

# TABLE OF CONTENTS

---

## TABLE OF CONTENTS

|  |      |
|--|------|
| TABLE OF CONTENTS .....                          | 0-1  |
| *EOS .....                                       | 1-1  |
| *EOS_LINEAR_POLYNOMIAL .....                     | 1-7  |
| *EOS_JWL .....                                   | 1-9  |
| *EOS_SACK_TUESDAY .....                          | 1-14 |
| *EOS_GRUNEISEN .....                             | 1-15 |
| *EOS_RATIO_OF_POLYNOMIALS .....                  | 1-17 |
| *EOS_LINEAR_POLYNOMIAL_WITH_ENERGY_LEAK .....    | 1-21 |
| *EOS_IGNITION_AND_GROWTH_OF_REACTION_IN_HE ..... | 1-23 |
| *EOS_TABULATED_COMPACTION .....                  | 1-27 |
| *EOS_TABULATED .....                             | 1-30 |
| *EOS_PROPELLANT_DEFLAGRATION .....               | 1-32 |
| *EOS_TENSOR_PORE_COLLAPSE .....                  | 1-37 |
| *EOS_IDEAL_GAS .....                             | 1-40 |
| *EOS_PHASE_CHANGE .....                          | 1-43 |
| *EOS_JWLB .....                                  | 1-45 |
| *EOS_GASKET .....                                | 1-48 |
| *EOS_MIE_GRUNEISEN .....                         | 1-51 |
| *EOS_MURNAGHAN .....                             | 1-53 |
| *EOS_USER_DEFINED .....                          | 1-54 |
| *EOS_USER_LIBRARY .....                          | 1-55 |
| *MAT .....                                       | 2-1  |
| MATERIAL MODEL REFERENCE TABLES .....            | 2-11 |
| Alphabetized Materials List .....                | 2-23 |
| *MAT_ADD_AIRBAG_POROSITY_LEAKAGE .....           | 2-35 |
| *MAT_ADD_BASIC_INCREMENTAL_FAILURE .....         | 2-43 |
| *MAT_ADD_CHEM_SHRINKAGE .....                    | 2-48 |
| *MAT_ADD_COHESIVE .....                          | 2-50 |
| *MAT_ADD_DAMAGE_DIEM .....                       | 2-54 |
| *MAT_ADD_DAMAGE_GISSMO .....                     | 2-67 |
| *MAT_ADD_EROSION .....                           | 2-80 |
| *MAT_ADD_EXTVAR_EXPANSION .....                  | 2-90 |
| *MAT_ADD_FATIGUE .....                           | 2-92 |

# TABLE OF CONTENTS

---

|   |       |
|---|-------|
| *MAT_ADD_GENERALIZED_DAMAGE.....            | 2-98  |
| *MAT_ADD_INELASTICITY .....                 | 2-110 |
| *MAT_ADD_PERMEABILITY .....                 | 2-127 |
| *MAT_ADD_PORE_AIR .....                     | 2-129 |
| *MAT_ADD_PROPERTY_DEPENDENCE .....          | 2-131 |
| *MAT_ADD_PZELECTRIC.....                    | 2-133 |
| *MAT_ADD_SOC_EXPANSION.....                 | 2-137 |
| *MAT_ADD_THERMAL_EXPANSION .....            | 2-139 |
| *MAT_NONLOCAL .....                         | 2-141 |
| *MAT_ELASTIC .....                          | 2-145 |
| *MAT_OPTIONTROPIC_ELASTIC.....              | 2-149 |
| *MAT_PLASTIC_KINEMATIC.....                 | 2-164 |
| *MAT_ELASTIC_PLASTIC_THERMAL.....           | 2-167 |
| *MAT_SOIL_AND_FOAM .....                    | 2-170 |
| *MAT_VISCOELASTIC .....                     | 2-174 |
| *MAT_BLATZ-KO_RUBBER .....                  | 2-176 |
| *MAT_HIGH_EXPLOSIVE_BURN.....               | 2-178 |
| *MAT_NULL .....                             | 2-181 |
| *MAT_ELASTIC_PLASTIC_HYDRO .....            | 2-183 |
| *MAT_STEINBERG.....                         | 2-189 |
| *MAT_STEINBERG_LUND .....                   | 2-194 |
| *MAT_ISOTROPIC_ELASTIC_PLASTIC.....         | 2-198 |
| *MAT_ISOTROPIC_ELASTIC_FAILURE.....         | 2-199 |
| *MAT_SOIL_AND_FOAM_FAILURE.....             | 2-201 |
| *MAT_JOHNSON_COOK.....                      | 2-202 |
| *MAT_PSEUDO_TENSOR.....                     | 2-212 |
| *MAT_ORIENTED_CRACK.....                    | 2-220 |
| *MAT_POWER_LAW_PLASTICITY .....             | 2-223 |
| *MAT_STRAIN_RATE_DEPENDENT_PLASTICITY.....  | 2-226 |
| *MAT_RIGID .....                            | 2-229 |
| *MAT_ORTHOTROPIC_THERMAL .....              | 2-236 |
| *MAT_COMPOSITE_DAMAGE .....                 | 2-245 |
| *MAT_TEMPERATURE_DEPENDENT_ORTHOTROPIC..... | 2-251 |
| *MAT_PIECEWISE_LINEAR_PLASTICITY .....      | 2-257 |
| *MAT_GEOLOGIC_CAP_MODEL .....               | 2-264 |
| *MAT_HONEYCOMB .....                        | 2-270 |
| *MAT_MOONEY-RIVLIN_RUBBER.....              | 2-278 |

# TABLE OF CONTENTS

---

|   |       |
|---|-------|
| *MAT_RESULTANT_PLASTICITY .....                     | 2-282 |
| *MAT_FORCE_LIMITED .....                            | 2-283 |
| *MAT_SHAPE_MEMORY .....                             | 2-290 |
| *MAT_FRAZER_NASH_RUBBER_MODEL .....                 | 2-296 |
| *MAT_LAMINATED_GLASS .....                          | 2-300 |
| *MAT_BARLAT_ANISOTROPIC_PLASTICITY .....            | 2-302 |
| *MAT_BARLAT_YLD96 .....                             | 2-307 |
| *MAT_FABRIC .....                                   | 2-312 |
| *MAT_FABRIC_MAP .....                               | 2-339 |
| *MAT_PLASTIC_GREEN-NAGHDI_RATE .....                | 2-356 |
| *MAT_3-PARAMETER_BARLAT .....                       | 2-357 |
| *MAT_EXTENDED_3-PARAMETER_BARLAT .....              | 2-378 |
| *MAT_TRANSVERSELY_ANISOTROPIC_ELASTIC_PLASTIC ..... | 2-383 |
| *MAT_BLATZ-KO_FOAM .....                            | 2-391 |
| *MAT_FLD_TRANSVERSELY_ANISOTROPIC .....             | 2-393 |
| *MAT_NONLINEAR_ORTHOTROPIC .....                    | 2-395 |
| *MAT_USER_DEFINED_MATERIAL_MODELS .....             | 2-401 |
| *MAT_BAMMAN .....                                   | 2-408 |
| *MAT_BAMMAN_DAMAGE .....                            | 2-413 |
| *MAT_CLOSED_CELL_FOAM .....                         | 2-416 |
| *MAT_ENHANCED_COMPOSITE_DAMAGE .....                | 2-419 |
| *MAT_LOW_DENSITY_FOAM .....                         | 2-437 |
| *MAT_LAMINATED_COMPOSITE_FABRIC .....               | 2-442 |
| *MAT_COMPOSITE_FAILURE .....                        | 2-461 |
| *MAT_ELASTIC_WITH_VISCOSITY .....                   | 2-468 |
| *MAT_ELASTIC_WITH_VISCOSITY_CURVE .....             | 2-471 |
| *MAT_KELVIN-MAXWELL_VISCOELASTIC .....              | 2-474 |
| *MAT_VISCOUS_FOAM .....                             | 2-476 |
| *MAT_CRUSHABLE_FOAM .....                           | 2-478 |
| *MAT_RATE_SENSITIVE_POWERLAW_PLASTICITY .....       | 2-484 |
| *MAT_MODIFIED_ZERILLI_ARMSTRONG .....               | 2-487 |
| *MAT_LINEAR_ELASTIC_DISCRETE_BEAM .....             | 2-490 |
| *MAT_NONLINEAR_ELASTIC_DISCRETE_BEAM .....          | 2-493 |
| *MAT_NONLINEAR_PLASTIC_DISCRETE_BEAM .....          | 2-499 |
| *MAT_SID_DAMPER_DISCRETE_BEAM .....                 | 2-507 |
| *MAT_HYDRAULIC_GAS_DAMPER_DISCRETE_BEAM .....       | 2-512 |
| *MAT_CABLE_DISCRETE_BEAM .....                      | 2-514 |

# TABLE OF CONTENTS

---

|   |       |
|---|-------|
| *MAT_CONCRETE_DAMAGE .....                            | 2-517 |
| *MAT_CONCRETE_DAMAGE_REL3 .....                       | 2-522 |
| *MAT_LOW_DENSITY_VISCOUS_FOAM .....                   | 2-531 |
| *MAT_ELASTIC_SPRING_DISCRETE_BEAM .....               | 2-537 |
| *MAT_BILKHU/DUBOIS_FOAM .....                         | 2-539 |
| *MAT_GENERAL_VISCOELASTIC .....                       | 2-542 |
| *MAT_HYPERELASTIC_RUBBER .....                        | 2-548 |
| *MAT_OGDEN_RUBBER .....                               | 2-561 |
| *MAT_SOIL_CONCRETE .....                              | 2-569 |
| *MAT_HYSTERETIC_SOIL .....                            | 2-573 |
| *MAT_RAMBERG-OSGOOD .....                             | 2-583 |
| *MAT_PLASTICITY_WITH_DAMAGE .....                     | 2-585 |
| *MAT_FU_CHANG_FOAM .....                              | 2-594 |
| *MAT_WINFRITH_CONCRETE .....                          | 2-607 |
| *MAT_WINFRITH_CONCRETE_REINFORCEMENT .....            | 2-625 |
| *MAT_ORTHOTROPIC_VISCOELASTIC .....                   | 2-627 |
| *MAT_CELLULAR_RUBBER .....                            | 2-630 |
| *MAT_MTS .....  | 2-635 |
| *MAT_PLASTICITY_POLYMER .....                         | 2-640 |
| *MAT_ACOUSTIC .....                                   | 2-645 |
| *MAT_ACOUSTIC_COMPLEX .....                           | 2-647 |
| *MAT_ACOUSTIC_DAMP .....                              | 2-649 |
| *MAT_ACOUSTIC_POROUS_DB .....                         | 2-651 |
| *MAT_SOFT_TISSUE .....                                | 2-653 |
| *MAT_ELASTIC_6DOF_SPRING_DISCRETE_BEAM .....          | 2-660 |
| *MAT_INELASTIC_SPRING_DISCRETE_BEAM .....             | 2-662 |
| *MAT_INELASTIC_6DOF_SPRING_DISCRETE_BEAM .....        | 2-665 |
| *MAT_BRITTLE_DAMAGE .....                             | 2-667 |
| *MAT_GENERAL_JOINT_DISCRETE_BEAM .....                | 2-671 |
| *MAT_SIMPLIFIED_JOHNSON_COOK .....                    | 2-673 |
| *MAT_SIMPLIFIED_JOHNSON_COOK_ORTHOTROPIC_DAMAGE ..... | 2-676 |
| *MAT_SPOTWELD .....                                   | 2-678 |
| *MAT_SPOTWELD_DAIMLERCHRYSLER .....                   | 2-703 |
| *MAT_GEPLASTIC_SRATE_2000a .....                      | 2-708 |
| *MAT_INV_HYPERBOLIC_SIN .....                         | 2-710 |
| *MAT_ANISOTROPIC_VISCOPLASTIC .....                   | 2-714 |
| *MAT_ANISOTROPIC_PLASTIC .....                        | 2-722 |

# TABLE OF CONTENTS

---

|  |       |
|--|-------|
| *MAT_DAMAGE_1.....                                     | 2-726 |
| *MAT_DAMAGE_2.....                                     | 2-736 |
| *MAT_ELASTIC_VISCOPLASTIC_THERMAL.....                 | 2-740 |
| *MAT_MODIFIED_JOHNSON_COOK.....                        | 2-746 |
| *MAT_ORTHO_ELASTIC_PLASTIC.....                        | 2-756 |
| *MAT_JOHNSON_HOLMQUIST_CERAMICS.....                   | 2-761 |
| *MAT_JOHNSON_HOLMQUIST_CONCRETE.....                   | 2-765 |
| *MAT_FINITE_ELASTIC_STRAIN_PLASTICITY.....             | 2-768 |
| *MAT_TRIP.....   | 2-771 |
| *MAT_LAYERED_LINEAR_PLASTICITY.....                    | 2-775 |
| *MAT_UNIFIED_CREEP.....                                | 2-779 |
| *MAT_UNIFIED_CREEP_ORTHO.....                          | 2-781 |
| *MAT_COMPOSITE_LAYUP.....                              | 2-786 |
| *MAT_COMPOSITE_MATRIX.....                             | 2-789 |
| *MAT_COMPOSITE_DIRECT.....                             | 2-792 |
| *MAT_GENERAL_NONLINEAR_6DOF_DISCRETE_BEAM.....         | 2-794 |
| *MAT_GURSON.....                                       | 2-810 |
| *MAT_GURSON_JC.....                                    | 2-817 |
| *MAT_GURSON_RCDC.....                                  | 2-826 |
| *MAT_GENERAL_NONLINEAR_1DOF_DISCRETE_BEAM.....         | 2-832 |
| *MAT_HILL_3R.....                                      | 2-835 |
| *MAT_HILL_3R_3D.....                                   | 2-839 |
| *MAT_HILL_3R_TABULATED.....                            | 2-846 |
| *MAT_MODIFIED_PIECEWISE_LINEAR_PLASTICITY.....         | 2-849 |
| *MAT_PLASTICITY_COMPRESSION_TENSION.....               | 2-857 |
| *MAT_KINEMATIC_HARDENING_TRANSVERSELY_ANISOTROPIC..... | 2-863 |
| *MAT_MODIFIED_HONEYCOMB.....                           | 2-870 |
| *MAT_ARRUDA_BOYCE_RUBBER.....                          | 2-885 |
| *MAT_HEART_TISSUE.....                                 | 2-888 |
| *MAT_LUNG_TISSUE.....                                  | 2-893 |
| *MAT_SPECIAL_ORTHOTROPIC.....                          | 2-896 |
| *MAT_ISOTROPIC_SMEARED_CRACK.....                      | 2-900 |
| *MAT_ORTHOTROPIC_SMEARED_CRACK.....                    | 2-903 |
| *MAT_BARLAT_YLD2000.....                               | 2-908 |
| *MAT_VISCOELASTIC_FABRIC.....                          | 2-923 |
| *MAT_WTM_STM.....                                      | 2-927 |
| *MAT_WTM_STM_PLC.....                                  | 2-939 |

# TABLE OF CONTENTS

---

|  |        |
|--|--------|
| *MAT_VEGTER.....                                 | 2-944  |
| *MAT_VEGTER_STANDARD.....                        | 2-951  |
| *MAT_VEGTER_2017 .....                           | 2-958  |
| *MAT_COHESIVE_MIXED_MODE .....                   | 2-964  |
| *MAT_MODIFIED_FORCE_LIMITED .....                | 2-969  |
| *MAT_VACUUM .....                                | 2-983  |
| *MAT_RATE_SENSITIVE_POLYMER.....                 | 2-984  |
| *MAT_TRANSVERSELY_ISOTROPIC_CRUSHABLE_FOAM ..... | 2-986  |
| *MAT_WOOD .....                                  | 2-991  |
| *MAT_PITZER_CRUSHABLE_FOAM.....                  | 2-1002 |
| *MAT_SCHWER_MURRAY_CAP_MODEL .....               | 2-1004 |
| *MAT_1DOF_GENERALIZED_SPRING.....                | 2-1012 |
| *MAT_FHWA_SOIL .....                             | 2-1014 |
| *MAT_FHWA_SOIL_NEBRASKA .....                    | 2-1017 |
| *MAT_GAS_MIXTURE.....                            | 2-1018 |
| *MAT_EMMI .....                                  | 2-1025 |
| *MAT_DAMAGE_3.....                               | 2-1033 |
| *MAT_DESHPANDE_FLECK_FOAM.....                   | 2-1045 |
| *MAT_PLASTICITY_COMPRESSION_TENSION_EOS.....     | 2-1048 |
| *MAT_MUSCLE.....                                 | 2-1054 |
| *MAT_ANISOTROPIC_ELASTIC_PLASTIC.....            | 2-1058 |
| *MAT_RATE_SENSITIVE_COMPOSITE_FABRIC .....       | 2-1074 |
| *MAT_CSCM .....                                  | 2-1081 |
| *MAT_ALE_INCOMPRESSIBLE .....                    | 2-1094 |
| *MAT_COMPOSITE_MSC.....                          | 2-1096 |
| *MAT_MODIFIED_CRUSHABLE_FOAM .....               | 2-1109 |
| *MAT_BRAIN_LINEAR_VISCOELASTIC .....             | 2-1112 |
| *MAT_PLASTIC_NONLINEAR_KINEMATIC .....           | 2-1114 |
| *MAT_MOMENT_CURVATURE_BEAM .....                 | 2-1116 |
| *MAT_MCCORMICK .....                             | 2-1120 |
| *MAT_POLYMER .....                               | 2-1123 |
| *MAT_ARUP_ADHESIVE.....                          | 2-1128 |
| *MAT_RESULTANT_ANISOTROPIC.....                  | 2-1138 |
| *MAT_STEEL_CONCENTRIC_BRACE.....                 | 2-1142 |
| *MAT_CONCRETE_EC2 .....                          | 2-1149 |
| *MAT_MOHR_COULOMB.....                           | 2-1172 |
| *MAT_RC_BEAM.....                                | 2-1179 |

# TABLE OF CONTENTS

---

|   |        |
|---|--------|
| *MAT_VISCOELASTIC_THERMAL.....                  | 2-1185 |
| *MAT_QUASILINEAR_VISCOELASTIC .....             | 2-1190 |
| *MAT_HILL_FOAM .....                            | 2-1195 |
| *MAT_VISCOELASTIC_HILL_FOAM.....                | 2-1199 |
| *MAT_LOW_DENSITY_SYNTHETIC_FOAM.....            | 2-1204 |
| *MAT_SIMPLIFIED_RUBBER/FOAM .....               | 2-1210 |
| *MAT_SIMPLIFIED_RUBBER_WITH_DAMAGE.....         | 2-1219 |
| *MAT_COHESIVE_ELASTIC .....                     | 2-1223 |
| *MAT_COHESIVE_TH .....                          | 2-1225 |
| *MAT_COHESIVE_GENERAL .....                     | 2-1229 |
| *MAT_SAMP-1 .....                               | 2-1234 |
| *MAT_SAMP_LIGHT .....                           | 2-1243 |
| *MAT_THERMO_ELASTO_VISCOPLASTIC_CREEP.....      | 2-1249 |
| *MAT_ANISOTROPIC_THERMOELASTIC.....             | 2-1255 |
| *MAT_FLD_3-PARAMETER_BARLAT.....                | 2-1259 |
| *MAT_SEISMIC_BEAM .....                         | 2-1265 |
| *MAT_SOIL_BRICK.....                            | 2-1275 |
| *MAT_DRUCKER_PRAGER.....                        | 2-1283 |
| *MAT_RC_SHEAR_WALL .....                        | 2-1286 |
| *MAT_CONCRETE_BEAM.....                         | 2-1294 |
| *MAT_GENERAL_SPRING_DISCRETE_BEAM.....          | 2-1297 |
| *MAT_SEISMIC_ISOLATOR.....                      | 2-1302 |
| *MAT_JOINTED_ROCK.....                          | 2-1314 |
| *MAT_BARLAT_YLD2004 .....                       | 2-1320 |
| *MAT_BARLAT_YLD2004_27P .....                   | 2-1325 |
| *MAT_STEEL_EC3 .....                            | 2-1332 |
| *MAT_HYSTERETIC_REINFORCEMENT.....              | 2-1335 |
| *MAT_DISCRETE_BEAM_POINT_CONTACT.....           | 2-1343 |
| *MAT_SOIL_SANISAND.....                         | 2-1349 |
| *MAT_BOLT_BEAM .....                            | 2-1357 |
| *MAT_HYSTERETIC_BEAM.....                       | 2-1364 |
| *MAT_SPR_JLR .....                              | 2-1383 |
| *MAT_COMPOSITE_TABULATED_PLASTICITY_DAMAGE..... | 2-1392 |
| *MAT_DRY_FABRIC.....                            | 2-1426 |
| *MAT_4A_MICROMECH .....                         | 2-1433 |
| *MAT_ELASTIC_PHASE_CHANGE .....                 | 2-1445 |
| *MAT_ORTHOTROPIC_ELASTIC_PHASE_CHANGE.....      | 2-1447 |

# TABLE OF CONTENTS

---

|   |        |
|---|--------|
| *MAT_MOONEY-RIVLIN_PHASE_CHANGE.....              | 2-1452 |
| *MAT_CODAM2 .....                                 | 2-1457 |
| *MAT_RIGID_DISCRETE.....                          | 2-1469 |
| *MAT_ORTHOTROPIC_SIMPLIFIED_DAMAGE .....          | 2-1470 |
| *MAT_TABULATED_JOHNSON_COOK .....                 | 2-1481 |
| *MAT_TABULATED_JOHNSON_COOK_GYS.....              | 2-1489 |
| *MAT_VISCOPLASTIC_MIXED_HARDENING .....           | 2-1494 |
| *MAT_KINEMATIC_HARDENING_BARLAT89.....            | 2-1496 |
| *MAT_PML_ELASTIC.....                             | 2-1502 |
| *MAT_PML_ELASTIC_FLUID.....                       | 2-1504 |
| *MAT_PML_ACOUSTIC .....                           | 2-1505 |
| *MAT_BIOT_HYSTERETIC.....                         | 2-1507 |
| *MAT_CAZACU_BARLAT .....                          | 2-1509 |
| *MAT_VISCOELASTIC_LOOSE_FABRIC.....               | 2-1524 |
| *MAT_MICROMECHANICS_DRY_FABRIC .....              | 2-1530 |
| *MAT_SCC_ON_RCC .....                             | 2-1536 |
| *MAT_PML_HYSTERETIC .....                         | 2-1540 |
| *MAT_PERT_PIECEWISE_LINEAR_PLASTICITY .....       | 2-1541 |
| *MAT_COHESIVE_MIXED_MODE_ELASTOPLASTIC_RATE ..... | 2-1542 |
| *MAT_JOHNSON_HOLMQUIST_JH1 .....                  | 2-1556 |
| *MAT_KINEMATIC_HARDENING_BARLAT2000.....          | 2-1560 |
| *MAT_HILL_90 .....                                | 2-1567 |
| *MAT_UHS_STEEL .....                              | 2-1578 |
| *MAT_PML_OPTIONTROPIC_ELASTIC .....               | 2-1599 |
| *MAT_PML_NULL .....                               | 2-1603 |
| *MAT_PHS_BMW.....                                 | 2-1605 |
| *MAT_REINFORCED_THERMOPLASTIC .....               | 2-1626 |
| *MAT_REINFORCED_THERMOPLASTIC_CRASH.....          | 2-1637 |
| *MAT_REINFORCED_THERMOPLASTIC_UDFIBER.....        | 2-1651 |
| *MAT_TAILORED_PROPERTIES .....                    | 2-1657 |
| *MAT_TOUGHENED_ADHESIVE_POLYMER.....              | 2-1661 |
| *MAT_GENERALIZED_PHASE_CHANGE.....                | 2-1670 |
| *MAT_PIECEWISE_LINEAR_PLASTIC_THERMAL.....        | 2-1687 |
| *MAT_AMORPHOUS_SOLIDS_FINITE_STRAIN .....         | 2-1690 |
| *MAT_NON_QUADRATIC_FAILURE.....                   | 2-1693 |
| *MAT_STOUGHTON_NON_ASSOCIATED_FLOW .....          | 2-1697 |
| *MAT_MOHR_NON_ASSOCIATED_FLOW.....                | 2-1708 |

# TABLE OF CONTENTS

---

|  |        |
|--|--------|
| *MAT_LAMINATED_FRACTURE_DAIMLER_PINHO .....        | 2-1722 |
| *MAT_LAMINATED_FRACTURE_DAIMLER_CAMANHO .....      | 2-1737 |
| *MAT_LOU-YOON_ANISOTROPIC_PLASTICITY .....         | 2-1755 |
| *MAT_TABULATED_JOHNSON_COOK_ORTHO_PLASTICITY ..... | 2-1763 |
| *MAT_CONSTRAINED .....                             | 2-1772 |
| *MAT_TISSUE_DISPERSED .....                        | 2-1780 |
| *MAT_EIGHT_CHAIN_RUBBER.....                       | 2-1788 |
| *MAT_BERGSTROM_BOYCE_RUBBER .....                  | 2-1800 |
| *MAT_CWM.....                                      | 2-1803 |
| *MAT_POWDER .....                                  | 2-1809 |
| *MAT_RHT.....                                      | 2-1817 |
| *MAT_CONCRETE_DAMAGE_PLASTIC_MODEL .....           | 2-1826 |
| *MAT_PAPER .....                                   | 2-1834 |
| *MAT_SMOOTH_VISCOELASTIC_VISCOPLASTIC .....        | 2-1844 |
| *MAT_CHRONOLOGICAL_VISCOELASTIC .....              | 2-1852 |
| *MAT_ADHESIVE_CURING_VISCOELASTIC .....            | 2-1855 |
| *MAT_CF_MICROMECHANICS.....                        | 2-1859 |
| *MAT_COHESIVE_PAPER .....                          | 2-1866 |
| *MAT_GLASS.....                                    | 2-1871 |
| *MAT_SHAPE_MEMORY_ALLOY.....                       | 2-1883 |
| *MAT_ELASTIC_PERI .....                            | 2-1896 |
| *MAT_ELASTIC_PERI_LAMINATE .....                   | 2-1898 |
| *MAT_COMPRF .....                                  | 2-1900 |
| *MAT_ANISOTROPIC_HYPERELASTIC .....                | 2-1906 |
| *MAT_ANAND_VISCOPLASTICITY.....                    | 2-1925 |
| *MAT_DMN_COMPOSITE_FRC .....                       | 2-1928 |
| *MAT_HOT_PLATE_ROLLING .....                       | 2-1946 |
| *MAT_GENERALIZED_ADHESIVE_CURING .....             | 2-1955 |
| *MAT_RRR_POLYMER .....                             | 2-1986 |
| *MAT_TNM_POLYMER.....                              | 2-1990 |
| *MAT_IFPD.....                                     | 2-1994 |
| *MAT_COHESIVE_GASKET .....                         | 2-1995 |
| *MAT_ALE_VACUUM.....                               | 2-1999 |
| *MAT_ALE_GAS_MIXTURE .....                         | 2-2000 |
| *MAT_ALE_VISCOUS .....                             | 2-2002 |
| *MAT_ALE_MIXING_LENGTH.....                        | 2-2005 |
| *MAT_ALE_INCOMPRESSIBLE .....                      | 2-2008 |

# TABLE OF CONTENTS

---

|  |        |
|--|--------|
| *MAT_ALE_HERSCHEL .....                          | 2-2009 |
| *MAT_ISPG_CARREAU .....                          | 2-2012 |
| *MAT_ISPG_CROSSMODEL .....                       | 2-2014 |
| *MAT_ISPG_ISO_NEWTONIAN .....                    | 2-2016 |
| *MAT_ISPG_CROSS_CASTRO_MACOSKO .....             | 2-2018 |
| *MAT_SPH_VISCOUS.....                            | 2-2021 |
| *MAT_SPH_INCOMPRESSIBLE_FLUID .....              | 2-2025 |
| *MAT_SPH_INCOMPRESSIBLE_STRUCTURE.....           | 2-2027 |
| *MAT_SPRING_ELASTIC .....                        | 2-2029 |
| *MAT_DAMPER_VISCOUS .....                        | 2-2030 |
| *MAT_SPRING_ELASTOPLASTIC .....                  | 2-2031 |
| *MAT_SPRING_NONLINEAR_ELASTIC .....              | 2-2032 |
| *MAT_DAMPER_NONLINEAR_VISCOUS.....               | 2-2033 |
| *MAT_SPRING_GENERAL_NONLINEAR .....              | 2-2034 |
| *MAT_SPRING_MAXWELL .....                        | 2-2037 |
| *MAT_SPRING_INELASTIC .....                      | 2-2039 |
| *MAT_SPRING_TRILINEAR_DEGRADING .....            | 2-2040 |
| *MAT_SPRING_SQUAT_SHEARWALL.....                 | 2-2041 |
| *MAT_SPRING_MUSCLE .....                         | 2-2042 |
| *MAT_SEATBELT .....                              | 2-2047 |
| <br>   |        |
| *MAT_THERMAL.....                                | 3-1    |
| *MAT_THERMAL_ISOTROPIC.....                      | 3-2    |
| *MAT_THERMAL_ORTHOTROPIC .....                   | 3-4    |
| *MAT_THERMAL_ISOTROPIC_TD .....                  | 3-7    |
| *MAT_THERMAL_ORTHOTROPIC_TD.....                 | 3-9    |
| *MAT_THERMAL_DISCRETE_BEAM.....                  | 3-14   |
| *MAT_THERMAL_CHEMICAL_REACTION.....              | 3-15   |
| *MAT_THERMAL_CWM .....                           | 3-25   |
| *MAT_THERMAL_ORTHOTROPIC_TD_LC .....             | 3-28   |
| *MAT_THERMAL_ISOTROPIC_PHASE_CHANGE .....        | 3-34   |
| *MAT_THERMAL_ISOTROPIC_TD_LC .....               | 3-37   |
| *MAT_THERMAL_USER_DEFINED .....                  | 3-41   |
| *MAT_THERMAL_CHEMICAL_REACTION_ORTHOTROPIC ..... | 3-44   |
| *MAT_THERMAL_ISPG.....                           | 3-51   |