# 4 Analysis Integration

- MSC/PATRAN Arbitrary Beam Library
- MSC/NASTRAN Direct Access of Results, Part 2
- MSC/PATRAN THERMAL Enhancements

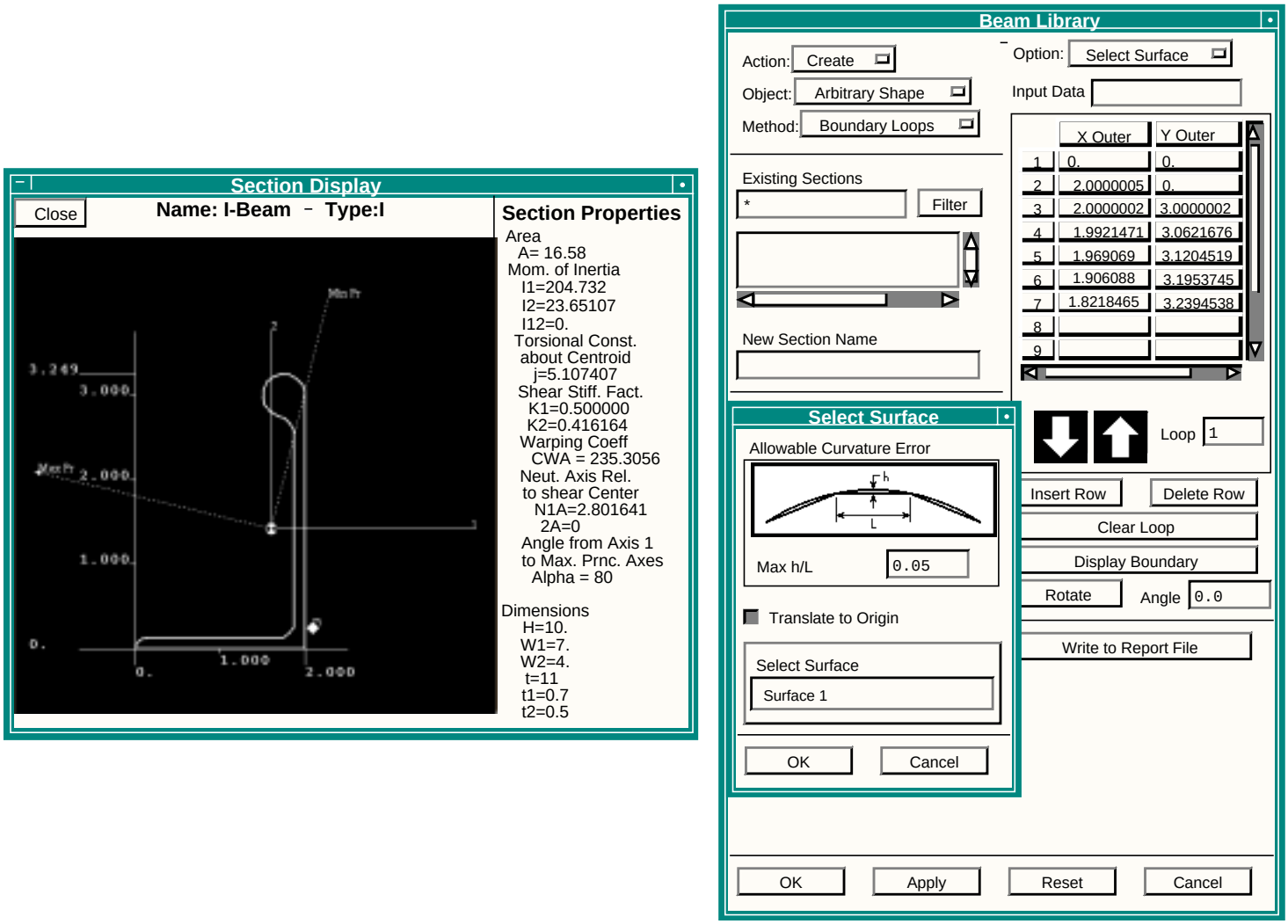
# 4.1 MSC/PATRAN Arbitrary Beam Library

The Version 8 MSC/PATRAN Beam Library will compute section properties for beams of arbitrary cross section. The cross section may or may not have internal openings, and may be thin or thick walled. Properties computed include area, neutral axis location, moments of inertia, principal axes, shear stiffness factors and warping coefficients.

This feature is an additional module which is licensed separately from MSC/PATRAN. Contact your sales representative for details.

Arbitrary shapes are defined with a set of loops that describe the outer and inner boundaries of a cross section with sets of points and straight lines. These loops may be defined via a spreadsheet, or by selecting a surface or trimmed surface. Beam sections can be named, saved, and written to, or read from text files. Like the Standard Shape tool, the Arbitrary Beam Library supports the ability to immediately calculate section properties and display a scaled graphic image of the section.

This feature is accessible from two places in MSC/PATRAN - the Tools selection on the main form, and under the Properties application for certain 1D elements. (MSC/PATRAN Version 8 only provides access to this capability from Properties for the MSC/NASTRAN Preference.) For complete documentation, see **Create Action - Arbitrary Shape** (p. 345) in MSC/PATRAN User's Guide, Part 2: Basic Functions.




**Limitations**

The current Arbitrary Beam Cross Section algorithms are limited to sections with seven or fewer internal openings (internal "loops"). Also, each loop is limited to 150 or fewer discrete points.

When using a surface to define the beam cross section, note that rare surfaces which are degenerate or contain duplicate edges may fail. If these are re-created as trimmed surfaces, they will work correctly.

The use of surfaces to define cross sections is designed to operate on surfaces oriented in a principal plane of the global coordinate system. Use of surfaces which do not lie in the principal planes may result in a rotation of the cross section.

Definition of the beam stress recovery points (CDEF points) must be on an internal or external loop, not internal to the beam section.

## 4.2 MSC/NASTRAN Direct Access of Results, Part 2

Direct Results Access was introduced in Version 7.5, and allows MSC/PATRAN to work directly with the MSC/NASTRAN results database (the XDB file). For Version 8.0, support for the following additional data entities has been added:

- Grid Point Forces and Stresses.
- Grid Point and Element Stress Discontinuities.
- Thermal Analysis Results for MSC/NASTRAN Sol 153 and 159 (Steady State Nonlinear and Transient Heat Transfer).
- Model Data (Grids, Elements, Superelements, and Coordinate Frames).
- Design Variables.

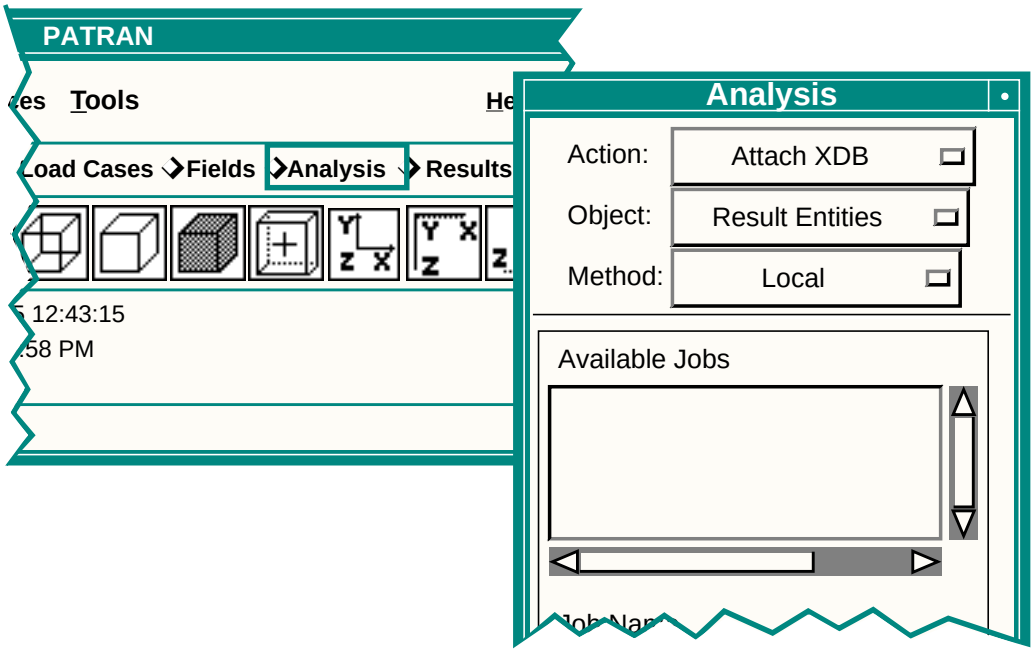
Also new for Version 8, Direct Results Access provides import control for super element models. Users can select which superelements to import through the Analysis - Attach XDB - Translation Parameters form. Nodes and elements of each superelements imported are grouped automatically.

As in Version 7.5, direct results access only imports “metadata” (i.e. the data that describes the data in the XDB file). This method has two principal advantages:

- The time to read the results into the MSC/PATRAN database is essentially eliminated.
- Since the XDB data is not duplicated in the MSC/PATRAN database, the impact on database size is greatly reduced.

Multiple XDB files can be accessed simultaneously from a single MSC/PATRAN database. Up to 20 XDB attachments can be made, and results can be simultaneously imported into the database from the .OP2 file.

The direct results access capability is available under the Analysis application using the MSC/NASTRAN Preference.



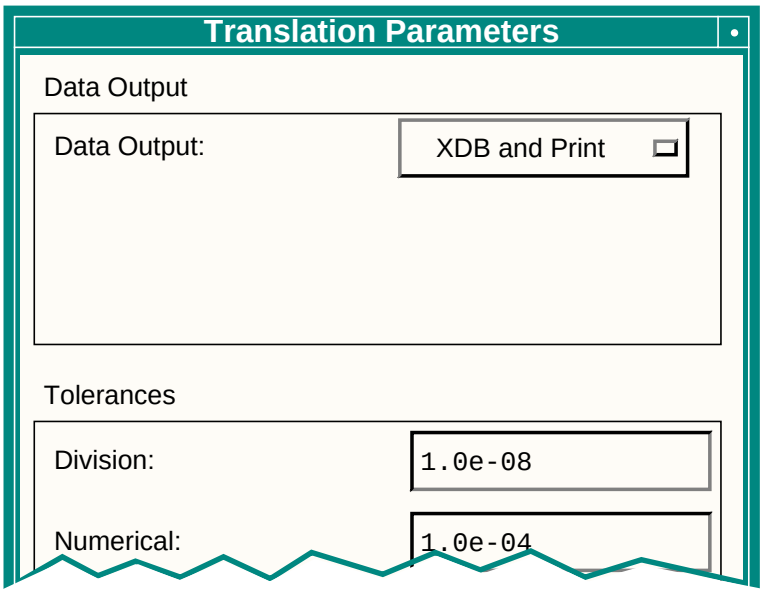

**Documentation**

See **Attach XDB** (p. 230) in MSC/PATRAN MSC/NASTRAN Preference Guide, Volume 1: Structural Analysis.

**Limitations**

- P-element results are not currently supported.
- Design optimization global variables are not currently supported.
- The XDB files can only be accessed when they are located on the same machine that MSC/PATRAN is running on or an NFS mounted disk.
- If the file(s) are moved or deleted, the connection is lost and they must be reattached.
- Deleting a single Result Case from an attached XDB file will result in deleting all “metadata” associated with that attached XDB file. Deleting one Result Case will delete all Result Cases.

XDB files are created from MSC / NASTRAN by placing a PARAM, POST, 0 in the bulk data portion of the input file. Preprocessing of this PARAM card is supported under the Translation Parameters form by the XDB options for Data Output when setting up an analysis in the Analysis application.



# 4.3 MSC/PATRAN THERMAL Enhancements

**Summary** Version 8 contains the most significant improvements to MSC/PATRAN THERMAL in years. The most common nonlinear loads and boundary conditions are now completely available from the MSC/PATRAN user interface, no longer requiring an external editor for control file input.

All other external input for more advanced boundary condition and material control parameters is also available from the new template writer. Upward compatibility is also supported by allowing for reading of these template files from previous MSC/PATRAN versions.

Loads & BCs Tabular based time and temperature convection, heat, and temperature boundary conditions no longer require external editing of the mat.dat, micro.dat, and template.dat files.

These new loads and boundary conditions utilize the multiple application forms (as in the previously existing gap radiation, gap convection, and temperature coupling forms). Because these forms require the application regions to be from “Geometry” to “Geometry” or “FEM” to “FEM”, they do not support convection from a geometric entity, such as a surface, to a FEM node. For these mixed application region cases, use the Template/Convection form.

Spreadsheets now exist within the loads and boundary condition forms, allowing for easier, faster, and more accurate input. These spreadsheet tables are automatically linked to the MSC/PATRAN fields application, eliminating the previous need to independently create the field and manually reference the appropriate field id.

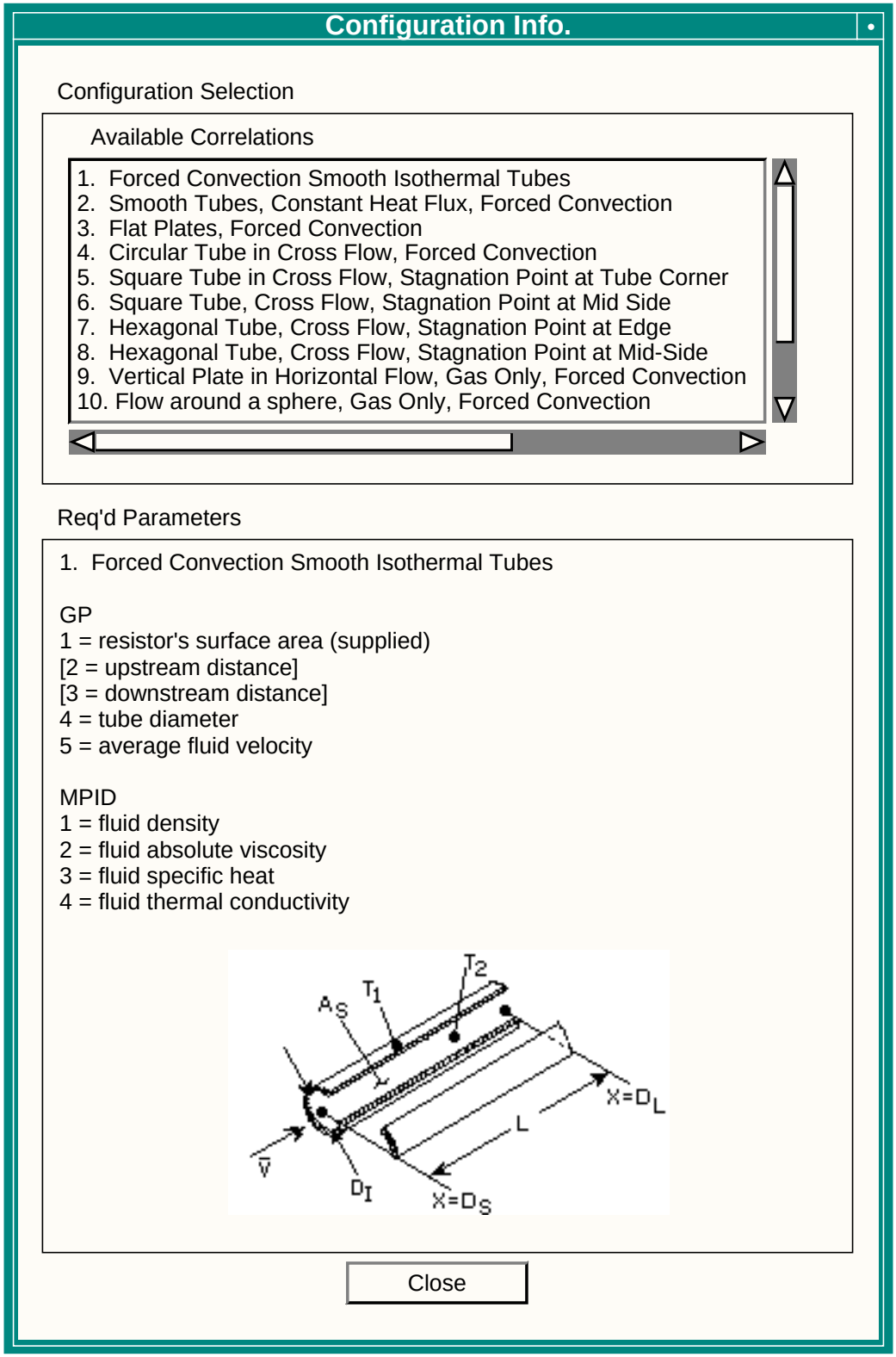



**Figure 4-1 Convection configurations**

**Template Writer** Previous versions of MSC/PATRAN THERMAL required extensive external editor input for boundary condition control parameters. New template reader and writer capabilities simplify the input of these boundary conditions. These forms are accessible

from the Analysis application. Figure 4-1 shows one of the convection writer forms that allows for selection of a specialized MSC/PATRAN THERMAL boundary condition. Once selected, the form guides the user to provide the necessary input parameters for the particular boundary condition.

Figure 4-2 shows the new ability to input all of the relevant radiation boundary condition information from the template writer. Input can range from a simple constant emissivity to a wavelength dependent property.

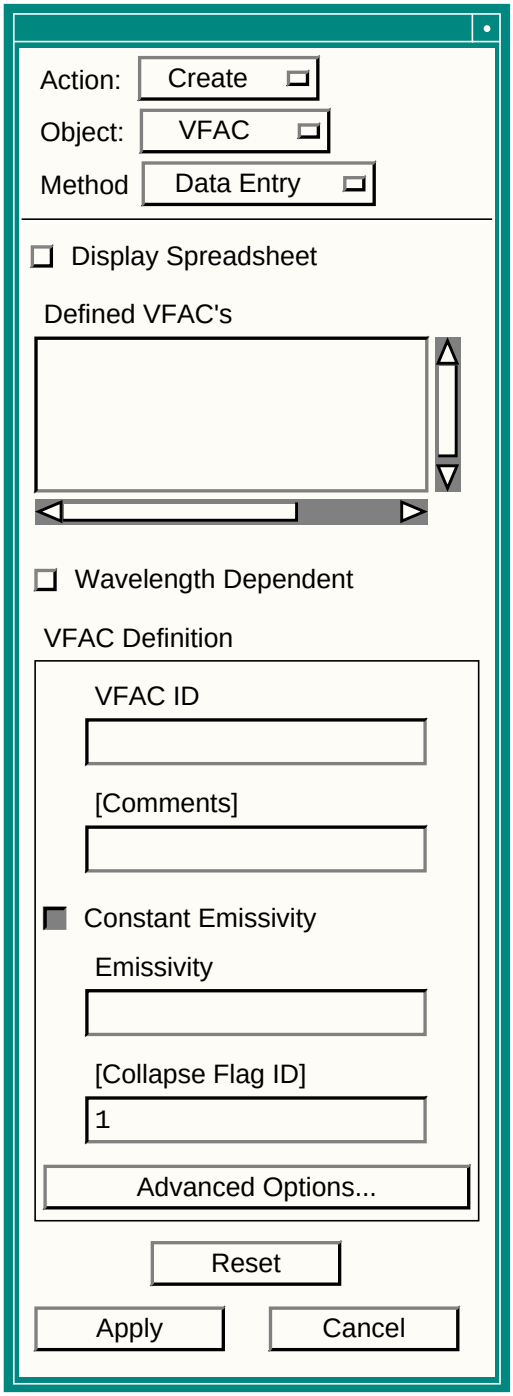



**Figure 4-2 Radiation ViewFactor Template Form.**