



# Deck Water Spray Systems on Liquefied Gas Carriers

Sector Houston-Galveston

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## Deck Water Spray Failures

Year after year, inadequate coverage of the required areas by the deck water spray system is one of top three deficiencies identified during Certificate of Compliance (CoC) exams on liquefied gas carriers. Across the industry, vessel operators and crews have struggled to keep these simple systems operating properly. Sector Houston-Galveston has engaged with companies considering everything from using cost prohibitive stainless steel piping to installing ball valves on each piping termination point to ease the effort required while purging the rust and debris that routinely clogs these systems.

Over the last 10 years, Sector Houston-Galveston has conducted in excess of 30% of all Gas Carrier CoC exams conducted by the Coast Guard. Averaging at least 3 gas carrier exams a week, has provided Sector Port State Control Officers' (PSCO) insight and experience that has recently identified a very probable cause to this decades old problem regarding deck water spray systems that most in the industry seem not to realize. In brief, the Deck Water Spray system is required on ships carrying flammable and/or toxic cargos for cooling, fire prevention and crew protection. It is comprised of a seawater pump typically located in the engine room. It supplies high volumes of water to the cargo area and face of the superstructure. The design should ensure uniform water spray coverage through nozzles that create a fog like mist that provides protection. Coverage of the areas in accordance with IGC 93 Chapter 11, Reg 11.3.1 which include cargo tank tops, cargo liquid and vapor manifolds and exposed emergency shutdown quick closing valves, cargo compressor and electric motor rooms and any boundaries of normally manned superstructure or deck houses. See IGC 1993 ed 11.3 and IGC 2016 ed 11.3 as appropriate.

The Deck Water Spray system is required by the International Code for the Construction and Equipment of Ships Carrying Liquefied Gasses in Bulk, 1993, Regulation 11.3 (IGC Code). This requirement text has remained nearly identical back

through the Code for the Construction and Equipment of Ships Carrying Liquefied Gasses in Bulk, 1983 (GC Code) and to the Code for Existing Ships Carrying Liquefied Gasses in Bulk (EGC Code). The substantially similar regulations existing for the deck water spray on U.S. Gas Carriers are found in 46 CFR 154.1105 through 46 CFR 1135.

The new 2016 edition of the IGC Code incorporates the amendments adopted by the Marine Safety Committee at its ninety-third session (May 2014) by resolution [MSC.370\(93\)](#). These amendments, which entered into force on 1 Jan 2016, consist of a complete replacement text of the IGC Code and will apply to ships whose keels are laid or are at a similar stage of construction, on or after 1 July 2016.

This is the first total rewrite of the IGC Code since December 1992, and includes many improvements in both text and function to include requiring water spray coverage at lifeboat or life raft muster stations facing the cargo deck and inline filters and fresh water flushing capability as well as other enhanced technical specifications.



Figure 1 - a very small sample of debris from 2 and half year old VLGC Deck Water Spray system. Total volume of debris cleared after temporary removal of 4 orifice plates could have nearly filled a five gallon bucket. Also cleared from the system were 3- 3inch x 1 inch bolts with nuts on obviously in the piping system since construction.

Photo Credit

(Mr. Jamie Wilson  
USCG Sector Houston-Galveston)

### SHG PSC: DWS & Fixed Gas Detection deficiencies

Year	DWS	/Fixed Gas
2006	13	/ 6
2007	13	/ 11
2008	8	/ 10
2009	5	/ 8
2010	13	/ 7
2011	9	/ 9
2012	6	/ 2
2013	12	/ 3
2014	13	/ 4
2015	22	/ 9
2016	13	/ 14
2017	11	/ 4



## It's the Orifice Plates, not the Nozzles

Ineffective operation of the deck water spray appears easily managed by periodic removal of the installed orifice plates & piping end caps and then flushing the debris from the system. Failure to do this allows for the rapid and substantial build up of debris behind each orifice plate. This situation, like plaque in an artery, has gone undiagnosed for decades as vessel crews endlessly poke at the clogged nozzles in futile attempts to cure a more severe and untreated issue.



Figure 2 – Deck Water Spray coverage of starboard cargo manifold on a LNG Carrier Photo Credit (Mr. Jamie Wilson, USCG Sector Houston-Galveston)

**“For several years we have informally asked Classification societies and Flag State Administrations to take a more active role during annual inspections and share this simple fix with no apparent results as failures and inadequacies of this system are still being identified.”**

Experience added with the volume of CoC-Gas exams has helped Sector PSCOs understand and accept that individual deck water spray nozzles are likely to be found blocked or ineffective every time a water spray system is energized. Circumstances and design should help dictate the observed severity of a blockage. If one of two nozzles is blocked over a cargo manifold, it is likely a bigger deal than one or two of 12 nozzles covering the same area. PSCOs assess each situation encountered individually and base written deficiencies on "adequate coverage".

Having witnessed hundreds of tests and seen countless arrangements and honest but failed attempts to maintain this simple yet frustrating system, we offer this

information to assist the industry overcome this recurrent issue. PSCOs in Houston have shared with ships masters, officers, superintendents and more senior company personnel when encountered, this common element and apparent cause of these continued problems. Experience has shown that if vessel crews or management are unaware of the orifice plates (shown above in Figure 3 & 4) installed throughout the water spray system, the system will be rendered ineffective within only a few years of construction. This leads to problems and frustration with the ship's crew, problems during inspections and more importantly an unresolved and tacitly accepted degradation in a significant safety system on these vessels.



Figure 3 – (left) Orifice plate temporarily removed to clear debris from deck water spray system. Note approx 2 inch internal diameter of pipe reduced to 1/2 inch trapping most debris behind each plate. At least 9 orifice plates were identified on this VLGC. Photo Credit – Mr. Jamie Wilson USCG Sector Houston-Galveston



Figure 4 - (above) Cutaway rendering of orifice plate installed in a pipe. Picture Credit - Omni Supply LLC.



Figure 5 – Excellent deck water spray coverage of deck tanks as viewed from bridge. Good example of why not to only test from the bridge, is there adequate coverage on the other cargo tank tops, manifolds, etc.? Something to think about.

*Photo Credit MSSD2 Chuck Ferrante, USCG Sector Houston-Galveston*

For several years we have informally asked Classification societies and Flag State Administrations to take a more active role during annual inspections and share this simple fix with no apparent results as failures and inadequacies of this system are still being identified. These primary authorities should proactively assist vessel owners and operators identify the installed as designed and necessary orifice plates and develop best practices and procedures to maintain this critical system appropriately.



Figure 6 – Testing of deck water spray during an initial COC-Gas Exam conducted in Houston, Texas.

*Photo Credit - LT Ethan Lewallen, USCG LGCNCOE*



## Sector Houston-Galveston

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Sector Houston-Galveston, where  
everything is bigger!



**CGPortal**

Sector Houston-Galveston, headquartered in Houston, Texas, covers parts of Texas and Louisiana, encompassing 180 miles of gulf coastline, from 60 miles east of Lake Charles, Louisiana, to the east bank of the Colorado River, 40 miles west of Freeport, Texas. Sector Houston-Galveston is home to the largest maritime petrochemical port, with seven major ports, all of which are listed amongst the nation's top 50 busiest ports for commerce. Ten of the top twenty gas and oil refineries in the U.S. reside within the Sector Houston-Galveston area including Motiva Enterprises, the largest U.S. refinery, located in Port

Arthur, Texas and Cheniere Energy located in Sabine Pass which is the first liquefied natural gas (LNG) receiving and export terminal in the continental U.S.

The main Sector PSC branch is composed of 31 military and civilian personnel that conduct exams on freight ships, oil tankers, chemical tankers, and gas carriers. MSU Lake Charles PSC branch comprises of 5 military and civilian personnel that deals with various

## U.S. Coast Guard Sector Houston-Galveston



### DAILY MISSIONS OVERVIEW

- 3 Lives Saved/Assisted
- 20 Vessel Inspections
- 35 Aids to Navigation Discrepancies
- 400 Tug/Barge Movements
- 86 Deep Draft Vessel Arrivals
- 4 Waterfront Facility Inspections
- 2 Security Boardings
- 2 Law Enforcement Violations
- 3 Marine Casualty Investigations
- 22 Merchant Mariner Credentials
- 4 Pollution Responses

freight, tankers, and LNG carriers. MSU Port Arthur has approximately 15 military and civilians that conduct PSC exams, and MSU Texas City PSC branch comprises of 14 military and civilian personnel who also conducts a majority of the offshore tank vessel exams in the Western Gulf of Mexico.