

Kudankulam Nuclear Power Project Unit 3 & 4

Sub: Development & Implementation of Construction Management Software

Technical Specification - II

A) NPCIL Technical Specification Document – ANNEXURE –D-13.0, Section-V attached.

B) In addition to the above NPCIL Document, the Scope includes the following.

1. Installation and Configuration of Servers like Application Server, Database Server, Web Application and Services Packs and Patches.
2. Installation of Construction Management Software with necessary Licenses
3. Client System(s) Configuration and interfacing with Servers and the CMS.
4. Configuration of Security Controls and rules in Firewall, SSL and all necessary requirements for ensuring Web Application Security.
5. Maintenance of Database and Application servers, Maintenance of Server OS, patches etc.
6. Backup schedules, restoration, monitoring and tuning of Database & Application Server whenever required. Re-installation of database & application if required.
7. All Software licenses are to be handed over to the Customer on a perpetual basis.
8. All additional developments/support required by NPCIL shall be provided by the Vendor as and when mandated by NPCIL.

HARDWARE and SOFTWARE

A) SERVER

- 1) **Operating System:** Windows Server 2012 R2 or later.
- 2) **Processor And Mother Board:** Intel Xeon Processor, 4 Core, Cache Memory 10 MB
- 3) **RAM:** DDR4- 32 GB 1600MHz to 2133MHz.
- 4) **Hard Disk Space:** 1TB HDD 7200rpm.
- 5) **SSD for Primary Disk:** 256GB SSD for primary drive (Its for higher performance and to be used For Windows OS and SQL Server installation only).
- 6) **Database Software:** SQL Server 2016 Standard (Separately if not available with the client).
- 7) **IIS Server** 10.0 and above. (For Web application, and Web-service)
- 8) **Net framework** 4.5.1 and above. (For Web application, and Web-service)

B) CLIENT

- 1) **Operating System:** Windows 8 / Windows 10
- 2) **Processor:** Intel i5 or i7 (recommended) or latest version.
- 3) **RAM:** 8 GB

- 4) Hard Disk Space: 500 GB
- 5) Microsoft Office Suite: Microsoft Office 2010\2013 or Latest version.

C) WEB Applications/Security – Needs to be configured, if required by the Customer

- 1) Public/Static access through **internet** for Web Application, Android Web Service or accessing SQL server Database from client server applications (E.g. SPOOLMAN, MATCONTRK etc)
- 2) Public/Static TCP/IP address required for Global Accessing.
- 3) For security **Https shall be used** which requires SSL (Secure Socket Layer) Certificate.
- 4) For Firewall Inbound and outbound rule for secure accessing Web Application Ports.
- 5) Configure SQL Server Dynamic Port, Web application and Android Web Service Port through Network for Global Accessing.
- 6) For Client/Server application - Database will be stored on the server and there should be connectivity between server and client through LAN/WAN/VPN/RDP/CITRIX.

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ANNEXURE-D-13.0

FOR

SECTION –V

TECHNICAL SPECIFICATION

FOR

**DEVELOPMENT AND IMPLEMENTATION OF CONSTRUCTION MANAGEMENT
SOFTWARE**

FOR

KKNPP UNIT-3&4

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NUCLEAR POWER CORPORATION OF INDIA LIMITED KKNPP- 3&4
TECHNICAL SPECIFICATION AND SCOPE OF WORK FOR DEVELOPMENT
AND IMPLEMENTATION OF CONSTRUCTION MANAGEMENT SOFTWARE

SECTION-V

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1. Introduction:

Proposed Project at Kudankulam in Radhapuram Taluk, Tirunelveli Dist, Tamil Nadu consists of two units of 1000 MWe and is referred to as Kudankulam Nuclear Power Project (KKNPP) Units 3 & 4 with two steam driven turbo-generators supplied with steam from two pressurized type reactors of Russian design. KKNPP Units 1&2 have already been established at the same site in accordance with the Inter Governmental Agreement (IGA) signed in 1998 between the Governments of India and Russian Federation. The first two Units were already been synchronized with the grid. The proposed expansion program is in accordance with the IGA signed during Dec. 2008 between the Governments of India and Russian Federation. The design of the plant is carried out by Russian Federation (RF) designers and Working Documentation (WD) is issued for construction. The subject contract is for development and implementation of software for construction management at KKNPP 3 & 4

2. General Information:

- i. NPCIL constructs and operates nuclear power plants throughout India under the department of atomic energy.
- ii. Subject site is a part of phase two at Kudankulam.
- iii. NPCIL prepares tenders and float tenders for various project related contracts for constructing and maintenance works.
- iv. Beginning from mega package contracts to petty contracts there will be 1000 plus contracts that will be awarded for completing a project. This is excluding the operation and maintenance contracts.
- v. During project phase there will be various erection groups for managing construction activities. Such as Civil, Mechanical, Electrical and Instrumentation.
- vi. Each group will identify the scope and quantum of work involved in completion of the project. Estimation will be worked out for total work and tenders will be floated.
- vii. Each tender will consists of various types of works called as item. There will be more than 300 plus items in mega package contracts. Also there will be more than 4 to 5 mega packages will be operating simultaneously. In parallel to mega package there will numerous contracts which will be executed where hundreds of items that will be under operation.
- viii. Presently report generation for all these works are being done manually and will be forwarded to concerned engineer from execution to quality and final closure of the reports are being done manually.
- ix. Preparation of measurements for submission of running account bills are being made in excel and reports in hard copy are being annexed to the measurements in the hard form. All these measurements will be checked manually for passing the running account bills.

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This process will be followed to all the running account bills for all the contracts of all the disciplines.

- x. Following and adapting this process is consuming considerable amount of time and valuable amount of man days are being wasted for unproductive works. Also checking the duplicity of the measurements for passing the running account bills is almost an impossible task.
- xi. Keeping in view of this NPCIL/KKNPP has decided to go for development of software to take care of all these issues. Where all the reports can be generated using the software. And the generated reports can be forwarded to concerned engineer as per the hierarchy defined in the quality plan.
- xii. Also using the same software measurements shall be extracted and submitted for running account bills. With this the duplicity of the measurements can be avoided.
- xiii. As a part of this detailed requirements and the tasks that are expected to carry out using this software are prepared and given in the upcoming sections.
- xiv. Also the scope of work under NPCIL and under the contractor is also given below.
- xv. Contractor may go through the specification fully before submitting the offer.

3. NPCIL Scope of work:

- i. Providing the detailed requirements for developing the software.
- ii. Providing sufficient hardware for installing the software for server as well as client.
- iii. Testing of the software for acceptance before finalizing the contract completion.
- iv. The KKNPP Intranet website is developed on the following platforms:

Server side	
Server Operating System	Microsoft Windows-2003 Server
Web Server	Apache Web Server (Tomcat 5.5 version)
Database Engine	Microsoft SQL server-2005
Supported Clients	
OS	Microsoft Windows-XP / Vista / 7
Compatible Web browser	Microsoft Internet Explorer (supported upto v9)
Technology used	
Client side coding	Java script, HTML, CSS, AJAX, JSP

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Server side coding	JAVA
Database technology	Microsoft SQL server
Reports	Reports generated through IText

4. Contractor Scope of work:

4.1. General :

- i. Understanding the complete scope of work before submitting the offer. Required software is not just data management software. This shall consist of various modules required such as specification driven isometrics, extracting bill of material from the neutral files supplied by the designer, auto generation of the pipeline joint numbers etc. There are many such requirements which are explained in the later sections. Bidder shall go through the requirements thoroughly before submitting the offer.
- ii. Deploying engineers at site for understanding the detail methodology how the contracts are being handled, how reports are being generated, how measurements are being generated etc.
- iii. Understanding requirements of various disciplines, and various items involved in each disciplines, understanding the work flow in the respective item, understanding the report format for further plan of action.
- iv. Providing training for NPCIL staff for understanding the software and keeping the software in use.

4.2. Software Requirement Specification:

4.2.1. Introduction:

4.2.1.1. Purpose:

- i. The purpose of the specification is to provide the detailed requirements for developing and implementation of the software for construction management at KKNPP. The detailed specification involves explanation of module by module requirements for each erection disciplines.

4.2.1.2. Scope:

- i. CONSTRUCTION MANAGEMENT SOFTWARE shall an integrated software solution for activity level project management, Planning and control, Progress Monitoring, Material management and reporting at various stages of piping fabrication, erection, Material warehouse and commissioning of units/ Plants.

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- ii. The software is implemented for much before starting the project for planning , standardization, analysis, the input require , understanding of expected deliverable incorporation of schedules of rates for billing etc. Software solution including piping spooling operation from IDF /PCF/IPMF files received from client , Fabrication Planning , Activity updating , Store & Inventory management
- iii. Specification for complete material and inventory management. weld mapping , revision management , Activity level stage wise control with documentation at all level of fabrication and erection and related commercial billing as per the scheduled of rates, advance technique like bar code system must be used for automation .
- iv. Software should be used for all activities of store management, Planning, Matching front, Fit-up, Welding, NDT spool clearance, Line Erection Testing & box-up etc. Its further being integrated to given below products in sequence.
- v. The proposed CONSTRUCTION MANGEMENT SOFTWARE is intended to contain following list of modules.
 - a. A module for managing Stores.
 - b. A module to create for specification from material catalog.
 - c. A module for Creation of specification driven isometric drawings.
 - d. A module for Spool marking and generating material take off is done.
 - e. A module for generating material takes off without drawing.
 - f. A module for managing spool fabrication activity is done.
 - g. A module for spool erection activity is done.
 - h. A module for Steel Structure Designing
 - i. A module for estimate cost and bid on items.
 - j. A module to handle the entire activities in steel construction
 - k. A module to handle and monitor CIVIL construction work from beginning to end
 - l. A module for managing all the Equipment related activities in the Project
 - m. A module for managing all the Electrical & Instrumentation related activities in the Construction Project.

4.2.1.3. General Interfaces of the Software: The S/w must be,

- a. Compatible with PDMS/PDS/SP3D etc. : Interpret IDF/PCF/IPMF files created through engineering software like PDMS/PDS/SP3D etc. & generate Piping MTO, Piping Isometrics with Weld Joint Numbers, Fabrication Spool and Erection drawings indicating construction workload

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like Inch Dia, Inch Meter, Pipe cut-lengths, Spool Weight, Surface Area etc. Program should be intelligent enough to generate piping isometric without using AutoCAD and generate neutral file for importing to piping spooling software.

- b. Piping Spooling- Program should have facility for Piping Spooling works graphically, program should generate Spool and erection drawing in DWG format and related bill of material. Program should be intelligent and quickly make piping isometric without using CAD system. Program should generate neutral files for importing to piping spooling software.
- c. Piping Isometric Drawing generation- Program should have facility to generate INTELLIGENT Piping Isometric drawing with MTO
- d. MTO Analysis : Comparison of various Piping MTOs (MTO-I, MTO-II, MTO-III etc.) to be done for analysis and decision making. Comparisons to be done in terms of Qty., Inch Dia, Inch Meter etc. (MOC-wise for Small & Large Bores) for Pipes, Fittings, Flanges, Valves etc.
- e. Surplus & Substitutions : The system should provide List of Surplus Materials with suggestions for Substitution. This will ensure minimization of surplus and thereby saving in Schedule and Cost of the Project.
- f. Revision Management : Revision management is one of the most important part of project execution. The system should be able to incorporate latest information from PDMS/PDS/SP3D etc. keeping all the previous data intact for comparison purpose. Comparison of data, isometrics (with clear marking of Weld Joints, Spool Nos. indicating additions/deletions) etc. w.r.t previous revisions to be done for analysis purpose.
- g. Program should have facility to modify the existing drawings based on the Piping Material Specification (PMS). As-Built changes to be added in the isometrics intelligently and generate spool and erection drawings after the changes has been incorporated with the new internal revision changes and without changing the isometric revision no.
- h. Interfaces : Suitable interfaces to be provided to Owner and PMC to view / extract data of the project for reviewing the progress at Fabrication and Erection stages at

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any time through internet link for seamless communication between Owners, PMC & Mechanical Contractors.

- i. Mapping of Codes : Mapping of client Item Codes with Engineering Codes (different) and creating of new Item Codes to suit the requirements including SAP environment.
- j. Optimization of Materials : Capable of performing Pipe cutting optimization. 3D Graphical & interactive Spool transportation in container by optimized arrangement of spools as per container dimension & load capacity.
- k. Procurement & Expediting : Interpret procurement related information like data related to PO, Expediting, Despatch, Receipt and Issuance at Site. Generation of delivery forecast of materials both for Equipment and Bulk Piping Materials indicating Qty., Inch Dia, Inch Meter etc. at entity as well as summary level for advance construction planning.
- l. Matching Front Analysis : Perform Material Matching Front Analysis, Look Ahead Schedule with respect to MTO (various revisions).
- m. Work Front Analysis : The program should be able to split MTOs for Fabrication (Spools) & Erection, Tracers, Pipe Supports and Insulation Materials. Piping workload in terms of Inch Dia/Inch Meter and Work Front Analysis for Fabrication as well as Erection.
- n. Resource Assessment : Estimate Manpower & Machinery during Fabrication and Erection stages.
- o. Tracking, Reporting & Monitoring : Shop / Erection work packages, Work allocation & Material Issuance Vouchers, Welding, Welder Performance & Penalty Clause, NDT Clearance & Percentage Coverage, Spool Surface Cleaning, Primer & Finish Painting, Spool Clearance, Storage in Lay down & Dispatch. Monitoring of inspection report at various stages including prioritization and checklist liquidation, Line history sheet for weld joints/ flanged joints/ traceability record, Hydro test reports / NDT loop clearance, Test wise reports, Line wise/Area wise/loop wise final completion reports, Fabrication and erection Material management, Tracking of spools / piping in case of recall of defective

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items, Piping Spooling data should directly available for further piping fabrication work, Program shall have provision for automatic Bay-level work planning/allocation for spool fabrication.

Each joint should also show the progress like Fit-up, Welding, NDT, Erection etc. Each spool status in isometric graphics in software should show the progress status like production, welding, NDT, Erection etc.

Keep the track / information of all Spool Identification & Spools storage location through Barcode scanning and tracking System. Program should facilitate fully automatic Barcodes printing) using on line and mobile printer). High Range Barcode Scanners shall be integrated with the system.

System level backlog report & open punch points shall be extracted for analysis and action. Overall complete tracking of progress, documentation, backlogs, monitoring control of Systems for pre-commissioning and commissioning shall be achieved.

Daily & Weekly Progress Reports to be generated separately for Supervisors, RCM & Management monitoring. Suitable reports for Billing / Invoicing purpose to be generated to facilitate approval of Bills/Invoices of the Contractors. The formats of all such reports should be such that it will serve the purpose of Reconciliation of Materials.

- p. 3D Progress Monitoring : Generate 3D drawing (*.dwg) files which can be merged in standard review software to see the progress in various color for various activities at fabrication stage and erection stage. Program shall have provision to generate 3D drawing (*.dwg) files containing construction progress data.
- q. Tracking through Scanning, Barcoding, RFID, Mobile Alerts : Program shall have facility for optimizing pipe cutting, kitting (gathering of components and parts needed for the fabrication of a particular assembly or product), progress backlog tracking and all live progress shall be updated through mobile devices, scanners. Automatic Real-time updating of progress shall be enabled through barcodes & scanning using mobile devices. Program should support application on Android, IOS, and Windows operating system for live and remote updatation of activities using 3G/4G /WIFI..

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- r. Steel Structures Management: System shall read/interpret input data of Structural Assemblies & MTO in .xml format from Tekla Structural Model, input data of Structural Assemblies with WBS/UNIT/GA/Structural fabrication drawing reference. Provision to print Barcodes & update progress like Fit-up/Welding/NDT/Laydown/Inspection Release Note (IRN), Dispatch, Receipt at Site, Storage, Issue to the Contractors, Erection, Alignment, Bolting, Grouting, Fireproofing etc. through scanning Barcodes and using Mobile Applications. Maintain revision control along with provisions for Stop Work Notice (SWN) & Hold Release Note (HRN). Provision to monitor Packages, Lots, Case numbers (Bundles) as per Bill of Lading. Progress reporting at WBS/Unit levels, Activity level with Charts & Curves.
- s. Management of Cross Country Pipelines Projects: Software driven process for uploading Pipe Tally sheets with Unique auto-generated Pipe Tag numbers right from Manufacturing (including Wrapping / Coating), Inspection, Dispatch, Receipt, Storage, OSRD management, Issue to the Contractors. Stringing, Welding, NDT, Lowering, Hydrotest, Cleaning/Gauging, Filling, Dewatering, Drying, Packing & Backfilling etc. Provision to maintain alignment sheet details with Pipe thickness change, Protective Coatings, Crossings, Horizontal/Vertical bends, Intersection points, Stored reference copy. Capture detailed welding data at ROW/ROU (Right of Way/Right of Use), Trench, Top with Root/Hot/Fill/Cap weld passes. Output report of Pipe book, Joint History sheet, Progress March Chart, Planned Vs Actual progress at Chainage/Section/Station level shall be generated from the system.
- t. Electrical & Instrumentation Material & Progress Management: System shall have provision to define Master data for Tagged Items/Non-Tagged Bulk items/Cable Tags & Cable Drums at WBS/Unit level. Dynamic Progress activity updates & monitoring for all categories with percentage weightage. Documented Material issue vouchers to contractors for all category materials (Tagged/Bulk/Cables). Auto-Suggestion of Cable cutting from Specified Drums based on Parameters based Drum Drumming. Generation of Progress reports & Charts at Contractor level, WBS/Unit levels.
- u. Civil Progress Monitoring : System shall have provision to upload Civil SOR Item Master with Scope Quantity/Unit-wise scope break-up. Work scope allocation sub-contractors. Daily progress updation with reference documents & signed records. Hierarchy filtration at Activity Grouping level like Excavation,

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Concreting, Flooring, Finishing etc. for progress monitoring. Monthly RA Bills for Contractors based on unit price/Lump-sum price as per SOR. Generation of Scope Overrun reports based on actual progress.

- v. Mechanical construction progress :
- Program should monitor progress of
- Static Equipment- (Pressure Vessels, Columns, Heat Exchangers, Drums etc.)
 - Rotary Equipment- (Pumps, Compressors etc.)
 - Packaged Equipment- (Gas turbine generator packages, air compressor package, air blower package, incinerator package, hydrogen compressor package etc.)
 - Furnace/Heaters - (decomposition furnace package etc.)
 - Auxiliary Items of Packages- (Burners, Cooler, Fan, Compressor)
- Overall Progress percentage of EQUIPMENTS based on weightage values
- Activity heads for monitoring progress can be defined/configured specific to
- STATIC Equipment – progress activities can be configured
 - ROTARY Equipment – progress activities
 - PACKAGE Equipment – progress activities
- Separate progress activities for various Auxiliary items can be define/configured specific to Auxiliary item types like -Fan, -Burners, -Compressors etc.
- Progress weightage Percentage can be assigned for each activity to monitor the overall progress.

w. Integrated Project Control Network Solution

Can create CPM based Project Network Schedules for Level-3, Level-4 & Level-5. While Level-3 Schedule will be at Activity Level, Level-4 & 5 will be at Milestone and Quantity based respectively.

Level-5 Schedule will be resource loaded particularly for Construction work. Resource calculation against an Activity will be based on workload in terms of quantity. Assessment of Resource will be rule based / data bank. This will be contract-wise and rolled up at Unit / Complex level.

Generation of Critical Paths at Unit / Complex levels. Calculation of work-fronts based on drawings, materials and access.

The system should generate dynamic schedules like 30 days / 90 days Look ahead Plan with Resource requirements.

Generation of Activity List based on Turn-Around-Document (TAD) as per requirements.

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Cost monitoring, reporting and control at Activity level as well as at Unit / Complex with forecast based on various scenarios.

Reporting in Tabular and various Graphical forms (histograms, curves etc.), %age Progress calculation at Activity as well as Unit & Complex level.

- x. Documentation: The system has the facility to track the clearance of the material documentation (TC/QC), IBR / Steam Services certificates etc.
- y. Offloading of Work: The system shall have the facility to analyze the work at any point, to facilitate the management and to take Offloading of any part of work at any time.
- z. Single RDBMS (SQL SERVER) database for all spooling operation, Fabrication and erection and all project activities.

The System should be versatile enough to customize reporting and monitoring formats as per Clients requirement and extendible to all packages without loss of time. Apart from PDF outputs, it should also be in Excel presentable format similar to PDF format.

4.2.1.4. Definitions:

User	The user that will use the application
Admin/Administrator	The administrator who has access to all the modules related to particular product
Super Admin	Super administrator is System administrator who has access to all the products.
WIFI	Wireless network that can be using either internet or intranet.
ICODE	Item Code or material's unique identification code.
IDF, PCF, IPMF	File formats that are used to save drawings.
LAN	Local Area Network
WAN	Wide Area Network

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VPN	Virtual Protocol Network
QC	Quality Control
BOQ	Bill of quantity
MTO	Material Take-Off
KKNPP	Kudankulam Nuclear power project
WIR	Weld inspection report

4.2.1.5. References:

- i. IEEE software Engineering Standards committee “IEEE Std 830-1998, IEEE recommended practice for software Requirements Specifications”. October 20, 1998.

4.2.2. Overall Description:

- a. Product Perspective:
 - i. The main perspective of the proposed software is to manage the construction activities at KKNPP.
 - ii. Generate all the required reports online ,clear the reports online including, management of stores, preparation of CRR, generation of CCC and carry out material accounting etc.
 - iii. The proposed software module is completely new idea at this site, there is not such software or similar software application that is being implemented at this site. So the application development shall be started from scratch.
 - iv. The developed software shall be compatible with the existing hard ware system of the KKNPP as mentioned above. This software may develop based on the single login system i.e. only one login shall be there for all the modules. There shall be not be multiple logins for each module.
 - v. Proposed software shall be of web based software or windows based, if in any case they are combined, then login shall be through either web or windows.
 - vi. A scheme of network for proposed software is as given below in sketch-1 for basic idea.

b. Product Functions :

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Brief functions of all the required modules are listed as below, detailed requirements and functions of each module will be explained in later sections .

- i. **A module for managing NPCIL stores:** Receipt of material from the supplier, codification as per the pre-defined procedure, segregating the material as per the erection package, raising the material request using the same module from contractor side and forwarding to concerned NPCIL engineer, approved by NPCIL user, forwarding request to stores and releasing the material to contractor. Once release material to the contractor shall reduce from the stock of store and it shall appear in the stock of contractor store. Further details will be explained in the later sections.
- ii. **A module for managing contractor Store:** Upon Receipt of material form NPCIL stores, contractor will use the material for erection. One contractor use the material for erection, the erected quantity shall be deducted from the contractor stock and consumption statement shall be auto generated.
- iii. **A module to handle and monitor CIVIL construction work from beginning to end:** In this module all the civil package related works are expected to monitor, (Note: Civil means not only civil works, it includes structural works, little quantity piping works etc) In civil contracts such as mega packages there will be more than 200nos of items (works) are to be handled. All these items are to be executed using this module only. All the report generations, inspection reports generation, structural report generation etc shall be generated and forwarded to NPCIL through this module only. Further more details will be provided in the later sections.
- iv. **Modules Related to Mechanical works:** Mechanical erection packages from mega packages to the small contracts shall have the access to this module. Even mechanical erection packages will have more than 100plus items(works) such as equipment assembly, equipment erection, pipeline fabrication, pipeline erection, pipe support erection, valves erection, pipeline welding, inspection report generation, radiographic inspection report generation , DPT report generation etc , hot insulation erection, cold insulation erection, painting works etc.
- v. **Module related to electrical & instrumentation works:** Electrical erection packages from mega packages to the small contracts shall have the access to this module. Each contract may consists of more 200 plus items (works) such as equipment erection , support erection, cable tray erection , cable laying, cable duct erection, junction box erection, local cable tray erection, cable termination, etc. Following up of erection activities, report generation, forwarding report for further clearances, online measurement generation for running account bill, etc.
- vi. **Planning module:** A planning module for defining the activities in all disciplines, identifying the predecessor, successor and finding out the critical path, linking the progress, comparing the actual with the targets

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Further details will be provided in the later coming sections.

c. User Classes and Characteristics :

- i. Various users will be accessing the data from the proposed software.
- ii. Users from the contractor execution for feeding the data, generating the reports, forwarding the reports to the next level etc.
- iii. Users from contractor QA for preparation of the inspection reports and forwarding the reports to NPCIL execution and QA for further course of action.
- iv. Users from NPCIL execution for review of the reports submitted by the contractor and accepting the reports
- v. Users from NPCIL QA for review and acceptance of the inspection reports or NDE reports.
- vi. Users from the planning section for following up the progress of the project.
- vii. Administrator for generating the contract (in case of new contract), for linking applicable modules for the respective work orders, assigning the users from the contractor side and the NPCIL side.

d. Operating Environment

- i. The proposed software will operate in windows operating system, with Microsoft windows 7 / WIN 10 OS.
- ii. With database platform as MYSQL or equivalent with open source.

e. Design and Implementation Constraints:

- i. Deployment of the technical /software team at KKNPP site to understand the requirements of the users from the various groups.
- ii. Deployed manpower shall have police verification certificate for posting at this site for more than 15 days.
- iii. They need special permission to work during holidays and work at late hours.
- iv. During providing the requirements there may be simultaneous interaction of the technical team with the respective execution group from NPCIL may be there, in view of this contractor shall deploy sufficient number of people to resolve the issues.
- v. During implementation stage like functional testing and acceptance testing, testing may be carried out on the live projects, in this phase any kind of delays in resolving the issues are not permitted.

f. User Documentation :

- i. Each and every module help in PDF form or HTML form shall be provided.

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- ii. Help messages shall be prompted with the cursor movement.

g. Assumptions and Dependencies:

- i. Providing the requirements for developing the software is fully depending upon the availability of the experts in the respective fields.
- ii. Assuming that there will be immediate deployment of the technical team for carrying collecting the requirements.

- h. Asdf

4.2.3. External interface requirements:

4.2.3.1. User Interface:

Application	Front end Platform	Back end Platform	Web Service
Windows based	Microsoft	SQL Server	NA
Windows CE	Microsoft	SQL Server	NA
Web Based	Microsoft	SQL Server	Microsoft

4.2.3.2. Hardware & Software Interface:

Server side	
Server Operating System	Microsoft Windows-2003 Server
Web Server	Apache Web Server (Tomcat 5.5 version)
Database Engine	Microsoft SQL server-2005
Supported Clients	
OS	Microsoft Windows-XP / Vista / 7
Compatible Web browser	Microsoft Internet Explorer (supported upto v9)
Technology used	
Client side coding	Java script, HTML,CSS,AJAX, JSP
Server side coding	JAVA
Database technology	Microsoft SQL server
Reports	Reports generated through IText

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4.2.3.3. Communication interfaces:

Communication between Windows application and database can be possible through local area network or virtual protocol network or wide area network.

4.2.3.4. Memory Constraints:

For using the "Construction **management software**" Minimum client machine memory available is 4GB.

4.2.4. Product Functions:

In this section detailed specification and the requirements of the proposed software is covered. Firstly functions of administrator and users are explained in detail, further the detailed requirements of the all the modules are explained.

4.2.4.1. Administrator login & His functions :

- i. The main functions of the administrator are to create access to the newly awarded contracts.
- ii. Enter / import all the bill of quantities (Schedule of quantities) to the software.
- iii. Against each and every item assign the applicable module such as piping welding / concreting/ support erection/ cable laying etc.
- iv. creating user logins for contractor users such as contractor execution / contractor quality . Creating user logins for NPCIL for the respective contracts, i.e. execution user for NPCIL, Quality user for NPCIL etc.
- v. Assigning permissions to the user such as report generation / report forwarding/ inspection report generation/ report review and forward etc / report acceptance / report closing etc/.
- vi. Resolving any issues and difficulties faced by users.

4.2.4.2. User Login & his functions:

- i. User may be from contractor side or NPCIL side.
- ii. User login is contract specific, i.e. login shall be created for each and every contract that is awarded from time to time. Contract specific user login is applicable for both the contractor and the NPCIL also.
- iii. Based on the rights provided for the user by the administrator for accessing the various modules, user can open various modules for creating the information and generating the reports based on the information.

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- iv. Users may be from the contractor side or NPCIL side, within the contractor and the NPCIL users may be from the execution department or quality department. Within the execution there may various category i.e.

Users for data feeding i.e. feeding the measurements, scope of work in the applicable modules.

Users for generating the reports based on the measurements fed and forwarding for the next higher authority

User as accepting authority from the contractor side, and forwarding to NPCIL side for further acceptance and clearance.

User from the NPCIL side for review and forwarding the report for quality section based on the process flow defined in the quality assurance plan.

Users from the NPCIL planning section and the contractor planning section for setting the targets for the coming month or comparing the progress to the targets set etc.

Users for the accessing the store module for managing the activities at stores such as issuing the material , to the contractor and NPCIL upon receipt of request through online.

- v. Login window shall be from the single window i.e. only through one window user has to login and can access to any module that he given right to access. There shall not be any multiple login windows for accessing various modules such as spool manager separate login window, spool generator separate login window. Provision of such separate login window is not allowed.

4.2.4.3. Store Module:

- i. NPCIL has its own stores i.e. contact and material management complex for maintaining the in house material management.
- ii. Whereas for the upcoming projects separate store contract will be awarded to maintain the stores. This is due to the large quantum of material to be handled during the project phase.
- iii. Main material for the project is expected to be received from RUSSIA, the material received from the Russia will be supplied with code called KKS code. Each and every item will have its own KKS code.
- iv. The function of the store module is to receive the material arrived from the Russia. Provision to feed the data i.e. complete list of material received under

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the KKS code. Along with the KKS code the material is identified by the contract and the contract item number.

- v. Entered data shall be identified by KKS code, contract item number. Many times one KKS code item will have many number of sub components which have specific number. Codification for such items shall be generating automatically based on the input data. i.e. separate codification module shall be available in such case to add a code to the items which are received under single KKS code.
- vi. After codification, provision shall be available for entering the responsible agency for the said material. i.e. which is the responsible erection package from the NPCIL side.
- vii. Once the responsible agency from the NPCIL side is identified, provision for sending a call for inspection for the received material shall be there. This is to identify any transit damages occurred, the condition of the items received etc. Once the SSIR i.e. site store inspection report is cleared that respective material is ready for issue to the contractor.
- viii. Store module shall be available separately for contractor also, i.e. when a material is issued to the NPCIL stores to the contractor, and then the material shall be automatically reduced from the NPCIL store account and shall appear in the contractor store account.
- ix. Contractor user shall have a provision to login and see the available material in the NPCIL stores belonging to him. He can raise a request for material with code and the quantity required, and can forward to NPCIL respective engineer for concurring.
- x. Such request forwarded for NPCIL , respective user from the NPCIL shall get some pop up to the request and concur and forward to the competent authority to accept the request and forward to store to release the material and issue to the contractor. Each such request shall be accounted by unique identification number.
- xi. As said earlier once material issued upon the request of the contractor , immediately the quantity from the NPCIL stores account shall be deducted and shall appear in the contractor store account.
- xii. From the contractor store account he can release the material for erection to the respective contractor engineer upon their internal request.
- xiii. After issue and before erection the material will be in the custody of the contractor engineer. Once the material is erected and the erection report is

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generated and accepted by NPCIL engineer then the material will be automatically reduced from the custody stock of the contractor engineer.

- xiv. Similar procedure shall also be implemented in case of returning the material also. i.e. raising the material return request from the contractor store, forwarding to NPCIL engineer for review and acceptance, once accepted will be forwarded to the stores for accepting the material returned by the contractor.
- xv. Some SSIR reports , MIV , MRV images are as given below for reference.



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SECTION-V

PROJECT : PROJECT-OL

Tasks

- DMR
- OSRD Report
- RFI Report
- Material Request
 - Create MR
- Material Issue Voucher
 - Create MIV
- Material Return Voucher
 - Create MRV
- Store Transfer
- BarCode
- Surplus Upload
- Delete DMR
- Erection Status Report

CHANGE PASSWORD

OPTION

MATERIAL ISSUE VOUCHER/GATE PASS.

PROJECT NAME : PROJECT-OL PMC : PMC-OL DATE : 31/03/2016

OWNER : Organisation-001 CONTRACTOR : PRIL-OL MIV Report No. :

BalanceToIssueQty : 20.000 IssuedQty : 10

BULK QTY :

BulkQty	IssuedQty
20.000	10

StoreNo LF MIVCategory OverHead Re

Store-OL

Store-OL

Store-OL

REQUISITIONED : B RECEIVED BY : C

APPROVED BY : D ISSUED BY : E

SAVE CANCEL UPLOAD

PROJECT : PROJECT-OL

Tools

MATERIAL RETURN REPORT

PROJECT NAME : PROJECT-OL PMC : PMC-OL DATE : 31/03/2016

OWNER : Organisation-001 CONTRACTOR : PRIL-OL MRV Report No. : MRV-01

Requester : AAA

Select MIVNo : MIV-01

Source : Project

Select All Show Selected

SelectRecord	ITEMCODE1	Description	RequestedQty	ApprovedQty	IssuedQty	ReturnQty	RetunableQty	BatchNo	StoreNo	Category
☒	1551NNFB15043	PIPE NIPPLE PB...	20.000	20.000	10.000	5	10.000	HN-01	Store-OL	FIM
☐	1561NBAA14040	SOCKET WELD ...	28.000	28.000	28.000		28.000	HN-01	Store-OL	FIM
☐	1599XYVZ01040	FLANGE SPLAS...	12.000	12.000	12.000		12.000	HN-02	Store-OL	FIM

Requisitioned: A Received By: B ApprovedBy: C Retuned By: D

Rows Count : 3

Save Cancel

4.2.4.4. Civil Module:

- i. Civil module is for handling the contracts related to the civil works.
- ii. Usually civil contracts consists of huge number of BOQ items (i.e., various types of works) such as concreting, structural works, reinforcement works, embedded parts works, painting works, piping works , road works, shuttering works etc.
- iii. Software shall have provision to add all the possible works which are available up to date, with the sequence of operation, report formats for erection , inspection , painting, road laying, pipe laying etc.
- iv. During the assigning of the contracts to the software, administrator shall import all the BOQ items of the respective contract and against each and every BOQ item administrator will assign the predefined works such as explained above.
- v. Once the works assignment is completed, the flow of path of the assigned work in the pre-defined works will be applicable to the BOQ item. If in any case the flow path is varying the there shall be feasibility for changing the flow path of the respective work.
- vi. Once assignment of the work is completed and flow path is defined by the administrator with the consent of the user section from the contractor side and the NPCIL side, user logins shall be created as explained in the user module. Once the user login is created then the module is ready for accepting the data against the work order or contract.
- vii. User from the contractor or the user from the NPCIL side shall have the provision for entering the complete break up quantities against the working drawings for each and every BOQ item.
- viii. Once the data feeding is completed, report generating for the fed quantity can be made.
- ix. Based on the fed quantity against the each and every BOQ ITEM user from the contractor shall generate the report for the executed quantity of the work (works such as explained above, these may hundreds in numbers).
- x. The same process will repeat to all the BOQ items and report will be generated for the executed quantity from time to time.
- xi. Such generated report will be forwarded to NPCIL for concurrence or acceptance or review etc. i.e. the flow path as defined in during assigning of the work order.
- xii. In addition to the civil related works, there will be some mechanical works always associated in the civil contracts such metal structure (structural steel works), equipment erection works, pipe line erection works etc.
- xiii. In such cases the equipment erection module shall also assign to the civil module, structural steel erection module shall also assign to the respective contract.
- xiv. For details of the equipment erection module and the structural steel erection module refer the next sections.

- xv. In the case of the civil contracts (not only civil contracts , this is applicable for all contracts) material involved in the construction of the projects are of three types i.e. Russian material issued by NPCIL to contractor , NPCIL procured Indian material to the contractor and Contractor procured material.
- xvi. Based on the specification given in the working drawings contractor shall used the any of the above material.
- xvii. Contractor will raise the request for material from the NPCIL stores and gets the material from NPCIL stores and the material will appear in his stores and such appeared material can be used by the contractor.
- xviii. During the report generation process the option shall be available against which drawing the report is being generated, against which material the material is being generated i.e. whether the material drawn from the NPCIL stores, or contractor supplied material etc.
- xix. In the material for erection is selected as the NPCIL material, the material drawn by the contractor from the NPCIL store shall appear from which the contactor shall select the material for erection and report shall be generated.

4.2.4.5. Electrical & Instrumentation Module

- i. Similar to the CIVIL contract E&I contract will also huge number of BOQ items, and as explained in the civil module , various type of BOQ items flow paths and reports formats shall be pre-defined in the module.
- ii. BOQ items of E&I contract may include various items such as Cable tray erection, cable metal structure erection, cable laying, local cable tray laying, Tubing works, junction box erection, electrical panel erection, equipment erection, metal structure (structural steel) erection, painting, fire resistant painting , cable termination works etc . There will be hundreds of such items.
- iii. All the items shall be separate flow path and the formats as pre-defined.
- iv. As explained above during the contract assignment itself, all the applicable pre-defined items shall be assigned to the each and every item of imported BOQ item.
- v. Even in this case material will be supplied by NPCIL and part material will be supplied by the contractor.
- vi. Bill of quantities may enter by the contractor or by NPCIL to the respective assigned BOQ items. During entering of bill of quantities, provision shall be made that against which working drawing this scope is being entered , and the material will be supplied by whom etc other details shall be updated fully.
- vii. In case of cabling, cable tray they are identified by separate cable log, cable route , junction box are identified by KKS code , panels are identified by KKS code. Based on the individual requirement formats will change.
- viii. Contractor user may generate reports for the items whose erection is completed by selecting the data already fed.

- ix. Equipment erection module, structural steel module will be explained in detail in the next coming sections.
- x. In addition to the pre-defined modules for various BOQ items, there shall be pre-defined items for inspection such as Radiography, dye penetrate inspection, vacuum box testing, visual inspection, ultra sonic testing etc.

4.2.4.6. Mechanical Erection module:

- i. As stated in the above modules the process is similar i.e. creating various items irrespective of contract. I.e. define the paths and process, report formats for all the known items (works) till date. This is the initial phase of the Software development module for construction. This is common for all the discipline erection works.
- ii. Once all the known items were entered and all the modules were developed for the respective items. Assigning of contracts shall be carried out, i.e. importing the BOQ item and mapping the pre-defined items with the applicable BOQ item for further processing.
- iii. Once mapping is completed, user logins shall be created with defined permissions for data entry, report generation, report acceptance etc.
- iv. Once logins are created, data entering into the each and every BOQ item shall be made. I.e. with respect to the working drawings what is the scope of work shall be entered. Note that the total scope entered against all the working drawings, known works etc shall be less than the quantity awarded to the contract. In any such case the quantities are exceeding then an alert message shall come to make the people aware that the scope of work will exceed the contract quantity.
- v. Some of the items in the mechanical type of works are Equipment erection, piping erection, piping welding, structural platform erection, valve erection, support erection, orifice erection, inspection, insulation, painting, anchor fasteners erection etc. There will be many more such items which will be provided during the implementation stage.

4.2.4.7. Equipment Erection module:

- i. Usually this module is applicable to all the erection packages and almost requirements will be same.
- ii. Total list of the equipments shall be available in the contractor scope and the same shall be available in the contractor store also.
- iii. Only equipments available in the contractor store shall be available for generation of the erection report.
- iv. Once single equipment shall contain many small types of equipment, in some cases there may only single equipment, so during equipment erection report generation

process user shall have facility to select the equipment and sub equipment for which he wants to generate the erection report.

- v. If the user selects the main equipment then all the sub equipments which were received along with the main equipment shall also appear in the list and the selection option shall be available for which equipment / sub equipment the user wants to generate the erection report.
- vi. The report will be generated only for that equipment only, All the details provided during the feeding of the data shall appear in the report when the report is generate.
- vii. Provision for adding an attachment such as as built drawings, signed erection report or any other document shall be provided.
- viii. Provision shall be made available for generating the welding inspection report so that if any welding involved in the erection of equipment, the same shall be generated and cleared in the path defined.
- ix. In such case where welding is involved in the erection of the equipment, all the weld joint numbers and quantity shall be feed during the data feeding stage.
- x. If any weld joint is fed into the data, system shall ask the applicable drawing number, what are the applicable inspections, what is the quantum of inspection etc. Once this data is fed the same quantities shall appear in the respective inspection module.
- xi. In case the data is not entered in the data feeding stage, the same can be fed during the report generating stage, but the procedure remains same.

4.2.4.8. Structural Module:

- i. Considering the scope and the quantum of job, structural erection is very huge work and very huge data will be generated for this job.
- ii. Structural module includes supply, fabrication and erection works.
- iii. In few cases supply may be from NPCIL side.
- iv. This module will be applicable for all the erection packages i.e. civil, mechanical, electrical and etc.
- v. Structural module shall be created with flow path and erection formats etc, if there is welding involved, inspection formats shall also made applicable by selecting what kind of inspection is applicable.
- vi. Once the applicable inspection is selected then the details shall appear in the respective inspection module.
- vii. After this work linking of BOQ items of structural steel shall be done with the pre-defined module.
- viii. Once the linking is created between the respective BOQ item and the module, user shall access the module and can enter the quantities with respect to the working drawings, also the scope and quantum of inspection.

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- ix. During feeding of data , there shall be pre uploaded data of structural steel as per the various standards such as IS 808, IS 2062 etc shall be made available for quick selection and entering the quantity. These standard details will be provided at the time of implementation.
- x. If welding is involved then link for generating the weld inspection reports shall be made. In addition to this NDE module shall be linked to generate the inspection report.
- xi. Provision for attaching the as build drawings shall be available, also any attachment such as the signed report, weld inspection reports etc.
- xii. Auto weld joint numbering for the structural steel fabrication, feasibility for this shall be checked.
- xiii. The generated report, here there will be more reports such as fabrication reports, weld inspection reports, inspection reports etc, each report will have different flow paths, and this shall be defined during the implementation stage.

4.2.4.9. Embedded parts:

- i. Embedded parts are the metal parts that are placed inside the concrete and later these parts are used as a anchoring element for supporting the metal platform or support for piping etc.
- ii. Each and every embedded part is identified by a KKS CODE; embedded parts may be of simple plate to a critical profile. These embedded parts involve welding as well as inspection also.
- iii. Welding inspection reports and NDE reports modules shall also linked to this.
- iv. Other than this all the work in fabrication and erection of embedded parts are similar to the structural platforms explained above in **4.2.3.10**

4.2.4.10. Piping Module:

- i. Piping is the most important work in power plants and very critical in case of nuclear power plants.
- ii. Piping involves lot of welding, inspection and other activities like hydro test, insulation, painting etc.
- iii. Also the time required for execution of the piping works is also very huge.
- iv. As explained earlier all the systems in KKNPP are identified by KKS code, this applicable to piping systems also, each and every components such as pipeline, valves and orifices are identified by KKS code.
- v. Piping in a process system has huge number of pipelines, based on the process requirements these lines are identified by a line number such as ex :

KAA 10 BR 001

Where KAA is the process system code (KKS CODE)

10 is the process train number

BR indicates the pipelines

001 indicates the line number. Etc

- vi. In case of piping the quantum of material involved is very high, so entering this huge data is not possible..

4.2.4.11. Auto spool generation :

- i. This software shall have a capability to extract bill of material from the neutral files supplied by the designer. Based on the supplied neutral file software module shall be cable to extract the total bill of material and generate the drawing using this neutral file , identifying the block numbers, joints numbers etc.
- ii. Neutral file *.idf, *.pcf, *.impf which are generated from leading plant design software but not limited to SP3D, PDMS, E3D, PDS etc., S
- iii. Based on the neutral files software shall be capable of generating the 3d MODEL of the piping for further viewing and processing.
- iv. Also the this module shall extract the scope of material required for the execution, auto number of the joints, extracting the total inch dia of welding involved, inch meter of erection involved etc.
- v. Note: Entry to this module shall be common login (contract login) only not through separate login from other window.

4.2.4.12. Pipe spooling and Erection module:

- i. Generated data from the auto spool shall migrate to the pipe spooling module. In any case that the auto spooling data is not available , in such case provision for manual entry of the data shall be available , also with import option from excel shall be made available.
- ii. All the line data i.e. that pipeline number, bill of material etc shall be fed into the system before start of erection activities at site.
- iii. This means that the joint numbering with the quantum of inspection as per the working drawing shall be fed into the system.
- iv. This data feeding may be done by the contractor or by NPCIL.
- v. Once the type of inspection and the quantum of inspection is defined in the system then the data shall be automatically uploaded in the respective inspection module.
- vi. During erection report generation user will select the line number and the joint number for which the weld inspection report and the liner erection report is needed to be generated. And shall feed the actual dimensions and give the remarks for any deviation from the fed data. After that the report can be generated and forwarded for further course of action such as review of NPICL execution, review of the contractor QA and review and final acceptance of NPCIL QA.
- vii. Note that till the inspection of the weld joint is not cleared till the final acceptance of the weld inspection reports shall not be possible.

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- viii. Once the records are final accepted, then there must be possibility for attaching the as built drawings, attaching the signed report etc.
- ix. At any movement of time there shall be feasibility in the software to extract the line erection report.
- x. Also option shall be available for selecting the line for hydro test circuit. So that after complete erection of the system or working drawing, there must be option available for extracting the liner erection report based on the hydro test circuit loop number.

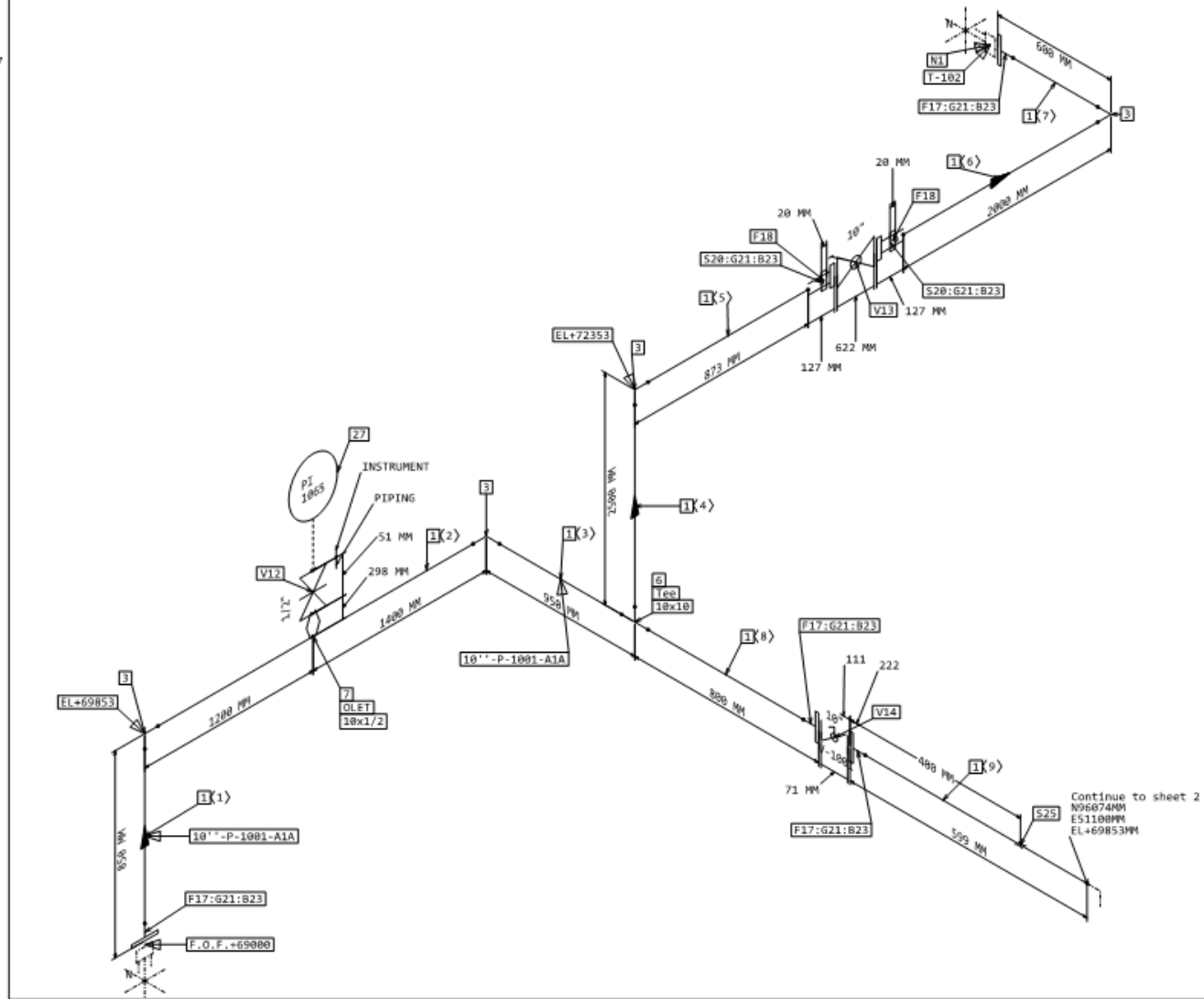
4.2.4.13. Specification driven Isomec Module:

- i. During piping erection works as built is the most important document after erection of the piping.
- ii. Drawing an isometric on the any cad tool with all bill of material is not easy and over that it is very time and labor oriented job.
- iii. Software shall contain a module for drawing a piping isometrics with full bill of materials, support location.
- iv. This isometrics shall be specification driven i.e. all the specification shall be fed into the system with all the dimensions and standards. So that during plotting isometric drawings selection of the material can be done through the software.
- v. One the drawing is plotted isometric drawing shall be generated which gives complete isometric with full bill of material.
- vi. Such isometric drawing is as given below:

1	PIPE 8-36-10 BE SEAMLESS	10	ASTM A 106 GR. B	7.67
2	SCH. 80 ASTM A 106 GR. B			
3	ELBOW 90 LR BW 1.5D B-16.9	10	ASTM A 234 GR.WPB	4
4	SCH. 10 ASTM A 234 GR.WPB			
5	TEE EQUAL 8-16.9 BW SCH.	10	ASTM A 516GR.70+3MM 4105	1
6	STD ASTM A 516GR.70+3MM 4105			
7	SOCKLET, 3800LB, SMF, CS	10X0.5 CS		1
8	VALVE GATE API-602 SW 3000#	0.5	BODY-ASTM A 105 TRIM	1
9	VALVE SHEET NO.		STELLITED,STEM-13% CR STEEL	
10	FLANGE WN B-16.5 150# RF	10	ASTM A 105	4
11	125AARH ASTM A 105			
12	FLANGE LAP B-16.5 150# RF	10	ASTM A 105	2
13	125AARH ASTM A 105			
14	STUB END LR B-16.9 BW	10	ASTM A 403 GR.MP316L-MX	2
15	125AARH SCH 105 ASTM A 403			
16	GR.MP316L-MX			
17	GUID SUPPORT	10		1

13	VALVE GLOBE BS-1873 FLDG	10	BODY-ASTM A 216GR.WCB,TRIM-13%CR	1
14	150# RF VALVE SHEET NO.		STEEL	
15	WAFFER STYLE BUTTERFLY VALVE	10	BODY-ASTM A	1
16	BS-5155 FLDG 150# RF VALVE		105/A216GR.WCB,TRIM-13%CR STEEL	
17	SHEET NO.			
18	GASKET B-16.20/ANSI B16.5	10	SP.MND 55316+GRAFIL	6
19	SPIRAL 150# SP.WIND			
20	191 BOLT WITH 2 NUTS BOLT:A	10X1	BOLT:A 193 GR.B7,NUT:A 194 GR.2H	96
21	193 GR.B7,NUT:A 194 GR.2H			
22	INSTRUMENT	0.5		1

1	367	10	BEVEL	BEVEL	PIPE10
2	1298	10	BEVEL	BEVEL	PIPE10
3	153	10	BEVEL	BEVEL	PIPE10
4	1983	10	BEVEL	BEVEL	PIPE10
5	492	10	BEVEL	BEVEL	PIPE10
6	1619	10	BEVEL	BEVEL	PIPE10
7	117	10	BEVEL	BEVEL	PIPE10
8	482	10	BEVEL	BEVEL	PIPE10
9	497	10	BEVEL	BEVEL	PIPE10



25/09/2015

10''-P-1001-A1A

10''-P-1001-A1A

10F2

R08

4.2.4.14. Pipe support module:

- i. Complete pipe supports data shall be arrive from the auto spool data which was extracted from the neutral files supplied by the designer.
- ii. In case such data is not arrived, the provision for the manual entry of the data shall be provided.
- iii. Each and every support in the piping system is identified by KKS code, all these data with KKS code, type of support (sliding support, guide support, hanging support, fixed support etc) , with dia of pipe line , location of the support etc.
- iv. And the applicable inspection methods and the quantum of inspection to be carried out over the weld joints of the supports shall be fed into the system.
- v. Other than this the reporting and everything is similar to the structural module.
- vi. Hydro test loop shall also available for the support data, so that during extraction of the CRR loop wise extraction is possible.
- vii. During erection of the support option for selecting the material i.e. from the which item number the materials is being selected, supplied by NPCIL or by contractor shall be available.

4.2.4.15. Valve / Orifice erection:

- i. Process flow for the valves is similar to the equipment, where as the welding is covered in piping.
- ii. Reports and the path flow is pre-defined before contract, once the contract is awarded then the pre-defined reports shall be assigned to the imported BOQ item which is applicable.
- iii. Once assigning activity is completed, user shall feed the data into the system with respect to the working drawings.
- iv. Based on the fed data, erection report of valves can be generated and forwarded to the next hierarchy as pre-defined.
- v. Valve data may be fed by contractor user or NPCIL user.
- vi. Option for identifying the hydro test loop of the valves in which it is falling shall be available. So that during CRR (Circuit release report) extraction loop wise report can be extracted even for valves also.

4.2.4.16. Planning module:

- i. For any project scheduling is very important, all the activities in the project to macro level shall be defined and all the predecessors and the successors shall be known. And what are the critical activities falling in the critical path shall be identified. And also targets shall be set to complete the project in the specified time period.
- ii. In this regard the proposed software shall consist of a module for planning.

KKNPP 3 & 4	Development and implementation of construction management software
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- iii. This module shall have feasibility to define projects, work break down structure, defining the activities in the work break down structure.
- iv. Provision for feeding the start date, duration of each and every activity.
- v. Provision for defining the predecessors and the successors of each and every activity.
- vi. Based on the predecessors and the successors software shall derive the critical path of the project and shall be able identify the critical activities in the project.
- vii. Also comparing the actual progress with respect to targets set and with respect to the schedule.
- viii. Here each and every activity shall have some scope of work such as unit of measurement; provision shall be made to include user defined fields.

4.2.5. Reports :

Sample report formats for the various module is as given in the Annexure - I.

WELDING INSPECTION REPORT FOR PIPING															
Contractor Name										Format No					
Project		Nuclear Power Project								Report No					
Package										Date					
Work Order No										Drg No					
Client		M/s. NPCIL, Kudankulam								Ref. QAP No					
Name of the System						Welding Consumables		CB04X9H11M3/CB-08F2C		Ref. WP No					
Unit		KKNPP-I / II / III / IV						ЭА-400/10Т/ЮНИИ-13/45/55		WPS No					
Weld Joint Category						Argon Purity				QA Category					
Welding Process		GTAW/GTAW+SMAW				Argon Flow Rate				Type of Record					
Sl No	Joint No	Line No	Pipe Size (mm)	Block / Spppl No	IMIR Report No	Welder No	Alignment & Fitup Inspection		Weld Fitup Inspection		Weld Visual Inspection		NDT Inspection		
							L&T (Mech)	NPCIL (Mech)	L&T (Mech)	NPCIL (Mech)	L&T (Mech)	NPCIL (Mech)	DPT Report No	RT Report No	UT Report No
1															
2															
3															
4															
5															
6															
7															
8															
9															
Above Joints are Accepted/Rejected															
L&T (QA)								NPCIL (QA)							

PIPELINE ERECTION / ALIGNMENT REPORT																
Contractor Name										Format No						
Project		Nuclear Power Project								Report No						
Package										Date						
Work Order No										Drg No						
Client		M/s. NPCIL, Kudankulam								Ref. WP No						
Name of the System										Type of Record						
Unit		KKNPP-I / II / III / IV								Material						
Sl No	Line No	Pipe Size			Identification		Quantity		Material Used (CS or SS)	Designation	Pipe Weight (kg)	Valve Weight (kg)	Support No	Elevation		Remarks
		Dia	Thick	Inch Dia	From Joint No	To Joint No	Mtrs / No	Inch Mtr						Required	Actual	
1																
2																
3																
4																
5																
6																
7																
8																
Above Joints are Accepted/Rejected																
L&T (MECH) NPCIL (MECH)																

HYDRO TEST SCHEME													
Contractor Name								Report No					
Project			Nuclear Power Project					Date					
Package								Drg No					
Work Order No								Test Scheme No					
Client			M/s. NPCIL, Kudankulam					Testing Medium					
Name of the System								Unit		KKNPP-I / II / III / IV			
SI No	Circuit No	Colour	Line No	Pipe Size (Dia & Thick)	Pipe Line Designation	Hydro test Pressure (Mpa)	Leak Search Pressure (Mpa)	SRV set Pressure (Mpa)	Holding Time (min)	L&T (MECH)	NPCIL (MECH)	Field Engg NPCIL	Remarks
1													
2													
3													
4													
5													
6													
7													
8													
Above Joints are Accepted/Rejacted													
L&T (MECH) NPCIL (MECH)													

LIST OF WELDED JOINTS WITH WIR											
Contractor							Report No				
Project		Nuclear Power Project					Date				
Package							Drg No				
Work Order No							Name of the System				
Client		M/s. NPCIL, Kudankulam					Unit		KKNPP-I / II / III / IV		
Sl No	Joint No	Line No	Pipe Size			WIR No	RT Inspection		Type of Joint	Sheet No	Remarks
			Dia mm	Thick mm	Inch Dia		XR No	RIR No			
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
L&T (MECH)NPCIL (MECH)											

SUPPORT ERECTION AND WELDING REPORT																																							
Contractor Name																								Format No															
Project				Nuclear Power Project																				Report No															
Package																								Date															
Work Order No																								Drg No															
Client				M/s. NPCIL, Kudankulam																				Ref. QAP No															
Name of the System												Welding Consumables				CB04X9H11M3/CB-								Ref. WP No															
Unit												KKNPP-I / II / III / IV												ЭА-400/10Т/ЮНИИ-13/45/55				QA Category											
Welding Process												GTAW/GTAW+SMAW												Weld Joint Category								Type of Record							
Sl No	Support			Anchor Fasteners					Depreservation		Location, Elevation asper Support Drg.		Application Graphite Powder		Tightness of Turnbuckles in Anger Rods		Status of Spring Hangers		Fitup				Weld Visual			Weld (DPT if Required)		Represe ravatio n		Ref. Piping Supp Fabrication Report									
	System	KKS Code	Weight	Size	Type	Q-Ty	Torque as in catalog	Actual Terque Applied	L&T (Mech)	NPCIL (Mech)	L&T (Mech)	NPCIL (Mech)	L&T (Mech)	NPCIL (Mech)	L&T (Mech)	NPCIL (Mech)	L&T (Mech)	NPCIL (Mech)	L&T (Mech)	L&T (QA)	NPCIL (Mech)	NPCIL (QA)	L&T (Mech)	L&T (QA)	NPCIL (QA)	L&T (QA)	NPCIL (QA)	L&T (Mech)	NPCIL (Mech)										
1																																							
2																																							
3																																							
4																																							
5																																							
6																																							
7																																							
8																																							
9																																							
10																																							
Above Joints are Accepted/Rejected																																							
L&T (MECH)										L&T (QA)										NPCIL (MECH)										NPCIL (QA)									

RADIOGRAPHY INTERPRETATION REPORT										
Contractor Name						Format No				
Project			Nuclear Power Project			Report No				
Package						Date				
Work Order No						Drg No				
Client			M/s. NPCIL, Kudankulam			Ref. WP No				
Name of the System						Type of Record				
WIR No						Weld Category				
Unit			KKNPP-I / II / III / IV			QA Category				
Acceptance Criteria						Flim				
Exposure Time						Sensitivity				
Source to film distance						Density				
Source/ X-ray						Source Size				
Technique of Exposure						Activity				
Material						Focal Size				
SI No	Line No	Joint No	Pipe Size		Welder No	Film No	Joint Segments	Observation	Result	Remarks
			Dia	Thick						
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
Abbreviations:										
LF : Lack of Fusion			S : Slag			B/T : Burn Through				
LP : Lack of Penetration			C: Crack			EP : Excess Penetration				
C/P : Cluster Porosity			P/H : Pin Hole			RC : Root Cancavity				
LEVEL II (NDT AGENCY)			L&T (QC)			NPCIL (QA)				

ULTRASONIC TEST REPORT

Contractor Name		Format No	
Project	Nuclear Power Project	Report No	
Package		Date	
Work Order No		Drg No	
Client	M/s. NPCIL, Kudankulam	Ref. WP No	
Name of the System		Type of Record	
Activity		Weld Category	
Unit	KKNPP-I / II / III / IV	QA Category	

Equipment Used		Method	
Calibration Block		Reference Block	
Probe Used		Reference Block SI No	
Frequency		Machine Calibration Date	
Size		Material	

1. Gain Setting		Couplant	
2. Gain Setting for Scanning		Type of Joint	
3. Transfer Correction		Weld Thickness	
4. Range		Acceptance standrad	

SI No	Test Materials Particulars	Joint No	Remarks
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Result : Acceptable / Repair

LEVEL II (NDT AGENCY)

L&T (QC)

NPCIL (QA)

LIQUID PENETRANT TEST REPORT					
Contractor Name				Doc No	
Project		Nuclear Power Project		Ref. WP No	
Package				Report No	
Work Order No				Date	
Client		M/s. NPCIL, Kudankulam		Drg No	
Name of the System				Ref. WIR No	
Activity				Weld Category	
Unit		KKNPP-I / II / III / IV		QA Category	
KKS Code				Surface Condition	
Equioment / Syztem				Temperature	
Location / Room No				Dwell Time	
		Make	Batch No	Date of Manufacture	Date of Expiry
Cleaner					
Penetrant					
Developer					
Sl No	System	Line No (or) Support No	Joint No	Observation	Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
LEVEL II (NDT AGENCY)		L&T (QC)		NPCIL (QA)	

INTEGRITY / LEAK TESTING REPORT					
Contractor Name		Report No			
Project		Format No			
Package		Doc No			
Work Order No		Date			
Client		Drg No			
Unit		Name of System			
1. Piping C.R.R.No & Circuit No :					
2. KKS Code :					
3. Impulse Tubing C.R.R.No & Circuit No :					
4. Equipment / System Category :					
5. Test Medium / Quality :					
6. Date of Testing :					
7. Test Scheme No :					
8. Deviations from Test Scheme (if Any) :					
9. a) Terminal Points (As per test Scheme) : YES / NO :					
b) Filling / Pressurization Point (As per test Scheme) : YES / NO :					
10. Pressure Gauges and Safety Relief Valve :					
Pressure Gauge / SRV	Equipment Sl. NO	Range	Least Count	Set Pressure	
Cleaner					
Penetrant					
Developer					
11. Rate of Pressurization Specified :			Actual :		
12. Test Observations :					
a) Integrity & Leak Search (Pressures and Temperature) :					
	Test Temperature	Test Pressure (Mpa)	Holding Time (Hours)	Leak Search Pressure (Mpa)	Pressure Drop
Specified					
Actual					
b) Number of Times the System is Subjected to integrity Test Pressure :					
c) Leak Search Results (attach list) :					
d) List of Inaccessible Joints / Area (attach list if Any) :					
13. Rate of De-Pressurization Specified :			Actual :		
14. Post Cleaning :					
15. Remarks :					
i) Portion Remain Untested :					
W.R.T.Circuit :					
ii) Test Experience :					

CALIBRATION REPORT FOR PRESSURE GAUGE

Contractor Name		Report / MR No	
Project	Nuclear Power Project	Date	
Package		Amp. Temp.	
Work Order No		R.H (30% to 80%)	
Client	M/s. NPCIL, Kudankulam	Drg No	
Unit	KKNPP-I / II / III / IV	Name of System	

1.1. Details of Gauge :

TAG NO / KKS CODE		Accuracy (%)	
SI No		Cal. Date	
Model No		Test Medium	
Contract Item No		Process Connection	
Least Count		Cal. Procedure	
Cal. Range			

1.2. Details of Pressure Gauge Accessories :

SI No	Description

1.3. Details of Master Equipment Used :

SI No	Description	Inst. SI. No	Make Model	Range	Accuracy	Cal. Reference	Cal. Due. Date

1.4. Calibration Data Table :

SI No	Input in Dial Reading	Input Kg/Cm2	Ref. Gauge Reading in Kg/Cm2	As Found					As Left				
				Inc	Dec	Error		Hysteresis	Inc	Dec	Error		Hysteresis
						Inc	Dec				Inc	Dec	
1													
2													
3													
4													
5													
6													

1.5. Result :

Description	0.381	Permissible (%)	1	Max. % Hysteresis	0.48
--------------------	--------------	------------------------	----------	--------------------------	-------------

Details of Adjustments : Zero : Nil Span : Nil

Inference : Instrument Accepted

Calibrated by

Verified by

Calibration Engineer

Calibration in Charge

LIST OF SUPPORTS / VALVE WITH ERECTION REPORT NO.						
Contractor Name				Package		
Project		Nuclear Power Project		Work Order No		
Client		M/s. NPCIL, Kudankulam		Date		
Name of the System				Drg No		
Unit		KKNPP-I / II / III / IV		Loop No		
SI No	ISO Sheet No	Support / Valve No	Support / Valve Type	Support / Valve Weight kg	Support / Valve Erection Report No	Remarks (Loop No)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
L&T (MECH)			NPCIL (MECH)			

SUPPORTS MODIFICATION REPORT

Contractor Name		Report No	
Project	Nuclear Power Project	Package	
Client	M/s. NPCIL, Kudankulam	Work Order No	
Name of the System		Date	
Drg No		Ref. W/R No	
Unit	KKNPP-I / II / III / IV	Type of Report	

SI No	Building	System / WD No	Support KKS Code	Details of Category	Support Sheet No	ISO Sheet No
1						

Any Other Reasons for Modification

Details of Category :

Description of Sketch :

L&T (MECH)

NPCIL (MECH)

Distribution : 1. L&T Site (Piping Execution), 2. L&T Document Cell, 3. NPCIL (Mech)

MATERIAL ACCOUNTING STATEMENT																														
SL NO	SOQR ITEM NO	MATERIAL CODE	MATERIAL (CS / SS)	DESCRIPTION	SIZE	ITEM NO	BOX NO	CIV NO	CIV DATE	CIV CONTROL NO	CIV CONTROL DATE	UOM AS PER SOQR	CIV UOM	CIV Q-ty	(MAIS) ISSUED QTY			ERECTED QTY			RETURN QTY			CCV NO	CCV DATE	CCV CONTR OL NO	CCV CONTROL DATE	WASTGAE		REMARKS
															Mtr	KGs	Nos	Mtr	KGs	Nos	Mtr	KGs	Nos					Max. invisible wastage 2% (Non Returnable)	Max. Permissible wastage 4% (Returnable)	
1																														
2																														
3																														
4																														
5																														
6																														
7																														
8																														
9																														
10																														
11																														
12																														
13																														
14																														
15																														
16																														
17																														
18																														
19																														
20																														
21																														
22																														
23																														
24																														
25																														

Summary Statement for SOQR Item No-					
CIV UOM	CIV Total Received	Total Erected	Total Returned	SOQR UOM	SOQR Erected
Mtr					
Kgs					
Nos					

Summary Statement for SOQR Item No-					
CIV UOM	CIV Total Received	Total Erected	Total Returned	SOQR UOM	SOQR Erected
Mtr					
Kgs					
Nos					

XXXX (Supervisor)
Work Order No-XXXXXX

XXXX (Site-in-Charge)
Work Order No-XXXXXX

NPCIL (MECH)
Site Supervisor

NPCIL (MECH)
Engineer-in-Charge

ERECTION COMPLETION CHECK LIST REPORT

Contractor Name		Document No	
Project	Nuclear Power Project	Report No	
Package		Date	
Work Order No		Drg No	
Client	M/s. NPCIL, Kudankulam	Ref. WP No	
Name of the System		Type of Record	
Activity		Weld Category	
Unit	KKNPP-I / II / III / IV	QA Category	

Name of the Equipment		Safety / Seismic Category	
Location / Room No		Building	

SI No	Particulars	Checked by			Remarks
		L&T (Mech)	L&T (QA)	NPCIL (Mech)	
1	Approved Drg/spec. For installation and foundation layout (Availability) by L&T				
2	Checking of Foundation location				
3	Modification of Foundation or equipment supports				
4	Transportation and shipment arrangement from store to erection site				
5	Adequacy of lifting arrangement and Testing of Tools and Tackles				
6	Clearance for EP and bottom surface of equipment. (cleanliness)				
7	Orientation and Elevation of Terminal points on the installed equipment				
8	Installation foundation fasteners and Torquing as per the requirement				
9	Availability of WPS. PQR, INFO and electrodes. Fit-up clearance.				
10	Welding completion				
11	Tack weld if any				
12	Preservation (painting)				
13	Completion of Installation with Date				
14	Final survey & Alignment checks				
15	Any Other Deviation or points pertaining to the installed equipment				

L&T (MECH)

L&T (QA)

NPCIL (MECH)

INSTALLATION REPORT FOR LYING OF GI CONDUIT

Contractor Name				Report No		
Project	Nuclear Power Project			Format No		
Work Order No				Date		
Client	M/s. NPCIL, Kudankulam			Elevation		
Qualified Manpower Code				Name of the System		
Unit	KKNPP-I / II / III / IV			Building		
Package		Drawing No. with Rev. no.				
SI No	DESCRIPTION	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Marking of Routes					
2	Type & Size of conduit					
3	Distance between Spacers					
4	Bending Radius of Conduit					
5	Fixing of Saddles					
6	Tightness of joints					
7	Touch up Galvanizing paint on exposed threaded joints / threads					
8	Location given for Sensors					

ECIL EXECUTION
(signature with stamp)

ECIL – QA (signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

INSTALLATION REPORT FOR LAYING CONTROL CABLES

Contractor Name		Report No	
Project	Nuclear Power Project	Format No	
Work Order No		Date	
Client	M/s. NPCIL, Kudankulam	Elevation	
Qualified Manpower Code		Name of the System	
Unit	KKNPP-I / II / III / IV	Building	
Package		Drawing No. with Rev. no.	

SI No	DESCRIPTION	QAP(002) Clause	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Type & Size of Cable	1.1					
2	I.R. value before laying	1.2					
3	Marking of Routes	3.1					
4	Clamping Interval & Tightness of Clamps	4.1					
5	Bending Radius	4.2					
6	Physical damage check	4.3					
7	Cable Continuity	4.4					
8	I.R. value after laying	4.5					

ECIL EXECUTION
(signature with
stamp)

ECIL – QA
(signature
with stamp)

NPCIL – E & I
(signature with
stamp)

NPCIL QA
(signature with
stamp)

INSTALLATION REPORT FOR PANEL ERECTION OF PANELS, JUNCTION BOXES, CABINETS & ISS

Contractor Name		Report No	
Project	Nuclear Power Project	Format No	
Work Order No		Date	
Client	M/s. NPCIL, Kudankulam	Elevation	
Qualified Manpower Code		Name of the System	
Unit	KKNPP-I / II / III / IV	Building	
Package		Drawing No. with Rev. no.	

SI No	DESCRIPTION	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	NPCIL (QA)	REMARKS
1	Welding machines ,Welding Electrodes/ Fasteners						
2	Panel identification & location marking						
3	Cleanliness of EP						
4	Alignment						
5	Welding and touch up painting						
6	Rigidity of fixing using fasteners(Tightening Torque)						

ECIL EXECUTION
(signature with stamp)

ECIL – QA (signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

INSTALLATION REPORT FOR FIXING OF ANCHOR FASTENER

Contractor Name				Report No		
Project	Nuclear Power Project			Format No		
Work Order No				Date		
Client	M/s. NPCIL, Kudankulam			Elevation		
Qualified Manpower Code				Name of the System		
Unit	KKNPP-I / II / III / IV			Building		
Package		Drawing No. with Rev. no.				
SI No	DESCRIPTION	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Type & Size of Anchor fastener					
2	Marking of Drill Holes					
3	Drilling & cleaning					
4	Distance between Anchor & Edge Distance					
5	Perpendicularity of Anchor fastener					
6	Rigidity of Anchor fastener					

ECIL EXECUTION
(signature with stamp)

ECIL – QA (signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

REPORT FORMAT FOR INSTALLATION OF FIRE ALARM DETECTORS

Contractor Name				Report No		
Project	Nuclear Power Project			Format No		
Work Order No				Date		
Client	M/s. NPCIL, Kudankulam			Elevation		
Qualified Manpower Code				Name of the System		
Unit	KKNPP-I / II / III / IV			Building		
Package		Drawing No. with Rev. no.				
SI No	DESCRIPTION	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Model and Type of detector					
2	Location Marking for Detectors					
3	Fixing of Detectors					
4	Identification of detectors					
5	Wiring					
	Termination (torque)					
6	Cable bending radius					

ECIL EXECUTION
(signature with stamp)

ECIL – QA (signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

FABRICATION REPORT

Contractor Name				Report No		
Project	Nuclear Power Project			Format No		
Work Order No				Date		
Client	M/s. NPCIL, Kudankulam			Elevation		
Qualified Manpower Code				Name of the System		
Unit	KKNPP-I / II / III / IV			Building		
Package		Drawing No. with Rev. no.				
SI No	DESCRIPTION	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Materials					
2	Fit up					
3	Welding					
4	NDT test					
5	Surface preparation & Painting					

ECIL EXECUTION
(signature with stamp)

ECIL – QA (signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

INSTALLATION REPORT FOR GLANDING & TERMINATION

Contractor Name		Report No	
Project	Nuclear Power Project	Format No	
Work Order No		Date	
Client	M/s. NPCIL, Kudankulam	Elevation	
Qualified Manpower Code		Name of the System	
Unit	KKNPP-I / II / III / IV	Building	
Package		Drawing No. with Rev. no.	

SI No	DESCRIPTION	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	NPCIL (QA)	REMARKS
1	Glanding						
2	Wiring						
3	Identification						
4	Dressing and bunching						
5	Cable bending radius						
6	Termination (torque)						

ECIL EXECUTION
(signature with stamp)

ECIL – QA (signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

INSTALLATION REPORT FOR FIELD INSTRUMENTS

Contractor Name				Report No		
Project	Nuclear Power Project			Format No		
Work Order No				Date		
Client	M/s. NPCIL, Kudankulam			Elevation		
Qualified Manpower Code				Name of the System		
Unit	KKNPP-I / II / III / IV			Building		
Package		Drawing No. with Rev. no.				
SI No	DESCRIPTION	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Location of Instrument					
2	Fixing of Support Structure					
3	Fixing of instrument					
4	Alignment					
5	Check for flow direction					
6	Tightening torque	Required / Observed				
7	Tagging of instrument					
8	Preservation & Protection after Installation					

ECIL EXECUTION
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ECIL – QA (signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

FORMAT FOR INSTALLATION REPORT OF DOOR SWITCH, WALL MOUNTED DEVICES/ UNITS etc,

Contractor Name				Report No			
Project	Nuclear Power Project			Format No			
Work Order No				Date			
Client	M/s. NPCIL, Kudankulam			Elevation			
Qualified Manpower Code				Name of the System			
Unit	KKNPP-I / II / III / IV			Building			
Package		Drawing No. with Rev. no.					
SI No	DESCRIPTION	QAP Clause	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Location Marking & Identification	3.1					
2	Type & Size of Anchor Fastener	3.2					
3	Edge Distance	3.4					
4	Perpendicularity of Anchor	3.5					
5	Tightening torque	3.6					
6	Stripping of wire	3.7.1					
7	Identification of wires	3.7.2					
8	Wire connection at their designated terminal.	3.7.3					
9	Termination Torque	3.7.4					
10	Bunching of spare wires.	3.7.5					

ECIL EXECUTION
(signature with stamp)

ECIL – QA
(signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

INSTALLATION REPORT FORMAT FOR QA2 CATEGORY PANELS

Contractor Name				Report No			
Project		Nuclear Power Project		Format No			
Work Order No				Date			
Client		M/s. NPCIL, Kudankulam		Elevation			
Qualified Manpower Code				Name of the			
Unit		KKNPP-I / II / III / IV		Building			
Package				Drawing No. with Rev. no.			

SI No	DESCRIPTION	ACCEPTANCE NORM QAP Clause	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	NPCIL (QA)	REMARKS
1	Welding Electrodes/ Fasteners	Test Certificate/ Certificate of Compliance						
2	Panel identification & location marking	As per Equipment Layout/ Installation Drawing as in Annexure-I						
3	Installation by welding:							
3.1	Fit up & Alignment	Fit up gap $\leq 1.5\text{mm}$, Alignment: $\pm 2.5\text{mm/m}$, Front face/ mosaic elements symmetrically matched in the same plane						
3.2	Welding	Process: SMAW, E 7018						
		Electrode Baking : 1 Hr.at 250°C						
		Cleaning: Fusion faces free from moisture, oil, paint, and heavy scale.						
3.2.1	- visual	Free from porosity, cracks, spatter, slag, blow holes, craters, pin holes, under cuts, over laps, un-uniform beading						
3.2.2	- measurement	As per Equipment Installation Drawing						
3.2.3	- PT	Max. 4nos of Rounded						
3.3	Touch up painting	No discontinuity, no peel off at Weld area and Heat affected Zone painted.						
4	Installation by bolting:							
4.1	Alignment	Alignment: verticality $\leq \pm 2.5\text{mm/m}$, Front face/ mosaic elements symmetrically matched in the same plane						
4.2	Tightening Torque	As per Equipment Installation Drawing/ Standard Engineering practice						M12: 40 To 50 Nm M14: 55 to 65 Nm
5	Protective Earthing,	Grounding resistance $\leq 0.1\Omega$						
6	Assembly & installation of loose parts/ accessories	As per manufacturer manual						
7	Measuring instruments/ equipments used: - Resistance meter - Torque wrench - Welding Machine - Baking Oven	Validity of test report/certificate						

ECIL EXECUTION
(signature with stamp)

ECIL – QA (signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA (signature with stamp)

FORMAT FOR OFC TERMINATION REPORT

Contractor Name						Report No		
Project	Nuclear Power Project					Format No		
Work Order No						Date		
Client	M/s. NPCIL, Kudankulam					Elevation		
Qualified Manpower Code						Name of the System		
Unit	KKNPP-I / II / III / IV					Building		
Package		Drawing No. with Rev. no.						
SI No	DESCRIPTION	QAP (027) Clause	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	NPCIL (QA)	REMARKS
1	Glanding	3.1 – 3.3						
2	Fiber Preparation	4.1 – 4.3						
3	Splicing	5.1 – 5.2						
4	Routing inside LIU	5.3						
5	Mounting & Earthing	6						
6	Interconnection between LIU and Equipment terminal point	7						
7	Fiber Loss Test	8						

ECIL EXECUTION
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ECIL – QA
(signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

REPORT FORMAT FOR GLANDING & TERMINATION IN QA2 CATEGORY PANELS

Contractor Name				Report No			
Project	Nuclear Power Project			Format No			
Work Order No				Date			
Client	M/s. NPCIL, Kudankulam			Elevation			
Qualified Manpower Code				Name of the System			
Unit	KKNPP-I / II / III / IV			Building			
Package		Drawing No. with Rev. no.					
SI No	DESCRIPTION	QAP (018) Clause	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Glanding	3					
2	Cable Identification tag	4.1					
3	Dressing and bunching	4.2, 4.3					
4	Ferrule identification	6.1					
5	Termination	6.2 to 6.7					
6	Drain Wire termination	7					

ECIL EXECUTION
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ECIL – QA
(signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

SOLDERING TERMINATION REPORT FOR CPS EE CONNECTORS

Contractor Name				Report No			
Project	Nuclear Power Project			Format No			
Work Order No				Date			
Client	M/s. NPCIL, Kudankulam			Elevation			
Qualified Manpower Code				Name of the System			
Unit	KKNPP-I / II / III / IV			Building			
Package		Drawing No. with Rev. no.					
SI No	DESCRIPTION	QAP (019) Clause	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	REMARKS
1	Identification	3					
2	Crimping	4.2					
3	Soldering	5.1					
4	Stress relieving arrangement	5.2					
5	Continuity & I.R.	5.3, 5.4					
6	Ingress Protection	5.5					

ECIL EXECUTION
(signature with stamp)

ECIL – QA
(signature with stamp)

NPCIL – E & I
(signature with stamp)

NPCIL QA
(signature with stamp)

INSTALLATION REPORT FOR NFME SENSORS

Contractor Name		Report No	
Project	Nuclear Power Project	Format No	
Work Order No		Date	
Client	M/s. NPCIL, Kudankulam	Elevation	
Qualified Manpower Code		Name of the System	
Unit	KKNPP-I / II / III / IV	Building	
Package		Drawing No. with Rev. no.	

SI No	DESCRIPTION	QAP (020) Clause	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	NPCIL (QA)	REMARKS
1	Sensor Inspection Report	Availability						
2	Sensor identification w.r.t. channel	As per Layout/ Installation Drawing						
3	Assembly of cable lines into the flange	As per ECIL/KKNPP-1&2/WP/032						
4	Installation	As per ECIL/KKNPP-1&2/WP/032						
5	Flange tightening torque	As per ECIL/KKNPP-1&2/WP/032						
6	Bending radius of coiling	As per ECIL/KKNPP-1&2/WP/032						
7	Plugging of connectors	As per ECIL/KKNPP-1&2/WP/032						

ECIL EXECUTION (signature with stamp)

ECIL – QA (signature with stamp)

NPCIL – E & I (signature with stamp)

**NPCIL QA
(signature with stamp)**

FORMAT FOR HCS FOC TERMINATION REPORT

Contractor Name				Report No				
Project		Nuclear Power Project		Format No				
Work Order No				Date				
Client		M/s. NPCIL, Kudankulam		Elevation				
Qualified Manpower Code				Name of the System				
Unit		KKNPP-I / II / III / IV		Building				
Package			Drawing No. with Rev. no.					
Sl No	DESCRIPTION	QAP (021) Clause	OBSERVATION	ECIL (EXCN)	ECIL (QA)	NPCIL (E&I)	NPCIL (QA)	REMARKS
1	Cable Identification	3.1						
2	Fiber Preparation	3.2						
3	Cleaving	3.3						
4	Fiber attenuation	3.4						
5	Bending radius	3.5						
6	Termination at optical port	3.6						

**ECIL EXECUTION (signature
with stamp)**

**ECIL – QA (signature with
stamp)**

**NPCIL – E & I (signature
with stamp)**

**NPCIL QA
(signature with
stamp)**

INSPECTION RECORD FOR ERECTION OF LINER PLATES (FLOOR / WALL)												
Contractor Name							Report No					
Project		Kudankulam Nuclear Power Project					Date					
Work Order No							Name of the System					
Client		M/s. NPCIL, Kudankulam					Building / Room No					
Area of Application							Drawing No. with Rev. no.					
Unit		KKNPP-I / II / III / IV					Package					
SI No	Plate / Joint No.	Location (As Per Drawing)	Fit-Up	Final Weld (Visual)		VBT		DPT		Final Dimensional Check		Remarks
		HCC	HCC-QA	HCC-QA	NPCIL-QA	HCC-QA	NPCIL-QA	HCC-QA	NPCIL-QA	HCC-QA	NPCIL	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

HCC (MECH)

HCC (QA)

NPCIL (MECH)

NPCIL (QA)

INSPECTION RECORD FOR PAINTING OF DUCTS / EP's																
Contractor Name									Report No							
Project		Kudankulam Nuclear Power Project							Date							
Work Order No									Name of the System							
Client		M/s. NPCIL, Kudankulam							Building							
Structure Identification:									Drawing No. with Rev. no.							
Unit		KKNPP-I / II / III / IV							Package							
SL NO	VENTILATION DUCT NO.	SAND / GRIT BLASTED AREA (VISUAL CHECK) - SA 2-1/2 GRADE.			PRIMER APPLICATION (AS APPLICABLE) (DFT MIN. MICRONS)				EPOXY COAT APPLICATION CHECK (AS APPLICABLE)				FINAL COAT AND THICKNESS CHECK (DFT MIN. MICRONS)			
		HCC	HCC-QA	NPCIL	COMP TIME	HCC	HCC-QA	NPCIL	COMP TIME	HCC	HCC-QA	NPCIL	COMP TIME	HCC	HCC-QA	NPCIL - QA
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

DOC.NO: HCC F 15 17 37, REV.NO: 2, DATE OF REV: 10-05-06

1. Sand / Grit blasting equipment check (Hopper, Compressor, Nozzle, Hose etc:-)
OK / Not OK
2. Hard dry sand size as per specifications (0.8 to 2mm) - OK / Not OK / Grit Size & Spec. (0.6mm to 1.6mm)
OK / Not OK
3. Painting material as per specs.(Primer - Zinc Anode 304 - Composition of Ethyl Silicate & Zinc dust)
OK / Not OK
- Subsequent coats - Protectomastic Dark Grey - Composition of Modified Epoxy Base with Special Catalyst (1:1)
OK / Not OK

HCC

HCC-QA

NPCIL

NPCIL-QA

CONCRETE POST-POUR INSPECTION REPORT

Contractor Name		Report No	
Project	Nuclear Power Project	Format No	
Work Order No		Date of Inspection	
Client	M/s. NPCIL, Kudankulam	Ref.Pre-Pour Report No.	
Location of the Structure		Name of the System	
Unit	KKNPP-I / II / III / IV	Building	
Package		Drawing No. with Rev. no.	

SI No.	Description of Activity	HCC		NPCIL	Remarks
		Site Engineer	QA Engineer		
1	Check for Application of Surface retarder for green cutting of concrete				
2	Cured by covering with Wet Hessian bags / Sprinkling water / application of Curing compound				
3	Checked for Stripping of Formwork/Supports etc. after specified duration of Stripping time				
4	Checked for Position of Embedment Parts				
5	Post Concrete Survey, if necessary, carried out				
6	Checked for presence of any surface Defects i.e., minor/major cracks, voids, segregation of aggregate etc. if any				
7	Repaired and Finished all surface Defects by specifications / approved methods				
8	Structure or part of Structure is alright and allowed for subsequent activity / backfilling around the structure				

HCC Site Engineer		HCC QA Engineer		NPCIL	
Name:		Name:		Name:	
Sign:		Sign:		Sign:	
Date:		Date:		Date:	

EMBEDDED PARTS / STRUCTURAL STEEL FABRICATION REPORT

Contractor Name		Report No	
Project	Nuclear Power Project	Date	
Work Order No		Name of the System	
Client	M/s. NPCIL, Kudankulam	Building	
Structure Identification:		Drawing No. with Rev. no.	
Unit	KKNPP-I / II / III / IV	Package	

Sr. No.	EP Identification	Description	Thick (mm)	Dia (mm)	Quantity		Length (m)	Total Length (m)	Wt./mtr or Wt./No. (MT)	Total Weight (MT)
					Set	Nos.				
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

HCC ENGINEER				NPCIL ENGINEER			
Name :				Name :			
Sign :				Sign :			
Date :				Date :			

EMBEDDED PARTS / STRUCTURAL STEEL ERECTION REPORT				
Contractor Name			Report No	
Project		Nuclear Power Project	Date	
Work Order No			Name of the System	
Client		M/s. NPCIL, Kudankulam	Building	
Structure Identification:			Drawing No. with Rev. no.	
Unit		KKNPP-I / II / III / IV	Package	
Sr. No.	EP Identification	Description	Name of Fragment / Location	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
HCC ENGINEER			NPCIL ENGINEER	
Name :			Name :	
Sign :			Sign :	
Date :			Date :	