Neufert architects' data pdf

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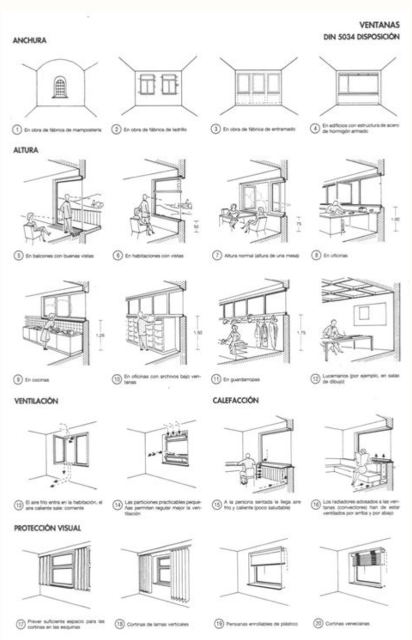

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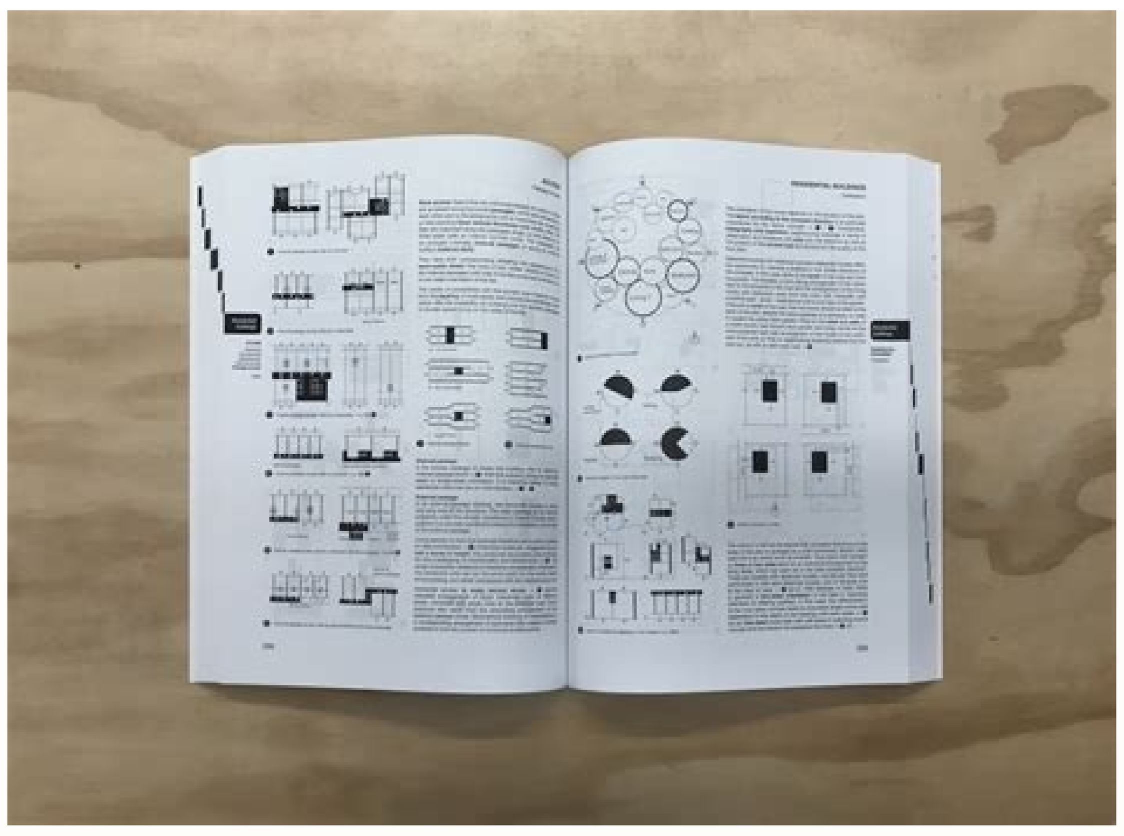

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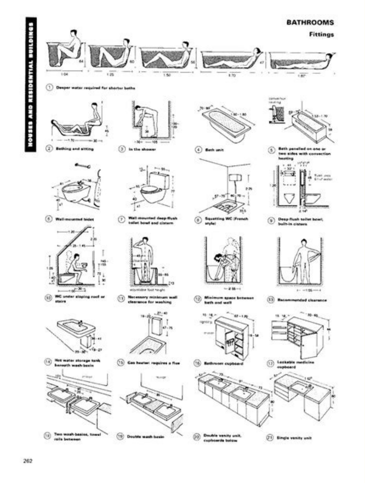

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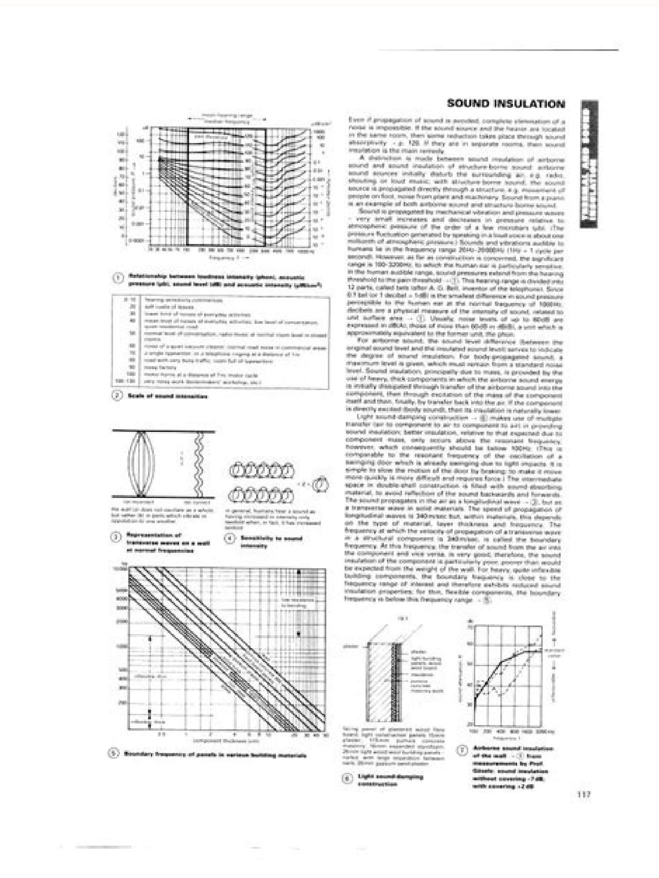

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V R o P G F H et> 8 symbol symbol basic unit definition Sl units in unit symbol based on the definition 1 length metre m wavelength of krypton radiation 2 mass kilogram kg international prototype 3 time second duration period of caesium radiation 4 electrical ampere A electrodynamic power kg, m, s current between two conductors 5 temperature kelvin K triple point of water 6 luminous candela cd radiation from freezing kg, s intensity platinum 7 quantity of mole mol number of carbon atoms kg matter G) 51 basic units The statutory introduction of SI Units took place in stages between 1974 and 1977. As from 1 January 1978 the International Measurement System became valid using Sl Units (SI = Svsterne Internationale d'Unites). c1t (K) (J) temperature differential quantity of heat (also measured in kilowatt hours (kWh)) o Decimal multipliers prefixes and their abbreviations are: T (tera) = 1012 (billion) c (centi) = 1/100 (hundredth) G (giga) = 109 (US billion) m (milli) = 10 3 (thousandth) M (mega) = 106 (million) p (micro) = 10- 6 (millionth) k (kilo) = 103 (thousand) n (nano) = 10- 9 (US billionth) h (hecto) = 100 P (pico) = 10 12 (billionth) da (deca) = 10 f (femto) = 10- 15 (US trillionth) d (deci) =1/10 (tenth) a (atto) = 10- 18 (trillionth) no more than one prefix can be used at the same time area velocity acceleration force 1 rn x 1 m= 1 m 2 1 m x 1 s 1 = 1 ms 1 = 1 rn/s 1 m x 1 s 2 = 1 ms? = 1 m/s?

1 kg x 1 m x: 1 s 2 = 1 kg m S2 = 1 kg m/s-' "A' 1//\ 1/(,(l/k D' S ~ (W/mK) (W/mK) (W/m 2K) (W/m 2K) (W/m 2K) (m 2K;W) (m 2K;W) (m 2K;W) (m 2K;W cm) (Wh/kgK) (Wh/m3K) (l/K) (Pa) (Pa) (g) (g) (%) (-) thermal conductivity (k-value) equivalent thermal conductivity coefficient of thermal conductance (C-value) coefficient of heat transfer (If-value) coefficient of heat penetration value of thermal insulation heat transfer resistance (R-value) heat penetration resistance coefficient of heat resistance specific heat value coefficient of heat storage coefficient of linear expansion pressure vapour pressure quantity of steam quantity of condensed water relative atmospheric humidity coefficient of diffusion resistance ® Examples of deriving 51 units quantity unit dimensions (symbol) (M = mass, L = length, T = time) area A m 2 L2 volume V m 3 L3 density I) kgm 3 ML3 velocity v ms 1 LT1 acceleration a ms 2 LT 2 momentum p kgms 1 MLT1 moment of inertia !,J kgm 2 ML2 angular momentum L kgm2s 1 ML2T 1 force F newton (N) MLT 2 energy, work E. W joule (J) ML2T 2 power P watt tw) ML 2T 3 pressure, stress p, (T pascal (Pa) ML 1T 2 surface tension y Nm 1 ML1T-2 viscosity '1 kgm 1S1 ML1T1 CD Summary of main derived 51 units (}) Symbols and units: sound ® Symbols and units: heat and moisture layer factor layer factor of atmospheric strata heating cost resistance to water vapour penetration coefficient of water vapour penetration equivalent atmospheric layer thickness (ern) (g/m2hPa) (m 2hPa/g) (W/mK) (W/mK) (£,$/kWh) '\0 pd symbol (unit) meaning (m) wavelength (Hz) frequency fg r (Hz) limiting frequency f ll (Hz) frequency resonance Edva (N/cm2) dynamic modulus of elasticity S' (N/cm3) dynamic stiffness R (dB) measurement of airborn noise reduction Rm (dB) average measurement of noise reduction R' (dB) measurement of airborn noise suppression in a building t, (dB) impact noise level standard (-) degree of sound absorption A (rn-') equivalent noise absorption area (m) radius of reverberation .\L (dB) noise level reduction 1 bar = 105 Pa 1 W = 1 J/s 1 Pa = 1 N/m2 1 N = 1 kqrn/s? 1 J = 1 Nm = 1 Ws 1 kca I = 4186 J, 1 kWh = 3.6 MJ relationships 1 kg x 1 m 3 = 1 kg m 3 = 1 kg/m3 density 2 UNITS AND SYMBOLS quantity symbol 51 unit statutory unit old unit relationships name symbols name symbols name symbols normal (cll.'{ radian rad 1 rad = 57.296 = 63.662 gon angle perrqon pia 1 pia = 2rr rad right angle L 1L = 1/4 pia = (rr/2) rad degree old degrees 1 = 1L/90 = 1 pla/360 = (rr/180) rad minute t: = 1 /60 second 1" = 1'/60 = 1 /3600 gon gon new degrees g 1 gon = 1 g = l L/100 = 1 pla/400 = rr/200 rad new minute a 1 c = 10-2 gon new second cc 1 cc = 10-2) C = 10-4 gon length I metre m micron urn inch in 1 in = 25.4 mm millimetre mm foot ft 1 ft = 30.48 cm centimetre cm fathom fathom 1 fathom = 1.8288 m decimetre dm mile mil 1 mil = 1.609 km kilometre km nautical mile sm 1 sm = 1.852 km area A square m 2 cross metre square foot (= 0.092 rn-): section acre (0.405 hal still in use of land are a 1 a = 102m plots hectare ha 1 ha = 104m volume V cubic metre rn-

litre I 1 1= 1 drn-' = 10 3 m 3 normal normal cubic metre Nm 3 1 Nm 3 = 1 m 3 in norm condition volume cubic metre cbm cbm = 1 m 3 time. t second s time span. minute min 1min = 60s duration hour h 1h = 60min = 3600s day d 1d = 24h = 86400s year a. y 1a = 1Y = 8765.8h = 3.1557><107s frequency f hertz Hz 1Hz = 1/s for expressing reciprocal frequencies in dimensional equations of duration angular (I) reciprocal l/s (1)=2,,(frequency second angular II) radians per rad/s (t)=2"n velocity second no. of revs. n reciprocal 1/s speed of second revs per second r/s revs per second r.p.s. 1/s = tis = r/s revolutions revs per minute r/rnin revs per minute r.p.m. velocity v metres per rn/s kilometres krn/h 1 m/s = 3.6 krn/h second per hour knots kn 1 kn = 1 srn/h = 1.852 km/h acceleration 9 metres per rn/s- due to second per gal gal 1 gal = 1 cm/s? = 10 2 rn/s? gravity second mass m kilogram kg weight (as a gram g 1 g = 10- 3 kg result of tonne t 1 t = 1 Mg = 103 kg weighing pound Ib 1 Ib = 0.45359237 kg metric pound 1 metric pound = 0.5 kg ton ton 1 ton = 2240 Ib = 1016 kg force F newton N 1 N = 1kgm/s2 = 1 Ws/m = 1 J/m thrust u dyn dyn 1 dyn = 1 q crn/s? = 10, N pond p 1 P = 9.80665 " 10-3 N kilopond kp megapond Mp kilogram force kg/f tonne force t/f stress () newtons N/m! newtons N/mm 1 strength per square per square kiloponds per kp/crn? 1 kp/crn? = 0.0980665 N/mm2 2ILGUaHJ bGL2dn9L6 b6L 2dn9L6 ~lIobouq2 b6L ~b\cws J ~b\cws = 0'Oa80ee2 It1\WWs sn ess (I IIe~colis 1-4)111· IleNrolls 1-4)flHli' strength per square per square kiloponds per kp/crn-' 1 kp/cm 2 = 0.0980665 N/mm2 metre millimetre square crn/rnrn kp/rnrn-' 1 kp/rnrn-' = 9.80665 N/mm2 energy WE joule J 1 J = 1 Nm = 1 Ws = 107 erg kilowatt hour kWh 1 kWh = 3.6 " 106 J = 3.6 MJ h.p. per hour h.p./h 1 h.p./h = 2.64780" 106 J erg erg 1 erg = 10-7 J quantity of Q Joule J calorie cal 1 cal = 4.1868 J = 1.163" 10 3 Wh heat torque M newton metre Nm kilopond metre kpm 1 kpm = 9.80665 J bending MI. or joule J moment power P watt W 1 W = 1 J/s = 1 Nrn/s = 1 kg m 2/s 3 energy current horsepower h.p. 1 h.p. = 745.7 kW thermodynamic T kelvin K deg. kelvin K temperature deg. Rankine R. Rk R = 5/9 K CelSIUStemp H degrees Celsius C H = T - T" (T" = 273.15 K) temperature \Tor K .\H = .\ T, therefore Interval and \1.\ 1 K = 1 C = 1 deg. differential Fahrenheit HI deg. Fahrenheit F HF = 9/5 H + 32 = 9/5 T - 459.67 temperature Reaumur temp HR deg. Heaurnur R HR = 4/5 H, 1 R 5/4 C G) SI and statutory units for the construction industry Mathematical symbols > greater than 2 greater than or equal to < smaller than ::::; smaller than or equal to L sum of L angle sin sine cos cosine tan tangent cotan cotangent on average equals identically equal 7:- not equals roughly equals, about congruent asymptotically equal (similar) to infinity II parallel equal and parallel $ not identically equal to x multiplied by divided by 1- perpendicular V volume, content <.D solid angle root of ~ final increment - congruent ~ triangle tt same direction, parallel ~ ~ opposite direction, parallel Greek alphabet An. (a) alpha B~ (b) beta ry (g) gamma ~8 (d) delta Er (e) epsilon Zr., (z) zeta H 11 (e) eta 88 (th) theta It (i) iota II (!) !0!9 It (i) iota KK (k) kappa 1\A (I) lambda Mil (m) mu Nv (n) nu :=:S (x) xi 00 (0) omicron flIT (p) pi Pp (r) rho La (s) sigma TT (t) tau Yu (u) upsilon Maintaining the same ratio of length to width, the sheet sizes are worked out by progressively halving (or, the other way round, doubling) the sheet area, as would happen if the rectangular sheet was repeatedly folded exactly in half ---) CD - Q). Additional ranges (8, C, and D) are provided for the associated products that require larger paper sizes, i.e. posters, envelopes, loose-leaf file binders, folders etc. The formats of range 8 are designed for posters and wall- charts. The formats in ranges C and 0 are the geometric mean dimensions of ranges A and 8 and are used to manufacture the envelopes and folders to take the A sizes. ~ @ The extra size needed for loose-leaf binders, folders and box files will depend on the size and type of clamping device employed. The strip or side margin formats are formed by halves, quarters, and eighths of the main formats (for envelopes, signs, drawings etc.) ~ @ + @. Pads and duplicate books using carbonless paper also have standard formats but may have a perforated edge or border, which means the resulting pages will be a corresponding amount smaller than the standard sheet size ~ @. During book-binding, a further trim is usually necessary, giving pages somewhat smaller than the standard format size. However, commercial printers use paper supplied in the RA or SRA sizes and this has an allowance for trimming, which allows the final page sizes to match the standard formats. 1/2A4 '118 1118' 1/4 I y/2 1I x/2 J- ~ 11 +,~ f--- x---l ---------T--------- t-- x/2 - 8) Sheet sizes ® Strip formats format abbre- mm viation half length A4 1/2 A4 105,< 297 quarter length A4 1/4 A4 52 x 297 one eighth A7 1/8 A7 9 X 105 half length C4 1/2 C4 114 x 324 etc.

G)-0 Basis of paper formats A4 ® Format strips in A4 1------ 210 ---------l ()) loose-leaf binder ® Pads (including carbonless) I--- layout width header area ---4 T 81 5 .:c type width, 1 double column ::J 0 ~ f---- type width, - single column 167 footer area picas mm type area width 39.5 I 40.5 167 171 type area, height (without header/footer) 58.5 I 59 247 250 space between columns 1 5 max. width, single column 39.5 167 max. width, double column 19 81 inside (gutter) margin, nominal 16 14 outer (side) margin, nominal 27 25 top (head) margin, nominal 20 19 bottom (foot) margin, nominal 30 28 ® Bound and trimmed books @ layouts and type area with A4 standard format 4 DOCUMENTATION AND DRAWINGS The use of standard drawing formats makes it easier for architects to layout drawings for discussion in the design office or on the building site, and also facilitates posting and filing. The trimmed, original drawing or print must therefore conform to the formats of the ISO A series. ----? @ - ® The box for written details should be the following distance from the edge of the drawing: for formats AO-A3 10 mm for formats A4-A6 5 mm For small drawings, a filing margin of up to 25 mm can be used, with the result that the usable area of the finished format will be smaller. As an exception, narrow formats can be arrived at by stringing together a row of identical or adjacent formats out of the format range. From normal roll widths, the following sizes can be used to give formats in the A series: for drawing paper, tracing paper 1500, 1560 mm (derived from this 250, 1250,660,900 mm) for print paper 650, 900, 1200 mm If all the drawing formats up to AO are to be cut from a paper web, a roll width of at least 900 mm will be necessary. Drawings which are to be stored in A4 box files should be folded as follows: ----?

@ (1) The writing box must always be uppermost, in the correct place and clearly visible. (2) On starting to fold, the width of 210 mm (fold 1) must always be maintained, and it is useful to use a 210 x 297 mm template. (3) Fold 2 is a triangular fold started 297 mm up from the bottom left-hand corner, so that on the completely folded drawing only the left bottom field, indicated with a cross, will be punched or clamped. (4) The drawing is next folded back parallel to side 'a' using a 185 x 298 mm template. Any remaining area is concertina-folded so as to even out the sheet size and this leaves the writing box on the top surface. If it is not possible to have even folds throughout, the final fold should simply halve the area left (e.g. A 1 fold 5, AO fold 7). Any longer standard formats can be folded in a similar way. (5) The resulting strip should be forded from side 'b' to give a final size of 210 x 297 mm. To reinforce holes and filing edges, a piece of A5 size cardboard (148 x 210 mm) can be glued to the back of the punched part of the drawing. ~ ..../\ ~ VNW cut-out ISO A2, A 1, AO cut-out ISO A3 cut-out ISO A4 ~ - l:':7:.. . . . . . ~ I __ :::::J divisions for 12 594 ® ISO size A5 o Field divisions (grid squares) ISO A2 lil I I I --~ ISO A3 D r I I~ LJ a -+ 20 l- I writing box ® ISO size A4 ® Dimensions and scheme for folding IH-+--+-- I I I '"'-+r--.r-,.---.-~-.---"---;--r---i L=:.......--'-_~t-L--.~_----L-...lL_".'..-L-...L- ...&....-.III~----L..._ --~ o ISO size A2; A1; AO uncut drawing sheet, depending on requirement, is 2-3cm wider than final trimmed original drawing and print box for written r--9 details and parts list I a I sheet sizes in acc. ISO AO ISO A1 ISO A2 ISO A3 ISO A4 ISO A5 with ISO A series uncut blank 880" 1230 625,,880 450,625 330,450 240 x 330 165 x 240 paper (mm) format trimmed, 8410..1189 594,841 420,594 297,420 210,,297 148 x 210 finished sheet (rnrn] G) Standard drawing o Sheet sizes 5 Arrangement Leave a 5cm wide blank strip down the left- hand edge of the sheet for binding or stapling. The writing box on the extreme right ~ CD should contain the following details: (1) type of drawing (sketch, preliminary design, design etc.) (2) type of view or the part of the building illustrated (layout drawing, plan view, section, elevation, etc.) (3) scale (4) dimensions, if necessary. On drawings used for statutory approvals (and those used by supervisors during construction) it might also contain: (1) the client's name (and signature) (2) the building supervisor's name (and signature) (3) the main contractor's signature (4) the building supervisor's comments about inspection and the building permit (if necessary on the back of the sheet). A north-point must be shown on the drawings for site layouts, plan views etc.

writing box DOCUMENTATION AND DRAWINGS I I 30 I site plan north elevation west elevation 20 I ...... : .. < ...:.,.: ....

< .: / : . • :::: :::.:: :::::: roof truss layout upper floor south elevation east elevation layout of joists ground floor foundations basement section ~ . .•...... . ..••...:....•...:.......•.•......•.....:•.....•.::.•.••.•.•.:..•.... :..:.•.......•..••.••..•.......•.....•.....:•..:::.: ••..•....•..:........••...:•...•...•..•..•.•..........:: •.•..•.....•.•.......•.:••.... ::.: •..... ::.:: .. 18·.·..···.:.·

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::•.::.. :: : ::.:/ : ..... . : :.:.. : .. .. --',',',". .. ",-. ',"',,. - _- -_---.. G) Suitable arrangement of a construction drawing 10 5 0 10 II I I I II I I I I I o Suitable arrangement of scale details o Standard method of dimensioning an oddly shaped plan (measurements given are structural dimensions) ··················j£·:~·¥:.:····F + 275 SZ + 2.69 'Y in ground plans Scales The main scale of the drawing must be given in large type in the box for written details. Other scales must be in smaller type and these scales must be repeated 'y next to their respective diagrams. All objects should be drawn to scale; where the drawing is not to scale the dimensions must be underlined. As far as possible, use the following scales: for construction drawings: 1:1, 1:2.5, 1:5, 1:10, 1:20, 1:25, 1:50, 1:100, 1:200, 1:250 for site layouts: 1:500,1:1000,1:2000,1:2500,1:5000,1:10000,1:25000. Measurement Figures and Other Inscriptions In continental Europe, for structural engineering and architectural drawings, dimensions under 1 m are generally given in cm and those above 1 m in m. However, recently the trend has been to give all dimensions in mm, and this is standard practice in the UK. Chimney stack flues, pressurised gas pipes and air ducts are shown with their internal dimensions as a fraction (width over length) and, assuming they are circular, by the use of the symbol (2) for diameter. Squared timber is also shown as a fraction written as width over height. The rise of stairs is shown along the course of the centre-line, with the tread depth given underneath (~ p.

13). Window and door opening dimensions are shown, as with stairs, along the central axis. The width is shown above, and the internal height below, the line (~ p.

13). Details of floor heights and other heights are measured from the finished floor level of the ground floor (FFL: zero height ± 0.00). Room numbers are written inside a circle and surface area details, in rn-', are displayed in a square or a rectangle ~ @. Section lines in plan views are drawn in chain dot lines and are labelled with capital letters, usually in alphabetical order, to indicate where the section cuts through the building. As well as standard dimensional arrows ~ @ oblique arrows and extent marks ~ ® + (f) are commonly used.

The position of the dimensional figures must be such that the viewer, standing in front of the drawing, can read the dimensions as easily as possible, without having to turn the drawing round, and they must be printed in the same direction as the dimension lines. :.:.:.:.:.:.:.:.:.:#i::¥;.:..b - 25 o Heights as shown in sections and elevations ® +------ 6250 --+ +-- ® f-- 6250 ----4 f-- + 312 ()) r-- ~~~~ r- Designers use drawings and illustrations to communicate information in a factual, unambiguous and geometric form that can be understood anywhere in the world. With good drawing skills it is simpler for designers to explain their proposals and also give clients a convincing picture of how the finished project will look. Unlike painting, construction drawing is a means to an end and this differentiates diagrams/working drawings and illustrations from artistic works. Sketch pads with graph paper having a.5cm squares are ideal for freehand sketches to scale ----) CD. For more accurate sketches, millimetre graph paper should be used.

This has thick rules for centimetre divisions, thinner rules for half centimetres and fine rules for the millimetre divisions. Different paper is used for drawing and sketching accord- ing to standard modular coordinated construction and engineering grids ----) (2). Use tracing paper for sketching with a soft lead pencil. Suitable sheet sizes for drawings can be cut straight from a roll, single pages being torn off using a T-square or cut on the underside of the T-square ----) @. Construction drawings are done in hard pencil or ink on clear, tear-resistant tracing paper, bordered with protected edges ----) ® and stored in drawers or hung in vertical plan chests. Fix the paper on a simple drawing board (designed for standard formats), made of limewood or poplar, using drawing pins with conical points ----) @. First turn over 2cm width of the drawing paper edge, which can later be used as the filing edge (see p.

4), for this lifts the T-square a little during drawing and prevents the drawing being smudged by the T-square itself. (For the same reason, draw from top to bottom.) The drawing can be fixed with drafting tape rather than tacks ----) @ if a plastic underlay backing is used. The T-square has tradit- ionally been the basic tool of the designer, with special T-squares used to draw lines at varying angles.

They are provided with octameter and centimetre divisions ----) (f). In general, however, the T-square has been replaced by parallel motion rulers mounted on the drawing board ----) @. Other drawing aids include different measuring scales ----)@, 45° set squares with millimetre and degree divisions, drawing aids for curves ----) @, and French curves ----) @. a .....;jIJ b CONSTRUCTION DRAWINGS)!iSt <:1... guided by little finger on the edge ® Set squares ® Specialist drawing board ~ .~ o Cutting paper to size @ Drawing movements @ Correct way of holding a pencil '$i5 wrong shape (drawing pin) folding over prevents tearing Sketching: construction engineering grid set of kales '" II N ~ ~ ~ 0 '" ,..,. ...l 0 '" N A. T 250 -~ 250 "'::~ 1125 750 ~ J.. '1 1111 0 " '" N IITnl "II I IJI cone shape: correct ® Drawing equipment CD ® Drawing table @ French curves @ Aid for hatching G) Paper for sketching ISO A4 CD Taping edges (]) T-square @ Drawing aids @ Drawing aids 7 To maintain accuracy i n construction drawings req- uires practice.

For instance, it is essential to hold the T- square properly and use pencils and pens in the correct manner. Another important factor in elirnin- ating inaccuracy is keeping a sharp pencil point. There are various drawing aids that can help: grip pencils, for example, are suitable for leads with diameters of 2 rnrn or more and propell ing pencils are useful for thinner leads. Lead hardnesses fr orn 68 to 9H are available. Many models of drafting pens are available, both refillable and disposable, and offer a wide range of line thicknesses. For rubbing out ink use rnech- anical erasers, erasing knives or razor blades whereas non- smear rubbers should be used for erasing pencil.

For drawings with tightly packed lines use eraser templates • <11- Write text preferably without aids. On technical drawings use lettering stencils, writing either with drafting pens or using a stipple brush 12). Transfer lettering (Letraset etc.) is also commonly used. The international standard for lettering ISO 3098/1.

To make the designer's intentions clear, d iag rarns should be drawn to con- vincingly portray the finished building. lsornetrv can be used to replace a bird's eye view if drawn to the scale of 1:500 • Q3) and perspective grids at standard angles are suitable for showing internal views '~6\ @ Perspective grid CONSTRUCTION DRAWINGS Underlay for perspective drawing Reilesch's perspective apparatus -f-- @ ® Typewriter for lettering @ o Rotary pencil sharpener CD Drafting pens &L ABeL- ABCDF...-- A ISCDEE.......-- Circular drawing board for perspective drawing lettering sizes measured in points ® ® o lettering stencils Three-armed drawing instrument Isometry Self-adhesive or letraset lettering st1ilrper)lr)~l with il sCill Pt~ I - - ~ - - ~ '\- ~ :!~~~~~')~-&~ --. ~~~ f1\ Erasers, eraser template, V eraser blades, etc. @ 8 CONSTRUCTION DRAWINGS line types (weight) primary application scale of drawings 1:1 1:20 1:100 1:5 1:25 1:200 1:10 1:50 line thickness (mm) solid line boundaries of buildings in section 1.0 0.7 0.5 (heavy) solid line visible edges of components; boundaries of narrow 0.5 0.35 0.35 (medium) or smaller areas of building parts in section solid line dimension guide lines; dimension lines; grid lines 0.25 0.25 0.25 (fine) indication lines to notes; working lines 0.35 0.25") 0.25 dashed line') hidden edges of building parts 0.5 0.35 0.35 (medium) ---- chain dot line indication of section planes 1.0 0.7 0.5 (heavy) ._._. chain dot line axes 0.35 0.35 0.35 (medium) .__ .__ . dotted line') parts lying behind the observer 0.35 0.35 0.35 (fine) 'I dashed line - - - - - - dashes longer than the distance between them dotted line dots (or dashes) shorter than the distance between them "I 0.35 mm if reduction from 1:50 to 1:100 is necessary In some European countries the measurement unit used in connection with the scale must be given in the written notes box (e.g. 1:50 ern). In the UK, dimensions are given only either in metres or millimetres so no indication of units is required. Where metres are used it is preferable to specify the dimension to three decimal places (e.g. 3.450) to avoid all ambiguity. 1 2 3 4 unit dimensions under 1 m over 1 m e.g. e.g. 1 m 0.05 0.24 0.88 3.76 2 cm 5 24 88.5 376 3 m,cm 5 24 885 3.76 4 mm 50 240 885 3760 ® Units of measurement ----- tiles -- mortar - screed damp-proof membrane insulation structural floor ® Indication lines to notes note: for plotter drawings using electronic data processing equipment and drawings destined for microfilm, other combinations of line widths may be necessary 4 3 a Oa o Designation for dimensioning i-----------dimension figure I 1-- --- dimension line : r -~ extension line I .>; dimension arrow -3.76~ ==u 01 Ob Ob1 Ob2 02 oc 3E ----- ---- ---- - -Ilt-- - ---r- I b24, I I I I I I I I c2 I I I I I I I I I I I I I I I I I -~ I I ---- - I I I I 1 I 0208 I I I 01 C(< w ~ ''It ~ C U CD -c 0 -co C\I 0 CD 0 axis field '1J (J)] .~ ® Axis-field grid 000 426 188.S ---#-#------- 24 Dimensions given by coordinates (drawn at 1:50cm, m; units = cm and m) Dimensions given around the drawing (drawn at 1:100cm; units = cm) I ~ I I ~O> ~ ~~ ~l .=--1~ 24r188.s*~i-- 426 - 24 236.S-"1 -437.S- -674- 88 5 ___.t:::======1...._J::::======L__I-~625 CD G) Types and thicknesses of lines to be used in construction drawings 1#=~ -J615t625l1135J615l1~1865 266 138.S 437 -S_1--.;38;...;:.-:.S'---_____+_ 236 674 CD Dimensions of piers and apertures (drawn at 1:50 cm; units = cm) 9 10 CAD application in architectural design The acronym CAD usually means either computer-aided design or computer-aided draughting. CADD is sometimes used to mean computer-aided draughting and design. Computer-aided design is a highly valued technique because it not only enables a substantial increase in productivity but also helps to achieve neater and clearer drawings than those produced using the conventional manual drafting techniques described in the preceding pages. Standard symbols or building elements can be compiled as a library of items, stored and used to create new designs. There is also a possibility of minimising the repetition of tasks by linking CAD data directly with other computer systems, i.e. scheduling databases, bills of quantities etc. Another advantage of CAD is that it minimises the need for storage space: electronic storage and retrieval of graphic and data features clearly requires a fraction of the space needed for a paper-based system. Drawings currently being worked on may be stored in the CAD program memory whereas finished design drawings that are not immediately required may be archived in high-capacity electronic storage media, such as magnetic tapes or compact disks. A drawback relating to the sophisticated technology required for professional CAD has been the high expense of the software packages, many of which would only be run on large, costly computer systems. However, various cheap, though still relatively powerful, packages are now available and these will run on a wide range of low-cost personal computers. CAD software A CAD software package consists of the CAD program, which contains the program files and accessories such as help files and interfaces with other programs, and an extensive reference manual. In the past, the program files were stored on either 51/ 4 11 or 31/i l floppy disks. The low storage capacity of the 51/ 4 11 floppy disks and their susceptibility to damage has rendered them obsolete.

Besides their higher storage density, 31/i l disks are stronger and easier to handle. Nowadays, the program files are usually stored on compact discs (CD-ROM) because of their high capacity and the ever increasing size of programs; they are even capable of storing several programs. When installing a CAD program onto the computer system, the program files must be copied onto the hard disk of the computer. In the past, CAD was run on microcomputers using the MS-DOS operating system only. New versions of the CAD programs are run using MS-DOS and/or Microsoft Windows operating systems.

laser printer CD CAD workstation: examples of hardware elements CONSTRUCTION DRAWINGS: CAD Hardware requirements Once the desired CAD software has been selected, it is important to ensu re that the appropriate hardware (equipment) needed to run the program is in place. A typical computer system usually includes the following hardware: Visual Display Unit (VDU): Also called a screen or monitor, these are now always full-colour displays. The level of resolution will dictate how clear and neat the design appears on the screen. For intricate design work it is better to use a large, high-resolution screen. The prices of such graphic screens have fallen substantially in recent years making them affordable to a wide range of businesses and they are hence becoming commonplace.

In the past, using CAD required two screens, one for text and the other for graphics. This is not necessary now because some of the latest CAD programs have a 'flip screen' facility that allows the user to alternate between the graphics and text display. In addition, the Windows version of some CAD programs also has a re-sizable text display that may be viewed in parallel with the graphics display. Disk drives and disks: The most usual combination of disk drives for desktop CAD systems initially was one hard drive and one 31/i l floppy drive. The storage capacity of hard disks increased rapidly throughout the 1990s, from early 40 MB (megabyte) standard hard drives to capacities measured in gigabytes (GB) by the end of the decade. The storage capability of floppy disks is now generally far too restrictive and this has led to the universal addition of compact disc drives in new PCs. These can hold up to 650MB. This storage limitation has also led to the use of stand-alone zip drives and CD writers (or CD burners) to allow large files to be saved easily. Keyboard: Virtually every computer is supplied with a standard alphanumeric keyboard. This is a very common input device in CAD but it has an intrinsic drawback: it is a relatively slow method of moving the cursor around the screen and selecting draughting options. For maximum flexibility and speed, therefore, the support of other input devices is required. Mouse: The advantage of the mouse over the keyboard as an input device in CAD is in speeding up the movement of the cursor around the screen. The mouse is fitted with a button which allows point locations on the screen to be specified and commands from screen menus (and icons in the Windows system) to be selected. There are several types of mouse, but nowadays a standard CAD mouse has two buttons: one used for PICKing and the other for RETURNing. processor Graphic tablet, digitising tablet (digitiser): A digitiser consists of a flat plate with a clear area in the centre, representing the screen area, the rest divided into small squares providing menu options. An electric pen (stylus) or puck is used to insert points on the screen and to pick commands from menus. The selection of a command is made by touching a command square on the menu with the stylus (or puck) and at a press of a button the command is carried out. Data can be read from an overlay menu or a document map or chart. The document should first be placed on the surface of the digitiser and its boundaries marked with the stylus or puck. The position of the puck on the digitiser may be directly related to the position of the cursor on the screen.

Most pucks have four buttons: they all have a PICK button for selecting the screen cursor position and a RETURN button for completing commands but, in addition, they have two or more buttons for quick selection of frequently used commands. Printers: Hard-copy drawings from CAD software can be produced by using an appropriately configured printer. Printers are usually simple and fast to operate, and may also be used for producing hard copies from other programs installed in the computer. There are several types of printer, principally: dot-matrix, inkjet, and laser printers. The graphic output of dot-matrix printers is not of an acceptable standard, particularly when handling lines that diverge from the horizontal or vertical axes. Inkjet and laser printers are fast and quiet and allow the production of high-quality monochrome and coloured ECSC MegaProject 5 demonstration building at Oxford Brookes University, designed using customised CAD software (courtesy of British Steel Strip Products) CONSTRUCTION DRAWINGS: CAD graphic diagrams up to A3 size. Colour prints are also no longer a problem since there is now a wide range of printers that can produce high-quality colour graphic prints at a reasonably low cost. Plotters: Unlike printers, conventional plotters draw by using small ink pens of different colours and widths. Most pen plotters have up to eight pens or more. Usually the CAD software is programmed to enable the nomination of the pen for each element in the drawing. Flat-bed plotters hold the drawing paper tightly on a bed, and the pens move over the surface to create the desired drawing. Although they are slow, their availability in small sizes (some with a single pen, for instance) means that a good-quality output device can be installed at low cost. Rotary (drum) plotters operate by rolling the drawing surface over a rotating cylinder, with the pens moving perpendicu larly back and forth across the direction of the flow. They can achieve high plotting speeds. With large- format drafting plotters, it is possible to produce drawings on paper up to AD size. Depending on the plotter model, cut-size sheets or continuous rolls of paper can be used. Modern printer technology has been used to develop electrostatic plotters, inkjet plotters and laser printer/plotters. These are more efficient and reliable, and produce higher line quality than pen plotters. As well as drawing plans and line diagrams, they can also be used to create large colour plots of shaded and rendered 3D images that are close to photographic quality. 11 GL= goods lift PL = passenger lift FL = food lift HL = hydraulic lift ventilation and extraction shaft cookers/hobs fuelled by gas cookers/hobs fuelled by oil cookers/hobs fuelled by solid fuels top cupboard ironing board cupboard/ base unit central heating radiator ® oil fired boiler @ gas fired boiler @ @ laundry chute @ refuse chute @ boiler (stainless) ® cooker @ dishwasher @ electric cooker/hob @ @ @ @ @ freezer @ refrigerator Other symbols -"- .x:n?~ . ~ J..·.....·..·..·L Jitn .:::::..::: :: .:..r r :/.::. fi :?·:::~::::::::: :.~:: :::t t.::: JiXIt. ~ . : :. "C2J .

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.::.} .::I:: urinal bowl 35/30 shower 80 x 80, 90 x 90, 75 x 90 bidet 38 x 60 stepped sinks corner shower 90 x 90 twin sinks, single drainer 60 x 150 sit-up bath 70 x 105,70 x 125 row of urinals single sink and drainer 60 x 100 built-in wash-basin 45 x 30 kitchen waste sink wardrobe 60 x 120 twin wash-basins 60 x 120,60 x 140 bath 75 x 170,85 x 185 wash-basin 50 x 60, 60 x 70 two wash-basins toilet 38 x 70 double bed 150 x 195 child's bed 70 x 140-170 twin bed 2(95 x 195, 100 x 200) bed 95 x 195 bedside table 50 x 70, 60 x 70 CONSTRUCTION DRAWINGS: SYMBOLS @ @) @ o]1 D@ Kitchen Bedroom Bathroom ~ l~ool DO o rn @ o @ [] ® coat rack hooks, 15-20cm apar...