

**G2593R3**

**SPECIAL HANDLING  
PROCEDURE  
of  
Sumitomo's High Alloy Materials  
With  
VAM Connection**

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**May, 2006**

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## General

This manual describes the special procedures to be followed for handling, running and storage of Sumitomo's Alloy and Special High Alloy Materials; **13CR, SM13CRS, SM13CRM, SM13CRI, SM22CR, SM25CRW and higher Cr-Ni alloy** for corrosive well.

The following four points are essential for proper care and use of these materials:

1. The material must be handled at every point in accordance with the procedures in this manual whether in transit from the mill to the field, or at storage facilities, threading shop, etc.
2. Since *these alloy materials are highly susceptible to galling on thread and seal* when making-up/breakout, the running procedure in this manual must be followed to prevent galling during stabbing and running.
3. Special procedures in this manual should be also be used *to maintain anti-corrosion properties of materials and sufficient leak-tightness of connection* in order to ensure reusability of materials.
4. When running these alloy materials, be sure to follow the basic recommendations in *API RP5C1*.

## General information of 13CR, SM13CRS, SM13CRM, SM13CRI and CRA materials

### 13CR

13Cr stainless steel material (AISI 420 and similar, 0.18%C-13%Cr) has good corrosion resistance in CO<sub>2</sub> environments. However, it is well known that 13Cr steel is high susceptible to sulfide stress cracking (SSC) in the CO<sub>2</sub> environment with a small amount of H<sub>2</sub>S, and also to pitting corrosion in the humid environment in air by Chloride ion (Cl<sup>-</sup>). 13Cr steel also has high sensibility of galling during make up connection.

### SM13CRS, SM13CRM and SM13CRI (Super 13Cr-Martensitic Stainless Steel)

*SM13CRS, SM13CRM and SM13CRI have been developed as higher resistance materials to pitting corrosion by chloride ion than conventional 13Cr stainless steel. SM13CRS and SM13CRM have also higher resistance to SSC than 13Cr stainless steel. However, SM13CRS and SM13CRM have higher level of sensitivity to galling on seal and thread than 13Cr stainless steel.*

### SM22CR, SM25CRW and Higher Cr-Ni Alloys (CRA Stainless Steel)

Duplex stainless steel (SM22CR and SM25CRW) and higher Cr-Ni alloys have been developed as higher corrosion resistance materials to SCC and pitting corrosion by chloride ion in hostile environment with H<sub>2</sub>S. However, SM22CR, SM25CRW and higher Cr-Ni alloys have higher level of sensitivity to galling on seal and thread than SM13CRS, SM13CRM and SM13CRI.

## I. Transportation, Handling and Storage

### General

*In order to retain the material's special properties to corrosive environments, it is very important to handle these materials properly.* The requirements and recommendations in this procedure should be adhered to at all times and in any place, to ensure that the optimum properties and service life are attained.

#### I – 1. **Transportation**

- 1) The pipe should be transported to storage location or well-site in special package system or equivalent *to prevent damage or spot hardening on pipe body during transportation.*
  - *Never use steel band or wire directly on these materials*  
Use textile or nylon slings or equivalent
  - *Never use metal protector to these materials*  
Use plastic or composite protector, or epoxy coated steel protector
- 2) Pipes in special package should be transported on flat bed with good support
  - *Pipes will be packed in spacer ring type packing system or commercially available RAP frame system*
  - Do not let box ends hang over or spring
- 3) It is recommended that proper supervising should be provided at the time of loading and unloading

#### I – 2. **Handling**

These alloy materials shall be handled with more care than usual as they can be severely damaged by mishandling. *It should be noticed that this damage might not be apparent until a failure such as SCC occurs in service.*

- 1) *Prevention of Iron Contamination*  
*Use of unpadded hooks, chains or rails is prohibited, and contact between pipes and carbon steel shall be avoided, in order to keep anti-corrosion properties of materials.*
- 2) *Prevention of Spot Hardening*  
Stress concentration which is a big factor of SSCC / SCC is induced by spot hardening on pipe. Therefore, materials shall be protected from partial damages such as drop, jaw, clash, hammering, etc. To prevent such damages, it is recommended that materials should be remained in the packing system in place until just before running.
- 3) *The following precautions* should be taken in handling pipe during unloading and inspection :
  1. Before unloading, make sure that the boxes and protectors should be visually inspected for transporting damage. To prevent bending, it is recommended to use tension bar attached with nylon sling when lifting up long pipe.
  2. The handling of pipes should be done in small quantities: 3 or 4 pipes maximum and set on racks protected with hard wooden material.
  3. Do not drop pipe down onto racks in unloading. The pipes should be handled carefully with lifting only one joint at a time and set on racks with proper supports.
  4. Avoid rough handling, which may produce damages on pipe and boxes. The out-of-roundness caused by crash will reduce collapse resistance remarkably. Therefore, it is recommended that the damaged package boxes or crates shall be separated for additional inspection, and then be opened and checked damages on pipe.

### I – 3. Storage

- 1) The following precautions should be taken in storage after removal from wooden crates or similar packing:
  1. **Never unload pipe directly onto ground, steel rail or bar, or concrete floors.**  
To keep moisture and dirt away from pipe, the first tier of pipes should be stored in **sufficient height (at least 18 inches) from the ground.**
  2. **Do not pile the pipes directly on wooden stringers or strips fumigated by fumigant containing chlorine or bromide.**
  3. Pipe should be rest on skid properly spaced to prevent bending of pipe or damages on threads.
  4. Stagger adjoining pipes with a little more than coupling length.
  5. **Block the pipes by nailing 1 by 2 or 2 by 2 blocks at both ends of the spacer.**
  6. Keep the pipes well away from all chemical agents.
  7. To keep the pipe away from **chloride ion in order to prevent pitting corrosion** in storage, **protect the pipes against the marine environments particularly sea spray or sea sand.**  
**Pipes should be stored in a covered place or in house.**  
*If not, all the pipes shall be covered with sheets which prevent water contact through storage.*
  8. **If the pipes are stored on outside racks, the separator shall be made of hard wood to avoid water build-up, and place a wedge near the box to create a slope (2%) to avoid the accumulation of water inside the pipes.**
  9. Pipes should be stored separately from the other pipe in order **to prevent pollution (iron contamination) from carbon steel.**  
It is recommended that the pipes be kept in original packing system as long as possible.
- 2) Pipes shall be cleaned by fresh water after pulling out from the well and be kept dry to prevent rust or corrosion during storage at well site.
- 3) It is recommended to apply anti-corrosion storage compound if the pipes are not run immediately.
- 4) **Pipes in storage should be inspected periodically (monthly interval is recommended)** and protective coating on pipe should be applied when necessary to arrest corrosion.

### I – 4. Special Caution

These special alloy materials are manufactured under well-controlled heat treatment for improvement of anti-corrosion properties. Rough or improper handling will easily result in the extreme reduction of material's good properties.

Due to the sensitivity to improper handling and care, it is essential that customers carefully follow the precautions listed below :

1. **Never use direct-flame heating or welding to the materials for any reason.**
2. **Avoid partial deformation by straightening.**
3. **Avoid cold-notch by improper power tong.**
4. **Never apply hammering on pipe**
5. **Avoid excess compression of deformation of pipe by slip**

**Corrosion on these materials can be influenced by well condition, packer and completion fluid, acidizing media, and the materials connecting to these special alloy. It will be formed in another type such as galvanic corrosion, bimetallic corrosion, crevice corrosion, etc. Therefore, it is recommended to investigate the occurrence of such a kind of corrosion before completion of well string. If you have any doubt or anxiety in your completion, please consult us.**

## II. Running of VAM Connection on SM Alloy and Special High Alloy

The procedures described below must be followed basically in addition to the special procedure in this manual:

- 1) Thread and thread protectors must be absolutely clean, free of grit, nicks, or any other debris or iron powder from magnetic particle inspection
- 2) Avoid damage by leaving protectors in place during handling
- 3) **Only clean and fresh API Modified thread compound complying with API Bul 5A2/5A3 should be used.**  
Apply evenly and completely to both pin and box thread and seal areas.  
Use soft bristle brush for applying dope. **Never use any type of metal brush.**
- 4) Prior to running or pulling out, ensure that the derrick and rig table are properly aligned.
- 5) Stab vertically in line and **make up to hand-tight position by hand or pipe wrench (strap wrench).**
- 6) **Use the recommended torque value when making-up.**
- 7) Be sure torque gauge accuracy. Do not use PSI gauge for determination of torque.

### II – 1. Preparation before Running

#### 1. Preparation of Equipment and Materials

- 1) Handling
  - **Use nylon sling for picking** up or lifting the materials **just** after unpacking
  - Do not lie directly on the ground, on rails, on steel material, or on a concrete floor.  
**Pipes should be rested on wooden or plastic dunnage.**  
**Do not use wooden material treated with chlorine or bromide.**
  - **Use Pickup / Lay-down machines or equivalent technique to lift up the joint to rig floor.**
- 2) Elevators and Slips
  - **Slip type elevator should be used**
    - Longer slip body to distribute the load of string over wider area.
    - Fine tooth and curved face slip inserts to reduce sharp tooth marks.
    - Longer slip body to distribute the load of string over wider area.
    - Inside diameter of gripping surfaces shall match with pipe O.D. uniformity
- 3) Power Tong and Back-up Tong
  - The power tong shall be suitable for the job in hand. Torque capability should be about 1.5 times more than the optimum torque, not too much or too low.  
**Do not use drill pipe tong or rig tong for making-up or breakout.**
  - Use wider and longer tong dies with fine roundish teeth that could cover evenly circumference of pipe.  
Do not use sharp and deep teeth for tong dies
  - Use the power tong equipped with an accurate torque gauge and monitoring system with the following functions :
    - **Load cell with electronic strain gauge**
    - **Hydraulic dump valve system activated automatically, when the optimum torque is achieved**
    - **Monitoring system that graphically displays the torque-building curve of torque versus turn.**
  - It is recommended that, to minimize potential problem in connection running, the **special running crew** through service company be appointed.

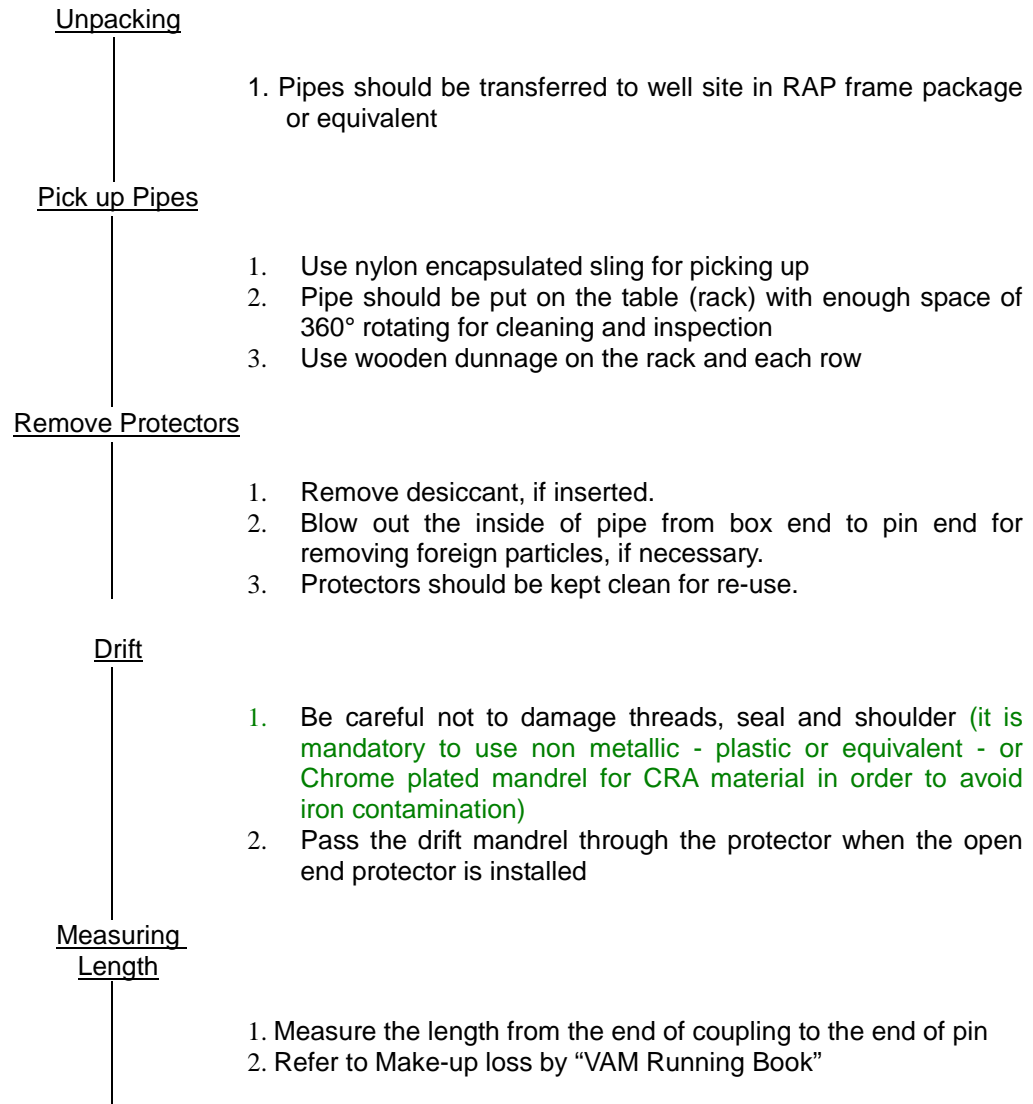
- 4) **Stabbing Guide**
  - **Stabbing guide shall be used when running these special materials.**
  
- 5) **Thread Compound**
  - **Use clean API Modified Thread Compound**
  - Do not use any type of compound containing teflon powder.
  - Never thin nor mix the compound for any reason.
  
- 6) Cleaning materials
  - **Clean thread and seal area completely using steam, jet water or proper solvents such as kerosene to be more volatile just prior to running.**

Do not use oily solvent such as gasoline or diesel.

  - Use rags or bristle brush when cleaning.
  - Air blowing is available to blow off dust or debris.

## 2. Preparation Procedure of Pipes

Details of preparation procedure before running are as follows :



Clean Thread

1. Clean thoroughly pin and box thread and protectors
  - Use steam, fresh water or solvents
  - Do not use oil or wire brush for cleaning
2. Dry thread and seal, and protectors by compressed air

Inspection

1. Check thread, seal and shoulder visually
2. Minor thread damage can be field repaired by qualified personnel. No repair of any kind is allowed on the seal area.

Apply Thread  
Dope

1. Stir the dope sufficiently before use
2. Apply API Modified Thread Compound on pin and box uniformly using soft bristle brush

Install Protector

1. Install clean and proper thread protector

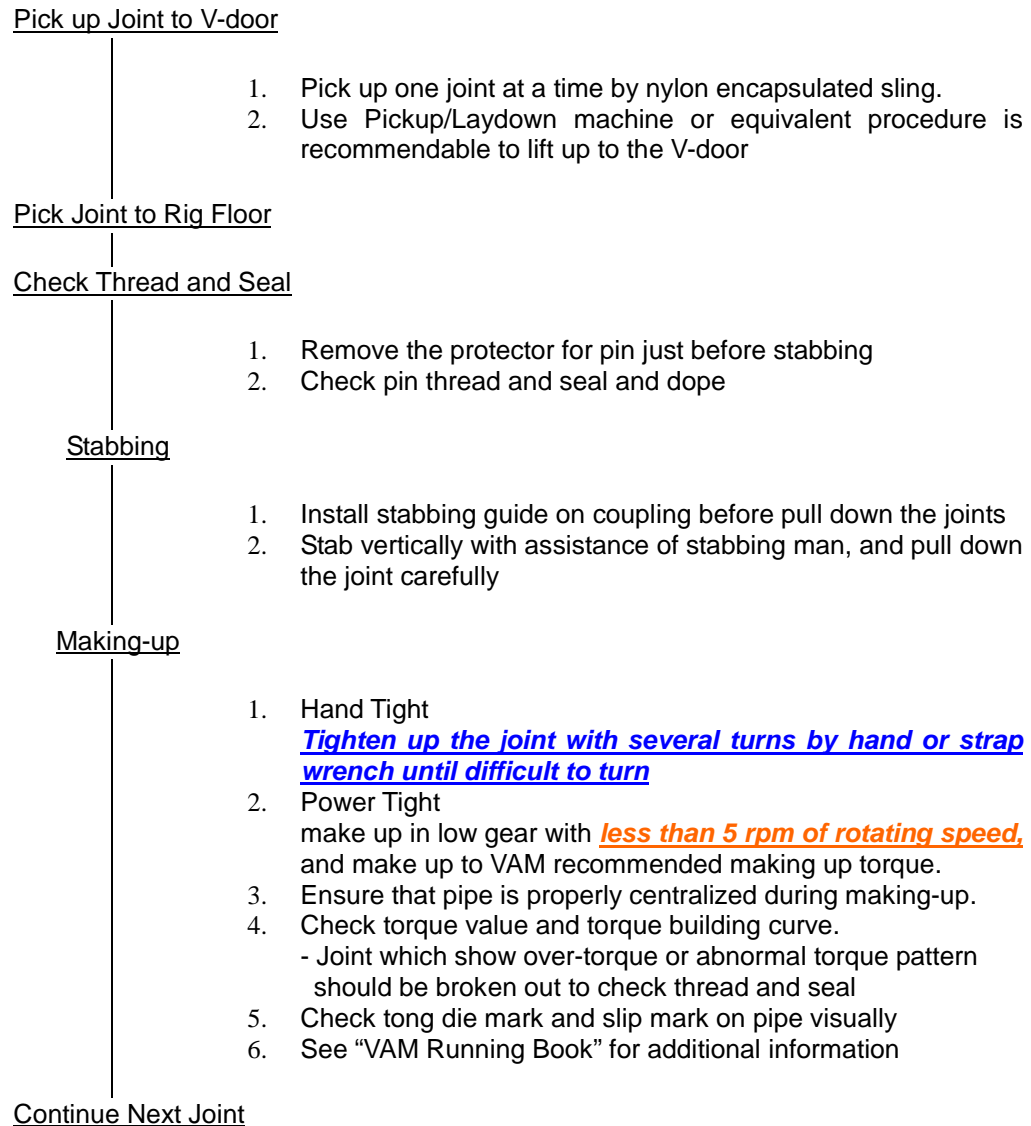
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**3. Preparation of Accessories**

- To ensure sealing in connection throughout the string, all accessories such as hangers, safety valves, flow couplings, pup joints and crossovers should be made up by power tong, and conduct pressure test in advance at stock yard.
- Wrench tight or use rig tong should be avoided.

## II – 2. Running Procedure

Details of VAM running procedure for these materials are as follows:



## II – 3. Breaking-out Procedure

### Break-out

1. Set the back-up tong on the coupling
2. Break out carefully with low gear for first two turns  
- *Rotating speed should be kept less than 2 RPM*
3. At final breakout stage, rotate by strap wrench or chain tong. Do not use power tong to the last stage.
4. Ensure that the stabbing board man keep pipe properly centralized during breaking-out
5. Install stabbing guide before lifting pin end up from box. Lift pipe carefully and slowly to avoid damage in pin seal area.

### Cleaning

1. Wash pipe internally and externally by fresh water
2. Dry out pipe by compressed air
3. Check thread and pipe body internally and externally
4. Apply thread dope or storage compound on pin and box thread completely

### Install Thread Protector

1. Install clean thread protector

### Lay Down/ Stand Back

1. Stand back pipe on wooden matting

## **III Recommendable Brine for 13CR, 13CRS, 13CRM, Duplex stainless and CRA steel**

	*1	C-steel	13Cr	13CRS, 13CRM	22Cr(Duplex s.s.)		CR-Ni
	PH	Corrosion *2	Corrosion *3	SCC *5	Pitting *4	SCC *5	
<b>NaCl</b>	△	△	○	○	△	○	○
CaCl <sub>2</sub>	○	△	△	×	×	×	○
MgCl <sub>2</sub>	×	○	△	×	×	○	○
ZnCl <sub>2</sub>	×	×	×	×	○	○	○
<b>NaBr</b>	○	○	○	○	△	—	○
<b>CaBr<sub>2</sub></b>	○	△	△	○	△	○	○
MgBr <sub>2</sub>	△	△	△	—	△	—	○
ZnBr <sub>2</sub>	×	×	×	—	○	○	○

\*1) In 60°C

(1g/m<sup>2</sup>/h=1.1mm/year)

0.1MPaCO<sub>2</sub>

○ : pH<sub>≥</sub>4

△ : 3<pH<4

×

\*2.3) Autoclave test 150°C、0.4MPaCO<sub>2</sub>

\*2)

○ : C.R.≤1g/m<sup>2</sup>/h

△ : 1<C.R.≤10

×

\*3)

○ : C.R.≤0.1

△ : 0.1<C.R.≤1.0

×

\*4) Pitting potential

○ : V<sub>p</sub>≥0.3V

△ : 0<V<sub>p</sub><0.3

×

\*5)

○ : Crack Free

×

Brine with a corrosion inhibitor, a biocide, and an oxygen scavenger added is acceptable as a completion fluid but careful investigation is required at selection brine and additives as a packer fluid.

An oil base solids free packer fluid is recommended, either diesel oil with a corrosion inhibitor additive or one of the proprietary oil base packer (Drilling) fluids.