

RELEASE NOTES

MSC.Dytran

Version 4.7 for Windows NT 4.0

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Introduction

MSC.Dytran is a general-purpose, three-dimensional computer program for simulating the dynamic response of solids, structures, and fluids. It combines structural and fluid mechanics technology to facilitate modeling, and uses explicit time integration to provide an efficient solution. MSC.Dytran is developed, marketed, and supported by MSC.Software Corporation.

MSC.Dytran Version 4.7 for Windows NT 4.0 uses FLEXlm as the licensing system for network and nodelock licensing.

Existing users of MSC.Dytran on UNIX workstations, who are migrating from UNIX to Windows NT 4.0, can still use their existing UNIX licenses, by using the UNIX system as the FLEXlm license server. If you want to set up your Windows NT 4.0 machine as the license server, you need a new authorization code from MSC.Software Corporation.

The installation procedure, similar to MSC.Nastran and MSC.Patran, using the installation Setup Wizard, allows an easy install of MSC.Dytran and the FLEXlm licensing system from CD ROM.



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Differences Between MSC.Dytran for Windows NT 4.0 and UNIX

MSC.Dytran Version 4.7 for Windows NT 4.0 offers the same basic analysis capabilities as MSC.Dytran Version 4.7 on UNIX. However, some differences do exist:

1. MSC.Dytran Version 4.7 for Windows NT 4.0 does not support the coupling to MADYMO for occupant dummy analysis. Currently, MADYMO is not available on Windows NT 4.0.
2. The interface to the Underwater Shock Analysis program USA is not available on Windows NT 4.0.
3. On Microsoft Windows NT 4.0, user subroutines must be compiled and linked manually to the MSC.Dytran library using the Digital Visual Fortran 6.0 compiler. See Section 4.3.3, [Customizing MSC.Dytran with User-Written Subroutines](#), in the *MSC.Dytran Installation and Operations Guide*, Version 4.7 for Windows NT 4.0.
4. The XDYTRAN and XDEXTR utility programs are not available on Windows NT 4.0. XDYTRAN is superseded by the graphical user environment provided by MSC.Dytran for Windows NT 4.0. See Chapter 4, [Using MSC.Dytran](#).

New Features and Enhancements

Compared to MSC.Dytran Version 4.6, several new features, enhancements, and error fixes augment the capabilities in areas such as structural crashworthiness and occupant safety, underwater explosions and gas dynamics.

1. MSC.Dytran for Microsoft Windows NT 4.0 Systems is Year 2000 Compliant

To ensure the viability of MSC.Dytran operational integrity, security, and authorization systems as they relate to Year 2000 compliance, MSC.Software Corporation conducted tests on MSC.Dytran Version 4.7 for the Windows NT environment. Full official certification has been established from the results of those tests.

The test results indicated that:

- The license for MSC.Dytran is valid to operate over a supported date range that extends from before January 1, 2000 and encompasses a time period reasonably suitable for the intended use of the product. This includes the critical moment of February 29, 2000. The license authorization is applicable to both nodelock and network licensing.
- MSC.Dytran does not perform date calculations.
- MSC.Dytran only obtains a date from the computer operating system and transfers it to print and results files.
- Date stamping data, although not four characters, is correct, valid, and will not lead to ambiguity in interpretation of data.

2. FLEXlm Licensing

MSC.Dytran Version 4.6 introduced the FLEXlm license manager as the license system for network and nodelock licensing on Windows NT 4.0.

With Version 4.7, campus licensing is also supported on Microsoft Windows NT 4.0 computers.

Please refer to the *MSC.Dytran Installation and Operations Guide*, Version 4.7 for Windows NT 4.0 for detailed instructions on installing MSC.Dytran Version 4.7 and the FLEXlm licensing system.

3. New User's Manual

MSC.Dytran Version 4.6 came with a *User's Manual Update for Version 4.6* that covered all the new functionality with respect to the *MSC.Dytran for Version 4.0 User's Manual*.

With MSC.Dytran Version 4.7, a newly updated User's Manual will be part of the release, covering all new functionalities in MSC.Dytran since Version 4.0.

You will also see the company and product name change appearing in the release documentation. You are accustomed to the names The MacNeal-Schwendler Corporation and MSC/DYTRAN, but you will now see the new names MSC.Software Corporation and MSC.Dytran.

4. Initial Metric Method for Airbag Analysis

The initial configuration of an airbag can be obtained from its original shape by folding or scaling (shrinking) operations in order to make it fit into the airbag compartment. However, at the start of an airbag analysis it is always assumed that this initial configuration is undeformed (no stresses), which makes the generation of the initial mesh quite complicated.

The initial metric method inside MSC.Dytran Version 4.7 allows the use of an initial airbag model, obtained from a folding or a scaling operation, in which the strains are initialized such that the original (stressless) shape is preserved. The initial metric method uses the initial airbag configuration and the original (or design) configuration to generate the initial strains. Elements can be initialized smaller than the original state, but it is also possible that they are initialized larger.

- If an element is initialized smaller compared to its size in the original configuration, no element stresses are introduced until the original state is reached.
- Elements that are initialized larger will have a positive initial metric strain. When shrinking, there will be no stresses applied until the original state is reached.

5. Multiple Detonation Sources for Explosives

In MSC.Dytran Version 4.6, only a single detonation point for high explosive materials could be used. In MSC.Dytran Version 4.7, the use of multiple detonation points for explosive materials is implemented.

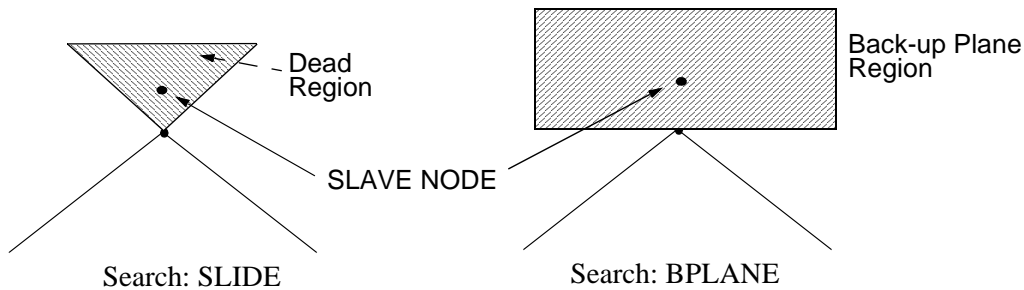
6. Eulerian Boundary Condition Output

In analysis involving Eulerian elements, the material state at the boundaries of the mesh can be written to an archive file for interpretation during postprocessing. Available are the mass flow, transported impulse and energy through the boundary, the velocity at the boundary and forces, and impulse acting on the Eulerian boundary.

7. Contact Improvements

- The adaptive contact algorithm has been revised. As a result, CPU time usage for adaptive contact generation and contact analysis has been greatly reduced.

- A new search option called BPLANE has been implemented in the contact algorithm. The search option SLIDE searches for the closest master face under the assumption that a slave node will only slide from the current master face to its neighbors during one time step. This search algorithm is much faster than the FULL option. However, the FULL search option can cause problems for slave nodes that have entered the “dead-region” on the “penetrated side” between neighboring master faces, where it can not be projected on either face, and the contact is lost because of that.



The search option BPLANE alleviates the problems for slave nodes that have entered the “dead-region” by automatically creating a plane perpendicular to the folding line between two master faces. Contact for slave nodes that reside in the back-up plane area is preserved, and the nodes remain in the contact search algorithm. A force perpendicular to the BPLANE is applied to those nodes, since they are on the penetrated side of the master surface.

Because the BPLANE search algorithm is very fast, it is advisable to contact search algorithm for airbag analysis.

8. Viscosity for Fluids

Viscosity for fluids has been implemented in the Eulerian ROE solver for polynomial equation-of-state and Tait equation-of-state materials.

System Information

3.1 Software Installation

MSC.Dytran Version 4.7 easily installs from CD ROM using the installation Setup Wizard. The installation procedure is described in the *MSC.Dytran Installation and Operations Guide*, Version 4.7 for Windows NT 4.0.

MSC.Dytran Version 4.7 uses the FLEXlm license manager as the licensing system for nodelock and network licensing. To run MSC.Dytran Version 4.7 you need an authorization code from MSC.Software Corporation.

MSC.Dytran requires an ethernet card, even if your Windows NT machine is not connected to a network. MSC.Dytran uses the ethernet card to create a system ID for FLEXlm licensing.

MSC.Dytran Version 4.7 was built and tested on the following Windows NT 4.0 hardware and software:

Table 3-1. Supported Hardware Configuration.

Hardware Platforms	Pentium II
Operating System	Microsoft Windows NT 4.0 with Service Pack 3
Other	Ethernet Card

For installation of the MSC.Patran-MSDytran Preference, see the *MSC.Patran-MSDytran Preference Guide*.

3.2 Memory Requirements

In general, the amount of memory required by MSC.Dytran Version 4.7 depends on the size of the engineering problem. The default memory size of MSC.Dytran Version 4.7 is preset to 40 Megabytes. This size is appropriately set for smaller analysis problems. This preset amount of memory is used by MSC.Dytran to generate the problem from the input file, while the required memory is assigned dynamically during execution.

In some cases, the default MSC.Dytran executable may not be large enough to generate medium or large problems. Besides the default size, MSC.Dytran Version 4.7 is delivered with two larger executables that can be used to run medium and large problems.

The executable for medium-size problems uses 90 MB of memory, and large-size problems use 160 MB. How these executables can be used is described in Chapter 4, [Using MSC.Dytran](#).

[Table 3-2](#) shows disk space, swap, and RAM guidelines for small, medium, and large analysis models. MSC.Dytran may actually run with fewer resources than shown, but we recommend these minimums for practical use of MSC.Dytran. Guidelines for typical hardware memory and disk space requirements are as follows:


Table 3-2. Disk Space and Memory Requirements.

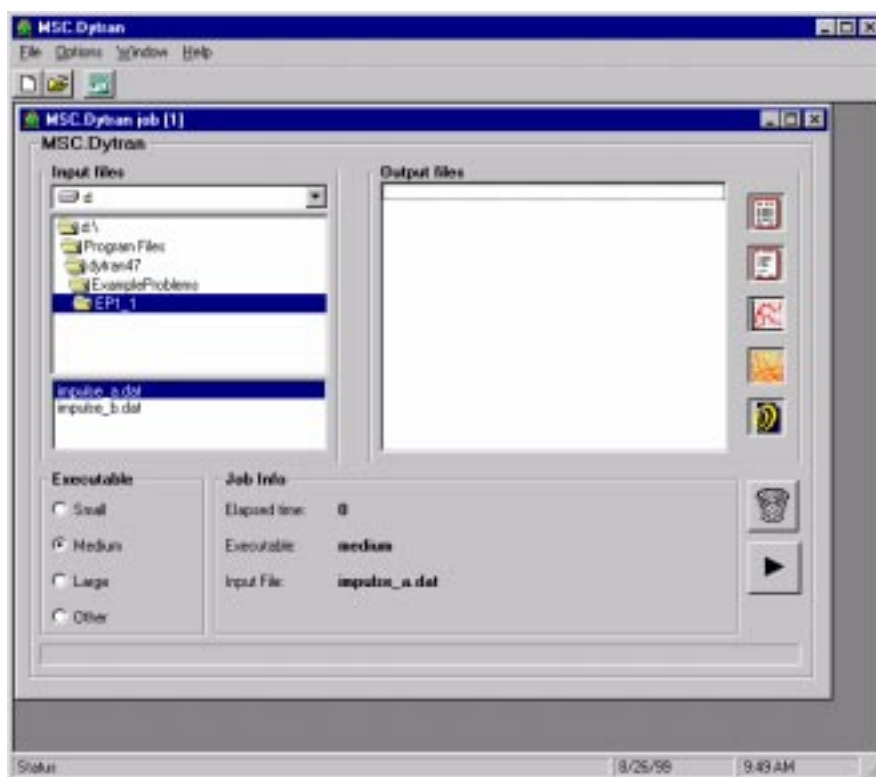
	Small Models	Medium Models	Large Models
Random Access Memory (RAM) per user	128 MB	256 MB	512 MB
Scratch Disk Space (/tmp)	50 MB	100 MB	200 MB

Note: The installation requires approximately 100 megabytes of disk space. Analysis results storage space is dependent upon the amount of results data a user requests to be saved. For extremely large problems, where many variables and time steps are saved, up to one gigabyte of storage space may be required. For small problems, 50 megabytes may be sufficient.



Using MSC.Dytran

4.1 Running MSC.Dytran

Submit an MSC.Dytran analysis by double-clicking the MSC.Dytran icon, , which is visible on your desktop. If the icon is not installed on your desktop, you can find it in the **Programs** folder under **MSC.Dytran**, or in a user-defined folder. After double-clicking the MSC.Dytran icon, the graphical MSC.Dytran user environment appears:



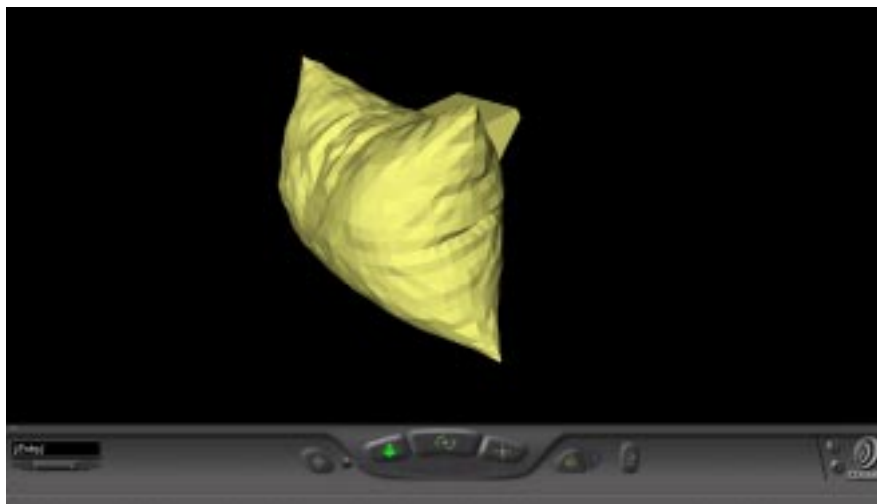
Following is a brief description of the main features of the graphical user interface.

- Start an MSC.Dytran analysis by clicking on the **Start Job** button,  , after selection of the input file(s) and executable size. The graphical user interface is a Multiple Document Interface (MDI) application. You can submit multiple jobs from the user interface by selecting **File →New** from the top menu.
- Kill an MSC.Dytran job by using the **Exit Job** button,  . This button appears in the window after submitting an MSC.Dytran analysis.

You can also kill a job by exiting the graphical user environment with **File →Exit**. Upon exiting the graphical user environment, a running analysis can be killed or can continue to run in the background. The progress of a background job can be monitored by selecting **File →Open** in the graphical user environment, selecting the appropriate job file name and double clicking on the printed output file.

Note that a job that is running in the background can only be killed using the Windows NT 4.0 task manager.

- File Preview
 - You can view and edit input files (extension .dat) by double-clicking on the filename. By default, the file will open in WordPad. You can select another viewer by selecting **Options →Preferences →Formats**.
 - During and after the analysis, you can view the printed output file (extension .OUT) by double-clicking on the output filename. During execution, monitor the progress of the analysis by looking at the cycle summary in the printed output file.
 - You can visualize the contents of an archive file (extension .ARC) for a quick preview by double-clicking on the archive filename. As a result, a VRML file is created for each archived time step. Only the geometry of shell quad and tria meshes are currently supported.



View these VRML files with your browser or any other VRML viewer by double-clicking on the VRML filename (extension .wrl). In order to view the archive content, your browser must be able to visualize VRML files.

In case your browser does not have a VRML plug-in, you can download a VRML viewer plug-in from the Web; the COSMO player, for example. Download the COSMO player from the Web by selecting **Help** → **VRML Files** and clicking the COSMO icon.

- Restarts are automatically detected in the input file.

4.2 Postprocessing MSC.Dytran Results

MSC.Dytran results can be postprocessed with MSC.Patran or another third party postprocessing product on either Windows NT 4.0 or on UNIX computers.

4.2.1 Postprocessing MSC.Dytran Results on Windows NT 4.0 with MSC.Patran

Starting with MSC.Patran V8.5, MSC.Patran supports pre- and postprocessing on Windows NT 4.0. See the *MSC.Patran-MSDytran Preference Guide* for more details.

4.2.2 Postprocessing MSC.Dytran Results on UNIX

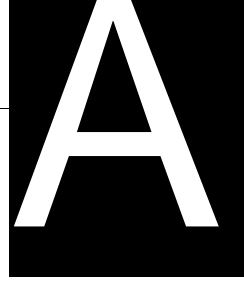
If you wish to postprocess Windows NT 4.0 analysis results on a UNIX computer, you need to write the results files out in a UNIX format. For Digital Alpha UNIX workstations, the native Windows NT 4.0 results files can be used directly without conversion. For all other UNIX workstations, you have to write the Windows NT 4.0 analysis results files in a UNIX format by selecting **Preferences** from the **Options** menu. Choose **Formats** and select **Convert output files automatically to Unix-format**.

Aside from the regular Windows NT 4.0 results files, UNIX native result files will also be generated at the end of the analysis. These UNIX native results files can be recognized by the prefix “UX_” in their name. Transfer the “UX_” prefixed files to your UNIX computer and postprocess as usual.

Documentation

The following documentation is provided with MSC.Dytran Version 4.7 on Microsoft Windows NT 4.0:

- *MSC.Dytran User's Manual*, Version 4.7.
- *MSC.Dytran Installation and Operations Guide*, Version 4.7 for Windows NT 4.0.
- *MSC.Dytran Release Notes*, Version 4.7 for Windows NT 4.0.
- *MSC.Dytran Example Problem Manual*, Version 3.0.



List of Fixed CSRs

A.1 Errors Fixed from MSC.Dytran Version 4.6 to MSC.Dytran Version 4.7

Licensing

- Campus licensing support.

Rigid Bodies

- A combination of more than one FORCE and MOMENT entry for a rigid body is not merged correctly.
- If an incorrect rigid ID is given in the rigid body output definition, an MSC.Dytran analysis core dump results. A new error message warns the user and prevents the core dump.
- Only one RBC3 entry can be applied on a RIGID. This error has been fixed and the RIGID now behaves similarly to a MATRIG.

Shell Elements

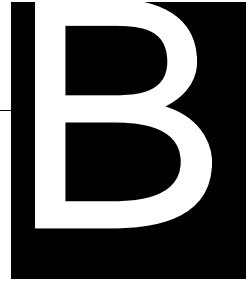
- The failure flag for QUAD shell elements is based on a time step smaller than one. When using different unit systems, this criterion can lead to erroneous results.

Output Requests

- The burn fraction FBURN in Eulerian analysis is not available for output.
- Output request for SURFACE gives incorrect results when a coupling surface is used in combination with QUAD or TRIA elements.

Miscellaneous

- A breakable connection (BJOIN) or spotweld connection (SPOTWELD) can not be used in combination with a kinematic join (KJOIN).
- The initial velocity generation for grid points consistent with a rotational field (TIC2) is incorrect when beam elements are use in combination with QUAD shell elements or Lagrangian solids.
- When a restart is made of an analysis that involves multi-material Euler with shear strength, the information in the output file about the Eulerian element type is printed out as multi-material Euler hydrodynamic. This is only a print error; the analysis is not affected.
- When a contact definition with SEARCH = FULL is used in combination with a CONTINI initialization, a core dump results. The CONTINI logic is not suited to work in combination with the SEARCH = FULL option. A new error message is implemented to avoid the core dump.

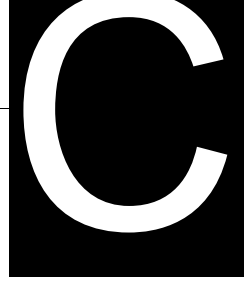


Current Limitations

- The interface to USA is not supported on Windows NT 4.0.
- The interface to MADYMO is not supported on Windows NT 4.0.
- Shared-memory parallel is not available in MSC.Dytran V4.7 on Microsoft Windows NT 4.0.
- The memory usage summary is not fully accurate. Keep safe margins in tailoring your memory.f routine.
- Shell sublayer variables can not be initialized using a TICEL or TICEEX entry. Only element variables can be initialized by a TICEL or TICEEX entry.
- It is not possible to use both multimaterial Eulerian elements and hydrodynamic Eulerian elements in the same calculation, even if the Eulerian regions are disconnected.
- For user-defined access to shell element sublayer variables, at least one element sublayer variable must be saved in an archive or time history file.
- ALE can only be used in conjunction with a hydrodynamic single material Euler formulation or with a multimaterial Euler formulation.
- The symmetric option on composite laminates is not available.
- There can be at most 15 Eulerian elements connected to a Eulerian grid point.
- There is a maximum of 127 continuation lines in the MSC.Dytran input file.
- Eulerian-Lagrangian coupling surfaces do not include friction.
- A Eulerian-Lagrangian coupling surface must not initially lie completely outside the Eulerian mesh.
- A Eulerian mesh must contain at least one nonvoid material somewhere in the mesh.
- The multimaterial Eulerian formulation can include no more than five materials in one element, simultaneously.
- For multiple BJOINS, boundary conditions can only be applied to the master node.

- Miscellaneous limits:

Item	Limit
Open Files	100
Generic File Names	20
Grid Point Constraints	2047
Rigid Constraints	127
Surfaces	127
Subsurfaces	1024
Surface Constraints	256
Rigid Ellipsoids	127
Join Sets	127



Current Error List

- PROD and PCOMP definitions should have different Property Numbers (PIDs).
- When defining your own variables, each name defined should be unique (see PARAM,EXTRAS).
- It is advisable not to use the subcycling (structural) in combination with the adaptive contact. At activation of contact faces, the newly generated contact surface is penetrated and may not be detected.
- The element time step as used in certain failure models is the currently used element time step and not the individual stable time step. The failure criterion is such that the first criterion must be satisfied before the time step can cause total failure. Do NOT use the time step as a criterion on its own for total element failure in a user-defined failure model as FAILEX1.
- In cases where a high rotational velocity occurs, either through initial conditions, boundary conditions or due to local effects, the stable time step computed according to the CFL condition (based on linear problems) may be too large. It can give rise to local instabilities. Especially in problems where subcycling is used, this can show up prominently due to the spreading in the magnitude of the time steps used to continue the solution.
- The ALE interface cannot be deactivated using the ACTIVE entry.

Workaround: The Eulerian processor can be deactivated, causing the FSI to be deactivated as well.
- Gravity on rigid bodies is applied differently at time step zero compared to later time steps:

Time step zero: Gravity is applied directly to the center of gravity of the rigid body.

Later time steps: Gravity is applied to the grid points belonging to the rigid body.
- On the CBEAM entry, MSC/NASTRAN assumes that the value for X1/X2/X3 = 0.0 if they are not defined. MSC.Dytran requires input.

Workaround: Fill in zeros.

- For the gasbag option (GBAG), the volume and pressure inside a gasbag are not updated if the mass flow is not defined.

Workaround: Specify a mass flow equal to zero.

- The damping entry PARAM,VDAMP,0.0 on restart gives an error message.

Workaround: Use VISCDMP to turn damping on and off.

- The contribution of the rotational velocities on beam grid points to the kinetic energy is not taken into account.
- If the CONTREL refers to a SET1 ID that does not exist, there is no User Warning Message supplied. The CONTREL definition will not appear in the problem setup.
- When TICGP is accidentally given on rigid body nodes, a warning is normally issued from subroutine P3036502_V3_CHECK_RIGID_PNT_AND_RBOUND, for possible incorrect results. Sometimes this warning message is not given, which causes erroneous results. In fact, the warning should be a fatal message.
- When breakable joins (BJOIN) are used together with ALE-Euler:

For BJOIN without offset: XDIS,YDIS,ZDIS of grid points is not correct.

For BJOIN with offset: BJOIN does not work properly.

- Deactivated variables can be requested for editing, but will not contain any data. If you wish to use the variable (e.g., in a user subroutine), be sure that it gets activated with a PARAM,VARACTIV entry in the input file.
- The following error message is not correct:

```
%P3028706-P3_INITIALIZE_STANDARD_MULTYP
'A grid point has moment of inertia equal to zero'
```

In reality it is a zero mass.

It does not specify which grid point. In a large mesh this makes it difficult to find the grid point.

The error seems to be the same for normal JOIN through JOIN cards, as well as for “Multiple-Join” by means of common grid points *not* explicitly connected by JOIN. This makes it difficult to locate the type of input data to use as a starting point to find a modeling mistake.

- The PARAM,GEOCHECK entry may reverse the surface vector of a CONTACT surface when it makes connectivity corrections for CHEXA elements, and the contact surface segments are on the HEXA faces.
- In an analysis where coupling and contact are used together, the friction coefficients defined for different contact surfaces can become confused.

Workaround: Define COUPLE first and use the same friction coefficient for all surfaces.

- MSC.Dytran does not give the correct output for centroidal strains for DMAT or DMATEL materials. A very high value is given.
- A 4×4 Gauss integration for the Hughes-Liu beam with a tube section does not work; only a 3×3 integration works.
- Mass scaling (PARAM,SCALEMAS) does not work for membrane elements.

