

**Electronics Corporation of India Limited**  
**(A Government of India enterprise)**  
**Antenna Products & Satcom Division**  
**Hyderabad – 500062 (Telangana ) India**  
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**TENDER NO : ECIL:AP&SD:PUR:14-5005**

**Date:17-01-2017**

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**Cover page to the Tender Document**

	<p align="center"><b>ELECTRONICS CORPORATION OF INDIA LIMITED</b>  <b>(A Government of India Enterprises)</b>  <b>Antenna Products &amp; Satcom Division , ECIL (PO), Hyderabad – 500 062</b></p>
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Name of Organization	Electronics Corporation of India Limited, Hyderabad – 500 062 (Telangana) India		
Type of Organization	Public Sector Undertaking		
Tender Ref. No:	ECIL:AP&SD:PUR:14-5005		
Tender Title:	Supply, Installation & Commissioning, interlinking of the software, training and Warranty of the software with updations as per enclosed Tender Document		
Product Category:	Composite design and analysis software		
Document Cost:	Rs. 1000/- (Rupees One Thousand only)		
Tender Value:	EMD: Rs.2,00,000/-	Security Deposit: @10% of order value	
Tender type:	Buy		
Location:	Hyderabad (Telangana)		
Request for quote date:	On or before due date		
Last date for submission of bid:	10.02.2017 at 14.00 Hrs		
Opening date of part I	11.02.2017 at 14.00 Hrs		
Description of item:	Supply, Installation & Commissioning, interlinking of the software, training and Warranty of the software with updations	Quantity	
		1 Set	
Pre-Qualification:	As per specifications given in the tender		
Tender Document:	View Tender Document *		
Bid Document:	View Price Bid Document *		
Technical Document:	View Technical Document*		
Sector:	Electronics		
State:	Andhra Pradesh		
For further Information contact: S r . DGM, IMM, AP&SD,ECIL			
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Tender No: ECIL/AP&SD/PUR/14-5005

## **Tender Document**

### **1. Invitation to Tender:**

Electronics Corporation of India Limited, Antenna Products & Communications Division (AP&SD) invites “Two part Bid” for as per details given below.

### **2. Important Dates**

**Due date for submission of Two Part Bids : 10-02-2017 up to 14-00 Hrs.**

Techno- commercial bid (part 1) will be **opened on 11-02-2017 at 14-00Hrs.** Interested vendors may be present with prior permission.

After evaluation of the techno commercial bids, qualified list of vendors will be finalized.

Price bid (part 2) of the qualified vendors will be opened at a later date, which will be communicated to the qualified vendors.

**Pre-bid meeting will be held on 03.02.2017 at 10.00 Hrs.**

### **3. Manner and method of submission of offers:**

All pages of the tender shall be numbered and typed on the letter head of the vendor and be duly signed and stamped by company's authorized signatory. Hand written quotation will be summarily rejected. Corrections if any shall be duly authenticated with signature and seal of the company.

The quotation in prescribed form to this invitation shall be submitted in two parts and in different sealed envelopes super scribing tender number with due date.

Part-I (Technical Bid); It shall comprise of two sections namely technical section and commercial section and both sections shall be submitted along with tender fee and EMD in a single sealed envelope. **This bid shall not contain any price details.**

Part-II (Price Bid): It shall comprise of price details and shall be summated in a sealed separate envelope.

The above two sealed envelopes of Part-I & Part II shall be put in a single sealed envelope and submitted to the attention of S e n i o r Deputy General Manger, AP&SD-MMD,ECIL Post, Hyderabad 500062,AP,India.

**4. Cost of Tender Documents:**

Tender fee of **Rs.1000/-** is to be remitted along with the techno commercial bid in the form of a crossed bank draft favoring Electronics Corporation of India Limited” from a nationalized bank payable at Hyderabad. The cost of tender document is non-refundable.

**5. Earnest Money Deposit (EMD):**

**Earnest money deposit of Rs.2,00,000/-** shall be submitted along with the techno-commercial bid in the form of demand draft favoring Electronics corporation of India limited or a Bank Guarantee valid for a period of six months drawn from a nationalized bank payable at Hyderabad. The EMD deposited by the unsuccessful bidders will be appropriated towards security deposit. The bids will not be considered in the absence of payment towards the cost of tender document and EMD.

**6. Security deposit(SD):**

The successful bidder will be required to remit a security deposit equivalent to 10% of the purchase order value exclusive of taxes and duties etc. after adjusting the EMD amount already remitted. SD is to be remitted along with the order acceptance in the form of a crossed bank draft favoring Electronics corporation of India limited or a Bank Guarantee from a nationalized bank payable at Hyderabad. The security deposit will be forfeited in the event of failure to execute the purchase order. The security deposit will be refunded without interest after the purchase order is successfully executed to the satisfaction of the purchaser.

**7. Items tendered for:**

SL. NO	Item description
01	Supply, Installation & Commissioning, interlinking of the software, training and Warranty of the software with updations as per enclosed Annexure

Intending bidders who have not yet registered with ECIL are also requested to download “Suppliers Registration Form” from web [site www.ecil.co.in/tenders](http://www.ecil.co.in/tenders), fill it up and send the same along with the bids.

## TENDER SUBMISSION FORMAT (PRICE BID DOCUMENT )

Tender No : ECIL/AP&SD/PUR/14-5005

Date: 17-01-2017

### **I Vendor Particulars:**

Name and address of the bidder	
Telephone, fax and e-mail	
Name and designation of the office representing vendor	

### **II Item tendered for:**

SL NO	Item description	Qty	Rate	Value
01	Supply, Installation & Commissioning, interlinking of the software, training and Warranty of the software with updations as per enclosed <b>Annexure-M&amp;E/SW/003</b>	1 set		

### **III Terms and Conditions.**

1	Terms of price	
2	Payment terms (Please refer general Terms and Conditions of this tenders)	
3	Rate of Excise Duty, Service, and any other Taxes and duties applicable ( in case Vendor imports any item directly Customs duty exemption will not provided by ECIL) Note: Vendor shall specifically mention applicability of all taxes and duties. In the absence of specific confirmation of Taxes and duties, the quotation is liable to be rejected.	
4	Tendered Items are required immediately. Vendors are requested to quote earliest possible delivery schedule.	
5	Standard warranty ( minimum 1 year from the date of Installation)	
6	Estimated Packing & forwarding charges.	
7	Validity of quotation (minimum 90 days)	
8	DD No. & Date for Cost of Tender Documents	
9	DD No. & Date for EMD	
10	CST Registration No.	
11	TIN No.	
12	Income Tax PAN No.	
13.	ISO – 9000 Certificate or any other Certification	
14.	SSI / NSI Registration No., if applicable.	
15.	Any other relevant information	

**NOTE:** The Vendor shall submit offer in the above format only. Against each instructions mentioned below the vendor shall give a comment complied (✓) or Not complied (x)

**Instructions :**

- a) No column shall be left blank in the format.
- b) Incomplete counter offer and deviation from the Terms and Conditions will be summarily rejected.
- c) Photostat copies of quote / offer will be accepted. Only originals received within the time limit will be accepted.
- d) The vendor shall submit the certificate of registration under micro, small and medium enterprises development Act, 2006, in case of applicability.
- e) The offer shall meet point wise compliance to all points of Tender document, wherever non-compliance is there, suitable explanation needs to be provided.
- f) Technical proposal need not be restricted to the user requirements as given above. Any additional features may be added in the proposal to make it a professional package.
- g) Technical proposal may be as detailed as possible with functional block diagram where ever applicable.
- h) Foreign vendors shall offer bids directly or through their Indian Partners / Representatives.

**General Criteria for acceptance of Tenders:**

- 1. **Technical Specification:** Vendor shall comply with the Technical specification given in the Technical Document. The commercial offer of the Vendor who satisfies the Technical requirement only will be opened -complied / not complied.
- 2. **Experience :** Vendor shall provide details with documentary evidence the experience in supply of similar systems - complied / not complied.
- 3. **Warranty :** 1 year Free warranty and support is to be provided against all manufacturing defects and software update – complied / not complied.
- 4. **Foreign Vendors** shall have a Branch Office in India / Indian Partners / Representatives rendering support service – complied / not complied.
- 5. **Facilities :** Details of factory assembly and Testing facility shall be furnished. A committee of ECIL may visit to verify the facilities of the vendors for execution of Order if any .
- 6. **Service Centre :** Details of Service Centre location / Engineers working.
- 7. **Acceptance of Tenders :** No Tender will be accepted after due date. ECIL will not be responsible for postal / courier delay or lost in transit if any.

**Note:** Vendor shall provide documentary proof to prove his adherence to the qualifying criteria where ever necessary. Claims without support will not be considered.

### **GENERAL TERMS AND CONDITIONS**

This Tender and any order resulting from this tender shall be governed by the following Terms and Conditions of the contract and the supplier quoting against this tender shall be deemed to have read and understood the same. In case counter terms and conditions of business have been offered by the supplier, ECIL shall not be deemed to be governed unless specific written acceptance thereof has been obtained from ECIL.

1. **Terms of Price** : Quotation shall be submitted on FOR Hyderabad or FOR destination basis including Transit insurance. In case of ex-works / Ex-godown / FOR dispatching station the approximate packing, forwarding and freight shall be indicated by the suppliers. Hyderabad suppliers shall arrange free delivery at our Stores.
2. **Validity of Quote** : The quotation shall remain valid for a minimum period of 90 days from tender opening date.
3. **Performance Bank Guarantee** : Vendor shall submit a performance bank Guarantee for 10% of Purchase order value covering standard free warranty period of 1 year from the date of acceptance of goods by ECIL.
4. **Payment** : Payments for material and services will be made within 60 days from the date of acceptance of goods and services on pro- rata basis by ECIL.
5. **Insurance** : The supplier shall ensure goods for all transit risks if the payment terms is FOR Hyderabad or FOR destination unless otherwise stated specifically by the supplier in their quotation. The supplier shall ensure goods for all risks till acceptance of goods by End User.
6. **Liquidated Damages** : Delivery date is the essence of the contract. In the event of any delay in supply beyond the agreed delivery schedule, liquidated damages will be recovered @ 0.5% for week of delay or part thereof subject to maximum of 10% of the value of the order.
7. **Force majeure** : If the execution of Purchase Order is delayed beyond the period stipulated in the Purchase Order as a result of out break of hostilities, declaration of any embargo or blockage or fire, flood, acts of nature or any other contingency beyond the suppliers control due to act of God ,then ECIL may allow such additional time by extending the delivery period as justified by the circumstances of the case and its decision in this regard shall be final. Power failure will not be considered as a force majeure condition.
8. **Risk Purchase**: In case of failure to deliver the goods within the delivery date stipulated in the purchase order unless prior extension of delivery period is obtained, ECIL will be at liberty to

obtain such items as necessary from other source or cancel the order and in either case ECIL reserves the right to recover from the supplier the additional amount spent plus 10% to cover incidental expenses.

9. **Dispute resolution:** Any dispute arising out of purchase order or interpretation of any clause or terms and conditions hereof shall be settled through conciliation by both ECIL and the supplier, under the specific provision of arbitrational and conciliation act 1996. Only courts in Ranga Reddy district, state of Telangana, India have exclusive jurisdiction over this order.
10. **Right to reject:** The purchase reserves the right to reject any or all offers wholly or in part without assigning any reason.
11. **Short closure:** ECIL has the right to short close the tender even after evaluating the quotations without assigning any reason.
12. **Bank details:** The supplier shall give along with the quotation name of their banker, account number and also income tax permanent (PAN).
13. **Jurisdiction:** All disputes arising in connection with executing the purchase order will be subject to jurisdiction of the courts in Hyderabad and Secunderabad only.



**SPECIFICATIONS FOR  
COMPOSITE DESIGN AND ANALYSIS SOFTWARE – Rev.01**

## **1.0 INTRODUCTION**

This specification document covers the requirements of software suit / software modules for design, modeling and analysis of composites. The scope includes delivery, installation, commissioning, interlinking, training and warranty of the software. The supplier has to supply the software as a package of modules seamlessly integrated to meet the requirement of design, modeling and analysis of composite materials as per section 2.0 and section 3.0 of this specification. Complete scope of supply shall be as per section 4.0. This document has 11 pages.

## **2.0 SOFTWARE FOR DESIGN AND MODELLING OF COMPOSITES**

The software should be a standalone module or distributed modules capable of design and modeling of composites. The software (modules) should have the following features.

### **2.1 Computer Aided Design capabilities**

The software should include the following features,

- Geometry healing and repair for gaps and other data inaccuracies
- Mid-surfacing to create surfaces for thin walled components
- De-featuring tools (geometry repair, feature suppression, stitch surface, remove hole/fillet and partitioning)
- Non-manifold topology generation for volumes
- Creating a surface from an orphan mesh
- Split body and partitioning methods for dividing solid geometry into more manageable sections prior to hex meshing
- Ability for 3D Design of Mechanical Parts & Assemblies
- Ability to switch from visualization mode to design mode interactively without exiting the application
- Ability for Multi body design
- Integrated wireframe, surface & solid modeling capabilities
- Hybrid design capability where one can mix solid with surfaces in the same design giving lot of flexibility to the designer
- Ability to combine parametric & non-parametric features in a part design
- Support for both history based and non-history based model creation
- Ability to re-use features using cut/paste, drag/drop with or without specifications
- Undo/Redo functionality
- System should have dedicated analysis tools to check the surface quality
- Support for both Top Down and Bottom up assembly design approach
- Skeleton based assembly design
- Relational Design – Ability to design parts in context of assembly
- Ability to link part designs through publishing geometry and parameters

- Ability to add inter-part relations
- Support for both constraints based and un-constrained assembly creation
- User should be able to visualize the constraints between components in specifications/history tree
- Clash / Clearance detection.
- Clash report output.
- Generation of exploded views
- Ability to dynamically unlink product structure and mechanical behavior through Flexible Sub-Assembly
- Automatic generation of product BOM
- The system should allow user to remove specific components from BOM
- Large Assembly Visualization & support
  - Ability to view large assemblies through light weight visualization techniques
  - System should enable designers to work on a few parts in assembly mode while rest of the assembly is in light weight visualization mode only
  - System should allow users to propagate the changes automatically as well as in manual mode
- 3D Sectioning
  - Ability to create dynamic sections in part and assembly modes
  - Ability to perform measurements during dynamic sectioning
  - Visualize both cut section & profile generated during sectioning in separate windows
- Ability to separate solid features, surface & wireframe features into separate geometrical sets
- Ability to unite two bodies with the option of trimming one side of the body being united.
- Ability to create interactive drawings that is not based on 3D model.
- Ability to project the associative drawing views from 3D Models.
- Standards based drawings - ISO, ASME etc
- Ability to use both First Angle & Third Angle projections
- Support for various types of views – Orthogonal views, section views, break-out view etc
- Ability to lock the drawing views in order to avoid auto update based on design change. Unlock only when updation of drawing is required to optimize the memory usage.
- Large assembly drawing creation with ease.
- Options to generate drawing projection based on visualization mode, design mode, b-rep mode referring to the same data set.
- The system should allow designers to alter the number of decimal places for individual dimensions manually
- Ability to create all production details on drawing – tolerances (dimensional & form), surface finish, weld symbols etc
- Ability for driving the geometry parameters of the model from .xls sheet.
- Ability to create multiple variants of 3D Parts based on geometry parameters from a reference model by defining the variables in .xls sheet.

- User-defined geometry edits, FE mesh and boundary conditions shall be associated to the base design. When the design topology changes, the module should update the existing analysis geometry, mesh, loads and boundary conditions as required.

## **2.2 Composite Engineering Requirements**

The software should be capable of designing a wide variety of composite parts and the complete range of materials and manufacturing processes to create them. It should be able to handle large, complex structures and should be able to define individual segment of plies.

The main capabilities of the software should include:

- Design methods for defining industry- and part- specific laminate specifications and requirements.
- Dynamic generation of ply boundaries and drop-offs.
- Generation of variable offset surfaces.
- Smart darting and splicing capabilities.
- 3D ply definition
- Laminate analysis.
- Generation of 3D flat patterns.

If more than one software modules are required for above features then the offered modules should communicate seamlessly with each other to carry out design, analysis and develop manufacturing data and documentation for the composite parts. It should be possible to add on laser projection software. More details regarding the composite modeling features are given in the following sub sections.

### **2.2.1 Laminate Composites**

The software should contain easy-to-use ply and laminate definition tools which can quickly create finite element models representing laminate composite design. It should create, optimize and validate composite structures using a suitable solver. Post-processing tools and advanced reporting tools should allow to efficiently identify problem areas from the simulation results. It should have following features.

#### ***Ply-based modeling***

The software should create global plies, assign them to polygon faces and/or 2D elements and define ply orientations by projection of the material orientation or by using one of the draping algorithms. It should stack the plies in the layup modeler and optionally define ply angular offsets. It should automatically compute element zones for solver export. It should be possible to assign different layup offsets on different faces and view the fiber orientations on the 2D meshes.

#### ***Zone-based modeling***

The software should attach the laminates directly to 2D or 3D mesh collectors. An interactive graphical modeler should help to create and stack laminated composite plies efficiently. It should use standard pre-defined stacking sequences and/or ply groups to minimize the effort required to create and modify complex, multi-ply laminates. It should also be possible to import laminate from Microsoft Excel.

#### ***Draping Simulation***

The software should have draping algorithms to predict the fiber orientations and shear of unidirectional and woven plies as they drape around doubly-curved or undevelopable surfaces. It should specify a draping start point and an initial draping direction, or to pick a seed curve. It should be possible to coarsen or refine the drape mesh size and view the ply flat pattern.

#### ***Ply materials***

The software should combine fiber and matrix properties to create ply materials, which can be used in the laminate stack. Micromechanics theories should allow to create ply materials with the following types of fibers:

- Unidirectional
- Woven (The user should specify the angle between the warp and weft fibers)
- Particulate
- Randomly oriented short fiber

A core ply material allows you to define thickness-dependent shear stress limits.

### ***Laminate validation***

It should be possible to view the thickness and the offsets (both nodal and reference plane location) of the laminate physical properties and the layups. Contour plots of laminate thickness should also be possible, helping to visually understand the model.

The laminate stiffness matrices should be displayed in both Microsoft Excel and text formats. Similarly, equivalent engineering constants should also be displayed, enabling one to assess the characteristics of the laminate prior to solution.

It should be possible to apply loads and temperatures to the laminate and review the ply stresses, strains, failure indices and margins of safety.

### ***Failure theories***

The software should support the following failure theories:

Maximum stress, Maximum strain, Hill, Hoffman, Tsai-Wu, Puck, LaRC02, Von Mises, Core shear and User-defined.

### ***Optimization***

The software should have an optimizer that handles continuous variables such as an orientation angle and ply thickness, as well as discrete variables such as the existence of a ply, ply material, thickness and orientation. The software should provide at least five laminate definitions that come the closest to meeting the objectives.

### ***Solvers***

The software should assign laminates to shell or solid elements, which then can be used for the supported solvers.

### ***Post Processing***

The software should allow viewing of shell stress resultants, ply stresses, ply strains, ply failure indices (ply and bond) and ply strength ratios (ply and bond). It should provide enveloping, filtering and sorting tools that enable you to quickly identify the critical element and ply over many solutions, including imported results. It also reads solver shell stress resultants and/or ply stresses, and computes ply strains, stresses, ply failure indices and margins of safety. It then graphically displays the critical ply ID for each element.

The software should also compute core ply transverse shear failure indices, strength ratios and margins of safety using allowable shear stresses.

## **2.2.2 Flat Pattern Export Feature**

It should be possible to automatically generate flat pattern data files from the engineering definition and producibility simulations done in the software offered herein. It should take into account part shape, material and layup process, thus eliminating trial-and-error scrap.

The software should have the following capabilities.

- It should ensure data integrity and accuracy
- The software should optimize flat patterns so that manufacturing productivity is maximized and cutting time is decreased

- The software should help minimize stop and start sequences. Sharp corners and line segments in the flat patterns should be detected and optimized, allowing the cutter to proceed at a smooth, consistent rate
- It should maintain flat pattern attributes such as laminate name, ply name and material automatically and oriented them to fit on the flat pattern, and markers that are used to assist in the layup are placed on the appropriate layer for printing.
- The software should generate native format input files for all major automated cutting and nesting systems

It should also generate standard IGES and DXF files.

### **2.2.3 Documentation**

The software should be able to automate the generation of accurate manufacturing of plybooks, ply tables and 3D data. Documentation types should include,

- Material tables, ply tables, ply call outs
- Cross-sections: Draped representations, Schematic representations
- Automated grid layout of flat patterns
- Annotations
- Engineering drawings with annotations and cross sections
- Ply book, Ply lay-up process diagrams
- Exploded laminate showing ply-by-ply surface representation of laminate (including core)

The software should generate manufacturing drawings automatically and create ply book documentation that can communicate the manufacturing process used to create the flat pattern and provide guidance to the layup technician, making it possible to achieve repeatable quality and increased throughput. It should also enable customizable drawings. As changes are made to the design, the documentation module should easily and automatically update and share across all related modules, if any, to ensure accurate manufacturing, reduce cycle times, and lower costs.

## **3.0 SOFTWARE FOR ANALYSIS OF COMPOSITES**

The analysis software should seamlessly interface with the design and modeling software as given in section 2 of this specification. A two-way communication between the software should be available without any data loss. Following software features are required.

### **3.1 Capabilities of pre-processing tool**

The preprocessor (geometry modeling tool and the mesh generator) should have the following capabilities.

- The tool should have the design mode options, 3D parametric Modeling, 3D Concept Modeling
- Other Advanced Features such as solid extension, surface extensions, Freeze/Unfreeze, volume fill, enclosure etc
- Other Advanced Tools such as merge/slice bodies, surface flip, surface patch, symmetry extraction , body operation, analysis tools, Repair tools etc
- Data import options: IGES, Parasolid, STEP, STL etc .
- Data export option: Parasolid, IGES, and STEP etc .
- Tetrahedral meshing methods-patch confirming and patch independent.
- Hexahedral meshing methods-General sweep, thin sweep, MultiZone, Hex Dominant.
- Surface meshing

### **3.2 Mesh Controls**

- Global Controls
- Physics preference settings
- Relevance settings
- Inflation settings
- Curvature-based refinement settings
- Proximity-based refinement settings
- Smoothing settings
- Transition/growth settings
- Pinch (de-featuring) settings
- Quality settings
- Element mid-side node settings
- Rigid-body behavior settings
- Automatic contact detection
- Contact sizing
- Body mesh method controls
- Body, face, edge, vertex sizing
- Body, face, edge, vertex sphere of influence
- Body, face, edge curvature based refinement
- Body of influence
- Solver-based refinement controls
- Mapped-face meshing controls

### **3.3 Structural Analysis Features**

- Static analysis
- Modal analysis
- Pre-stress effects
- Complex Eigen value extraction
- Buckling - linear & nonlinear
- Transient analysis
- Spectrum & Harmonic analysis
- Random vibration
- Sub-structuring
- Shape & Topology Optimization
- Geometric Nonlinearity
- Large strain
- Large deflection
- Stress stiffening
- Material Models for Structural analysis
- Linear material models
  - Rate-dependent plasticity
  - Rate-independent plasticity
  - Hyperelasticity
  - Viscoelasticity
  - Viscoplasticity
  - Creep
  - Cast Iron plasticity

- Multiscale modeling
- Curve fitting tools
- Isotropic, Orthotropic & Anisotropic definition
- User Defined Material Models

### **3.4 Contact Modeling Features**

- Automatic Contact Detection for Assemblies
- Bonded/no separation sliding
- Bolt Pretension (bolts, etc.)
- Spot welds
- Nonlinear Contact Modeling
- Sliding with separation
  - Friction
  - User Defined Friction models
- Gaskets
- Fluid Penetration

### **3.5 Thermal Analysis Features**

#### Analysis Types

- Steady state Analysis
- Transient Analysis

#### Thermal Modelling

- Conduction
- Convection
- Radiation Phase Change

### **3.6 Advanced Analysis Features**

- Cyclic symmetry analysis
- Adaptive Meshing
- 2D & 3D Rezoning
- Sub-modeling (including Solid-Shell)
- Element birth and death
- Fracture mechanics & Crack Propagation
- Rigid & Flexible Multi-body dynamics
- De-lamination
- Parametric Optimization
- What-if analysis
- Design of Experiments (DOE)
- Fitting of 3D Response Surfaces
- Paritto charts
- Design for Six Sigma
- Bi-directional Associativity with CAD Packages

### **3.7 Element Technologies**

- Beam and Link elements
- Pipe elements
- Shell elements
- Solid elements
- Planar Axisymmetric elements
- 3D Axisymmetric elements
- Nonlinear Spring elements
- All elements capable of the following:
  - All types of Structural nonlinearity
  - Buckling and collapse
  - All types of Dynamic analysis
- Special Purpose elements like:
- Gasket elements
- Kinematic Joints
- Interface elements
- Mass elements

### **3.8 Solvers**

- Direct Sparse Solver
- Iterative Solvers (Preconditioned Conjugate Gradient & Jacobi Conjugate Gradient i.e. PCG & JCG)
- HPC enabled (Both SMPS and Distributed Parallel Processing)
- HPC for GPGPU (General Purpose Graphical Processing Unit)
- Special Solvers for Large Number of Modal Extraction

### **3.9 Boundary Conditions**

- Solid model loads and boundary conditions
- Tabular loads and boundary conditions
- Function loads and boundary conditions
- Apply temperature loads

### **3.10 Post Processing**

- Report generator ( HTML, MS Word & MS Power Point)
- Contour displays
- Vector displays
- Ability to display result Summaries (Max & Min, specified Range)
- ISO surface displays
- Slicing planes
- Path Plots
- Time History Plots & Data Output
- Quantitative calculations (Including Differentiation Integration, Statistical Quantities, etc)
- Animation (Including Over Time History)
- Output (Images, Text format & Excel data)



### 3.11 Licensing format

1. Software shall be delivered to the purchaser in original CD/DVD's with 2 additional copies. The license key for software shall be with life time validity without any need for internet connection of the PC/ Workstation on which installation is required.
2. User license key shall be Re-generated and provided to the purchaser without any additional cost or commercial implications for a minimum period of 5 (Five) years in case of any need for Re-Installing the software due to Hardware or software failure in the target PC/Workstation in which the License is installed. However this License key shall be valid for the same software version or next higher level.
3. Technical support in terms of software installation & usage shall be provided without any additional cost for the minimum period of 5(Five) years from the date of delivery & commissioning of the software.
4. Licenses should be enrolled with the same licensing server utilities to avoid any chargeable support arising out of need to reinstall.
5. If the user requests to transfer the licenses from one workstation to the other, then the supplier should accept the same for a minimum period of 5 (five) years from the date of delivery & commissioning of the software without any additional charges.
6. End user customer support should be available for the procured perpetual licenses for a period of at least of 5 (five) years from the date of delivery & commissioning to perform the following day to day activities:
  - a. Prepare/build/develop the various "CAE- Models"
  - b. De-Bugging /Error checks/convergence of various simulations.
  - c. The above mentioned support is required for Pre, Post & solver licenses that are delivered to ECIL.
7. The issued online User ID for browsing the OEM website for any kind of learning material downloads like Help files, Tutorials, any Free Issue papers. etc.. to remain active for life time for at least one (01) user.
8. All the above mentioned (Sl. No. 1 to 7) should be invariably signed by the concerned OEM signing authority on their letter head along with the covering letter endorsed by the supplier.

**Note:** \* Re-issued fresh Licenses can be same as earlier procured dated - version or the next higher version only.

### 3.12 Further details about requirements of main features of analysis software

- Should allow engineers and scientists to simulate the interaction between structural mechanics, heat transfer, fluid flow, acoustics all within a single unified simulation environment. Users should not need to switch between multiple programs and also enabling them to take into effect of one physics on to the other in a single unified interlace.
- Auto Contact Detection for Assemblies: Mechanical solutions should automatically detect and perform setup for contacts or joints between parts of an assembly. The contact settings and options can be modified, and additional manual contact definitions can be added. Joints for flexible/rigid dynamics are automatically detected.
- Comprehensive Element Technology: Should have element technologies that provides rich functionality with a consistent theoretical foundation coupled with the most advanced algorithms. structural mechanics software should provides a large library of elements including beam, pipes, shells, solids, 2-D planar/axi-symmetric and 3-D axi-symmetric elements, which have wide applicability that includes composites, buckling and collapse analysis, dynamics analysis, and nonlinear applications. The library also includes special-purpose elements like gaskets, joints, interface elements and layered elements for composite structures.
- Extensive Library of Material Models: Should provides a vast library of mathematical material models that aid the user in simulating various kinds of material behavior, such as elasticity, visco-elasticity, plasticity, visco-plasticity, cast iron plasticity, creep, hyper-elasticity, gaskets and anisotropy. These constitutive models can be used to simulate various kinds of materials such as metals, rubber, plastics, glass, foam, concrete, bio-tissues and special alloys. In addition, to aid in finding parameters for these materials models, SHOULD provide a set of curve-fitting tools.
- User Defined Material Models: Allows user to read Material Models from external software and also allows user to define their own material models.
- Advanced Numerical Methods for Nonlinear Problems: Should offer various advanced modeling methods for different kinds of applications. There are modal, harmonic, spectrum, rotordynamics, flexible multibody dynamics, component mode synthesis, cyclic symmetry, delamination, composite failure, fracture mechanics, adaptive meshing, 2-D rezoning, sub-modeling, sub-structuring, element birth and death, and topology optimization, among others.
- Solver Customization and scripting: should have Customization capabilities through user elements, user materials and scripting using the Parametric Design Language (APDL) provide flexibility and extend the range of applications for multi-physics solutions.
- Advanced Post-Processing: Should provides a comprehensive set of post-processing tools to display results on models as contours or vector plots to provide summaries of the results (like min/max values and locations). Powerful and intuitive slicing techniques allow the user to get more detailed results over given parts of the geometries. All the results can be exported as text data or to a spreadsheet for further calculations. Animations are provided for static cases as well as for nonlinear or transient histories.
- Automatic Report Generation: The structural mechanics solutions should provide instantaneous report generation to gather all technical data and pictures of the model in a convenient format (HTML, Microsoft® Word or Microsoft® PowerPoint®.)

- Automation: Should have workbench that provides easy interface to capture and reuse analysis data. Any changes in simulation data can be updated without much manual intervention.
- Meshing Platform: A Robust meshing platform for generating mesh for multiple physics. The Workbench also should provides a wide range of highly robust and automated physics-based meshing tools including tetrahedral, pure hexahedral, mixed hex/tet/pyramid, inflation layers and high-quality surface meshes. Users have the ability to control many advanced meshing options such as body, surface or edge sizing controls, sphere of influence, inflation layer meshing, mesh defeaturing tolerances, and much more.
- Unified Simulation Environment: The Workbench platform should be a powerful multi-domain simulation environment that harnesses the core physics from single simulation vendor, therefore enables physics interoperability and provides common tools for interfacing with CAD, repairing geometry, creating meshes and post-processing results. An innovative project schematic view ties together the entire simulation process, guiding the user through complex multiphysics analyses with drag and drop simplicity.

#### 4.0 Scope of Supply

1. The firm should supply and install the software described in section 2 and section 3. Wherever multiple modules are involved, interlinking of the modules shall be provided by the supplier.
2. The firm should supply **lifelong license** for all the software offered by him as per the requirements as given in this specification. The license file, Login and Password should be supplied through official e-mail address specified by ECIL within a period of two months of placement of purchase order. The installation media (DVDs) consisting of above software modules should also be supplied by firm.
3. The software should have warranty period of one year and the version upgrades/updates should be freely available for one year.
4. The firm should arrange two weeks of training program for ECIL/BARC representatives (5 Nos.) at its office. One week should be used for basic familiarization about software modules. After completion of basic training, second week should be utilized for advanced training. The advanced training should consist of hands on sessions for the problems specified by ECIL. Technically competent engineers who are capable to address ECIL problems should be made available by the firm to provide advanced training. The firm should discuss with ECIL to enquire about topics of interest prior to advanced training.
5. Installation to be done by supplier's technical personnel at no additional cost.
6. Shipping address: ECIL, Hyderabad.
7. Delivery schedule: **2 months** from placement of purchase order.
8. All other terms and conditions shall be as per ECIL standard format.

(Includes installation, training and 1 year warranty)