

SCALE

Structural CALCulations Ensemble

SCALE is a computer program for producing neatly composed pages of structural engineers' calculations and component details for the design of a variety of components such as beams, columns and slabs, using steel, concrete, masonry and timber.

SCALE incorporates a library of over 1000 proforma calculations, any of which may be selected for use when SCALE is run. The content of this library is continually under review, proformas being added or modified as codes of practice develop and change. The library includes:

- [SCALE](#) - Reinforced Concrete Design to Eurocode 2 and BS8110
 - Reinforced & Prestressed Concrete Design to BS5400 & DOT
 - Reinforced Concrete to Eurocode 2, BS8007, BS8666 and Section Analysis
 - Composite Construction to Eurocode 4, BS5950 and BS5400
 - Timber Design to Eurocode 5 and BS5268
 - Steel Design to BS5400 & DOT
 - Steel Design to Eurocode 3 and BS5950-1:2000
 - Masonry Design to Eurocode 6, BS5628 and MEXE
 - Analysis by NL-STRESS
 - Analysis by Traditional Methods
 - Pre and Postprocessors for Structural Analysis
 - Loadings and Foundations
 - Drainage and Surveying
 - Mathematics
 - Manuals and Miscellaneous
- [LUCID](#) for reinforced concrete component detailing.
- [SPADE](#) for steelwork, timber and masonry component detailing.
- [NL-STRESS](#) for the structural analysis of frameworks.

The principal proformas have now been modified such that each proforma will allow design to the new Eurocode with full working displayed to the Eurocode, or allow design to the previous British Standard showing full workings displayed to the British Standard. The user can choose the code at the start of the proforma and alternate between codes as required.

Your pdf viewer should show a list of bookmarks to the left of this document, click on the bookmarks to jump to the relevant example proformas. Alternatively click on the highlighted links above to jump to the relevant section headings in the full list of proformas on the following pages.

The output from SCALE is a set of pages, neatly titled, dated and numbered, containing calculations and component details made to a standard suitable for submission to a checking authority.

Where a SCALE proforma has a # sign following its number, this indicates that that proforma pulls forward the moments, shears etc. from an NL-STRESS analysis into the proforma.

The proformas marked with an (E) allow full workings to the Eurocodes and full workings to the British Standard, or are analytical and applicable to both. There are now over 500 proformas ready for the Eurocodes.

SCALE - Structural CALCulations Ensemble - MENU OF OPTIONS

REINFORCED CONCRETE DESIGN TO EUROCODE 2 AND BS8110

- 072 (E) Rectangular beam - flexure only
- 073 (E) Rectangular beam - flexure, span/depth, curtailment, laps
- 074 (E) Tee beam - flexure only
- 075 (E) Tee beam - flexure, span/depth check
- 076 (E) Design of walls
- 077 (E) Wall to wall intersection
- 078 (E) Rectangular and Tee beam - shear only
- 080 (E) Solid slab - flexure, tension steel only, span/d /m width
- 081 (E) Solid slab - flexure, tension & comp steel, span/d /m width
- 082 (E) Solid slab - flexure, tens & comp steel, span/d given width
- 083 (E) Solid slab - shear only
- 084 (E) Slab rib - shear only
- 085 (E) Two way slabs - moments only
- 086 (E) Two way slabs - with design
- 087 (E) Flat slabs - simplified method
- 088 (E) Slabs - punching shear
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- 090 (E) Stocky column - biaxial bending
- 091 (E) Slender rectangular column - uniaxial bending
- 092 (E) Slender rectangular column - biaxial bending
- 094 (E) Circular column - design for ultimate
- 095 (E) Circular column - cracking
- 096 (E) Circular column - cracking with tension stiffening
- 097 (E) Rectangular column uniaxial bending - rigorous procedure
- 098 (E) Rectangular column biaxial bending - rigorous procedure
- 099 (E) Circular column in accordance with IStructE/ICE manual
- 100 (E) Simply supported rectangular beam/slab with general loading
- 101 (E) RC beam on elastic piles subjected to train of moving point loads
- 102# (E) Rectangular beam/slab section
- 103 (E) Rectangular beam/slab section - checking aid
- 104# (E) Biaxially bent stocky column
- 105 (E) Rectangular column section - checking aid
- 106# (E) Flanged beam section design to IStructE manual
- 107# (E) Flanged beam section design to Clause 3.4.4.4
- 108 (E) Torsion steel for rectangular section
- 109 (E) Ground-supported concrete slabs for industrial buildings
- 110 (E) Pad footing with uniaxial bending, including section design

- 111 (E) Deep beams - Kong's method
- 112 (E) Modular-ratio design of reinforcement for circular column
- 113 (E) Modular-ratio calculation of stresses for circular column
- 117 (E) Simply supported R.C. staircase
- 118 (E) Concrete nibs
- 119 (E) Fire resistance

REINFORCED & PRESTRESSED CONCRETE DESIGN TO EUROCODE 2, BS5400 & DOT

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- 123 (E) General reinforced concrete section - assessment
- 124 (E) Early thermal cracking
- 125 (E) Half joint
- 126 (E) Torsion in reinforced concrete - design
- 127 (E) Torsion in reinforced concrete - assessment
- 128 (E) Temperature effects
- 130 (E) HA loading to BD 37/01
- 131 (E) HA loading assessment to BD 21/01
- 132 (E) ULS flexure in prestressed members - design
- 133 (E) ULS flexure in prestressed members - assessment
- 134 (E) ULS shear in prestressed members - design
- 135 (E) ULS shear in prestressed members - assessment
- 114 (E) TY beam with in-situ infill
- 115 (E) TY beam with in-situ top slab
- 116 (E) TYE beam with in-situ top slab
- 165 (E) TYE beam with in-situ infill
- 138 (E) SY beams with insitu top slab
- 139 (E) YE beams with insitu top slab
- 140 (E) Inverted T beam
- 141 (E) M beam
- 142 (E) UM beam
- 143 (E) Y beam
- 144 (E) U beam
- 145 (E) Wide box beam
- 146 (E) Box beam
- 148 (E) General precast prestressed bridge beam
- 149 (E) Concrete mix design
- 151 (E) Rectangular column - section interaction - design
- 152 (E) Rectangular column - section interaction - assessment
- 153 (E) Circular column - section interaction - design
- 154 (E) Circular column - section interaction - assessment
- 155 (E) General column - section interaction - design
- 156 (E) General column - section interaction - assessment
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- 158 (E) Rectangular column - biaxial bending - assessment

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- 191 (Withdrawn) Bar scheduling to BS4466
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- 193 (E) Biaxial bending of rectangular section
- 194 (E) Biaxial bending of circular section
- 195 (E) Biaxial bending of user defined section

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- 212 (E) Edge beam with UDL to BS5950 and EC4
- 214 (E) Internal beam with secondary beams to BS5950 and EC4
- 216 (E) Edge beam with secondary beam to BS5950 and EC4
- 218 (E) Internal beam with secondary beams at third points to BS5950 & EC4
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- 222 (E) Section properties to BS5950 and EC4
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- 255 (E) Simply supported Glulam beam with general loading
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- 260 (E) Howe truss
- 262 (E) Pratt truss
- 266 (E) Fink truss
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- 268 (E) Fire design of timber beam
- 269 (E) Residential floor vibration check to EC5
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- 272 (E) Screwed joint
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- 367 (E) Shape limitations for tee stiffeners
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- 372 (E) Evaluation of stresses
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- 384 (E) Stainless steel circular hollow section design
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- 388 (E) Axially loaded stainless steel angle
- 390# (E) Concrete filled square and rectangular hollow section column
- 391# (E) Concrete filled circular hollow section column
- 392 Fire design of concrete filled structural hollow section column
- 396 (E) Moment connection between RHS column and column base
- 407 (E) Simple design, builder's arithmetic, general check, safe loads
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- 410# (E) I beam section design
- 411# (E) Portal frame rafter design
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- 422 (E) Extended bolted end plate connection beam to column
- 423 (E) Flush bolted end plate connection beam to column
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- 427 (E) Flush beam splice with end plates and single flange plate
- 428 (E) Cantilevered beam
- 429# (E) Cantilevered beam - alternative linking with NL-STRESS
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- 432 (E) Fully restrained SS I beam with UDL and point load/s
- 434 (E) SS I Beam with UDL - restrained at ends only
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- 437 (E) SHS beam restrained at ends and loads
- 438 (E) Purlin on sloping roof
- 439 (E) Side rail
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- 441# (E) Cased I section column
- 442# (E) H Section column with biaxial bending
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- 446 (E) Single angle - section design
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List of SCALE proformas.
Fitzroy Systems Ltd.
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STEEL DESIGN TO BS449 INCLUDING AMENDMENT 8,1989

300# (E) I beam
305# (E) I column
310# (E) RHS beam
315# (E) RHS column
320 (E) Angle cleat

LUCID: Reinforced concrete detailing system. LUCID (and SPADE) are not just electronic drawing boards, each is an 'expert detailer' which does the drawing for you, producing to-scale details. The details may be edited directly, or read and edited by your own CAD system.

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- 110 (E) Pile caps
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- 420 (E) One way spanning slabs
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- 460 (E) Holes and chairs for top reinforcement

COLUMNS

- 510 (E) Square, rectangular and circular columns

WALLS

- 610 (E) Walls

STAIRCASES

- 710 (E) In-situ staircases

BEAMS

- 810 (E) Simply supported and continuous beams
- 820 (E) Cantilever beams

GENERAL

- 910 (E) Bar schedule

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SPADE: Structural Parts And Details Ensemble

(Steel, masonry & timber component detailing)

TIMBER

- 202 (E) Beam to column connection
- 250 (E) Spliced joints - various
- 252 (E) Timber joist bearings on steel beams
- 265 (E) Fan truss - general arrangement

- 266 (E) Fink truss - general arrangement
- 267 (E) Howe truss - general arrangement
- 268 (E) Pratt truss - general arrangement
- 269 (E) Queen post truss - general arrangement

PORTAL CONNECTIONS

- 310 (E) Portal eaves haunched connection
- 320 (E) Portal apex haunched connection

END PLATE CONNECTIONS

- 410 (E) Flexible end plate connection - beam to beam
- 412 (E) Flexible end plate connection - beam to column
- 416 (E) Extended end plate connection - beam to column

ANGLE CLEAT & ANGLE SEAT CONNECTIONS

- 420 (E) Double angle cleat - beam to beam connection
- 422 (E) Double angle cleat - beam to column connection
- 430 (E) Angle seat - beam to column connection

FIN PLATE CONNECTIONS

- 440 (E) Fin plate - beam to beam
- 442 (E) Fin plate - beam to column

MOMENT CONNECTIONS

- 450 (E) Tongue plate connection - beam to column
- 452 (E) Direct welded connection - beam to column
- 454 (E) Tee connections - beam to column
- 458 (E) Beam stub connection

MISCELLANEOUS CONNECTIONS

- 460 (E) Beam over beam connection

SPLICES

- 490 (E) Beam splice
- 492 (E) Column splice

COLUMN BASES

- 510 (E) Column base plate
- 512 (E) Welded gusset column base plate

SHOP DETAILS

- 540 (E) Shop detail - non skew beam - drilled
- 550 (E) Shop detail - column - drilled

FIRE CASINGS

- 580 (E) Beam and column fire casing - timber framing - up to 1 hour
- 582 (E) Beam and column fire casing - steel angle framing - up to 2 hours

LOCATION DRAWINGS

- 590 (E) Location drawing - single bay portal frame
- 592 (E) Location drawing - multi-storey frame

MASONRY

- 605 (E) Raft foundation - wide toe
- 608 (E) Raft foundation - deep edge beam
- 610 (E) Raft foundation - plain edge detail
- 612 (E) Raft foundation - plain internal wall support
- 613 (E) Bored pile foundation to resist uplift
- 614 (E) Bored pile foundation
- 615 (E) Masonry walls
- 616 (E) Trench fill foundation
- 618 (E) Traditional strip footing with concrete floor
- 619 (E) Traditional strip footing with suspended timber floor
- 620 (E) Wide strip foundation
- 622 (E) Pad and stem foundation for loose fill
- 624 (E) Precast driven segmental pile foundation
- 630 (E) Granular layer beneath slab venting through trench
- 632 (E) Granular layer beneath slab venting through trench with riser
- 634 (E) Granular layer beneath slab venting through slotted pipe & riser

GENERAL

- 801 (E) Graph plotting

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NL-STRESS Structural Analysis - MENU OF OPTIONS

NL-STRESS PARAMETRIC MODELS

NL-STRESS parametric models are particularly useful for checking that the results from other structural analysis programs are in the right field.

m105.ndf Warren thru latt truss, const height, udl top+bot, sway loads.
m106.ndf Warren thru latt truss w verts, udl top+bot, sway loads.
m107.ndf Warren deck latt truss w end verts, udl top+bot, sway loads.
m108.ndf Warren deck latt truss w verts, udl top+bot, sway loads.
m109.ndf Roof of 2 rafters w single tie, udl on plan, lateral udl.

PLANE FRAMES

m201.ndf Cantilever beam, sectn prop by geom, udl & conc loads.
m202.ndf Propped cantilever, sectn prop by geom, udl & conc loads.
m203.ndf Cantilever with tie-down span, udl and end point load.
m204.ndf Tapered cantilever, sectn prop by geom, loads p(1:n) at a(1:n).
m205.ndf Continuous beam, sectn prop by geom, various udl on each span.
m206.ndf Continuous beam, sectn prop by geom, udl & concentrated loads.
m207.ndf Continuous beam, sectn prop by geom, udl, conc & linear loads.
m208.ndf Ground beam on elastic foundation, train of moving loads.
m209.ndf Ground beam on piles at various centres with train of loads.
m210.ndf Influence lines, reaction, shear & bm, cont beam of nsp spans.
m211.ndf Cranked beam, sectn prop by geom, combn of fixities & supports.
m212.ndf Single span SS beam, sectn prop by geom, patterns for udl.
m213.ndf 2 span continuous beam, sectn prop by geom, patterns for udl.
m214.ndf 3 span continuous beam, sectn prop by geom, patterns for udl.
m215.ndf 4 span continuous beam, sectn prop by geom, patterns for udl.
m216.ndf Cantilever column, sectn prop by geom, udl & conc loads.
m217.ndf Cant column propped, sectn prop by geom, udl & conc loads.
m218.ndf Cant column with tie-down span, udl & end point loads.
m219.ndf Cranked col, sectn prop by geom, pin/fixed ends, may be propped.
m220.ndf Column w.rect offset, sectn prop by geom, J2/5 may be propped.
m221.ndf Lean-to frame, rigid joint col to horiz beam, var supports.
m222.ndf Lean-to frame, rigid joint col to sloping rafter, var supports.
m223.ndf Lean-to frame, rigid joint sloping col to horiz beam, var supt.
m224.ndf Lean-to frame, rigid joint sloping col to sloping rafter.
m225.ndf Couple roof with rigid connection at apex and various supports.
m226.ndf Collar-tie roof (or A-frame), var member connectns, var suppts.
m227.ndf Couple close roof, var members, var connections, var supports.
m228.ndf Unsymm couple roof, rigid connection at apex, various supports.
m229.ndf Unsymm couple close roof with tie, var connectns, var supports.
m230.ndf Unsymm couple roof w. sup at diff levels, various connections.
m231.ndf Unsymm triangular frame, 1 leg vertical, with various supports.
m232.ndf Unsymm triangular frame, 1 leg vertical with tie, var supports.
m233.ndf Lean-to with col & beam & skew corner between, var supports.
m234.ndf Couple roof (gable frame) with left column, various supports.
m235.ndf Rect portal, optional pins at transom ends & at supports.
m236.ndf Rect rigid portal, pin ended tie grd level, optnl slidng rel.
m237.ndf Rect portal, optional pins at transom ends, unequal len cols.
m238.ndf Rect rigid portal, unequal len cols, pin ended sloping tie.
m239.ndf 2 storey bent, optn rel for middle beam, var sup at grd level.
m240.ndf Shed: sloping roof, various support conditions.
m241.ndf Shed: sloping roof, tied columns & various supports.
m242.ndf Shed: sloping roof, bases at diff levels, various supports.
m243.ndf Shed: columns & beam & skew corner, various supports.
m244.ndf Shed: columns & beam & skew corner, var support at diff levels.
m245.ndf Shed: vert columns, skew corner & horiz beam, tie at supports.

m246.ndf Shed: vert columns and asymm rafters with various supports.
m247.ndf Shed: vertical columns and asymm rafters, tie at supports.
m248.ndf Shed: vert cols & asymm rafters, tie at eaves, var supports.
m249.ndf Symm trapezoidal rigid frame, various support conditions.
m250.ndf Symm trapezoidal rigid frame, tie at supports.
m251.ndf Asymm trapezoidal rigid frame, var support levels & conditions.
m252.ndf Asymm trapezoidal rigid frame, tie & var support conditions.
m253.ndf Asymm trapezoidal rigid frame, sloping&vert cols, sup diff lvl.
m254.ndf Asymm trapezoidal rigid frame, sloping&vert cols, tie between.
m255.ndf Asymm trapezoidal rigid frame, vert&sloping cols, var supports.
m256.ndf Single bay ridged portal frame, various support conditions.
m257.ndf Single bay ridged portal frame, tie at grnd level, var supps.
m258.ndf Single bay ridged portal frame, tie betwn eaves, var supports.
m259.ndf Symmetrical Mansard frame, various support conditions.
m260.ndf Symmetrical Mansard frame, ground tie, var support conditions.
m261.ndf Symmetrical Mansard frame, eaves tie, var support conditions.
m262.ndf Symmetrical bent, skew corners, various support conditions.
m263.ndf Symmetrical bent, skew corners, tie at ground level.
m264.ndf Barrel-vault portal frame, vertical columns, various supports.
m265.ndf Barrel-vault portal frame, vert cols, ground tie, var supps.
m266.ndf Barrel-vault portal frame, vert cols, eaves tie, var supps.
m267.ndf Vierendeel frame, var suppts at grnd level, optnl sliding rel.
m268.ndf N/Pratt latt girder/portal, nb bays, opt taper, end diag tens.
m269.ndf Howe latt girder/portal, nb bays, opt tc taper, end diag tens.
m270.ndf Warren latt girder/portal, nb bays, opt taper, end diag tens.
m271.ndf Warren latt girder/portal, nb bays, opt taper, end diag comp.
m272.ndf Sing/multi-bay portal frame/s, no haunch, nb bays, vert & sway.
m273.ndf Sing/multi-bay portal frame/s, haunches, nb bays, vert & sway.
m274.ndf 3 seg rafters, Warren internals, udl/point loads; wind normal.
m275.ndf Attic room roof frame, proj udl, point loads, wind normal.
m276.ndf A-frame, plan udl rafters, collar&point lds on J3-5; wind norm.
m277.ndf Collar-and-tie roof frame, proj udl/point loads; wind normal.
m278.ndf Couple roof frame, proj (plan) udl, wind normal to rafters.
m279.ndf Couple roof frame with tie, proj (plan) udl, wind normal.
m280.ndf Fink roof frame, plan udls, point loads, wind normal.
m281.ndf King post frame, plan udls, point loads, wind normal.
m282.ndf Queen post frame, plan udls, point loads, wind normal.
m283.ndf Mansard roof frame, plan udls, point loads, wind normal.
m284.ndf Tied-Mansard roof frame, plan udl and point loads, wind normal.
m285.ndf Pitched Vierendeel roof frame, plan udl/point loads, wind norm.
m286.ndf Pipe tree with 2 horizontal branches, vertical & lateral loads.
m287.ndf Pipe tree with 4 horizontal branches, vertical & lateral loads.
m288.ndf Pipe tree with 6 horizontal branches, vertical & lateral loads.
m289.ndf 1 storey bent with vert/raking cols, optn pins at transom ends.
m290.ndf 2 storey bent with vert/raking cols, vertical & lateral loads.
m291.ndf 3 storey bent with vert/raking cols, vertical & lateral loads.
m292.ndf 2-pinned segmental circular arch, distr loading, var conc lds.
m293.ndf Encastre segmental circular arch, distr loading, var conc lds.
m294.ndf Subframes: beams w.cols below and optn beams above, nb spans.
m295.ndf Modelling inclined supports.
m296.ndf Modelling overlapping members.
m297.ndf Modelling structural scissors.
m298.ndf Infl lines for cont beams of const span, by 'print collection'.
m299.ndf Vierendeel girder, udls/loads on top & bottom chords/joints.
m300.ndf Outrigged frame carrying a point load on a beam, var supports.
m301.ndf Braced outrigged frame carying end point load, var supports.
m302.ndf Symmetrical centre span with cantilevers at both ends.
m303.ndf Built-in beam, sectn prop by geom, udl & concentrated loads.

PLANE GRIDS

m401.ndf Circular-arc bow girder, out of plane concentrated and udls.
m402.ndf Circular-arc cantilever, out of plane concentrated and udls.
m403.ndf Grillage: girders & stiffeners, point/udls; all edges blt-in.
m404.ndf Grillage: girders & stiffeners, point/udls; all edges SS.
m405.ndf Grillage: girders & stiffeners, point/udls; N&S blt-in, E&W SS.
m406.ndf Grillage: girders & stiffeners, point/udls; E&W blt-in, N&S SS.
m407.ndf Grillage: girders & stiffeners, point/udls; N&W blt-in, S&E SS.
m408.ndf Grillage: girders & stiffeners, point/udls;N&S blt-in,E&W free.
m409.ndf Grillage: girders & stiffeners, point/udls;E&W blt-in,N&S free.
m410.ndf Grillage: girders & stiffeners, point/udls;N&W blt-in,S&E free.
m411.ndf Grillage: girders, point/area/udls; all edges SS.
m412.ndf Grillage: girders, point/area/udls; all edges blt-in.
m413.ndf Grillage: girders, point/area/udls; E&W edges SS, N&S blt-in.
m414.ndf Grillage: girders, point/area/udls; N&S edges SS, E&W blt-in.
m415.ndf Grillage: girders, point/area/udls; W&S edges SS, prop at nj.
m416.ndf Grillage: girders, point/area/udls; W&S edges blt-in, prop@nj.
m417.ndf Grillage: girders, point/area/udls; N&S&W SS, East edge free.
m418.ndf Grillage: girders, point/area/udls; N&S&W blt-in, E edge free.
m419.ndf Grillage: girders, point/area/udls; W edge SS, props@E corners.
m420.ndf Grillage: girders, point/area/udls; W edge blt-in, props@Ecnrs.
m421.ndf Grillage: girders, point/area/udls; S edge SS, props @ N cnrs.
m422.ndf Grillage: girders, point/area/udls; S edge blt-in, props@Ncnrs.
m423.ndf Skew grillage of girders, point/area/udls; all edges SS.
m424.ndf Skew grillage of girders, point/area/udls; all edges built-in.
m425.ndf Skew grillage of girders, point/area/udls; N&S blt-in, E&W SS.
m426.ndf Skew grillage of girders, point/area/udls; E&W blt-in, N&S SS.
m427.ndf Skew grillage of girders, point/area/udls; E&W blt-in,N&S free.
m428.ndf Skew grillage of girders, point/area/udls; E&W SS, N&S free.
m429.ndf Skew grillage of girders, point/area/udls; N&S blt-in,E&W free.

SPACE FRAMES

m703.ndf Circular concrete tank, internal fluid pressure, on springs.
m704.ndf Multi-storey frame, nx/nz bays along X/Z axes, ny storeys up Y.
m707.ndf Lattice tower, tapered lower section, optional straight upper.

VERIFIED MODELS

NL-STRESS Verified Models cover a wide range of engineering structures; each Verified Model is self-checking. To run a verified model, the engineer need only click on one in the following list, then click Continue. To edit the parameters, click Edit instead of Continue, type replacement values for typically 10-20 parameters, click End & Continue to run.

PLANE FRAME & TRUSS VERIFIED MODELS

vm110.ndf Simply supported beam including shear deflection.
vm112.ndf Cantilevered beam.
vm113.ndf Cantilevered beam subjected to many point loads.
vm114.ndf Tapered cantilevered beam subjected to many point loads.
vm115.ndf Cantilever with tie-down beam.
vm117.ndf Subframe, continuous beam with columns below & above.
vm120.ndf Continuous beam with pattern loadings.
vm122.ndf Two member lean-to or Mansard beam.
vm123.ndf Three member lean-to or Mansard beam.
vm124.ndf Three member cranked beam.
vm130.ndf Ground beam on an elastic foundation.

vm131.ndf Ground beam on elastic piles.
vm140.ndf Influence lines for continuous beams.
vm150.ndf Pratt through truss.
vm153.ndf Pratt deck truss.
vm156.ndf Howe through truss.
vm159.ndf Howe deck truss.
vm162.ndf Warren through truss.
vm164.ndf Warren through truss with verticals.
vm165.ndf Warren deck truss.
vm168.ndf Warren deck with verticals.
vm171.ndf Two rafters with tie.
vm172.ndf Two rafters, post & tie.
vm173.ndf King post roof truss.
vm174.ndf Roof truss, three segment rafters, Pratt internals.
vm175.ndf Roof truss, three segment rafters, Howe internals.
vm177.ndf Trussed rafter, or Fink roof truss.
vm178.ndf Roof truss, three segment trussed rafter, Warren internals.
vm179.ndf Three segment rafters, Warren internals roof truss.
vm181.ndf Mansard truss.
vm202.ndf Pipe tree having two branches.
vm203.ndf Pipe tree having four branches.
vm204.ndf Pipe tree having six branches.
vm207.ndf One storey bent having vertical/raking piles.
vm208.ndf Two storey bent having vertical/raking piles.
vm209.ndf Three storey bent having vertical/raking piles.
vm210.ndf Bent, or rectangular portal frame.
vm211.ndf Rigid pile cap with several piles.
vm215.ndf Ridged portal frame with pinned or fixed feet.
vm216.ndf Nissen or Mansard portal.
vm217.ndf Gable frame with inclined legs.
vm218.ndf Portal frame with skew corners.
vm219.ndf Trapezoidal frame.
vm220.ndf Two bay ridged portal with pinned feet.
vm223.ndf Multi bay haunched ridged portal with pinned/fixed feet.
vm225.ndf Couple roof frame.
vm226.ndf Couple close roof frame.
vm227.ndf Collar-tie roof frame.
vm228.ndf Collar-and-tie roof frame.
vm230.ndf Attic room roof frame.
vm232.ndf Fink roof frame.
vm233.ndf King post roof frame.
vm234.ndf Queen post roof frame.
vm235.ndf Tied Mansard roof frame.
vm241.ndf Vierendeel girder.
vm242.ndf Vierendeel roof frame.
vm244.ndf N/Pratt lattice portal/girder.
vm245.ndf Howe lattice portal/girder.
vm246.ndf Warren lattice portal/girder, end diagonals in tension.
vm247.ndf Warren lattice portal/girder, end diagonals in compression.
vm260.ndf Multi-storey frame, moment distribution self-check.
vm262.ndf Multi-storey frame, equilibrium & compatibility self-check.
vm270.ndf Pierced shear walls.
vm280.ndf Two pinned circular arch.
vm281.ndf Encastre circular arch.
vm282.ndf Two pinned parabolic arch.
vm283.ndf Encastre parabolic arch.
vm290.ndf Outrigged frame.
vm291.ndf Braced outrigged frame.

PLANE GRID VERIFIED MODELS

vm300.ndf Cantilever or propped-cantilever on plan.
vm301.ndf Circular arc cantilever on plan.
vm302.ndf Circular arc bow girder on plan.
vm310.ndf Grillage of beams, classical check.
vm311.ndf Grillage of beams, modern check.

PLASTIC ANALYSIS

vm410.ndf Plastic analysis of cantilever.
vm411.ndf Plastic analysis of propped cantilever.
vm420.ndf Plastic analysis of continuous beam.
vm430.ndf Plastic analysis of rectangular portal.
vm435.ndf Plastic analysis of ridged portal.
vm436.ndf Plastic analysis of multi-bay ridged portal.
vm440.ndf Plastic analysis of multi-storey frame.

VERIFIED MODELS FOR DYNAMICS

vm710.ndf Natural frequency of beam.

VERIFIED MODELS FOR STABILITY

vm802.ndf Cantilever beam with large displacements.
vm810.ndf Stability of columns with various supports.
vm830.ndf Stability of circular ring/pipe.
vm850.ndf Stability of cantilever with udl & end load.
vm852.ndf Multi-storey frame using non-linear elastic analysis.
vm950.ndf Hanging cable with flexible platform.
vm951.ndf Suspension bridge with three pinned stiffening girder.
vm952.ndf Suspension bridge with two pinned stiffening girder.

KLEINLOGEL'S RIGID FRAME FORMULAS

Click on a chosen frame (starting nk) click Edit and amend the numerical data as required, press the End key to leave the Editor, click Continue, press Enter twice, compare the results at the end. Note that Prof. Kleinlogel changes the direction of reactions to oppose the loading applied, and ignores axial shortening.

LEAN-TO FRAMES WITH RIGID JOINT AT EAVES

nk001.ndf Pinned at ground & wall.
nk002.ndf Pinned at ground, fixed at wall.
nk003.ndf Pinned at wall, fixed at ground.
nk004.ndf Built-in at wall and ground.
nk005.ndf Built-in at ground, sliding support at top of wall.
nk006.ndf Built-in at wall, sliding support at ground.
nk007.ndf Pinned at ground and wall.
nk008.ndf Built-in at ground and wall.
nk009.ndf Pinned at ground and wall, inclined column.
nk010.ndf Built-in at ground and wall, inclined column.
nk011.ndf Pinned at ground and wall, inclined column & rafter.
nk012.ndf Built-in at ground, pinned at wall, inclined col & rafter.
nk013.ndf Built-in at wall, pinned at ground, inclined col & rafter.
nk014.ndf Built-in at wall and ground, inclined column & rafter.

SYMMETRICAL TWO-HINGED TRIANGULAR FRAME

nk015.ndf Rigid connection at apex, pinned at ground.
nk016.ndf Rigid connection at apex, tie-rod at ground.

nk017.ndf Rigid connection at apex, hinged tie and pinned supports.
nk018.ndf Pinned connection at apex, hinged tie and pinned supports.
nk019.ndf Rigid connection at apex, and fixed supports.
nk020.ndf Rigid connection at apex, hinged tie and fixed supports.
nk021.ndf Pinned connection at apex, hinged tie and fixed supports.

UNSYMMETRICAL TRIANGULAR FRAME, RIGID CONNECTION AT APEX

nk022.ndf Pinned supports at same level.
nk023.ndf Tie-rod at ground level.
nk024.ndf Left support fixed, right support pinned.
nk025.ndf Both supports fixed.
nk026.ndf Pinned supports at different levels.
nk027.ndf Left support fixed, right pinned at different levels.
nk028.ndf Both supports fixed, supports at different levels.

UNSYMMETRICAL TRIANGULAR FRAME, RIGID CONNECTION AT APEX

nk029.ndf Right column vertical, both supports fixed.
nk030.ndf Right column vertical, tie-rod at ground level.
nk031.ndf Right column vertical, both supports fixed.
nk032.ndf Right column vertical, left support fixed, right pinned.
nk033.ndf Right column vertical, left support pinned, right fixed.

THREE MEMBER LEAN-TO RIGID FRAME, INSIDE JOINTS FIXED,
LEFT COLUMN VERTICAL, RIGHT RAFTER HORIZONTAL

nk034.ndf Left and right supports pinned.
nk035.ndf Left support fixed, right support pinned.
nk036.ndf Left and right supports fixed.

THREE MEMBER GABLE FRAME

nk037.ndf Both supports fixed.

SYMMETRICAL RECTANGULAR FRAME

nk038.ndf Left and right supports fixed, eaves joints pinned.
nk039.ndf Left and right supports pinned, eaves joints fixed.
nk040.ndf Eaves joints fixed, tie-rod at ground level.
nk041.ndf Left and right supports fixed, eaves joints fixed.
nk042.ndf Left and right supports pinned, eaves joints fixed.
nk043.ndf Eaves joints fixed, tie-rod at ground level.
nk044.ndf Left and right supports fixed, eaves joints fixed.

RECTANGULAR FRAME WITH SUPPORTS AT DIFFERENT LEVELS

nk045.ndf Left and right supports fixed, eaves joints pinned.
nk046.ndf Left and right supports pinned, eaves joints fixed.
nk047.ndf Tie-rod at ground level, eaves joints fixed.
nk048.ndf Left and right supports fixed, eaves joints fixed.
nk049.ndf Left supports fixed, right pinned, eaves joints fixed.
nk050.ndf L. & R. supports pinned, eaves fixed, tie in middle.
nk051.ndf L. & R. supports pinned, eaves fixed, tie in middle.

RIGID FRAME SHED WITH FIXED EAVE AND RIDGE

nk052.ndf Left and right supports pinned.
nk053.ndf Tie-rod at ground level.
nk054.ndf Left and right supports pinned at different levels.
nk055.ndf Left support fixed, right pinned, at different levels.
nk056.ndf Left support fixed, right pinned at same level.
nk057.ndf Left support pinned, right supp fixed at different levels.
nk058.ndf Left support pinned, right support fixed at same levels.
nk059.ndf Left and right supports fixed at different levels.

- nk060.ndf Left and right supports fixed at same level.
- BENT WITH ONE SKEW CORNER, INSIDE JOINTS FIXED
- nk061.ndf Left and right supports pinned at different levels.
nk062.ndf Left and right supports pinned at different levels.
nk063.ndf Left support fixed, right support pinned at same level.
nk064.ndf Left support fixed, right pinned at different levels.
nk065.ndf Left support pinned, right fixed at different levels.
nk066.ndf Left and right supports fixed at different levels.
nk067.ndf Left and right supports fixed at same level.
- RIGID FRAME SHED, FIXED JOINTS AT EAVES & APEX
- nk068.ndf Left and right supports pinned at same level.
nk069.ndf Left and right supports pinned with tie-rod.
nk070.ndf Left and right supports pinned with tie-rod between eaves.
nk071.ndf Left and right supports fixed at same level.
nk072.ndf Left and right supports fixed with tie-rod between eaves.
- SYMMETRICAL TRAPEZOIDAL FRAME, JOINTS AT EAVES FIXED
- nk073.ndf Left and right supports pinned at same level.
nk074.ndf Left and right supports pinned with tie-rod at same level.
nk075.ndf Left and right supports fixed at same level.
- UNSYMMETRICAL TRAPEZOIDAL FRAME, JOINTS AT EAVES FIXED
- nk076.ndf Left and right supports pinned at different levels.
nk077.ndf Left and right supports pinned with tie-rod at same level.
nk078.ndf Left and right supports pinned at same level.
nk079.ndf Left support pinned, rightfixed at different levels.
nk080.ndf Left and right supports fixed at different levels.
nk081.ndf Left and right supports fixed at same level.
- TRAPEZOIDAL SHED FRAME WITH ONE VERTICAL COLUMN
- nk082.ndf Left and right supports pinned at different levels.
nk083.ndf Left and right supports pinned with tie-rod at same level.
nk084.ndf Left and right supports pinned at same level.
nk085.ndf Left supports pinned, right support fixed at diff. levels.
nk086.ndf Left supports pinned, right support fixed at diff. levels.
nk087.ndf Left and right support fixed at different levels.
nk088.ndf Left and right supports fixed at same level.
nk089.ndf Left supports pinned, right support fixed at diff. levels.
- SYMMETRICAL GABLE FRAME, VERTICAL LEGS, FIXED EAVES & APEX
- nk090.ndf Left and right supports pinned, with tie-rod.
nk091.ndf Left and right supports pinned, with tie-rod between eaves.
nk092.ndf Left and right supports fixed.
nk093.ndf Left and right supports fixed, with tie-rod.
- GABLE FRAME WITH INCLINED LEGS, FIXED JOINTS AT EAVES & APEX
- nk094.ndf Left and right supports pinned.
nk095.ndf Left and right supports pinned, with tie-rod.
nk096.ndf Left and right supports pinned, with tie-rod between eaves.
nk097.ndf Left and right supports fixed.
nk098.ndf Left and right supports fixed, with tie-rod between eaves.
- SYMMETRICAL BENT WITH SKEW CORNERS, FIXED AT RIDGE & EAVES
- nk099.ndf Left and right supports pinned.
nk100.ndf Left and right supports pinned, tie-rod at ground level.
nk101.ndf Left and right supports fixed.

SYMMETRICAL BENT WITH PARABOLIC GIRDER, FIXED AT EAVES

nk102.ndf Left and right supports pinned.
nk103.ndf Left and right supports pinned, tie-rod at ground level.
nk104.ndf Left and right supports pinned, tie rod at eaves level.
nk105.ndf Left and right supports fixed.

SYMMETRICAL VIERENDEEL FRAME, EXTERNALLY SIMPLY SUPPORTED

nk106.ndf Left and right supports pinned, top & bottom different.
nk107.ndf Left and right supports pinned, square, same all members.
nk108.ndf Left and right supports pinned, all members different.

SYMMETRICAL VIERENDEEL FRAME, ON ELASTIC FOUNDATION

nk109.ndf Properties of verticals the same, horizontals different.
nk110.ndf All section properties are the same.

CLOSED TRIANGULAR RIGID FRAME

nk111.ndf Left and right supports pinned, unsymmetrical shape.
nk112.ndf Left and right supports pinned, symmetrical shape.
nk113.ndf Left and right supports pinned, equilateral shape.

SQUARE OR RECTANGULAR FRAME, SUBJECTED TO INTERNAL PRESSURE

nk114.ndf Different section properties for verticals & horizontals.
nk115.ndf As for frame 114 with central vertical tie-rod.
nk116.ndf As for frame 114 with two vertical tie-rods.
nk117.ndf As for frame 114 with central vertical & horizontal tie-rods.

PARAMETRIC DATA FILES

A file of data for the analysis of a structural framework in which the data has been written parametrically i.e. the geometric, loading & material properties are given as parameters, is referred to as a Parametric Data File. To run a parametric data file, the engineer need only click on one in the following list, then click Continue. To edit the parameters, click Edit instead of Continue, type replacement values for typically 10-20 parameters, click End & Continue.

PLANE FRAME PARAMETRIC DATA FILES

pf01.ndf Cantilever beam, parametric data, NL-STRESS editor.
pf02.ndf As pf01 with inclined supps & use of syntax diagrams.
pf03.ndf As pf01 including diagrams & calculations.
pf04.ndf Multi-storey frames.
pf05.ndf Natural frequency calculation.
pf06.ndf Influence lines by Muller-Breslau method.
pf07.ndf Influence lines by PRINT COLLECTION command.
pf08.ndf Curved beams introducing functions.
pf09.ndf Coupled shear walls - up to 100 storeys.
pf10.ndf Continuous beams.
pf11.ndf Subframes - beams with columns below and above.
pf12.ndf Including post processing in an NL-STRESS data file.
pf13.ndf Overview of the stiffness method.
pf14.ndf Data preparation of large structures by substructures.
pf15.ndf Thermal strains.
pf16.ndf Member eccentricities and end joint sizes.
pf17.ndf Overlapping members and scissors.
pf18.ndf Prestressed continuous beams - load balancing method.
pf19.ndf Ground beam on elastic piles subjected to load train.

pf20.ndf Box culvert.
pf21.ndf Loads on piles in groups.
pf22.ndf Circular/parabolic arches.
pf23.ndf Pipe-tree racks.
pf24.ndf Bents and pipe racks.
pf25.ndf Two member lean-to or Mansard beam.
pf26.ndf Three member lean-to or Mansard beam.
pf27.ndf Dogleg or cranked beam.
pf28.ndf Vierendeel girder.
pf29.ndf Ground beam on elastic piles.

PLANE GRID PARAMETRIC DATA FILES

gr01.ndf Bow girder introducing PLANE GRIDS.
gr02.ndf Ground slab with loads from racks.
gr03.ndf Pseudo slab bridges.
gr04.ndf Timber floor panel.

SPACE FRAME PARAMETRIC DATA FILES

sf01.ndf 3D multi-storey frames.
sf02.ndf Circular tanks.
sf03.ndf Space structures - square on square example.
sf04.ndf Shear (flexural) centre.
sf05.ndf Conical roof.
sf06.ndf Orange segment roof truss.
sf07.ndf Spiral stair - reinforced concrete.
sf08.ndf Temporary works - column outriggers.
sf09.ndf Dynamical behaviour of 3D multi-storey frame.

ROOF FRAME/TRUSS PARAMETRIC DATA FILES

rf01.ndf N/Pratt lattice girder/portal - end diagonals in tension.
rf02.ndf Howe lattice girder/portal - end diagonals in compression.
rf03.ndf Warren lattice girder/portal - end diagonals in tension.
rf04.ndf Warren lattice girder/portal - end diags in compression.
rf05.ndf Portal frame/s without haunches.
rf06.ndf Portal frame/s with haunches.
rf07.ndf Gangnail roof truss.
rf08.ndf Attic room roof truss.
rf09.ndf Collar-tie roof truss.
rf10.ndf Collar-and-tie roof truss.
rf11.ndf Couple roof truss.
rf12.ndf Couple-close roof truss.
rf13.ndf Fink roof truss.
rf14.ndf King post roof truss.
rf15.ndf Queen post roof truss.
rf16.ndf Mansard roof truss.
rf17.ndf Tied-Mansard roof truss.
rf18.ndf Plane/pitched Vierendeel roof truss.

SWAY & WITHIN MEMBER STABILITY

sw01.ndf Longitudinal deflection of cantilever with lateral load.
sw02.ndf Elastic critical load (E.c.l.) - end loaded columns.
sw03.ndf E.c.l. - end & distributed loaded columns.
sw04.ndf E.c.l. - piles with lateral restraint pressure.
sw05.ndf E.c.l. - circular ring with lateral pressure.
sw06.ndf E.c.l. - circular arch.
sw21.ndf Column subjected to axial load and lateral restraint.

BENCHMARKS

Benchmarks are a collection of examples taken from engineering textbooks & periodicals. Embedded in the data file for each example, is part of the results, so that after the benchmark is run the printed results may be checked. To run a benchmark, the engineer need only click on one in the following list, then click Continue.

TIMING BENCHMARKS

bm01.bmk Plane frame with 27 joints, 38 members & 2 load cases.
bm02.bmk Space frame with 66 joints, 99 members & 1 load case.

DEPARTMENT OF TRANSPORT - HECB BENCHMARKS

dt01.bmk Plane truss with varying relative stiffness.
dt02.bmk Plane frame with displaced supports.
dt03.bmk Plane frame problem 2.
dt04.bmk Encastre segmental arch rib.
dt05.bmk Grillage with applied displacements & elastic supports.
dt06.bmk Grillage with shear deformation.
dt07.bmk Skew deck of orthogonal grillage.
dt08.bmk Circular-arc bow girder.
dt09.bmk Space truss.
dt10.bmk Space frame with varying stiffnesses & displaced supports.

DYNAMICAL BEHAVIOUR BENCHMARKS

dy01.bmk Ex. from Fig 3.2, Warburton 1964.
dy02.bmk Ex. from Table 12.2, Steel Designers' Manual 1992.
dy03.bmk Ex. from Table 12.2, Steel Designers' Manual 1992.
dy04.bmk Nat. freq. for point loads, Dunkerley method Ryder, 1957.
dy05.bmk Nat. freq. example 10.3-2 Coates et al. 1988.
dy06.bmk Nat. freq. example in Fig 4.8, Warburton 1964.
dy07.bmk Nat. freq. example problem 1 in Chapter 1, Warburton 1964.
dy08.bmk Nat. freq. example problem 7 in Chapter 15, Ryder 1957.
dy09.bmk Nat. freq. grid cl.12.15, Steel Designers' Manual 1992.

PLANE GRID BENCHMARKS

gr01.bmk Bridge deck example, C&CA 1972.
gr02.bmk Foundation raft, Sawko 1972.
gr03.bmk Authentic bridge deck provided by Dr R. C. Slater.
gr04.bmk Curved balcony member from Design Ex. 6, SCI 2001.
gr05.bmk Member stresses for sections defined by props or geometry.

PLANE FRAME BENCHMARKS

pf01.bmk Shear wall, MacLeod April, 1966.
pf02.bmk Box culvert.
pf03.bmk Influence lines by Muller-Breslau, Coates et al. 1988.
pf04.bmk Natural frequency determination, McMinn 1962.
pf05.bmk Prestressed continuous beam, Lin 1963.
pf06.bmk Shear deformation - Ex. 6.7-1 by Coates et al.
pf07.bmk Member loads - Example 6.7-2 by Coates et al.
pf08.bmk Symmetry - Example 6.10-1 by Coates et al.
pf09.bmk Looping example, Problem 6.1 by Coates et al.
pf10.bmk Looping across tables - Pr. 6.2 Coates et al.
pf11.bmk Springs at supports - Pr. 7.18 by Coates et al.
pf12.bmk Applied moments - Problem 8.5 by Coates et al.
pf13.bmk DIAGRAMS example - Pr. 6.14 by Coates et al.
pf14.bmk Propping force - Problem 6.16 by Coates et al.
pf15.bmk Member distortions - Pr. 4.15 by Coates et al.
pf16.bmk Temperature, self weights, length coefficients example.

pf17.bmk Curved member, Design example 6, BCC 842, SCI 2001.
pf18.bmk Temperature gradient, example from Emkin et al. 1977.
pf19.bmk Stresses for sections defined by properties or geometry.
pf20.bmk Member properties given by: AS other member properties.

PLASTIC ANALYSIS BENCHMARKS

pl01.bmk Single bay portal frame, Morris & Randall, 1977.
pl02.bmk Two storey frame, Horne & Merchant, Fig 5.14, 1965.
pl03.bmk Plastic grillage, Example 1.0, Morris & Randall, 1977
pl04.bmk Elastic-plastic analysis of compression members.
pl05.bmk Reversing plastic hinge example.
pl06.bmk Built-in beam, Example 1.1, Morris & Randall.
pl07.bmk Propped cantilever, Example 1.2, Morris & Randall.
pl08.bmk Two span beam, Example 2.1, Morris & Randall.
pl09.bmk Three span beam, Example 2.3, Morris & Randall.
pl10.bmk Single ridged portal, Example 4.4, Morris & Randall.
pl11.bmk Two bay ridged portal, Ex. 4.7, Morris & Randall.
pl12.bmk Multi-storey frame, Example 6.2, Morris & Randall.
pl13.bmk Test order of formation of plastic hinges.
pl14.bmk Portal frame with out of plane loading.
pl15.bmk Space frame - ring beam supported on RHS columns.
pl16.bmk Example 14.6-1 from Coates et al. 1988.
pl17.bmk Rect. portal, Example 14.6-4 from Coates et al. 1988.
pl18.bmk Non-symmetric portal, Ex. 14.6-5 from Coates et al.
pl19.bmk Non-symm. 2 bay portal, Ex. 14.7-1 from Coates et al.
pl20.bmk Two storey portal, Example 14.7-2 from Coates et al.
pl21.bmk Collapse load factor, Ex. 14.8-1 from Coates et al.

PLANE TRUSS BENCHMARKS

pt01.bmk Ex. 20, Gennaro, Computer Methods in Solid Mechanics 1965.
pt02.bmk Example 22, Gennaro.
pt03.bmk Chapter 4 Problem 1, Gennaro.
pt04.bmk Chapter 4 Problem 4, Gennaro.
pt05.bmk Chapter 4 Problem 13, Gennaro.
pt06.bmk Example 31, Gennaro.
pt07.bmk Example 32, Gennaro.
pt08.bmk Example 33, Gennaro.
pt09.bmk Example 34, Gennaro.
pt10.bmk Example 4.10, Grassie.

SPACE FRAME BENCHMARKS

sf01.bmk Cantilever stair.
sf02.bmk Guide dolphin.
sf03.bmk Example in Figure 3-8, Weaver 1967.
sf04.bmk Example in Figure 3-9, Weaver 1967.
sf05.bmk Example from UCC symposium Nov 1972.
sf06.bmk Tapered beams example - equivalent to rect. section.
sf07.bmk Cantilever with various loadings, Steel Designers' Man 1966.
sf08.bmk S.S. beam with various loadings, Steel Designers' Man. 1966.
sf09.bmk Built-in beam with various loadings, Steel Des. Man. 1966.
sf10.bmk Ring beam on T columns to show need for BETA angle.
sf11.bmk Curved balcony member for SCI design example 6.
sf13.bmk Member distortions for cantilever or built-in beam.
sf14.bmk Temperature gradient, Emkin et al. 1977.
sf15.bmk Stresses for sections defined by properties or geometry.
sf16.bmk Rectangular/ridged haunched portal frame.
sf17.bmk Isection tapered in two directions with Eurocode 3 axes.

SWAY FRAME BENCHMARKS

sw01.bmk	Column with axial load, Figure 4.1, Horne & Morris 1981.
sw02.bmk	Column with axial load and lateral load.
sw03.bmk	Guyed mast analysis.
sw04.bmk	Two storey frame, Figure 5.14, Horne & Merchant 1965.
sw05.bmk	Lateral displacement of tip of end loaded cantilever.
sw06.bmk	Suspension bridge, Chap. 13, Ex. 5, Pippard & Baker 1957.
sw07.bmk	Comparison between member end springs & pseudo springs.
sw08.bmk	Modelling imperfections by parabolic bow.
sw09.bmk	Example 9.11-1, Coates et al. 1988.
sw10.bmk	Problem 9.1, Coates et al.
sw11.bmk	Problem 9.2, Coates et al.
sw12.bmk	Problem 9.8, Coates et al.
sw13.bmk	Problem 9.9, Coates et al.
sw14.bmk	Problem 9.10, Coates et al.
sw15.bmk	Problem 9.11, Coates et al.
sw16.bmk	Problem 9.12, Coates et al.
sw17.bmk	Net, symmetrical loading, Elibiari et al., Nooshin 1984.
sw18.bmk	Net, unsymmetrical loading, Elibiari et al., Nooshin 1984.
sw19.bmk	Hyperbolic paraboloid net, Elibiari et al., Nooshin 1984.
sw20.bmk	Stable/unstable post-buckling behaviour, Coates et al. 1988.
sw21.bmk	Snap through - Problem 9.8-1, Coates et al. 1988.

PROFORMA DATA FILES

To run a proforma data file, the engineer need only click on one in the following list, then click Edit and type numbers to replace all question marks. When editing: pressing Insert toggles between Insert/Overstrike; Ctrl+Y deletes the line containing the cursor; Ctrl+N inserts another line at the cursor position; Ctrl+U deletes to the right of the cursor.

CONTINUOUS BEAM PROFORMAS

cb01.ndf	1 span beam with UDLs.
cb02.ndf	2 span beam with UDLs.
cb03.ndf	3 span beam with UDLs.
cb04.ndf	4 span beam with UDLs.
cb05.ndf	5 span beam with UDLs.
cb06.ndf	6 span beam with UDLs.
cb07.ndf	7 span beam with UDLs.
cb08.ndf	8 span beam with UDLs.
cb09.ndf	9 span beam with UDLs.
cb10.ndf	10 span beam with UDLs.
cb11.ndf	11 span beam with UDLs.
cb12.ndf	12 span beam with UDLs.
cb13.ndf	13 span beam with UDLs.
cb14.ndf	14 span beam with UDLs.
cbp02.ndf	2 span beam with udl & point loads.
cbp03.ndf	3 span beam with udl & point loads.
cbp04.ndf	4 span beam with udl & point loads.
cbp05.ndf	5 span beam with udl & point loads.
cbp06.ndf	6 span beam with udl & point loads.
cbp07.ndf	7 span beam with udl & point loads.
cbp08.ndf	8 span beam with udl & point loads.
cbp09.ndf	9 span beam with udl & point loads.
cbp10.ndf	10 span beam with udl & point loads.
cbp11.ndf	11 span beam with udl & point loads.
cbp12.ndf	12 span beam with udl & point loads.

cbp13.ndf 13 span beam with udls & point loads.
cbp14.ndf 14 span beam with udls & point loads.

MULTI-STOREY PROFORMAS

ms1x1.ndf 1 bay x 1 storey.
ms1x2.ndf 1 bay x 2 storey.
ms1x3.ndf 1 bay x 3 storey.
ms1x4.ndf 1 bay x 4 storey.
ms1x5.ndf 1 bay x 5 storey.
ms2x1.ndf 2 bay x 1 storey.
ms2x2.ndf 2 bay x 2 storey.
ms2x3.ndf 2 bay x 3 storey.
ms2x4.ndf 2 bay x 4 storey.
ms2x5.ndf 2 bay x 5 storey.
ms2x6.ndf 2 bay x 6 storey.
ms2x7.ndf 2 bay x 7 storey.
ms2x8.ndf 2 bay x 8 storey.
ms2x9.ndf 2 bay x 9 storey.
ms3x1.ndf 3 bay x 1 storey.
ms3x2.ndf 3 bay x 2 storey.
ms3x3.ndf 3 bay x 3 storey.
ms3x4.ndf 3 bay x 4 storey.
ms3x5.ndf 3 bay x 5 storey.
ms4x1.ndf 4 bay x 1 storey.
ms4x2.ndf 4 bay x 2 storey.
ms4x3.ndf 4 bay x 3 storey.
ms4x4.ndf 4 bay x 4 storey.
ms4x5.ndf 4 bay x 5 storey.
ms5x1.ndf 5 bay x 1 storey.
ms5x2.ndf 5 bay x 2 storey.
ms5x3.ndf 5 bay x 3 storey.
ms5x4.ndf 5 bay x 4 storey.
ms5x5.ndf 5 bay x 5 storey.

N GIRDER PROFORMAS

ng02.ndf 2 bay N girder.
ng03.ndf 3 bay N girder.
ng04.ndf 4 bay N girder.
ng05.ndf 5 bay N girder.
ng06.ndf 6 bay N girder.
ng07.ndf 7 bay N girder.
ng08.ndf 8 bay N girder.

PORTAL FRAME PROFORMAS

prt1.ndf 1 bay portal frame.
prt1h.ndf 1 bay portal frame with haunches at eaves.
prt1hh.ndf 1 bay portal frame with haunches at eaves and ridge.
prt2.ndf 2 bay portal frame.
prt2h.ndf 2 bay portal frame with haunches at eaves.
prt2h1.ndf 2 bay portal frame with haunches at eaves & single ridge.
prt3.ndf 3 bay portal frame.
prt3h.ndf 3 bay portal frame with haunches at eaves.
prt3h1.ndf 3 bay portal frame with haunches at eaves & single ridge.
prt4.ndf 4 bay portal frame.
prt4h.ndf 4 bay portal frame with haunches at eaves.
prt4h1.ndf 4 bay portal frame with haunches at eaves & single ridge.
prt5h.ndf 5 bay portal frame with haunches at eaves.

nls.ndf NL-STRESS data file for any structure.

ROOF TRUSS PROFORMAS

rtatt.ndf Attic room roof truss.
rtfink.ndf Fink roof truss.
rtcl.ndf Collar-tie roof truss.
rtct.ndf Collar & tie roof truss.
rtcts.ndf Roof truss collar-and-tie sloping.
rtcp.ndf Roof truss couple.
rtcpc.ndf Roof truss couple close.
rtking.ndf King post roof truss.
rtqn.ndf Queen post roof truss.
rtmans.ndf Roof truss Mansard - steel.
rtmant.ndf Roof truss Mansard - timber.

SUBFRAME PROFORMAS

sub01.ndf 1 bay subframe.
sub02.ndf 2 bay subframe.
sub03.ndf 3 bay subframe.
sub04.ndf 4 bay subframe.
sub05.ndf 5 bay subframe.
sub06.ndf 6 bay subframe.
sub07.ndf 7 bay subframe.
sub08.ndf 8 bay subframe.
subh01.ndf 1 bay half subframe.
subh02.ndf 2 bay half subframe.
subh03.ndf 3 bay half subframe.
subh04.ndf 4 bay half subframe.
subh05.ndf 5 bay half subframe.
subh06.ndf 6 bay half subframe.
subh07.ndf 7 bay half subframe.
subh08.ndf 8 bay half subframe.

WARREN GIRDER PROFORMAS

wg02.ndf 2 bay Warren girder.
wg03.ndf 3 bay Warren girder.
wg04.ndf 4 bay Warren girder.
wg05.ndf 5 bay Warren girder.
wg06.ndf 6 bay Warren girder.
wg07.ndf 7 bay Warren girder.
wg08.ndf 8 bay Warren girder.

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Kleinlogel, Parametric Data Files, Benchmarks and Proforma
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