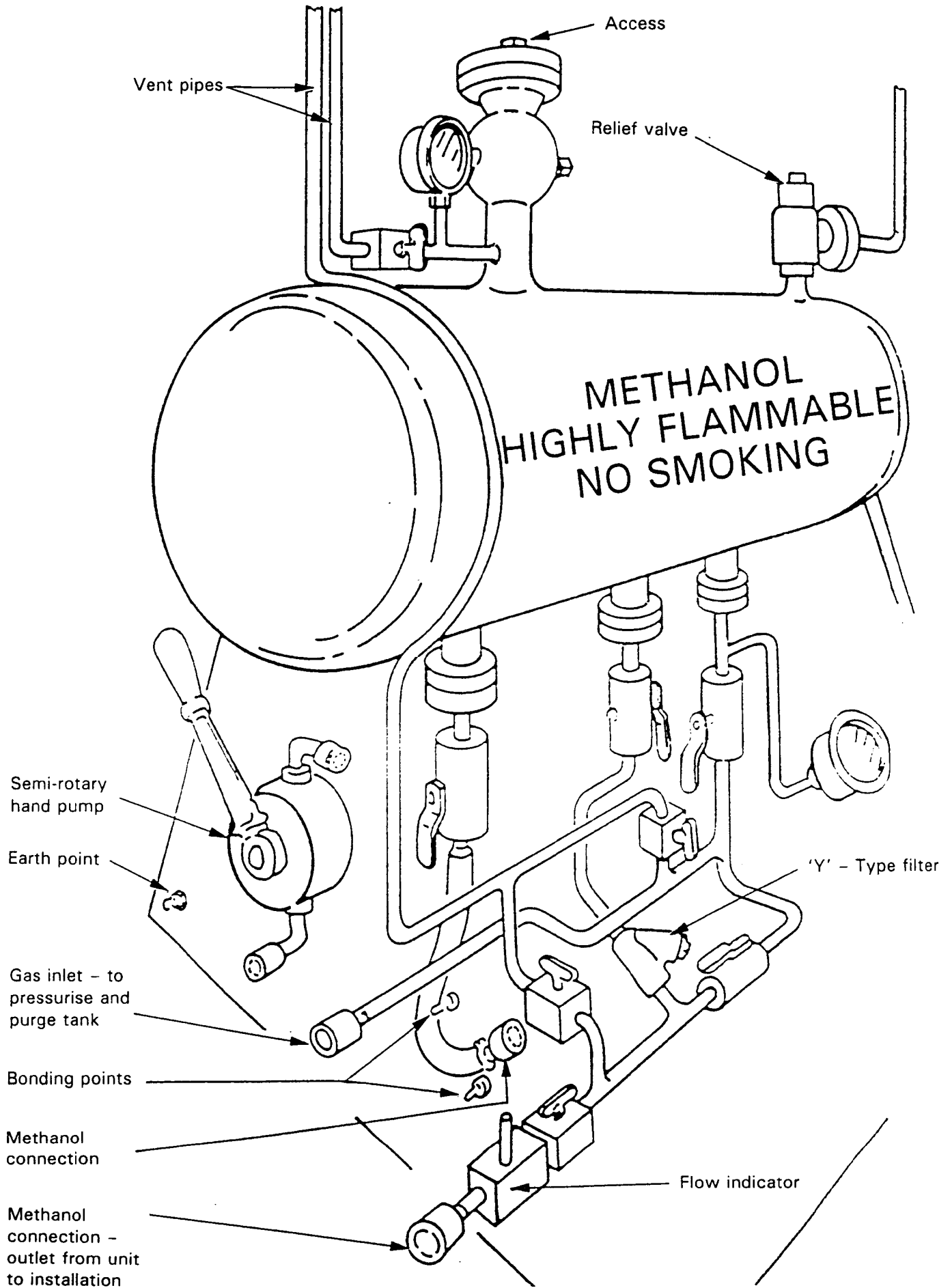


Figure 1 – Transportable Methanol Injection Unit





---

Published by the Institution of Gas Engineers  
21 Portland Place, London W1N 3AF

July 1999

Communication 1661 (IGE/SR/12 Edition 2)

Copyright