

Checklist	Remarks	Action (X)	
<p style="text-align: center;">Project System Audit Piping Design</p> <p>Note: Not all items of the checklist shall be checked. It depends on the status of the work and whether it is the first, second or third audit.</p> <p>⊗ = EH&S related question.</p> <p>1. Project Definition</p> <p>1.1 Is the Project Procedure and Execution Manual (PPEM) available? What is the status, issue and date?</p> <p>1.2 Does the PPEM properly describe the scope of work and services expected from your discipline to execute the work?</p> <p>1.3 Are the applicable governmental, local authorities design codes/norms/rules/standards design guides listed in the PPEM and available in the discipline group?</p> <p>1.4 Are Company/client, standards/norms/ guides/practices/procedures/forms and specifications applicable and to be used by the piping design group listed in the PPEM and available in the group</p> <p>1.5 Are specific project (account) specifications and/or amendments applicable and to be used? Have these been certified, including client's comments incorporated? i.e.:</p> <ul style="list-style-type: none"> • pressure vessel specifications including tubular heat exchangers and airfins • pump specifications • compressor specifications • building specifications • civil/structural specifications • piping specifications • control systems specifications • painting specifications 			
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<ul style="list-style-type: none"> • noise specifications <p>1.6 Has a Design Basis Memorandum been issued to the group?</p> <p>Has a G1 spec been issued to the group?</p> <p>1.7 Does the PPEM contain an instruction how to handle project variations of the original scope of work regarding administration, comments, approvals and distribution prior to implementation?</p> <p>2. Engineering Inputs/ Technical</p> <p>2.1 What is the availability and status of information on Company designed equipment and facilities to complete detailed piping design?</p> <p>2.2 What is the availability and status of information on supplier designed equipment prior to release of iso's for construction for:</p> <ul style="list-style-type: none"> • in-line instruments • airfins • fired heaters • pumps • compressors • other supplier designed equipment such as package units? <p>2.3 Assess the percentage of supplier prints which have been marked as "final" and their availability in the piping design group.</p> <p>2.4 Have instrument vessel sketches been issued?</p> <p>Are there any outstanding?</p> <p>2.5 ⊗ Have equipment instrument trims been defined and completed?</p> <p>How is this information conveyed to the Piping Design group?</p>			
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<p>2.6 Have lines at battery limits (BL) been defined, located and agreed upon with the client?</p> <p>How is this recorded?</p>		
<p>2.7 Have tie-in points been defined, located and agreed upon with the client?</p>		
<p>2.8 Has a tie-in list been issued and what is its status?</p>		
<p>2.9 ⊗ At what stage of the piping design effort are the piping support and stress analyses performed?</p> <p>Is a record maintained of systems already covered / outstanding?</p>		
<p>2.10 Where have piping (and instrument and civil/ structural) requirements for package units been defined with split of supply coordinates by purchaser/ supplier?</p> <p>How is this recorded?</p>		
<p>2.11 To what extent have piping studies been performed in the project spec phase to determine the isometric count and structural steel requirements?</p>		
<p>3. Engineering Inputs/ General</p> <p><i>Coordination</i></p> <p>3.1 What is the status of the sizing of the control and safety valves?</p> <p>3.2 Are job related internal instructions used to execute the scope of work and services?</p> <p>Have all group members and other disciplines involved been provided with a copy?</p> <p>3.3 Are the C1/C2 (pipe spec), C4 (pipe support spec) and C6 (insulation spec) available?</p> <p>3.4 Where can be verified that these specs are of the relevant issue?</p> <p>3.5 Are requisitions of Company designed equipment (towers, vessels and shell and tube heat exchangers) and other relevant requisitions such as pump requisitions</p>		
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<p>available in the piping design group?</p> <p>3.6 Have these been released for purchase or for bids?</p> <p>3.7 ⊗ Are the maintenance requirements, drainage and blowdown philosophies available?</p> <p>In what form?</p> <p>3.8 Have the equipment nozzle locations and sizes and in-line instrument sizes been coordinated with the control systems group?</p> <p>Has this been documented?</p> <p>3.9 In case of a revamp design, how is ensured that field information is properly checked?</p> <p>Engineering Flow Diagrams etc.</p> <p>3.10 To what extent did issues of Engineering Flow Diagrams (EFD's) and Line Designation Tables (LDT's), after their release for detailed design, cause changes?</p> <p>3.11 Where are Process Flow Diagrams (PFD's), EFD's, Utility Flow Diagrams (UFD's) and LDT's recorded to check the latest issue status?</p> <p>3.12 ⊗ Are pressure/temperature profiles available with relief valve locations?</p> <p>3.13 What is the EFD's/UFD's with LDT's issue frequency?</p> <p>When was the last (re)issue?</p> <p>3.14 How is the group informed about EFD changes after the "approved for design" issue?</p> <p>3.15 Are these changes properly highlighted on the later revisions?</p> <p>Linetables</p> <p>3.16 Were LDT's issued together with the relevant EFD's and consistent with each other as far as the design data is concerned?</p> <p>3.17 Are the linetables reissued with every issue of the EFD's/UFD's?</p>			
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<p>3.18 ⊗ Are the insulation and tracing requirements available for equipment and piping (e.g., on LDT's)?</p>		
<p>3.19 ⊗ Have the pressure testing and non-destructive examination (NDE) requirements been listed in the line-table?</p>		
<p><i>Plot plans</i></p>		
<p>3.20 Was the initially furnished basis of design correct without significant changes to date? State issue status of plot plans on which piping design lay out has been started.</p>		
<p>3.21 What is the present status of the overall/unit plot plans being developed?</p>		
<p><i>3D system</i></p>		
<p>3.22 Have studies been approved before 3D input starts?</p>		
<p>3.23 Were there piping material specification revisions after the purchase of the first piping material bulk quantities?</p> <p>If so, has Piping Engineering been advised to change the relevant PO's?</p>		
<p>3.24 During the 3D input phase did we encounter delays which reflect program problems?</p>		
<p>3.25 During the 3D coding submission phase did we encounter delays due to coding input problems?</p>		
<p>3.26 Have steel and electric field panels been included in the model?</p>		
<p>3.27 Have junction boxes been included in the model?</p>		
<p>3.28 How is the accessibility of (relief) valves ensured?</p>		
<p>3.29 To what extent do clash checks also include steel and cable trays?</p>		
<p>4. Interface with Civil and Structural Steel Dept.</p>		
<p>4.1 How have Company structural/civil designs for</p>		
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<p>piperacks, superstructures, platforms, railings, stairs, ladders, etc. been coordinated with the civil/structural design group?</p> <p>5. Interfaces with Process</p> <p>5.1 ⊗ Have Process identified the need for safety related equipment, i.e. eye wash/safety showers, fire fighting equipment, breathing apparatus etc.?</p> <p>5.2 ⊗ Have Process identified and listed <u>all</u> equipment and lines subject to lethal or toxic rules or requiring special attention for corrosive service and/or safety reasons, i.e. explosive area detection service?</p> <p>5.3 ⊗ Have Process identified whether there is any equipment and/or system(s) to be provided with a gas recovery and/or inert gas blanketing service for safety and/or environmental requirements?</p> <p>5.4 ⊗ Have Process identified <u>all</u> equipment and lines or systems requiring special design conditions beyond normal code, rules and client's regulation requirements?</p> <p>5.5 ⊗ Have Process identified type (service) of flare headers which are to be utilized with their particular requirements?</p> <p>5.6 ⊗ Have Process performed a flare system study for the units concerned?</p> <p>Have the final configuration and sizing formally been submitted to the piping design group?</p> <p>5.7 ⊗ Have approved piping design studies of lines in critical process service been reviewed and approved by the process lead engineer?</p> <p>How is this administered?</p> <p>5.8 ⊗ Have the reciprocating and/or centrifugal compressor piping, pump suction lines, (long) transfer lines, relief valve inlet/outlet lines and flare headers been reviewed by the piping engineer and the pipe support designer?</p> <p>5.9 ⊗ Have Process formally approved reciprocating and/or centrifugal compressor piping, final pump suction lines, relief valve inlet/outlet lines, (long) transfer lines and flare headers?</p>		
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<p>5.10 ☒ Have heater and/or reactor piping been reviewed by piping engineer, pipe support designer and formally approved by Process?</p>				
<p>6. Job Control</p> <p>6.1 Have the budget for the piping design group been defined?</p> <p>6.2 Have the Project Execution Control System (PEC) been prepared for the scope of work, services and deliverables required and is it used for progress measurement?</p> <p>6.3 How much is the progress measured against the PEC summary for the piping design group? State date.</p> <p>6.4 What efficiency is reported in PEC?</p> <p>6.5 How does the final expected manhours requirement relate to the assigned manhour budget?</p> <p>6.6 Have the PEC and scheduled manhours been adjusted based on the approved project variations and/or change orders?</p> <p>6.7 Have planned milestones on BTO's and major deliverables been met in time?</p> <p>6.8 Is the planning list of all piping design group deliverables available and regularly updated?</p> <p>6.9 Are changes in the scope of work being processed in time?</p> <p>6.10 What is the current status of change orders/project variations?</p> <ul style="list-style-type: none"> • are any CO's outstanding? • is a register maintained? <p>6.11 Does the lead man piping receive a copy of the weekly LDS print-out?</p> <p>6.12 Is there a regular coordination meeting with the project/engineering management and other lead engineers, including planning and cost control?</p> <p>6.13 Are problem areas being discussed during</p>				
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<p>these meetings?</p> <p>6.14 How is ensured that the planned dates for various levels of document issues are being met?</p> <p>6.15 Has a release schedule for isometrics been established? Does this schedule cover :</p> <ul style="list-style-type: none"> • various issue levels • split per process/utility area • dips in vacation periods • area milestones? <p>6.16 Are checkprints and masterprints of piping documents available?</p> <p>6.17 Are previous issues of piping documents kept with the piping design group?</p> <p>6.18 Did we deviate from normal checking practices as defined in Company's design and engineering guides relative to piping general arrangement drawings and/or isometrics?</p> <p>6.19 What was the reason for deviating from the normal checking practice, if we did so?</p> <p>6.20 Have model reviews been scheduled?</p> <p>7. Additional Questions</p>		
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Product Audit Checklist

Note:

Any major deviation from requirements shall be tagged in the 'No' column and be elaborated on in the main report under Product Audit Findings.

Documents reviewed:

Questions	YES	NO	NA
1. Are input data available?			
2. Have they been formally issued?			
3. Have the data been qualified? (what is/is not included)			
4. Have they been screened for completeness?			
5. Have calculations been performed?			
6. Have these calculations been checked?			
7. Has the product been formally checked?			
8. Is checking evidence available?			
9. Do the issued documents contain sufficient information?			
10. Have multi-discipline input/comments been obtained?			
11. Are the issued documents checked for compliance with client, licensor and authority specifications?			
12. Have all deviations from client, licensor and authority specifications been discussed and formally agreed upon with the relevant party?			
13. Are supplier data included in the document?			
14. Have supplier data been qualified?			
15. Have all requirements of the document been covered?			
16. Have the document requirements been discussed with the internal client?			
17. Have the document requirements been discussed with the external client?			
18. Have any comments been received on earlier issues of the document?			
19. Have all comments been incorporated in later issues?			
20. If not, has agreement been reached about the implementation of comments?			
21. Have changes been clearly indicated?			
22. Has the PM or EM been involved in this discussion in case of comments from the client?			
23. Has the document been reviewed by the discipline manager or his delegate, if required?			
24. Has the document been formally approved at the proper authorization level?			