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Reconfirmed 2013

Australian Standard®

**Mine plans—Preparation and
symbols**

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The following interests are represented on Committee MN/1:

Australasian Institute of Mining and Metallurgy
Australian Chamber of Commerce and Industry
Australian Coal Association
Australian Coal Industry Research Laboratories
Australian Coal Preparation Society
Australian Institute of Energy
Australian Mining Industry Council
Bureau of Steel Manufacturers of Australia
CSIRO, Division of Coal and Energy Technology
Department of Minerals and Energy, Queensland
Electricity Supply Association of Australia
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Queensland Coal Board
Royal Australian Chemical Institute
Standing Committee on Coalfield Geology of New South Wales
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STANDARDS AUSTRALIA

RECONFIRMATION
OF
AS 4368—1996
Mine plans—Preparation and symbols

RECONFIRMATION NOTICE

Technical Committee MN-001 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

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Australian Coal Industry Reference Samples
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Coalfield Geology Council of NSW
CSIRO Energy Technology
National Association of Testing Authorities Australia
National Generators Forum
The University of New South Wales
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NOTES

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PREFACE

This Standard was prepared by the Standards Australia Subcommittee on Coal Mining and Geology under the direction of the Committee on Coal and Coke.

Input was received from the following organizations:

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BHP Australia Coal

Department of Minerals and Energy, N.S.W.

Department of Manufacturing and Industry Development, Vic.

Department of Minerals and Energy, W.A.

Department of Mines and Energy, S.A.

FAI Mining, N.S.W.

WMC Olympic Dam Operations

Western Collieries, W.A.

Griffin Coal, W.A.

KCC West Cliff Colliery, N.S.W.

Institution of Engineering and Mining Surveyors, Australia

The objective of this Standard is to provide those responsible for drafting symbols for mine plans with a common set of rules and principles.

The term ‘normative’ has been used in this Standard to define the application of the Appendices to which it applies. A ‘normative’ appendix is an integral part of a Standard.

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FOREWORD

In modern mining, there is a general interchange of professional staff and workpeople among surface and underground mines extracting coal, industrial minerals and metalliferous deposits. It is therefore important to prepare mine plans with standard symbols and with standard scales, so that plans are easier to read and the chances of reading errors are minimized. This is especially important with plans used in emergencies.

Mine plans have to be updated regularly (usually quarterly). Many plans are already digitized for drafting and printing by computerized methods and it is foreseen that the standard symbols will be introduced as software is improved. Much of the mining software is already common, although not all symbols are in use universally. For part of the process, the Australian Surveying and Land Information Group, and the Australian Geological Survey Organization (formerly the Bureau of Mineral Resources, Geology and Geophysics), already have their symbols available on software.

Legislation in many States prescribes a basic core of symbols, and individual mines have added their own symbols to plans. A general review of existing symbols has been made and those most commonly in use have been chosen. It is recognized that some mines may have a need for extra symbols but those should follow a common pattern and should also be easy to understand. Mine plans are needed for posterity as well as for the current user, and in most cases have to conform to legislation designed to protect the public as well as employees and management in the mining industry.

The symbols shown in this Standard have been chosen for easy drafting by computer. Letter codes are preferred for descriptive symbols for that reason and because they can be readily understood. Colour is avoided where possible so that portions of plans can be easily reproduced in black and white.

STANDARDS AUSTRALIA

Australian Standard**Mine plans—Preparation and symbols**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE Without prejudice to any requirements of statutory regulations, this Standard sets out recommendations for the preparation of mine plans and the symbols to be used on all underground and surface mine plans. It does not deal with drafting practices, for which reference should be made to AS 1100.101 and AS 1100.401.

1.2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

1100 Technical drawing

1100.101 Part 101: General principles

1100.401 Part 401: Engineering survey and engineering survey design drawing

1345c Wallchart—Pipeline identification

2418 Coal and coke—Glossary of terms

2916 Symbols for graphical representation of coal seams and associated strata

Symbols Used on Geological Maps, Australian Geological Survey Organization (AGSO), Canberra.

Specifications for Topographic Maps (NATMAP), Australian Surveying and Land Information Group (AUSLIG), Canberra.

1.3 DEFINITIONS Plans are prepared by a mining company for different purposes, and their end use may dictate the choice of symbol to be used. For the purposes of this Standard, the definitions given in AS 2418 and those below will apply, and the word ‘plan’ should be taken in a generic sense to include cross-sections and isometric drawings where appropriate.

1.3.1 Electrical plans—plans that show the main electrical cables and fixed electrical equipment, and may need to comply with statutory requirements. They are associated with working plans.

1.3.2 Firefighting and rescue plans—plans that provide the information required to meet emergency situations. Such plans may be statutorily prescribed, and State Acts or Regulations give details of the minimum information to be provided, which usually includes firefighting equipment, the principal ventilation devices and the direction of airflow.

1.3.3 Geological plan—a plan that is primarily concerned with the geology of the district in which the mine is situated. The mine workings may be shown only in outline on the plan, along with the location of shafts, adits and boreholes.

1.3.4 Other plans—plans that may include such items as water and drainage plans, progress plans layout plans and accident plans. In general, they are associated with the working plans and follow the same conventions.

1.3.5 Surface plans—plans that include a plan of the surface area of the mine lease showing such information as improvements, infrastructure, dirt disposal areas and dams, and are of a topographical nature. Some aspects of these plans may be covered by statutory requirements, but these plans should not be confused with the working plans of surface mining excavations, which are provided as in Clause 1.3.7.

1.3.6 Ventilation plan—a statutory requirement that shows the devices used to produce and direct the airflow, and the direction of flow in each roadway.

1.3.7 Working plan—plans of the mine produced for operational and statutory purposes. They provide a permanent and accurate record of all excavations at the mine, whether on the surface or underground, and show details of any geological features such as faults and shear zones, igneous intrusions, erosion channels and the surface locations of representative boreholes that intersect the workings. For underground plans, the locations of all boreholes that intersect the workings are shown. Metalliferous ore bodies have their known outlines shown in plan and section, and coal seams have their—

- (a) roof and floor;
- (b) roof with negative seam thickness; or
- (c) floor with positive seam thickness

shown, along with any seam intrusions such as stone rolls.

1.4 LIMITATIONS

1.4.1 General The symbols shown in this Standard will be used on plans drafted for operational purposes (such as mineral extraction, planning, ventilation, mine rescue). Where special plans are prepared, for example, detailed structural geology, coal seam properties, ore grades determined from boreholes as for Clause 1.3.3 or surface plans as in Clause 1.3.5, it may be necessary to add appropriate symbols from other sources. These would include the following:

- (a) AS 2916.
- (b) Symbols Used on Geological Maps, Australian Geological Survey Organization, G.P.O. Box 378, Canberra, ACT 2601. Telephone (06) 245 1295. These are available in PC-based Microstation and Intergraph (VAX) IGDS formats.
- (c) Specifications for 1:100 000 and 1:250 000 Topographic Maps (NATMAP Series), Australian Surveying and Land Information Group (AUSLIG), PO Box 2, Belconnen, ACT 2616, Tel (06) 201 4300 or NATMAP 1-800-800-173, Fax (06) 201 4367. Specifications are available in hard copy or as Microsoft Access Version 2.

In addition, where a plan may become crowded, e.g. when all boreholes are shown, it may be necessary to use margin notes and not place all the information on small-scale plans.

1.4.2 Date of application Much of this Code and many of the symbols are already in use. For established mines, it may not be practical to adopt the Code fully in older parts of the workings. Every endeavour should be made to adopt the Standard as new parts of the mine are developed.

SECTION 2 PLAN PRESENTATION

2.1 GENERAL Working plans will be used by many non-specialists and the symbols should therefore be simple and informative. A wide range of special geological and topographical symbols would not be appropriate. For example, on a working plan used by miners, a single generic symbol for a fault would be more appropriate than the closely descriptive range of symbols used for fault types on a structural geology plan.

2.2 PLAN SCALES

NOTE: The scale of a plan is its reduction ratio; therefore, for example, a scale of 1:10 000 is smaller than a scale of 1:1000.

2.2.1 Mine plans The scales used for mine plans shall be 1:25 000, 1:10 000, 1:5000, 1:4000, 1:2500, 1:2000, 1:1250, 1:1000 and 1:500. For layout and detail plans, it may be necessary to use 1:100 and 1:50. For mines currently operating, new mapping should not conflict with existing scales.

2.2.2 Other plans For topographical and geographical purposes, it may be necessary to use 1:25 000 and 1:100 000 to conform to National and State mapping authorities' plans.

2.2.3 Not-to-scale plans Where it is necessary to show information clearly, e.g. electrical equipment layout in a substation, the enlargement may be drawn not strictly to scale, provided that its location is clearly identified on a scaled plan.

2.2.4 Dimensional check There shall be a means of checking plans and sections for loss of scale during reproduction or storage. This may be by means of at least two grid intersections or a linear scale on the title block or on the plan itself.

2.3 SURVEY GRID

2.3.1 General A survey grid with coordinate system on the Australian Map Grid or a State Integrated Survey Grid shall be shown on all mine plans either as full lines, or as grid intersections if detail would be obscured by a full line. Where a local grid system is used, a datum point related to the Australian Map Grid or a State Integrated Survey Grid shall be shown. The grid is necessary to orientate maps and to check on shrinkage or distortion, as well as to locate mine workings accurately.

2.3.2 Grid spacing All plans shall have a grid spacing that does not exceed 250 mm on the plan, regardless of scale. The recommended spacing is shown in Table 2.1.

2.3.3 Grid orientation The grid should be parallel to the sheet edges, with North orientated to the top of the page or map sheet on Working Plans, and on topographical and geological maps.

NOTE: Grid north to the top of the page is always preferred, but for some layout, detail and progress plans, and for planning reports, it may be preferable to adjust the grid orientation to allow a better use of the page. In those circumstances, a prominent north sign should be included to draw attention to the non-standard orientation.

2.3.4 Orientation of text Text should not be written upside down in relation to the title box. Text may be written vertically or parallel to outlines, but should then face the right side of the sheet.

2.4 REDUCED LEVELS Australian Height Datum (AHD) shall be used. To avoid confusion between positive and negative figures, a constant may be added to the AHD value. Where used, such constant shall be clearly defined on the plan. It is recommended that the constant be an Assumed Datum of 10 000 m below AHD.

NOTE: In the transition period, where existing metalliferous mine levels have been identified as an RL depth below AHD, it may not be possible to adopt Clause 2.4 immediately, but consideration should be given to identifying new levels in such a way that the transition can be made in mines having large reserves of ore.

TABLE 2.1
RECOMMENDED GRID SPACING

Plan scale	Grid spacing m
1:5 000	1 000 (maximum)
1:4 000	500
1:2 500	500
1:2 000	250
1:1 250	250
1:1 000	100
1:500	50
1:100	} At least one grid intersection shall be shown, with coordinates.
1:50	

2.5 USE OF COLOUR

2.5.1 Permanent plans All mine plans shall be drafted in black for permanent records. Where the use of colour will aid interpretation, e.g. display plans showing ingress and egress routes, ventilation plans and progress plans, the colours shall be added after drafting.

2.5.2 Short-term plans Transient plans, such as those showing electrical cables, or rescue plans, which may be changed monthly, may have the transient features printed in colour, but long-term features such as shaft cables should be printed in black and have colour added.

2.5.3 Conventional colours Where a plan has colour added, the usage given in Table 2.2 is recommended.

2.6 INFORMATION TO BE SHOWN ON MINE PLANS AND PREFERRED SCALES

2.6.1 Enlargement of details For all of the plans specified in this Section, it may be necessary to provide enlargements of specific areas such as pit bottoms, shaft entries and plats, and the surface areas around shafts or drifts, to show details of specified items. Where appropriate, such enlargements need not be strictly to scale.

2.6.2 Working plans Without prejudice to any requirements in statutory legislation, a working plan shall be on a scale of not smaller than 1:2500. Separate plans shall be prepared for each overlying seam or level worked and they shall show the name of the mine and the grid coordinates of any shafts or mine entries.

The other information that shall be shown is as follows:

- (a) The date of construction of the plan and its latest amendment for statutory submission with the signature of the person responsible for the plan.

- (b) The scale as a numerical ratio, e.g. 1:2500, and a graphical scale bar where a full grid is not used. The addition of a scale bar should be considered on all plans.
- (c) The datum to which the levels are referred.

TABLE 2.2
CONVENTIONAL COLOURS

Item	Colour
(a) <i>Working plans</i> Intake airways Return airways Conveyor roadways Other transport roadways Warning lines for limits of working (e.g. water hazards or surface support) Underground barrier pillars Faults Bodies of water <i>Extra colours for coal mines</i> Cross measure drifts Stone intrusions (in seams) Extracted areas in principal seam on plan Extracted areas in other workings on plan Coal seam outcrops	blue red green, or brown for isolation plans brown green red green blue brown (burnt sienna) brown (burnt sienna) red blue crimson
(b) <i>Electric plan</i> Above 3300 V 600 V to 3300 V 220 V to 600 V Below 220 V Mains shotfiring	purple red blue green violet
(c) <i>Rescue plan</i> Compressed air First aid equipment Fire depots and stations Water pipes*, hydrants, tanks and similar Fresh water Dirty water	light blue green red green purple

* For detailed plans, pipes should be coloured to conform to AS 1345C.

- (d) Shaft or entry data as follows (for underground workings):
 - (i) Level of surface at shaft top or centre of entry mouth.
 - (ii) Level of any winding insets, plats or levels.
 - (iii) The shaft or drift sump level.
- (e) A small inset key diagram showing any adjacent sheets of working plans for the mine lease and a list of any superjacent or subjacent plans of other mine levels or seams worked.
- (f) Reference to one or more mapping authority topographical maps covering the mine lease.
- (g) The location of survey stations to be held on a register showing the identification number, coordinates and level.

NOTE: The register should be kept at the mine or its survey office while the mine is operational, and deposited with the closing plans provided to the statutory authority.

- (h) The location of any buildings, dams, bridges, or other surface features entitled to support or special consideration.
- (i) A warning of approach to unconsolidated deposits, old workings, tidal waters, rivers, streams, swamps, reservoirs, aquifers or other bodies of water that may represent a danger to the mine workings. The position of such features shall also be shown.
- (j) The sites of any fires or heatings that have required sealing off, and the sites of the seals.

For mines other than coal, the following shall also be shown:

- (k) Accurate levels for each plat in every shaft, and from the entrance of every adit or tunnel into the face of every drive and cross-cut in the mine.
- (l) The outline of all workings, dated where possible, for each survey. Sufficient plans and sections shall be used in addition to a composite plan to make the information clear.

For all coal mines, the following shall also be shown:

- (m) The name of the seam being worked in an underground mine, or the seams in a surface mine.
- (n) The seam floor level in the shaft.
- (o) Contour lines or spot heights on the floor or the roof at the working section, so that the horizontal distance on the plan between spot heights shall not exceed 100 m or the contour interval shall not exceed 5 m.
- (p) Two boreholes not more than 1000 m apart that are indicative of the strata from the surface and showing—
 - (i) identification;
 - (ii) borehole collar level;
 - (iii) seam floor level; and
 - (iv) the seam floor levels of other seams that may be worked.
- (q) The position of any barrier or protective pillar to be left in the seam or seams that are currently being worked or are to be worked.
- (r) A line showing the position of the face of the mine workings at the last statutory survey and the date of such survey on such line. The survey shall be authenticated either on the plan or in associated records.
- (s) The position and details of all known outcrops, faults, dykes, cinder belts and other significant dislocations to the seam.
- (t) The sites of any outbursts of gas or coal.
- (u) The sites of any pillars or roadway surfaces sealed off because of spontaneous heating.

For surface mines other than coal mines, the following shall also be shown:

- (v) The limit of the workings in the full section worked and the limit of overburden removed, along with any areas reclaimed or again filled in.
- (w) A line showing the position of the face and sufficient cross-sections to show advance made in the mining operations at the date of the last survey, along with the date of the survey on such line. The survey shall be authenticated either on the plan or in associated records.

There shall be at least three cross-sections of the mine, and at least one cross-section for each part of the working plan, and they shall show for each survey—

- (i) the date of the survey;
- (ii) levels at the top of each batter and the working floor;
- (iii) the line of the original surface; and
- (iv) vertical graduations at 10 m intervals.

For any mine that has encountered in the workings water that required continual pumping or the provision of dams to seal off the water, the details of pumping rates and pressures, and of the location and construction of dams, shall be recorded on the plan when that section of the mine has ceased working.

2.6.3 Ventilation plans In conjunction with any relevant legislation, a ventilation plan shall be on a scale not smaller than 1:5000 and shall show—

- (a) the direction of air flows and the volume at major splits and where entering and leaving stopes, coal mine pillar panels, and longwall faces;
- (b) the position of all air doors, regulators, air crossings, stoppings, fans and other principal ventilating devices; and
- (c) any compressed air supply.

2.6.4 Rescue, firefighting, and emergency plans Without prejudice to any requirements of statutory legislation, emergency plans shall be drawn to the following scales:

- (a) For metalliferous mines: not smaller than 1:1000.
- (b) For coal mine pillar panels: not smaller than 1:2500.
- (c) For longwall workings not smaller than 1:5000.

Where these scales are too large to show the entire workings, a location key plan shall be prepared.

If the mine is sufficiently large to be divided into firefighting zones, these zones shall be shown on the key plans and any relevant sectional plans.

The following items shall be shown on the plans:

- (i) All shafts and other entries, including rises or staple shafts.
- (ii) All major ventilation devices, such as stoppings, regulators, trap door stoppings, overcasts and air crossings, ventilation doors and fire seals, and auxiliary ventilation fans.
- (iii) The direction of airflow.
- (iv) Ambulance and first aid stations.
- (v) Fire stations, fire depots, pipe mains, and their isolation valves, valves and hydrants.
- (vi) Location of rescue equipment.
- (vii) Water dams, bulkhead doors and isolation doors.
- (viii) Sites for emergency stoppings (prepared sites).
- (ix) Compressed air and water supplies.
- (x) Fixed electrical equipment and main cables.
- (xi) All telephones.
- (xii) Belt conveyors and drives.
- (xiii) Engine houses and haulages, and battery charging stations.

- (xiv) Fuel stores, refuelling points and workshops.
- (xv) Explosives magazines, ANFO storages, or other concentrations of flammable material.
- (xvi) Any stores of toxic or harmful chemicals, or materials and chemicals that may become dangerous if heated or mixed, such as cleaning materials and plastic articles.

2.6.5 Underground electrical plans Without prejudice to any requirements of statutory legislation, the scale of the plan shall not be smaller than 1:2500. Local enlargements, e.g. of substations, need not be to scale. The plans shall show all fixed cables and fixed electrical switchgear. A separate drawing may be needed for shafts and insets or plats. Where large haulages or similar items are used, it shall be sufficient to indicate the position of the main switch and controller and to give the details in writing. For such mobile items as the electrical supply for a longwall face or for electric loaders, an indication shall be given on the roadways involved of the presence of high voltage cables, transformers and switchgear. The actual position of the switchgear at the date of the plan may be shown in pencil.

The position of every telephone shall be shown on the electrical plans, and shotfiring mains and control boxes where they are in use. It shall not be necessary to show lighting fittings.

2.6.6 Surface electrical plans A schematic or a plan, of a scale not smaller than 1:50 000, shall be kept at a mine. It shall show the position, size and duty of the mine power reticulation, fixed substations, and load centres.

The schematic or plan shall be brought up to date as often as may be necessary, but in no case at intervals of more than three months.

2.6.7 Geological plans A geological map related to a mine shall show the boundaries of superficial and drift deposits at the mine, outcrops of seams or ore bodies, major faults with their direction of throw, any known igneous intrusions and any known geological feature likely to affect the stability of the workings, such as slickensides, shear zones, talc or schistose structures, or washouts and roof or floor rolls in coal seams. Any known aquifers or cavernous (vuggy) rocks shall also be shown.

The position of all shafts, adit and drift mouths and boreholes shall be shown, and details shall be available of any intersections of water-bearing beds or oil or gas intersections, with an appropriate note on the plan. Details shall also be available of how all boreholes and any shafts or other mine entries have been sealed and capped.

Where the plan is computer drafted, the details of all boreholes shall be on the same database or on an easily available associated compatible file held in the mine office.

The scales of the geological plans shall match the working plan for the mine so that they can be overlaid, but a separate key plan may be maintained to match the local maps prepared by the Australian Geological Survey Organization or similar mapping authority.

2.6.8 Surface plans Separate plans may be prepared for the mine buildings and infrastructure, and for the surface above the mine workings. For improvements in proximity to the mine entrances, the surface plans shall be on a scale of not smaller than 1:2500 and for other areas of the mine lease, the plan shall be on a scale not smaller than 1:5000.

All tenures should be marked on surface plans connected to the coordinate system of the plan. Precautions should be taken against mine subsidence affecting any reference point shown.

The plan shall show the following:

- (a) All permanent mine structures.

- (b) In the case of an underground mine, all streets, roads and buildings likely to be affected by subsidence, and dams, reservoirs, swamps, water bodies, unconsolidated surface deposits, railways, main pipelines and any other features whether of the same or a different kind.
- (c) In the case of an open-cut mine or other surface excavation, all streets, roads, dams, reservoirs, swamps, water bodies and any other permanent feature whether of the same or a different kind which, if disturbed by mining operations, is likely to cause damage to or danger in the open cut or other surface excavation, or any continuation downwards by underground excavation.

The plan shall also show the location of all water retention areas and washery reject, slimes, tailing and mine refuse dumps, with the contours of the bases of such areas, and a note of any underlying natural or geological features that bear a relationship to their stability, e.g. a culverted drainage channel or the outcrop of water bearing strata.

SECTION 3 SYMBOLS FOR MINE PLANS

3.1 GENERAL It is not possible to prescribe every symbol that may be needed, and allowances must be made for manual drafting and for computer software. A reasonable facsimile of the prescribed symbol shall be provided where one is shown in the appendices to this Standard, and where no symbol is prescribed for the information to be shown, a logical pattern based on similar items should be followed. For some plans it will be necessary to use a combination of the symbols prescribed in this Standard, and symbols used by other authorities, e.g. for geological and topographical maps. The combination should generally be obvious but, where there is any possibility of confusion, the title block of the plan shall have an explanation of the relevant symbols. If symbols unduly deface or clutter the plan, annotation may be used.

3.2 UNDERGROUND MINES The symbols used on the working plan, the electrical plan, ventilation, firefighting, rescue, and any other emergency plan shall be as in Appendices A and B. For surface plans and geological plans, the symbols used shall be an appropriate mixture from Appendix B and the databases or hard copies of ‘Symbols Used on Geological Maps’, from the Australian Geological Survey Organization, Canberra, and ‘Specifications for 1:100 000 and 1:250 000 Topographic Maps (NATMAP Series)’, Australian Surveying and Land Information Group (AUSLIG), (see Clause 1.4.1).

3.3 SURFACE MINES The symbols used on the electrical plan, firefighting, rescue and other emergency plans shall be as in Appendix A. Where underground workings are associated with the surface mine, the working plan shall also use the relevant symbols from Appendix A in preference to the shaft and adit symbols given on the NATMAP Series. For other topographic symbols and geological symbols, the Australian Surveying and Land Information Group and the Australian Geological Survey Organization Guides shall be used.

3.4 NUMERICAL CODING Some software has already been developed for mine plan symbols, and it is necessary to combine geographical, geological and mining symbols. For that reason it is preferable to have a standard alphanumeric code for easy keyboard access, and the Appendices list such a code.

The AGSO Symbols for Geological Maps code is fully numeric with points, e.g. 2.1.1, 2.1.2.1, 2.1.2.2 and so forth, but that requires extra keystrokes and potential errors when compared to a more easily remembered VE12, FR08 and others. Mine plans should be kept simple, so symbols should not proliferate by subdivision.