

# DET NORSKE VERITAS

## TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. D- 3331

This Certificate consists of 4 pages

*This is to certify that the*

**Ball Dart Head Assembly**

*with type designation(s)*

**Mud and Cementing Equipment**

*Manufactured by*

**Gulfstream Services, Inc.**

**Houma, Louisiana - USA**

*is found to comply with*

DNV's Offshore Standard DNV-OS-E101 "Drilling Plant" October 2006

*Application*

See design limitations on page 2

*Place and date*

Houston, 30 September 2008

for DET NORSKE VERITAS (USA) INC.

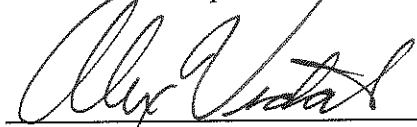
  
Brandon Caraway  
Senior Engineer



Local Office  
DNV Houston

*This Certificate is valid until*

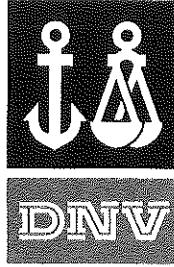
30 September 2012



Alexander Vidal  
Project Engineer

**Notice: This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.**

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million. In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.



Cert. No.: D-3331  
File No.: 523.50  
Job ID No.: 262.1-005767-1  
DNV Project No.: 47000887

## Product description

NC50 (4 1/2" IF) Ball Dart Head Assembly  
6 5/8" FH Ball Dart Head Assembly

## Application/Limitation

	4 1/2"	6-5/8"
- Max. Working Pressure	: 10,000 psi	10,000 psi
- Max. Working Tensile Strength	: 1,000,000 lbs	2,000,000 lbs
- Torsional Yield	: 53,926 ft/lbs	89,000 ft/lbs
- Service	:	Standard

## Type Approval documentation

Drawings:

### 4 1/2" Ball Dart Head

<u>Drawing No.</u>	<u>Rev.</u>	<u>Description</u>
BDH-10-7-1	A	Top Sub (2 Sheets)
BDH-10-7-2	A	Ball Barrel (2 Sheets)
BDH-10-7-3	A	Dart Barrel (2 Sheets)
BDH-10-7-4	A	Bottom Sub (5 Sheets)
4.5-BSB-1	A	Bushing
4.5-IFR-1	A	Bypass Restrictor
4.5-OBOC-1	A	Ball Actuator
4.5-OBLS-1	A	Brake Actuator
4.5-FDP	A	Flow Deflector
4.5-BDS-4	A	Lower Sleeve
4.5-BDS-3	A	Ball Sleeve
4.5-DDS-2	A	Dart Sleeve
4.5-OB-7	A	Ball

### 6-5/8" Ball Dart Head

<u>Drawing No.</u>	<u>Rev.</u>	<u>Description</u>
BDH-13-10-1	A	Top Sub (2 Sheets)
BDH-13-10-2	A	Ball Barrel (2 Sheets)
BDH-13-10-3	A	Dart Barrel (2 Sheets)
BDH-13-10-4	A	Bottom Sub with Indicator (5 Sheets)



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#### Material Specifications:

Materials for load bearing components are as specified in the above drawings.

#### Calculations:

- "*Mechanical Design Review & Analysis of NC50 (4 1/2 IF) Ball Dart Head Assembly*", Doc No. THHA E3-0550, prepared by Grant Pettit, dated February 6, 2008.
- "*Mechanical Design Review & Analysis of 6-5/8 FH Ball Dart Head Assembly*", Doc No. THHA E3-0544, prepared by Grant Pettit, dated February 6, 2008.

#### Fabrication Procedures

Procedures related to testing, welding, NDT, etc are to be reviewed/approved by DNV's local surveyor

#### Tests carried out

The Ball/Dart Assembly was tested by Stress Engineering Services, Inc. per GSI PO2068, dated January 23, 2008. Proof Tested to 3,000,000 lbs, (5 minute hold at Max Load).

The Ball/Dart Head Assembly 6-2-G was tested by Stress Engineering Services, Inc. per GSI PN118227, dated June 19, 2008. Proof tested to 3,000,000 lbs, (5 minute hold at Max Load)

The Ball/Dart Head Assembly 4-1-A was tested by Stress Engineering Services, Inc. per GSI PN118227, dated June 19, 2008. Proof tested to 1,500,000 lbs, (5 minute hold at Max Load)

#### Marking of product

For traceability to this Type Approval Certificate the products are as a minimum to be marked as follows:

1. "NV D-3331"
2. Serial Number
3. Manufacturer's name and trademark
4. Safe Operating Loads

#### Certificate retention survey

The arrangement is to be in accordance with Certification Notes No. 1.2, dated December 1996, paragraph 4.3.



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**Documentation to be accompanied with each product/delivery**

1. Data book index
2. Equipment name, number, purchaser, etc.
3. Manufacturer's statement of compliance
4. Assembly drawing
5. Actual material certificates as purchased and Charpy impact test records as applicable
6. Heat treatment records/charts when applicable
7. Load, pressure and performance test reports
8. DNV Product Certificate
9. DNV Type Approval Certificate

END OF CERTIFICATE

