



ISO/TC 67

Materials, equipment and offshore structures for petroleum and natural gas industries

Secretariat: American Petroleum Institute, 1220 L Street NW, Washington, DC 005
US Tel: + 1 202 682 8000 Fax: + 1 202 962 4714

Activity Report of ISO/TC 67/WG10 June 2006 – June 2007

STANDARDIZATION FOR INSTALLATIONS AND EQUIPMENT FOR LIQUEFIED NATURAL GAS, EXCLUDING PRODUCT OR TESTING

1. Convenor information

Bernard Perisse
Total
2, place de la Coupole – La Défense 6
92078 Paris La Défense Cedex
France
E-Mail bernard.perisse@total.com

Summary

Executive summary

1. Objectives of ISO TC67 WG10
2. First meeting ISO/TC67/WG10 - Abu Dhabi, December 6th 2006
 - 2.1 Organization
 - 2.2 Preliminary proposed tasks
 - 2.3 Conclusions of first meeting ISO/TC67/WG10
3. Second meeting ISO/TC67/WG10 - Barcelona, April 26th 2007
 - 3.1 Organization
 - 3.2 Steering Committee
 - 3.3 Selected tasks and conclusions of second meeting ISO/TC67/WG10
4. General conclusions and recommendations

- Annexe 1 : Worldwide existing codes & standards related to LNG industry (except EN)
- Annexe 2 : Existing TC67 liaisons with other TC's relevant to the LNG industry
- Annexe 3 : Potential TC's addressing LNG standards
- Annexe 4 : Task 3 "Guidance on performing risk assessments in the design of onshore LNG installations including the ship/shore interface"
- Annexe 5 : Task 4 "Characteristics of LNG and materials suitable for construction of equipment for cryogenic uses"

Executive summary

The formation of TC 67 Work Group 10 "Standardization For Installations And Equipment For Liquefied Natural Gas, Excluding Product Or Testing" was approved (resolution 25) during the ISO/TC 67 Management Committee held in Veracruz (Mexico) September 20th/21th 2006.

A first meeting of ISO/TC67/WG10 was held in conjunction with the 22nd GASTECH conference in Abu Dhabi December 6th 2006 at the Hilton hotel. The objectives of this first meeting were to clarify the scope of work of WG10, to propose an organization and working procedures, and to establish a preliminary list of tasks to be addressed.

A second meeting of ISO/TC67/WG10 was held in conjunction with the LNG 15 conference in Barcelona April 26th 2007. The objectives of this second meeting were to confirm the nomination of the Steering Committee Members, to endorse the proposed organization, to endorse the proposed tasks within the working program.

Main results of the ISO/TC 67 WG10 activity are as follows:

- a steering committee has been created
- Four (4) main tasks have been selected, namely :
 - Task 1: "Energy calculation during LNG custody transfer"
 - Task 2: "LNG ship to shore interfaces & port operations"
 - Task 3: "Guidance on performing risk assessments in the design of onshore LNG installations including the ship/shore interface"
 - Task 4: "Characteristics of LNG and materials suitable for construction of equipment for cryogenic uses"
- Task leaders and task experts have been nominated and have started to work on detailed scope and schedule for each selected task
- A fifth task has been recognised with a strong interest (Task 5 : Storage tanks guidance document")
- Particular attention should be paid to existing documents related to the LNG industry (ISO, NFPA, EN, API, SIGTTO, GIIGNL...). Forthcoming activities of the ISO/TC 67 WG10 should integrated a review of existing works and liaise with national standardization bodies and international organizations.

The results of this WG10 confirm high interest from participating countries to work on "Standardization for installations and equipment for liquefied natural gas, excluding product or testing". A very pro-active partnership between participants during the two meetings, and numerous exchanges during this preliminary phase of the work would provide robust bases for future development or related ISO standards. The selected tasks work program is then expected to be approved by TC 67 Management Committee, in order to enable the actual work to start.

It was noted that the absence of representatives from USA and Spain was a concern, and action shall be taken by WG10 steering committee to obtain their participation.

1. Objectives of ISO TC67 WG10 :

Since several years, the LNG industry shows a very strong development, the LNG market being the most dynamic energy supplier with a high growing potential. Numerous projects for LNG liquefaction plants and receiving terminals are underway, and many projects are in their last stage of preparation of a Final Investment Decision. Further additional projects are also considered to fill in the anticipated LNG demand beyond 2012.

The growing demand needs new technologies and high reliability of equipments and installations is mandatory to cover production forecast. Today, LNG plants of 10 to 15 MMTPA are considered and a limited number of engineering, procurement and construction companies can manage these ambitious projects. These contractors must have a suitable track record of large scale LNG projects.

On technical ground, new equipment, new liquefaction processes and new concepts (offshore LNG, FSRU and GBS, modularization) will be or are already proposed by engineering companies. Before application, these new technologies must be validated and certified according to codes and standards endorsed by countries involved by the new LNG industry developments.

Despite the number of ongoing projects, the forthcoming LNG market will be characterized by supply shortfalls, resulting from commissioning problems and delayed start-up of new trains. New projects are subject to cost inflation, shortage of work forces, and extended lead times for procurement. In addition ambitious schedules require fast front end engineering design and challenging construction phases.

In order to better manage future projects, existing codes and standards related to the LNG industry must be reinforced and/or new codes and standards must be developed. New international codes and standards would allow to enhance collaboration between LNG main actors (countries, companies and contractors), to reduce post EPC awards clarifications or change order, and to attain the objectives of the market. Codes and Standards will focus on materials, components and equipments for construction and operation, as well as equipment used in the servicing and maintenance of LNG facilities for both production plants and receiving terminals. One major concern is related to safety of installations, for which an international standardization would be highly valuable.

With a projected realistic increase of LNG production from around 300 MMTPA in 2010 to 600 MMTPA in 2020, the level of investments required in new liquefaction plants and regasification terminals would reach circa 150 to 200 billions US\$ within the next decade (at today's project costs). By facilitating understanding between host countries, investors, operators, engineering and construction companies, and equipment suppliers, standardization in the LNG industry would certainly bring significant cost savings while helping to maintain the high level of safety and reliability which is required throughout the LNG chain.

To date, several standards on LNG already exist. Among the European published standards, the following documents are related to "Installation and equipment for liquefied natural gas" (CEN TC 282).

Standard reference	Title
EN 1160:1996	General characteristics of liquefied natural gas
EN 12065:1997	Testing of foam concentrates designed for generation of medium & high expansion foam and of extinguishing powders used on LNG fire
EN 12066:1997	Testing of insulating linings for LNG impounding areas
EN 12308:1998	Suitability testing of gaskets designed for flanged joints used on LNG piping
EN 12838:2000	Suitability testing of LNG sampling systems
EN 13645:2001	Design of onshore installations with a storage capacity between 5 t and 200 t
EN 1473:2007	Design of onshore installations
EN 1474:1997	Design and testing of loading/unloading arms
EN 1532:1997	Ship to shore interface

Within these 9 standards, 5 are under revision and / or amendment. According to the last CEN TC282 meeting, cooperation with a SC of ISO TC67 dedicated to the LNG industry may be proposed. Possible subject of common interest could be EN 1160 (possible inclusion in ISO TC67 through an UAP), EN 1532 (possible inclusion in ISO TC67 through an UAP after implementation of the revision in CEN TC282) and EN 1474 (possible inclusion in ISO TC67 through an UAP after implementation of the revision in CEN TC282 with a possible more active participation of ISO as this document is at an early development stage).

Other European Standards potentially related to LNG industry include the following documents:

The CEN TC265 is related to "Design and manufacture of site built, vertical, cylindrical, flat bottomed steel tanks for the storage of refrigerated liquefied gases with operating temperatures between -5°C and -165°C ". Chairman of this TC is informed of the action of ISO TC67 and further contact can be made by the future WG convenor if so desired

The CEN TC218 related "Rubber and plastics hoses and hose assemblies" with EN 13766: 2003 and EN ISO 4080: 1995 concerning more particularly LNG industry

The CEN TC342 "Metal hoses, hose assemblies, bellows and expansion joints" with EN ISO 10380:2003 and EN ISO 10806:2003 concerning more particularly LNG industry

In addition to European standards, Canadian standard CSA Z276:2001 and US standard NFPA 59A:2001 regard respectively "LNG Production, Storage and handling" and "Standard for the production, storage, and handling of LNG". It must be noted that the US standard is a general document technically constraining, in opposition with the design documents of CEN TC282. However, CEN TC282 opens cooperation program with NFPA

further to the revision of EN 1473 in order to exchange information on respective work programs. For information, a listing of existing codes and standards is provided in annexe 1.

The above considerations highlight that there is an actual need of standardization of the LNG industry, and that several documents already exist.

In order to bring-up the existing codes and standards to an international level, it is proposed to create a working group dedicated to the LNG industry in the frame of ISO TC67 with the following scope of work:

- review of LNG industry requirements in terms of codes and standards
- review of available national codes & standards applicable to the LNG industry
- definition of potential cooperation with codes & standards owners in the frame of a new ISO TC67 working group about LNG
- definition of a priority action list starting from existing documents (CEN TC282)

The possibility to transform this new Working Group into a Sub-Committee must be considered taking into account the wide range of subject related to the LNG industry.

Objectives of this ISO/TC67/WG10 were presented during the 26th Meeting of ISO/TC67 held in Veracruz (Mexico). ISO/TC67 is related to “Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries”. In the frame of this ISO/TC67, the MC decided to create a Working Group (WG10) is set develop “Standardization for installations and equipment for liquefied natural gas, excluding product or testing”.

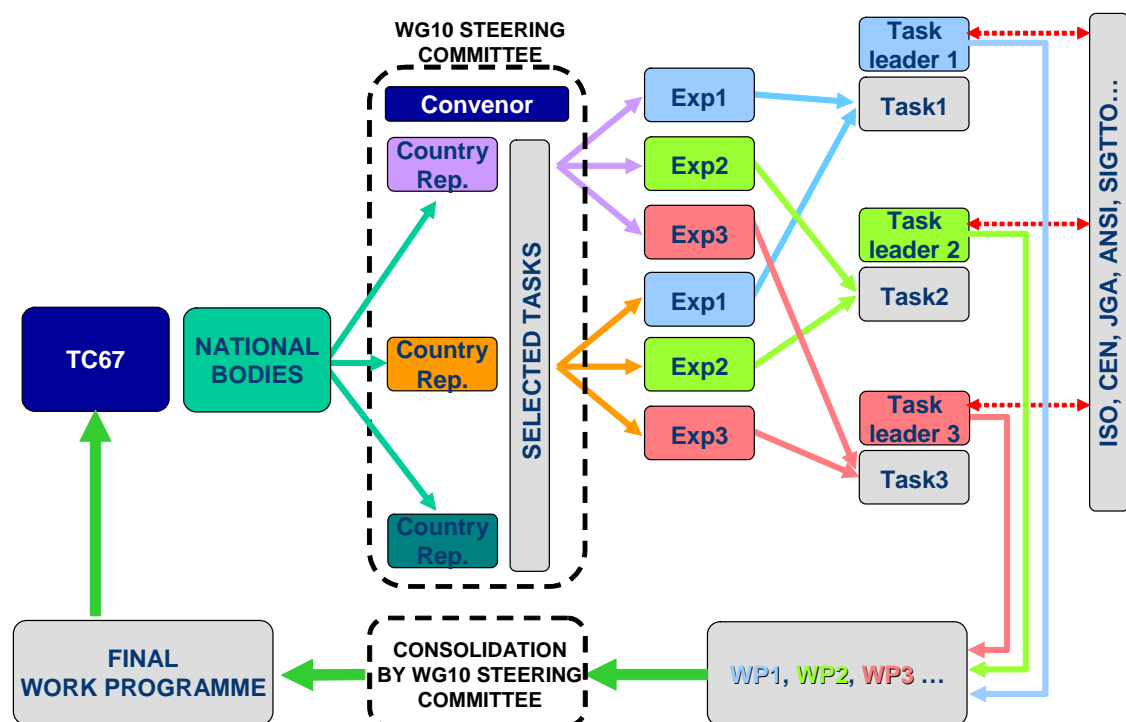
2. First meeting ISO/TC67/WG10 - Abu Dhabi, December 6th 2006

A first meeting of ISO/TC67/WG10 was held in conjunction with the 22nd GASTECH conference in Abu Dhabi December 6th 2006 at the Hilton hotel.

The objectives of this first meeting were to clarify the scope of work of WG10, to propose an organization and working procedures, and to establish a preliminary list of tasks to be addressed.

2.1 ISO TC67 WG10 organization

The following organization was proposed and endorsed by participants:



The milestones of this organisation are as follows:

- a Steering Committee must be created with one representative by participating country. It was reminded that representatives must be appointed by National Bodies
- a final selection of tasks to be addressed must be agreed by the Steering Committee. Each country is invited to nominate one expert for each selected task to form Task Groups, and one task leader is nominated among the experts. Experts must be appointed by national Bodies.
- a preliminary work programme must be proposed during the second TC67-WG10 steering committee to be held during LNG15 in Barcelona, Spain (24 – 27 April 2007)

2.2 Preliminary proposed tasks:

Ship to shore interfaces :

This task is considered as an international issue and even if it must be focused on onshore facilities, it must take into account future developments and be open to forthcoming offshore export plants and import terminals. Relevant documents identified during the meeting are:

- EN1532:1997 - Installation and equipment for liquefied natural gas – ship to shore interface
- EN1474:1997 – Installation and equipment for liquefied natural gas. Design and testing of loading/unloading arms
- SIGTTO steering group document and OCIMF documents

Additional sub-tasks may also be proposed as guidance for site selection. It must be noted that on behalf of CEN/TC282, a revision of EN1532:1997 must start in January 2007.

Storage tanks:

The task related to storage tanks is very large and covers numerous technical issues. In addition, several specifications, codes and guidelines already exist or are under development. Relevant documents identified during the meeting are:

- JGA 107 - Recommended practice for LNG in-ground storage
- JGA 108 - Recommended practice for LNG aboveground storage
- KSA documentation
- EN14620 - Design and manufacture of site built, vertical, cylindrical, flat-bottomed steel tanks for the storage of refrigerated, liquefied gases with operating temperature between 0°C and -165°C.
- EEMUA147 - Recommendations for the Design and construction of refrigerated liquefied Gas Storage tanks.
- ACI376 - Concrete structures for refrigerated liquefied gas

LNG facility layout:

This task must address both liquefaction plants and regasification terminals. It may include sub-topics as the framework of safety concept for plants and terminals. One relevant document was identified during the meeting:

- EN1473:1997 - Installation and equipment for liquefied natural gas. Design of onshore installations

Other tasks :

The following tasks were addressed during the meeting. It must be noted that these tasks are related to products and may not be relevant to ISO/TC67 scope of work:

- ISO8943:1991 - Refrigerated light hydrocarbon fluids – Sampling of liquefied natural gas – Continuous method (issued by TC28/SC5)
- EN1160:1997 – Installations and equipment for liquefied natural gas. General characteristics of liquefied natural gas

2.3 Conclusions of the first meeting ISO/TC67/WG10

The tasks listed during the first meeting were considered as preliminaries as other subjects of interest may arise. The following steps were selected as way forward :

- constitution of the Steering Committee
- registration of Steering Committee members and experts to the ISO/TC67/WG10 website (ISOTC portal)
- review, comment and update the preliminary list of task established during the first meeting and update of any existing document (organisation, company specifications...) relevant to the selected tasks
- constitution of Task Group and designation of Task Leader

3. Second meeting ISO/TC67/WG10 - Barcelona, April 25th 2007

The second meeting of ISO/TC67/WG10 was held in conjunction with the LNG 15 conference in Barcelona April 25th 2007.

The objectives of this second meeting were:

- to confirm the nomination of the Steering Committee Members
- to endorse the proposed organization
- to endorse the proposed tasks within the working program

3.1 Organization:

The organisation, as discussed and proposed at the Abu Dhabi meeting was rapidly reviewed. No formal objections were exposed during the meeting with regards to the general organization of WG10. The organisation is agreed by the WG10 members.

3.2 Steering Committee :

The following members were designated as steering Committee members:

Brazil :	Luiz Pereira da Silva
Belgium	Daniel Acheroy
Canada :	Guy Wassick
China :	Qiu Jianyong
France :	Benedict Weiss
Indonesia :	Ir Mulyono
Japan :	Seiichi Uchino
Korea :	Seung-Rim Lee
Netherlands :	Jaap Vreeburg
Norway :	Erik Skramstad
Qatar :	Saif Al Naimi
UK :	Roger Roue
USA :	Guillaume Besnard (<i>to be confirmed</i>)

It was noted that the absence of representatives from USA and Spain was a concern, and action shall be taken by WG10 steering committee to obtain their participation.

3.3 Selected tasks:

Preliminary list of tasks as defined further to the first meeting were discussed and prioritized, with the following outcome:

Task 1:	“Energy calculation during LNG custody transfer”	
Priority:	1	
Task leader:	France	Christophe Thomas
Nominated task experts:	France	Cecil Torun
	Netherlands	Klaas Hoving
	Brazil	Luiz Pereira da Silva
Task experts to be nominated:	Qatar, Norway, Japan, Korea, China, USA	
Reference document:	GIIGNL, API17.10, TC28-SC5	
Tentative schedule:	starting end '08 for 12 months	
Comments:	TC28 must be consulted	

Note : This task may refer to TC28-WG5. In addition, further work on this topic is being captured in ISO/TC193 and in possible part liaison with ISO/TC30. The existing ISO 6578:1991 dated December 1991 “REFRIGERATED HYDROCARBON LIQUIDS STATIC MEASUREMENT CALCULATION PROCEDURE” provide the principle for the Energy Calculation of the LNG transferred at a typical (Ship/shore) custody transfer. The actual application of the proposed method will depend on the specific of the facilities and it's operating conditions. It is noteworthy that the ISO 6578 addresses the equivalence between mass, volume and energy for the LNG and LPG; for the LNG density the correlations are based on Klosek-Mc Kinley for the molar volumes (1968) and Haynes/Hiza/Mc Carty correlation (1977) for the correction factor, both data dating quite a bit.

The GIIGNL “LNG CUSTODY TRANSFER HANDBOOK (2001)” addresses most of the issues of the (ship/shore) LNG custody transfer. The description of the calculation of the transferred energy is described in section 2 of this document which could be also used as starting point for task 1.

Task 2 :	“LNG ship to shore interfaces & port operations”	
Priority:	1	
Task leader:	UK	Roger Roue
Nominated task experts:	France	Dominique Ingrain
	Netherlands	Jaap Vreeburg
	USA	Scott Erwin (to be nominated by API)
Task experts to be nominated:	Qatar, Japan, Korea	
Reference document:	EN1532, SIGTTO, JGA, Qatar	
Tentative schedule:	Activity to start following completion of EN1532 (draft early '08), 18 months?	
Comments:	ready documents to be downloaded on WG10 website	

Translation of JGA document financing by OGP (Internal Association of Oil & Gas Producers)

This task 2 may be split in two sub-tasks: one related to cables and plugs, and one related to other interfaces

Note: With the increase of spot trading and short term contracts it is essential that there is basic standardization of LNG operations both at the ship/shore interface and also in port operations. The problem with achieving this is that there are liner trades that have been in existence for more than 30 years and these port have developed their own rules and regulations which they will be reluctant to change. The challenge, therefore, is to produce a useful document that is acceptable to all parties. In our favour we have the existing EN 1532, which we are currently revising and there are several SIGTTO publications, particularly LNG Operations in Port Areas and other industry documents that have been accepted by the international LNG community. Work on this ISO can start when a draft of the EN has been completed, most probably early 2008, and will require between 12 and 18 months to complete the work.

Task 3:	“Guidance on risk assessments in the design of onshore LNG including marine facilities”
----------------	--

Priority: 1

Task leader : Norway Erik Skramstad

Nominated task experts: Belgium A. Lardinoit
France Jean-Louis Deveautour
Brazil Luiz Pereira da Silva

Task experts to be nominated: Qatar, Indonesia, Korea, Japan, China, Canada, USA, Netherlands

Reference document : EN1473, EN1532, NFPA

Note: A preliminary document related to this Task 3 is presented in Annexe 4

Task 4:	“Characteristics of LNG and materials suitable for construction of equipment for cryogenic uses”
----------------	---

Priority: 2

Task leader: Belgium – Daniel Acheroy

Task experts: Indonesia – I. Mulyono
France – Dominik Uznanski

Task experts to be nominated: Qatar, Norway, Japan

Reference document: EN1160

Tentative schedule: 12 months starting '09

Comments: Must be a high level document (principles, framework...)

Note: A preliminary document related to this Task 4 is presented in Annexe 5

Task 5 :	“Storage tanks guidance document”
-----------------	--

Priority: 3

Task leader: not defined

Task experts: not defined

Reference document: to be defined
 Tentative schedule: not defined
 Comments: **This task is considered only as a reminder.** An interesting paper “*RLG Tank design, Principles and applicable rules: Inventory and Variations across various standards*” was presented at LNG15 by Mr P. Vander Meulen (Tractebel Engineering). It addresses the merits of developing new standards as the current standards are not easy to use.

Summary of task & Participating countries (task leader are in red)

	Task 1	Task 2	Task 3	Task 4	Task 5
France					
Netherlands					
Qatar					
Norway					
UK					
Japan					
Korea					
China					
USA	?	?	?	?	?
Belgium					
Canada					
Brazil					
Indonesia					
Spain	?	?	?	?	?

3.3 Selected tasks and conclusions of second meeting ISO/TC67/WG10

Further to this second meeting, 3 tasks priority 1, 1 task priority 2 and 1 task priority 3 (for information) have been selected and discussed. In order to consolidate these selected tasks, the following actions are required:

- Each country must nominated task expert according to the above table and inform task leader of nomination
- Each task leader must:
 - Consolidate task expert list
 - Gather relevant document
- Propose to WG10 steering committee a working program and schedule before first week of June
- The WG10 steering Committee will endorse each work program and prepare a final document to be submitted as final work program to TC67 in June 2007.

Other actions :

WG10 steering Committee will take contact with others ISO TC's in order to list relevant ISO documents of working groups that may interface with the LNG industry (welding, valves, pumps...). Several areas of improvement on certain equipment or emerging technologies were spotted during the meeting. Further actions by WG10 are likely to be required, and will be handled in a second phase of WG10 activities, after initiation of the tasks 1 to 4 program.

4. General conclusions and recommendations

From June 2006 to June 2007, an intensive work has been carried on regarding the creation of a new Working Group (WG10) related to the LNG industry in the frame of ISO/TC 67 activities. Main results of this WG10 are as follows:

- a steering committee has been created
- Four (4) main tasks have been selected, namely :
 - Task 1: "Energy calculation during LNG custody transfer"
 - Task 2: "LNG ship to shore interfaces & port operations"
 - Task 3: "Guidance on performing risk assessments in the design of onshore LNG installations including the ship/shore interface"
 - Task 4: "Characteristics of LNG and materials suitable for construction of equipment for cryogenic uses"
- Task leaders and task experts have been nominated and have started to work on detailed scope and schedule for each selected task
- A fifth task has been recognised with an interest (Task 5: Storage tanks guidance document") but need to be re-analysed later on.
- Particular attention must be paid to existing documents related to the LNG industry (ISO, NFPA, EN, API, SIGTTO, GIIGNL...). Forthcoming activities of the ISO/TC 67 WG10 should integrate a review of existing works / documents and liaise with national standardization bodies and international organizations.
- The final edition of selected tasks, task leaders, nominated task experts, reference document and schedule are listed below.

The results of this WG10 confirm high interest from participating countries to work on "Standardization for installations and equipment for liquefied natural gas, excluding product or testing". A very pro-active partnership between participants during the two meetings, and numerous exchanges during this preliminary phase of the work would provide robust bases for future development or related ISO standards. The selected tasks work program is then expected to be approved by TC 67 Plenary meeting of October 2007, in order to enable the actual work to start.

Task 1:	“Energy calculation during LNG custody transfer”	
Priority:	1	
Task leader:	France	Christophe Thomas
Nominated task experts:	France	Cecil Torun
	Netherlands	Klaas Hoving
	Brazil	Luiz Pereira da Silva
	Qatar	to be nominated
	Norway	to be nominated
	Japan	Masayuki Hirabayashi
	Korea	Young-cheol Ha, Byeong Ha Lee
	China	to be nominated
Reference document:	GIIGNL, API17.10, TC28-SC5	
Tentative schedule:	starting end '08 for 12 months	
Comments:	TC28 must be consulted	

Note : American Petroleum Institute (API) proposed a new work item “Measurement of cargoes on board marine LNG carriers” as N364 to ISO/TC28/SC5 and the proposal N364 was approved as a Preliminary Work Item (PWI) on 14th June. Since the similar standard should not be worked by two TCs at the same time, this Task 1 should be terminated. In addition, ISO13398 “Refrigerated light hydrocarbon fluids Liquefied natural gas - Procedure for custody transfer on board ship,” which covers the same area, has already existed and will be revised by ISO/TC28/SC5 this year periodically.

Task 2 :	“LNG ship to shore interfaces & port operations”	
Priority:	1	
Task leader:	UK	Roger Roue
Nominated task experts:	France	Dominique Ingrain
	Netherlands	Jaap Vreeburg
	USA	Scott Erwin (to be nominated by API)
	Qatar	to be nominated
	Japan	Yasunari Orito
	Korea	Young-myung Yang, Jae-Shin Kim
		Suk Chul Shin
Reference document:	EN1532, SIGTTO, JGA, Qatar	
Tentative schedule:	Activity to start following completion of EN1532 (draft early '08), 18 months?	
Comments:	ready documents to be downloaded on WG10 website Translation of JGA document financing by OGP (Oil & Gas Producers forum) This task 2 may be split in two sub-tasks: one related to cables and plugs, and one related to other interfaces	

Note: With the increase of spot trading and short term contracts it is essential that there is basic standardization of LNG operations both at the ship/shore interface and also in port operations. The problem with achieving this is that there are liner trades that have been in existence for more than 30 years and these port have developed their own rules and regulations which they will be reluctant to change The challenge, therefore, is to produce a

useful document that is acceptable to all parties. In our favour we have the existing EN 1532, which we are currently revising and there are several SIGTTO publications, particularly LNG Operations in Port Areas and other industry documents that have been accepted by the international LNG community. Work on this ISO can start when a draft of the EN has been completed, most probably early 2008, and will require between 12 and 18 months to complete the work.

Task 3:	“Guidance on performing risk assessments in the design of onshore LNG installations including the ship/shore interface”
----------------	--

Priority:	1	
Task leader :	Norway	Erik Skramstad
Nominated task experts:	Belgium	A. Lardinoit
	France	Jean-Louis Deveautour
	Brazil	Luiz Pereira da Silva
	Qatar	to be nominated
	Indonesia	to be nominated
	Korea	Seung-rim Lee, Shin-Kyu, Oh Kwang Jun Kim
	Japan	Norihiro Terada, Masatada Kobayashi
	China	to be nominated
	Canada	to be nominated
	USA	to be nominated
Netherlands	to be nominated	
Reference document :	EN1473, EN1532, NFPA	

Note: A preliminary document related to this Task 3 is presented in Annexe 4

Task 4:	“Characteristics of LNG and materials suitable for construction of equipment for LNG”
----------------	--

Priority:	2	
Task leader:	Belgium	Daniel Acheroy
Task experts:	Indonesia	I. Mulyono
	France	Dominik Uznanski
	Qatar	to be nominated
	Norway	to be nominated
	Korea	Seung-Hyun Lee, Young Soon Sohn Suk Chul Shin
	Japan	Seiichi Uchino
	Reference document:	EN1160
Tentative schedule:	12 months starting '09	
Comments:	Must be a high level document (principles, framework...)	

Note: A preliminary document related to this Task 4 is presented in Annexe 5

Task 5 :	“Storage tanks guidance document”
-----------------	--

Priority: 3
Task leader: not defined
Task experts: not defined
Reference document: to be defined
Tentative schedule: not defined
Comments: **This task is considered only as a reminder.** An interesting paper "*RLG Tank design, Principles and applicable rules: Inventory and Variations across various standards*" was presented at LNG15 by Mr P. Vander Meulen (Tractebel Engineering). It addresses the merits of developing new standards as the current standards are not easy to use.

Annex 1: Worldwide existing codes & standards related to LNG industry (except EN)

Reference	Title/Description
IBC Code	International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk.
IGC Code (IMO)	International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.
GCC	Gas Carrier Code produced first by IMCO and subsequently by IMO. Contains a chapter 11 called "Fire protection and fire extinction"
NFPA 1	Fire Prevention Code
NFPA 30	Flammable and Combustible Liquids Code
NFPA 52	Compressed Natural Gas (CNG) Vehicular Fuel Systems Code
NFPA 54	Natural Fuel Gas Code
NFPA 57	Liquefied Natural Gas (LNG) vehicular Fuel Systems Code
IP Code Part 15	Area Classification Code for Petroleum Installations
BS 7777	Flat-bottomed, vertical cylindrical storage tanks for low temperature service,
DIN 4119, part 1	"Above-ground Cylindrical Flat-bottomed Tank Installations of Metallic Materials"
API Std. 620	Design and Construction of Large, Welded, Low-pressure Storage Tanks
API Std. 2000	Venting Atmospheric and Low Pressure Storage Tanks : Non-refrigerated and Refrigerated
API Std 2510	"Design & Construction of LPG installations"
API Std 2510A	Fire and protection considerations for the design and operation of liquefied petroleum gases (LPG) storage facilities
ASME B 31.3	Process Piping
ASME B 31.8	Gas Transmission & Distribution Piping System
NFPA 11	Low-Expansion Foam
NFPA 11A	Medium and High-Expansion Foam Systems
NFPA 11C	Mobile Foam Apparatus
NFPA 13	Standard for the Installation of Sprinkler Systems
NFPA 15	Water spray fixed systems
NFPA 16	Installation of Deluge Foam - Water Sprinkler and Foam - Water Spray Systems
NFPA 17	Dry Chemical Extinguishing Systems
NFPA 18	Standard on wetting agents
NFPA 30 A	Motor Fuel Dispensing Facilities and Repair Garages
NFPA 37	Installation and Use of stationary Combustion Engines and Gas Turbines
NFPA 59	Storage and Handling of Liquefied Petroleum gases at Utility Gas Plants
NFPA 59A	Standard for the Production Storage and Handling of

Reference	Title/Description
	Liquefied Natural Gas (LNG)
NFPA 307	Standard for the Construction and Fire Protection of Marine Terminals, Piers and Wharves
NFPA 497	Classification of flammable Liquids, Gases or Vapours and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
NFPA 921	Guide for Fire and Explosion Investigations
NFPA 1405	Land-Based Fire Fighters Who Respond to Marine Vessel Fires
JGA 108	Recommended practice for LNG aboveground storage
JGA 107	Recommended practice for LNG in-ground storage
JGA 102	Recommended practice for LNG facilities
GIIGNL	LNG Custody Transfer Handbook

Annex 2: Existing ISO TC67 liaisons with other ISO TC's relevant to the LNG industry

TC5 :	Ferrous metal pipes & metallic fittings
TC164 :	Mechanical testing of metals
TC8 :	Ships & marine technologies
TC44 :	Welding & allied processes
TC98 :	Bases for design of structures
TC115 :	Pumps
TC176 :	Quality management & quality assurance
TC184 :	Industrial systems and integration

Annex 3: Potential ISO TC's addressing LNG standards

TC12 :	Quantities, units, symbols, conversion factors
TC21 :	Equipment for fire protection and fire fighting
TC28 :	Petroleum products and lubricants
TC30 :	Measurement of fluid flow in closed conduits
TC79 :	Light metals and their alloys
TC86 :	Refrigeration and air conditioning
TC92 :	Fire safety
TC118 :	Compressors and pneumatic tools, machines and equipment
TC153 :	Valves
TC155 :	Nickel and nickel alloys
TC156 :	Corrosion of metal and alloys
TC 158 :	Analysis of gases
TC185 :	Safety devices for protection against excessive pressure
TC192 :	Gas turbines :
TC193 :	Natural gas
TC207 :	Environmental management
TC220 :	Cryogenic vessels

Annex 4: Task 3 “Guidance on performing risk assessments in the design of onshore LNG installations including the ship/shore interface”

Objective

The objective of this task is to provide a road map (framework) for performing safety and risk assessments in the planning and design phases of onshore LNG terminal projects to ensure that key issues related to safety are addressed at the right time to provide basis for the different decisions to be made at the different Project stages.

The framework shall provide guidance for a safe route through the different stages with reference one of the following alternative approaches:

Legislation referring to risk based standards (Safety Case regimes, NFPA 59, EN 1473)

National prescriptive regulations

A generic risk based approach as outlined in this document.

Overall structure

The structure of the document reflects the normal phases of an onshore LNG terminal project and aims at delivering appropriate information for the key decisions to be made in each phase, and the decisions that need to be made to move into the next phase. The main structure will be:

Id.:	Project Phase	Needed risk related information	Activities	Key decisions
1	Business case and concept evaluation	Establish risk criteria. Identify stakeholders. Overall risk assessment	Concept development. Due diligence studies. Project risk assessments. Contract negotiations. Coarse risk assessment w.r.t safety and environment	Select business model. Select contractual strategy. Select design criteria. Identify and decide risk criteria. Concept selection. Site selection.
2	Development of basic design	First estimate of risk level. Design criteria for safety system.	Quantative Risk Assessment (QRA). Environmental Impact Assessment (EIA). Ram analysis. HAZIDs.	Confirm concept selection according to business model and design criteria. Select main technologies. Decision to start detail design.

Id.:	Project Phase	Needed risk related information	Activities	Key decisions
			Fire explosion analysis. Evacuation analysis.	
3	Detail design	Refined QRA results. HAZOP findings Consequence assessment.	Develop detailed basis for construction and operation.	Selection of equipment, solutions and operational procedures.
4	Construction and installation	Safe operation. Quality assurance and verification. Training material.	Construction and commissioning.	Decide operational procedures.
5	Operation	Maintain safety case.	Assess modifications.	

Contents

Foreword

- 1 Scope and applicability
- 2 Normative references
- 3 Terms, definitions and abbreviations
- 4 Stakeholders and overall requirements
- 5 Risk activities
 - 5.1 Concept evaluation and site selection
 - 5.2 Basic design
 - 5.3 Detailed design
 - 5.4 Construction and installation
 - 5.5 Operation
- 6 Risk methodologies
Overview of methodologies (HAZID, QRA, Consequence assessment, EIA)
- 7 Risk criteria
 - 7.1 Principles and formats for risk criteria for risk to personnel
(Direct exposure, escape, evacuation)
Environmental risk criteria
Risk criteria for property.
- 8 Risk tools and data
Overview with reference to annex
- 11 Quality insurance and control
- 12 Documentation

- Annex A: Risk methodologies : Ship collisions, explosions, fire assessment.
 Annex B: Risk data : Failure frequencies, input data to risk models,
 Annex C: Risk models

Work programme

The following work programme is proposed

Date	Milestone/activity	Activity	Who	Comment
June 2007	Input to TC67 MC meeting in June	Review and comment on this proposal	Task experts.	
June 29 2007	ISO/TC67 MC meeting next	Approve/comment proposal		
Autumn 2007	Complete expert group	Identify additional experts	TC67WG10 SC members	
Autumn 2007	Preparation to workshop	Identify and collect reference material	Task experts	
January 2008	Task Workshop	Refine scope and mandate. Agree table of contents Agree work distribution	Task experts	Will there be a common venue for TC67 WG10
January 2008- June 2008	Prepare draft documents		Task experts	
June 2008	2nd workshop	Compile inputs and develop 1st draft of guideline	Task experts	
June 2008- October 2008	Review draft guideline		Industry	
December 2008	3 rd workshop	Compile comments and prepare Proposal.		
2009	Formal review process	Review and comment on the proposal	Review lists per ISO practice.	

Annex 5: Task 4 “Characteristics of LNG and materials suitable for construction of equipment for LNG”

INTRODUCTION

The purpose of this note is to propose the scope of the future standard that will give the LNG characteristics and the related definitions.

STANDARD TABLE OF CONTENT

1. introduction / scope description
2. normative references
3. definitions
Note: list is not exhaustive
 - a. boil-off gas
 - b. condensate
 - c. liquid petroleum gas
 - d. liquefied natural gas
 - e. natural gas liquids
4. Usual abbreviations (Note: list is not exhaustive)
 - a. BLEVE
 - b. VCE
 - c. LNG
 - d. LPG
 - e. RPT
 - f. SEP
5. General characteristics of LNG (Note: list is not exhaustive)
 - a. Properties of LNG
 - i. Composition
 - ii. Density
 - iii. Temperature
 - iv. viscosity
 - b. Physical properties
 - i. evaporation
 - ii. flashing
 - iii. spillage
 - iv. gas dispersion
 - v. gas ignition
 - vi. rollover
 - vii. RPT
 - viii. BLEVE
 - ix. VCE
 - c. Health and safety
 - i. exposure to cold
 - ii. exposure to gas
 - iii. fire precautions and protection
6. Material of construction
 - a. in contact with LNG

- i. 9% Ni steel
- ii. Stainless steel
- iii. Aluminum
- iv. Copper
- v. Invar
- vi. Concrete
- vii. Insulation material
- viii. Bearing material
- b. in contact with cold temperature
 - i. insulation material
 - ii. wooden supports
 - iii. concrete
 - iv. cold bridge stops

STANDARD DEVELOPMENT PROGRAM :

1. team kick-off meeting: To, after approval by TC/67 and team building (early 2008)
2. 1st draft preparation: home works, as decided during kick-off meeting
3. 1st draft issue for discussion: To + 6 months
4. comments on 1st draft: To +6.1/2 months
5. team review meeting: To + 7 months
6. final draft issue: To + 9 months
7. final comments: To + 10 months
8. finalisation meeting: To + 11 months
9. issue to TC/67 WG steering committee: To + 12 months

BASIS FOR WORKS :

The basis for this task development will be:

- EN 1160
- SIGTTO definitions and usual abbreviations
- Glossary of terms by EXXONMOBIL
- all documents that will be proposed by the experts during the kick-off meeting

For material general characteristics (chemical composition families, physical properties) will be given to highlight the material that could be used for cryogenic application. It is not the task scope to propose material selection for specific uses.

Annex 6: List of participants for the ISO TC67 WG10 meeting 06/12 2006 Abu Dhabi

COUNTRY	SURNAME	FIRST NAME	COMPANY	EMAIL
BRAZIL	CHEROTO	Silvia	PETROBRAS	scheroto@petrobras.com.br
CHINA	ZHAO	Baocai	ZPEB	baocai_zhao@yahoo.com.cn
CHINA	ZHAO	Degui	PETROCHINA	zhaodg@petrochina.com.cn
CHINA	XU	Xiaming	CNOOC	xuxm@cnooc.com.cn
CHINA	QIU	Jianyong	CNOOC Gas & Power	qiujiy@cnooc.com.cn
FRANCE	WEISS	Benedict	GAZ DE FRANCE	benedict.weiss@gazdefrance.com
FRANCE	LE DEVEHAT	Renaud	FMC	renaud.ledevehat@intl.fmcti.com
JAPAN	UCHINO	Seiichi	TOKYO GAS CO LTD	s-uchino@tokyo-gas.co.jp
JAPAN	ORITO	Yasunari	TOKYO ELECTRIC POWER CY	y.orito@tepcoco.jp
JAPAN	KOBAYASHI	Masatada	JGA	kobayashi.masatada@gas.or.jp
KOREA	YANG	Young-Myung	KOGAS	ymyang@kogas.re.kr
KOREA	LEE	Seung-Rim	KGS (Korea Gas Safety Corp)	srlee@kgs.or.kr
NETHERLANDS	VREEBURG	Jaap	SHELL	jaap.vreeburg@shell.com
NORWAY	SKRAMSTAD	Erik	DNV	erik.skramstad@dnv.com
QATAR	AL NAIMI	Saif Saed	Qatar Petroleum	sss_alnaimi@qp.com.qa
UK	HOLLEYOAK	John	BP	john.holleyoak@bp.com
UK	HASSETT	M.John	KELLOGG	martin.hassett@mwkl.co.uk
UK	ROUE	Roger	SIGTTO	roger.roue@sigtto.org
CANADA	WASSICK	Guy	TERASEN GAS	guy.wassick@terasengas.com
ISO/TC67/WG10	CAUQUIL	Eric	TOTAL	eric.cauquil@total.com
ISO/TC67/WG10	PERISSE	Bernard	TOTAL	bernard.perisse@total.com
FRANCE	GOANVIC	Jean	TOTAL	jean.goanvic@total.com
FRANCE	SOUBIGOU	Annick	TOTAL	annick.soubigou@total.com

Annex 7: List of participants for the ISO TC67 WG10 meeting 25/04 2007 Barcelona

COUNTRY	SURNAME	FIRST NAME	COMPANY	EMAIL
BRAZIL	PEREIRA DA	Luiz Clovis	PETROBRAS	luizcp@petrobras.com.br
BELGIQUE	ACHEROY	Daniel	TRACTEBEL Engineering	daniel.acheroy@tractebel.com
CANADA	WASSICK	Guy	TERASEN GAS	guy.wassick@terasengas.com
CHINA	ZHANG	Tao	CNOOC	zhangtao3@cnooc.com.cn
FRANCE	WEISS	Benedict	GAZ DE FRANCE	benedict.weiss@gazdefrance.com
INDONESIE	MULYONO	Ir	PT. BADA K NATURAL GAS ACTION	mulyono@badakeng.co.id
JAPAN	UCHINO	Seiichi	TOKYO GAS CO LTD	s-uchino@tokyo-gas.co.jp
JAPAN	ORITO	Yasunari	TOKYO ELECTRIC POWER NY	y.orito@tepco.co.jp
JAPAN	TOSHIHIDE	Kanagawa	THE JAPAN GAS ATION	kanagawa.toshihide@gas.or.jp
KOREA	JANG-SIK	Park	Korea Gas Safety Corporation	pjsik@kgs.or.kr
KOREA	LEE	Seung-Rim	KGS (Korea Gas Safety Co.)	srlee@kgs.or.kr
NETHERLANDS	VREEBURG	Jaap	SHELL	jaap.vreeburg@shell.com
NETHERLANDS	HOVING	Klaas	NEDERLANDSE GASUNIE	k.hoving@gasunie.nl
NORWAY	TORE	Loland	STATOIL	tolola@statoil.com
NORWAY	SKRAMSTAD	Erik	DNV	erik.skramstad@dnv.com
QATAR	AL NAIMI	Saif Saed	Qatar Petroleum	sss_alnaimi@qp.com.qa
UK	HOLLEYOAK	John	BP	john.holleyoak@bp.com
UK	ROUE	Roger	SIGTTO	roger.roue@sigtto.org
ISO/TC67/WG10	CAUQUIL	Eric	TOTAL	eric.cauquil@total.com
ISO/TC67/WG10	PERISSE	Bernard	TOTAL	bernard.perisse@total.com
ISO/TC67/WG10	THOMAS	Christophe	TOTAL	christophe.thomas@total.com
FRANCE	ANDRIANALY	Mylène	TOTAL	mylene.andrianaly@total.com