SPECIFICATION

AK PROCESS PROJECT No:	51202280
PLANT:	ASIAN PILLAR PROJECT
CLIENT:	DOW CORNING
LOCATION:	ZHANGJIAGANG, JIANGSU PROVINCE, PR CHINA
DOCUMENT TITLE:	SPECIFICATION FOR ERECTION OF METALLIC PIPEWORK
DOCUMENT No:	0136-OBJ-100014013
ITEM No:	N/A No OFF: N/A

Area No.	Building No.	Process ID	DC Disp. Code	AK Disp. Code	AK Doc Type
95	N/A	N/A	ME	9144	SPC

ISSUE:	0	1	T0	T1	
QUALITY LEV.:	S3	S5	SD	SD	
DATE:	28/04/06	18/05/06	31/Aug/07	08/Jan/08	
PURPOSE:	FOR CLIENT APPROVAL	FOR DESIGN	FOR DESIGN	FOR DESIGN	
PREPARED BY:	P. MARRIOTT	P. MARRIOTT	Y.K.Kim/Kitamura	H.Miyoshi	
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CLIENT APPROVED BY:		A. THOMAS			

T1	Update as per DC comment
T0	Update of Phase-1 feedback report
1	Issued for Design
0	Client review and comment
ISSUE	ALTERATION

AK Process
One Port Way
Port Solent
Portsmouth PO6 4TZ
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AK Process

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Appendix A Piping Connections to Mechanical Equipment and In-Line Components

1. GENERAL

1.1 Objective

The objective of this specification is to define the acceptable standards for the erection of metallic pipework for the Dow Corning Asian Pillar Project at Zhangjiagang and to illustrate the relevant technical documents forming the contract.

The project strategy is to maximise finished painting of all pipework prior to erection.

1.2 Definitions

Where used in this Specification, the following terms will have these definitions:

1.2.1 Contractor

The organisation responsible for the erection of all pipework and other items covered under Sections 2 and 4 of this document.

1.2.2 Client

Dow Corning Limited.

2. SCOPE

The Contractor shall be responsible for the erection of all carbon steel, alloy steel, stainless steel, exotic alloy and lined pipe systems including pipe supports, in accordance with the documents and special requirements listed herein.

3. APPLICATION OF STANDARDS

The erection of pipework shall be in accordance with this and the other specifications listed herein and with the requirements of the ASME code for pressure piping, B31.3 2004. Where differences exist between any of these codes and specifications, the more stringent requirements shall govern.

4. PIPING MATERIALS

Metallic piping materials in random lengths of pipe, fittings, valves, bolts, gaskets and special items will be supplied "free-issue" to the Contractor from the appointed Dow Corning Engineers' Stores at or before the time required to comply with the construction programme.

Lined pipe for on-site erection will be supplied "free-issue" in fabricated flanged spool pieces and fittings.

FRP will be supplied and installed by a nominated supplier.

5. RESPONSIBILITIES OF CONTRACTOR

5.1 The Contractor shall be responsible for the erection of all metallic and lined pipe systems including pipe supports, in accordance with the documents and special requirements listed herein.

5.2 **The Contractor shall not take any decision that could jeopardise the plants design integrity and special attention is drawn to any line (as indicated in the Line List) or isometric drawing highlighted as "Stress Critical". Under no circumstances are these lines to be modified without prior agreement of the Dow Corning appointed Engineer.**

5.3 To ensure no error occurs in the selection of materials for fabrication and erection, it is the Contractor's responsibility to identify and segregate all materials. The Contractor shall establish an efficient material control procedure and demonstrate the same to the satisfaction of the Dow Corning appointed Engineer.

5.4 No piping spools shall be despatched from any off-site fabrication shop to the site without prior agreement of the Dow Corning appointed Engineer.

5.5 It shall be the responsibility of the Contractor in all cases to ensure that:

a) the fabrication and erection of all sizes of pipework is accurate within the required general tolerances (see 0136-OBJ-100014012)

and

b) the field welds in all planes, including those at loose flanges are provided to ensure correct positioning at fixed points on pipe racks and at connections to equipment items

and

account has been taken of the effects of fabrication and construction tolerances and variations which may occur

The Contractor shall demonstrate to the Dow Corning appointed Engineer, at any time, that he has made these allowances. It is the Contractor's responsibility to establish the number of configurations and length of individual spools to make-up the isometrics, taking into account any erection difficulties of threading pipe spools through erected pipework or steelwork and any limits on road transportation sizes.

5.6 **Isometrics are provided for all lines within the Dow Corning appointed Engineer's scope, including small bore piping (40 NPS and smaller). The Contractor shall be responsible for allowing sufficient field welds and for verifying the route, configuration and dimensions of pipes before erection proceeds.**

5.7 Except where cold springing is specified on the piping drawings, all piping shall be installed in place without springing or forcing and the Contractor must be able to demonstrate this to the Dow Corning appointed Engineer by breaking joints. This particularly applies to equipment connections, pumps, bellows-type expansion joints, bursting disc assemblies and other sensitive equipment/components.

5.8 Slopes on piping shall be as indicated on the piping isometric drawings.

5.9 The Contractor shall ensure that all the Dow Corning appointed Engineer's and Vendor's requirements of the specific installation instruction for valves, expansion joints and other specialist in-line items are met.

5.10 In particular, valves subjected to heat during installation shall have internal parts which could be damaged by heat, removed prior to welding. The Manufacturer's installation instructions should be checked for details of this requirement and will be advised by the Dow Corning appointed Engineer.

5.11 The sequence, programme and methods of pressure testing shall be submitted by the Contractor at an early stage of erection for the approval of the Dow Corning appointed Engineer. The installation of test blinds at equipment shall be accomplished during pipe erection in accordance with the hydrostatic test plan. The project strategy is to maximise pressure testing of prefabricated spools off-site prior to delivery to the job site. Vent and drain points have been provided in the piping design where necessary.

5.12 Hoses shall be installed prior to pressure testing.

5.13 Temporary suction strainers in certain cases supplied by Dow Corning shall be installed at pumps and compressors as indicate on the piping isometrics.

5.14 Completed spool assemblies which have been inspected, accepted and identified as such shall be forwarded to the site lay-down area. The organisation of this lay-down area shall be agreed with the Dow Corning appointed Engineer.

5.15 The Contractor shall visually examine spools to ensure debris has not remained inside pipes or assemblies, prior to installing the spools.

5.16 The Contractor shall coat all exposed gate and globe valve stem threads with Molykote HSC Plus at the time of installation.

5.17 Method Statement/Risk Analysis and/or Lifting Study shall be prepared by the Contractor and shall be submitted to the Dow Corning appointed Engineer for approval prior to commencing any lifts associated with the unloading or erection of pipe spools, or components which exceed the allowed manual handling maximum weight.

6. ASSEMBLY OF PIPEWORK

6.1 Flange Joints

The Contractor shall be responsible for the proper assembly of flanged joints and shall pay due attention to the following paragraphs:

- The flange faces shall be cleaned free of all dirt, corrosion, grease and protective coatings and shall be inspected for defects such as scratches or dents prior to installation.
- The flanges shall be properly aligned prior to the insertion of gaskets and bolts to avoid undue stresses or uneven gasket loads.
- Bolts should be thoroughly lubricated with Molykote HSC Plus or equal prior to torque loading.
- Stud bolts shall be tightened by means of proper bolt tightening devices (Calibrated Torque wrench, etc.) to ensure that the correct bolt stress is obtained.
- Flange studbolts shall extend fully through their nuts and with equal

lengths showing on each side. The lengths of studbolts are in accordance with Document 0136-OBJ-100210012 'ZJG Joint Gasket / Bolt Specification for Pipework'.

- The length of studbolts has been calculated to provide the correct number of threads protruding beyond the nut face.
- The use of washers or spacers to take up excess bolt length is not permitted.
- Gaskets must not be re-used after they have torqued.
- Particular care should be taken when assembling and tightening joints which employ Rotabolts. Bolt torquing shall be undertaken in accordance with the Rotabolt manufacturer's instructions. Correct torquing shall be verified by the DC appointed Contractor.

Particular attention shall be paid to glass-lined, tantalum lined, GRP and brick lined vessel nozzles. No strain or jacking shall be applied to the mating pipework.

Final alignment checks will be carried out in the presence of the Dow Corning appointed Engineer for all lines connecting to equipment, expansion joints and relief valve and bursting disc assemblies. 'J' bolts must be installed correctly when supplied with bursting disc assemblies.

Flange protection shall be kept on lined pipe and fittings and all flanged connections to pumps, compressors and similar equipment, until ready to connect the piping. Flange facings must not be damaged as a result of removing flange protection.

All flange faces must be protected during transportation and installation.

The bolt tightening operation shall be carried out in accordance with the EMTN 15.061.006. Grease or gasket compound shall not be used on gasket or flange faces.

The Contractor shall not assemble any joint not covered by EMTN 15.061.006 without ascertaining the recommended installation procedures and bolt torques.

6.2 Screwed Pipework

Pipe ends shall be cut square, threaded and reamed, all cuttings both internal and external shall be cleaned from the surfaces.

Threads shall be concentric with the outside of the pipe and shall be as stated on the pipe and valve specification.

Joints shall be assembled using a suitable Loctite thread sealant which shall only be applied to the male thread. The use of PTFE tape is not permitted.

Prior to assembly, the Contractor shall ensure that all threaded connections, both male and female, shall be protected from damage.

Where seal welds are specified no sealant or thread compounds shall be used and all cutting fluids shall be removed prior to the joint being made. Seal welds shall cover all exposed threads.

Where threaded couplings, thredolets, or nipples are welded onto pipe spools, the thread must be checked for fit and roundness after welding, using a thread gauge. If the thread is found to be unacceptable it shall be chased with a tap or die.

7. PIPE SUPPORTS

7.1 General

The Contractor shall quantify and supply materials, fabricate and erect all pipe supports required in the plant in accordance with the standards and drawings specified herein. Pipe materials used for pipe supports, e.g. duck foot supports etc. for stainless and galvanised piping, will be free issued for fabrication to the Contractor as part of the overall piping quantities.

It is recommended that pipework be erected on permanent supports especially where temporary supports are unsuitable due to height or loading.

The Contractor is also responsible for accurate installation, taking into account construction tolerances.

Variations to the Dow Corning appointed Engineer's Standards and Specification may be allowed provided the Contractor is able to demonstrate economical and functional advantages and also that the overall design is not compromised.

If by exception, "Site Support" of pipes smaller than 40 NPS is required, then pipes shall not be supported from other pipes without the prior agreement of the Dow Corning appointed Engineer.

Welding of unauthorised attachments (clamps, lugs, erection aids) to any pipe is prohibited.

Lined pipe shall only have welding carried out at the Supplier's premises before lining takes place.

Pipe spools shall be permanently attached (i.e. bolted or welded) to mechanical equipment only after the equipment has been grouted and permanent pipe-hangers and supports have been installed to accept the entire pipe load.

7.2 Support Location Adjustment

When Fabricating and Erecting Pipe Supports the Contractor shall make allowance for site variations by:-

a) Shimming up.
b) Cutting the support to suit and welding.

7.3 Spring Support Units

Spring supports, including fixing nuts & bolts will be supplied free issue for installation by the Contractor.

The Spring Units shall be unlocked upon completion of spring unit installation, pipe pressure and leak testing and, if required, insulation installation. The "Cold Pre-setting Pins" or plates can easily be removed when the spring is adjusted so that the cold load and actual acting load are balanced. Adjustment is achieved by turning the rod turn-buckle on the hanger type units and the hexagon nuts on pedestal type units. The "Cold Pre-setting Pins" must not be hammered or shocked free.

The "Cold Pre-setting Pins" shall be removed from all spring units in the presence of the Dow Corning appointed Engineer before plant start-up. Loose-type pins shall be greased and wired to the unit for future use.

In the event that piping requires to be dismantled the spring unit shall be re-locked prior to the commencement of the work.

N.B. Close attention shall be paid to the spring Manufacturer' installation

instruction leaflets prior to work commencement.

7.4 Temporary Supports

The Contractor shall be responsible for the design and erection of any temporary pipe supports for all sizes of pipework to ensure that damage by distortion is avoided.

NOTE: All temporary supports must be removed on completion of erection and prior to any in-situ pressure test or commissioning.

7.5 Related Document for pipe support

a) 0136-STD-100112001 Design Instruction for Pipe Support.

b) 0136-STD-100112002 Pipe Support Standard.

8. TEMPORARY SPOOLS

For the purpose of Cleaning and Pressure Testing the Contractor shall supply a sufficient number of temporary spool pieces in place of the expansion joints, in-line instruments, bursting disc assemblies (carrier) and similar equipment to enable pipework completion and prevent mechanical damage. These spool pieces shall be manufactured to the following tolerances:-

Linear tolerances = $\pm$ 1.0 mm
Flange alignment/orientation = shall not exceed 1.0 mm
Flange alignment/squareness = shall not exceed 0.5 mm across diameter.

The temporary spool pieces must be tagged to identify the piece of equipment which the spool has replaced.

The Contractor shall demonstrate by unbolting flanges that the expansion joints are correctly aligned. Refer to 5.7.

9. LINED PIPE

For details of erection and installation requirements for Fluoropolymer lined piping systems refer to EMTN 15.061.152.

10. DOCUMENTATION

Fabrication and erection of pipework shall be in accordance with the

documents listed in the attached Schedule of Documents.

The Contractor's attention is drawn to the following:-

10.1 Piping General Arrangement Drawings

When computer drawing Piping General Arrangements (only applicable to Area 48) and section drawings are provided these will show sufficient dimension for erection purposes only.

Any additional Piping Arrangement Drawings (Area 48 only) which are provided will show sufficient dimensions to enable the DC appointed Engineer to produce Isometrics and for erection purposes.

10.2 Isometric Drawings

Isometric drawings are provided for both large and small bore piping, including pipe tracks and vessel trims.

10.3 Piping Material Specifications and Material Summaries

The Dow Corning piping and valve specifications defining materials of construction and pressure ratings for specific services will be provided by the Dow Corning appointed Engineer.

Piping Materials summaries are provided for all piping materials excluding pipe supports which are in general the Contractor's responsibility to quantify and supply.

Special Piping Items (DI's) not included in the standard piping and valve specifications are listed in the Design Item List and cross referenced in the SPP index.

10.4 Identification and Selection of Pipe Supports

All pipe supports, guides and anchors are indicated on Isometric Drawings for all areas. Area 48 Piperacks will have pipe supports on PGAs **T1**

Special Pipe Supports, i.e. those supports outside the scope of the standard range of supports are detailed where necessary and the requirement locations shown on the drawings.

10.5 The Contractor's Senior Site Supervisor, together with the DC appointed Engineer's representatives from Design and Construction, shall attend the DC appointed Engineer's design office for a review and discussion of the design concepts and documentation before Fabrication and Erection commences.

10.6 Schedule of Documents

Pipe and Valve Specs	Various EMTN nos.
Spec for Fabrication, Testing & Inspection Of Carbon Steel LTCS and Stainless Steel Pipework	0136-OBJ-100014012
Spec for Pressure Testing Pipelines	EMTN 15.061.061
Spec for the Welding of Pipe & Fittings	0136-OBJ-100014011
Specification for Pipe Support Installation & Fabrication	HOLD
Specification for Steam Trapping & Arrangements	0136-OBJ-100014009
Specification for Expansion Joints	0136-OBJ-100012203
Specification for Process & Utility Stations & Hoses	EMTN 15.061.160
Joint Gasket/Bolt Specification	EMTN 15.061.006
Project Pipe Support Standards	HOLD
Special Pipe Support Drawings	By Area
Document Register	By Area
Line Schedules	By Area
Piping Speciality (DI) List	By Area
Index & Specification – Piping Specials	By Area
Isometric Index (incl Vessel Trims)	By Area

Special Pipe Support Drawings Index	By Area
Spring Support Schedule	By Area
Pipe Support Schedule	By Area
Bellows Schedule	By Area
Hot Oil Tracing Schedule	By Area
Specification for Heat Tracing Systems	EMTN 07.061.009
Management of High Integrity Vessels, Heat Exchangers, Piping & In-Line Piping Components	EMTN 00.061.008

APPENDIX A

PIPING CONNECTIONS TO MECHANICAL EQUIPMENT AND IN-LINE COMPONENTS

All pipe connections to machinery or equipment shall be inspected and approved by the Dow Corning appointed Engineers prior to final bolting up in order to witness that no excessive nozzle loads are exerted by poorly fitted pipework. A records of this witness check shall be made and kept for inspection.

Points to be considered:-

- Flange faces must be parallel.
- Where 0 mm cold spring is specified the bolts must pass freely by hand through the hole with the exception of Tongue and Groove where the gasket seating face is to be aligned.

For smaller sizes (<2") if the pipe can be pulled by hand back into alignment the bolts should then pass freely through the holes.

The allowable cold spring for pipework connected to pipework is as per the following table:

Equipment Type	Connecting Line Size	Allowable Cold Spring (in each of three planes X, Y, Z)
Glassed lined vessel/column	<2"	0 mm
GRP Vessels	<2"	0 mm
Carbon, alloy steel vessels/column/exchangers	<2"	3.0 mm
Carbon, alloy steel vessels/column/exchangers	2" to 6" inc.	2.5 mm
Carbon, alloy steel vessels/column/exchangers	>6"	1.5 mm
Plastic Tanks	All Sizes	0 mm
Carbon Block Exchangers	All Sizes	0 mm
Rotating equipment (inc pumps)	<2"	2.0 mm
Rotating equipment (inc pumps)	2" to 6" inc	1.0 mm
Rotating equipment (inc pumps)	> 6"	0 mm
Plastic Pumps	All Sizes	0 mm
TSV's and other actuated valves fitted directly on equipment nozzles	<2"	Allowable as specified for equipment type
TSV's and other actuated valves fitted directly on equipment nozzles	2" to 6" inc.	Allowable as specified for equipment type
TSV's and other actuated valves fitted directly on equipment nozzles	> 6"	Allowable as specified for equipment type
In line actuated and control valves	<2"	3.0 mm
In line actuated and control valves	2" to 6" inc.	2.5 mm
In line actuated and control valves	>6"	1.5mm
Relief valve/bursting disk	All Sizes	0 mm