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 한국가스공사 KOREA GAS CORPORATION						
SAMCHEOK LNG TERMINAL (삼척기지 LNG RELOADING 시스템 구축 기술검토 및 설계 용역)						
BOLTS & NUTS SPECIFICATION						
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	삼척기지 LNG RELOADING 시스템구축 기술검토 및 설계 용역	2019. 06
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1. GENERAL

1.1 Scope

Bolt/Nut shall be purchased in accordance with This Specification and SPECIFICATION REQUIREMENTS FOR BULK MATERIAL.

Related pipe classes : all classes except for WOWA3, WOWA4 W1W1.

1.2 Applicable Codes and Standards

All following Codes and Standards of the latest edition shall be applied, unless otherwise specified.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME Section II "Material Specifications", Part A – Ferrous Materials

<u>ASME</u> B1.1	Unified inch screw threads
<u>ASME</u> B16.1	Cast Iron Pipe Flanges and Flanged Fittings
<u>ASME</u> B16.5	Pipe flanges and flanged fittings
<u>ASME</u> B18.2.1	Square, Hex Bolts and Screws
<u>ASME</u> B18.2.2	Square and Hex Nuts
<u>ASME</u> B31.3	Process piping
<u>ASME</u> B16.47	Large diameter steel flanges

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A193	Alloy Steel and Strainless Steel Bolting Materials for High-Temperature Service
ASTM A194	Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

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ASTM A320 Alloy-Steel Bolting Materials for Low-Temperature Service

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA-C207 Steel Pipe Flanges for Waterworks service - Sizes 4" through 144"

2. BOLT TYPES

The material and dimensional specifications for the bolting types, and the material and dimensional specifications for the nuts to be used with various bolting types shall be defined as follows.

ASTM Specifications

<u>Bolts</u>	<u>Nuts</u>
A193-B7	A194-2H
A320-B8M	CL.2 A194-8MA
A193-B8C	CL.1 A194-8MA
A193-B8	A194-8A

3. DESIGN CONDITIONS

All bolt/nut types shall be stud bolt, heavy hex nut respectively, and stud bolt shall be conformed to the requirements of ASME B18.2.1 and heavy hex nut shall be conformed to the requirements of ASME B18.2.2.

Two heavy hex nuts per each one stud bolt shall be supplied by Vendor.

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The dimensions of studs and bolts shall be based on the [ASME B16.5](#), [ASME B16.47 Series A](#), [AWWA C207](#) and will take account of the gaskets used, or any special mating flanges, blinds in the lines and bolt tensioning devices proposed.

The threads of stud bolts and nuts shall be based on UNC (unified coarse thread) series up to 1 inch nominal size and 8 TPI (thread per inch) for sizes above 1 inch. The tolerances shall conform to [ASME B1.1](#), class 2A fit for bolts/studs and class 2B fit for nuts.

4. SPECIAL REQUIREMENTS FOR BOLTING IN CRYOGENIC SERVICE (PIPE CLASS: 1R1J-9R1J)

4.1 DEFINITION

Cryogenic service: Liquefied natural gas or natural gas vapours process at temperatures between -46°C and -196°C .

4.2 MATERIAL REQUIREMENTS

The material specification of bolt shall comply with ASTM A320 Grade B8M Class 2.

The material specification of nuts shall comply with ASTM A194, grades 8MA.

4.3 Resilience tests

Acceptance criteria for resilience tests shall be allowable average value (3 tests) over 600 kJ/m^2 (6daj/cm^2) with no individual value under

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400 kJ/m² (4daj/cm²)(KCV at -196°C-Transversal Impact Test) according to ASTM A370. The specimens for impact test shall be taken from two bolts of each lot.

A lot of bolts mean the same size and same wall thickness from any one heat of steel. Additionally, base metal shall be impact tested at minus(-)196°C in accordance with Para.323.3.5(b) of [ASME](#) B31.3 (ie, lateral expansion not less than 0.38 mm).