



Whitecroft Green Ltd

Chartered Building Surveyors
& Energy Assessors

AutoCAD LT 2004, 2007 CAD Standards Guideline

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Document Quality Control

CAD Drawing Standards

Electronic File Format

All documentation drawings and construction project drawings must be submitted to Whitecroft Green in full compliance with AutoCAD LT 2004, file extension .dwg to ensure full backwards compatibility.

Throughout this document, the use of the name AutoCAD always implies "AutoCAD LT 2007" unless otherwise noted.

XREFS

Whitecroft Green will not accept the submission of any CAD drawing which contains references to external source drawing files. All externally referenced data sources that were used during the CAD drawing production and subsequent viewing, should be inserted and retained as a block within a single drawing file, including the title block. This is to ensure completeness of information.

Upon project completion and prior to drawing delivery to Whitecroft Green, the consultant(s) should satisfy themselves that the resulting self-contained drawing file and is an acceptable format as outlined in this document.

Drawing Units

All CAD drawing models should be drafted at full scale in metric units, such that one drawing unit equals one millimeter (mm).

All overall plans, sections and elevations are to be drawn at 1 AutoCAD unit to 1mm scale, with a precision no greater than one unit.

All drawings should be drawn in Model Space and at full size i.e. at a scale of 1:1. Any scaling of finished drawings should be achieved by using Paper Space and Viewports.

BS Scales

2:1	1:1	1:2
1:5	1:10	1:20
1:25	1:50	1:75
1:100	1:200	1:250
1:500	1:1000	
1:1250	1:2500	

Non-standard scales are **NOT** to be used without the consent of Whitecroft Green. In order to ensure that when plotted all drawings are correctly scaled, drawings should be plotted at the correct scale not scaled to fit the paper.

Layers

Whitecroft Green uses as its basis, **BS1192 part 5: 1998** and **AEC (UK) CAD Standard** as the basis for its layering convention, in conjunction with the **Common Arrangement of Work Sections (CAWS)**.

The AEC (UK) CAD Standard is developed from previously existing CAD standards documentation (BS1192 part 5, Autodesk User Group's CAD Layering in The Construction Industry, and the committee's own internal and project based CAD standards) in order to provide an update of those documents to allow for more up-to-date CAD usage.

Template files can be supplied for consultants and contractors to use which have the Whitecroft Green layers already loaded. It should be noted that the BS and Whitecroft Green template files form the basis of the layering code system.

Additional layers can be added within the parameters of BS1192 using the coding system for products literature. See Appendix D and E

Colours

All colours of lines should be BYLAYER i.e. governed by the colour as shown in the layer dialogue box. Drawings will not be accepted where entities are coloured individually.

Linetypes

All linetypes should also be BYLAYER. Generally a linetype scale of 1 should be used. A file containing all additional Whitecroft Green line types is available upon request

Polylines

Where requested, Consultants are required to include appropriate layers with an outline drawn closed to enable the area to be calculated, by way of polylines.

The polylines should be drawn to define required area or areas, as defined by the RICS Code of Measuring Practice 6th edition. In broad terms, this means that the polylines should be drawn to the internal face of external walls and the centreline of internal partitions/walls etc..

Theses should be drawn on layer(s);-

- A001_AREA_Gross External = m²
- A001_AREA_Gross Internal = m²
- A001_AREA_Net Internal = m²

Room Data

Room Data should be included on all plans and the numbering/naming convention agreed with the project leader prior to submission. They should be drawn on layer(s);-

- A001_Room Number = alphanumeric
- A001_Room Name = text
- A001_Room Area = m²
- A001_Room Description = text

This information should be positioned in the centre of the polylined space. The text justification should be 'Left'. This is important to enable the room numbers to be clearly seen in context of each room.

Symbols & Libraries for Drawings

Whitecroft Green has an extensive but not exhaustive library of AutoCAD symbols. All these symbols are in AutoCAD LT format.

Appendix A – Whitecroft Green - Layer names and descriptions

Whitecroft Green - Layer names and descriptions

Layer / Description	Lineweight	Linetype	Colour
GENERAL LAYERS			
Layer in the process of being updated please refer to revised issue			

Appendix B - Ordnance Survey - Layer names and descriptions

Ordnance Survey - Layer names and descriptions

Layer	Description	Linetype	Colour
G8010001	Building outline	Continuous	Red
G8010004	Building outline (overhead)	Dashed	Red
G8010007	Civil Parish or community boundary	Continuous	Magenta
G8010008	District or unitary authority boundary	Continuous	Magenta
G8010009	County boundary	Continuous	Magenta
G8010010	Electoral division or Ward boundary	Continuous	Magenta
G8010011	Boundary post or stone	Continuous	Magenta
G8010013	Boundary half mereing symbol	Continuous	Magenta
G8010014	Railway (narrow gauge)	Continuous	
G8010015	Railway (standard gauge)	Continuous	
G8010021	Road (public) edge of metalling	Dashed	Blue
G8010025	Triangulation point	Continuous	Blue
G8010026	Bench mark	Continuous	Blue
G8010027	Spot height	Continuous	Blue
G8010030	General line detail, hedges	Continuous	White
G8010032	General ground level or minor	Dashed	White
G8010033	Underground alignments,	Dashedx2	Blue
G8010035	Vegetation or landform limit	Dashed	Green
G8010036	Vegetation or landform limit	Dashed	Green
G8010043	Overhead detail	Dashedx2	Blue
G8010049	Pylon, tower, flare stack	Continuous	Blue
G8010052	Minor detail	Continuous	White
G8010057	Point feature	Continuous	White
G8010059	Water detail	Continuous	Cyan
G8010069	Flow arrow	Continuous	Cyan
G8010071	Mean high water (springs)	Continuous	Cyan
G8010072	Mean low water (springs)	Continuous	Cyan
G8010079	European, parliamentary or assembly constituency boundary	Continuous	Magenta
G8010098	Centreline public road	Continuous	Yellow
G8010321	Roofed building indicator	Continuous	Red
G8010323	Glasshouse indicator	Continuous	White
G8010372	Positioned coniferous tree - seed	Continuous	Green
G8010373	Positioned non-coniferous	Continuous	Green
G8010374	Top of slope	Continuous	Red
G8010375	Top of cliff	Continuous	Red
G8010376	Bottom of cliff or slope	Dashed	Brown
G8010377	Area of boulders - seed	Continuous	Brown
G8010378	Area of scattered boulders - seed	Continuous	Brown
G8010379	Area of coniferous trees - seed	Continuous	Green
G8010380	Area of scattered coniferous	Continuous	Green
G8010381	Area of coppice or osier - seed	Continuous	Green
G8010382	Area of marsh, saltmarsh or	Continuous	Green
G8010384	Area of non-coniferous trees - seed	Continuous	Green

G8010385	Area of scattered non-coniferous	Continuous	Green
G8010386	Area of orchard – seed	Continuous	Green
G8010387	Area of heath – seed	Continuous	Green
G8010388	Area of rock – seed	Continuous	Brown
G8010389	Area of scattered rock – seed	Continuous	Brown
G8010390	Area of rough grassland – seed	CONTINUOUS	GREEN
G8010392	Area of scrub – seed	CONTINUOUS	GREEN
G8010392	Upper level of communication – seed	CONTINUOUS	MAGENTA
G8010396	Area of cliff – seed	CONTINUOUS	BROWN
G8010397	Area of slope – seed	CONTINUOUS	BROWN
G8010400	Water surface – seed	CONTINUOUS	CYAN
G8010570	Copyright and registered trade mark	CONTINUOUS	WHITE
G8010571	Footnotes	STANDARD	WHITE
G8010572	Grid lines	DOT	WHITE
G8010573	Neatline	CONTINUOUS	WHITE
G8010574	Marginal text	STANDARD	MAGENTA
G8010575	Grid values	STANDARD	WHITE
G8011000	Road names and numbers	STANDARD	BLUE
G8011005	Administrative boundary text	STANDARD	MAGENTA
G8011006	Building names and numbers	STANDARD	RED
G8011009	Miscellaneous text	STANDARD	WHITE
G8011010	Water feature text	STANDARD	CYAN
G8011013	Land parcel number	STANDARD	GREEN
G8011210	Area of scree – seed	CONTINUOUS	BROWN
G8011211	Positioned boulder	CONTINUOUS	BROWN
G8011212	Rock or ridge line	CONTINUOUS	RED

Appendix C – AutoCAD QA Checklist

Appendix C – AutoCAD QA Checklist

CAD drawings delivered upon closeout of a project must be accompanied by submission of the following checklist. When a checklist has been signed and submitted, the vendor (architect, engineer, contractor, etc.) is assuring that all materials adhere to the standards and guidelines set out in this document.

CHECKLIST --

File Format and Setup

- Electronic File Format
- Scale, Units & Tolerances
- Fonts and Text Styles
- Blocks
- Title blocks
- Policy on Model Space and Paper Space
- Policy on External Reference Files (XREFs)

Layering

- Standard Layer List
- Layer Name Formatting
- General Rules about Naming and Uses
- Layer Attributes (Colors, Pens, Linetypes)

File Name Conventions

- Building and Floor Identification Codes
- Discipline Identification Codes
- Drawing Type Codes
- Drawing Numbers

Policy on CAD File Translation

- Full AutoCAD Compliance
- Translation Testing Procedures (if applicable)

Name of Accountable Vendor Representative (*please print*)

Signature of Accountable Vendor

Representative

Phone Number

Date

Appendix D – Layer Naming and Coding

Example layer naming and coding

Fields **1**, **2** & **3** are mandatory; field **4** is optional.

1		2	3	4
Agent		Element	Presentation	Alias
A	Architect	Common Arrangement of Works Sections CAWS	D - Dimensions	Optional
B	Building Surveyor		G - Graphics	
C	Civil Engineer		H - Hatching	
D	Drainage, Highways Engineer		T - Text	
E	Electrical Engineer		M - Model Graphics	
F	Facilities Manager		- (hyphen) whole	
G	GIS, Land Surveyor		Model or drawing	
H	Heating, Ventilation Designer		definition	
I	Interior Designer		P - Page, Plot related	
K	Client		Graphics	
L	Landscape Architect			
M	Mechanical Engineer			
P	Public Health Engineer			
Q	Quantity Surveyor			
S	Structural Engineer			
T	Town, Country Planner			
W	Contractor			
X	Sub-Contractor			
Y	Specialist Designer			
Z	General (non disciplinary)			

Appendix E – Common Arrangement of Work Sections

STANDARD VERSION

Contents

B	Complete buildings/ structures/ units
C	Demolition/ Alteration/ Renovation
D	Groundwork
E	In situ concrete/ Large precast concrete
F	Masonry
G	Structural/ Carcassing metal/ timber
H	Cladding/ Covering
J	Waterproofing
K	Linings/ Sheathing/ Dry partitioning
L	Windows/ Doors/ Stairs
M	Surface finishes
N	Furniture/ Equipment
P	Building fabric sundries
Q	Paving/ Planting/ Fencing/ Site furniture
R	Disposal systems
S	Piped supply systems
T	Mechanical heating/Cooling/Refrigeration systems
U	Ventilation/Air conditioning systems
V	Electrical supply/power/lighting systems
W	Communications and security systems - domestic
X	Transport Systems
Y	General engineering services
Z	Building fabric reference specification

Preliminaries		A Preliminaries/General Conditions	
Complete buildings/units		B Complete buildings/structures units	
Parts of buildings (by type of work)	Work which is wholly and peculiarly to do with altering the site and any existing buildings.	C Existing site/buildings/services D Groundwork	
	Building fabric and site	Structure/Carcass work	E In situ concrete/Large precast concrete F Masonry G Structural/Carcassing metal/timber
		Space enclosure work	H Cladding/covering J Waterproofing K Linings/Sheathing/Dry partitioning L Windows/Doors/Stairs
		Finishing and furnishing work (building)	M Surface finishes N Furniture/Equipment
		Sundry work	P Building fabric sundries
		Finishing and furnishing work (site)	Q Paving/Planting/Fencing/Site furniture
		Services	Mechanical (mainly piped or ducted work)
	Electrical work		V Electrical supply/power/Lighting systems W Communications/Security/Control systems
	Electromechanical work		X Transport systems
	Reference specification		Y Services reference specification Z Building fabric reference specification

Work Sections	
B	Complete Buildings/Structures/Units
B10	Prefabricated buildings/structures
B11	Prefabricated building units
C	Existing Site/Buildings/Services
C10	Site survey
C11	Site investigation
C12	Underground services survey
C13	Building fabric survey
C14	Building services survey
C20	Demolition
C21	Toxic/Hazardous material removal
C30	Shoring/Façade retention
C40	Cleaning masonry/concrete
C41	Repairing/Renovating/Conserving masonry
C42	Repairing/Renovating/Conserving concrete
C45	Damp proof course renewal/insertion
C50	Repairing/Renovating/Conserving metal
C51	Repairing/Renovating/Conserving timber
C52	Fungus/Beetle eradication
C90	Alterations – spot items
D	Groundwork
D11	Soil stabilisation
D12	Site dewatering
D20	Excavating and filling
D21	Ground gas venting
D30	Piling
D40	Embedded retaining walls
D41	Crib walls/Gabions/reinforced earth
D50	Underpinning
E	In situ Concrete/Large Precast Concrete
E05	In situ concrete construction generally
E10	Mixing/Casting/Curing in situ concrete
E11	Sprayed in situ concrete
E20	Formwork for in situ concrete
E30	Reinforcement for in situ concrete
E31	Post tensioned reinforcement for in situ concrete
E40	Designed joints in in situ concrete
E41	Worked finishes/Cutting to in situ concrete
E42	Accessories cast into in situ concrete
E50	Precast concrete frame structures

E60

| Precast/Composite concrete decking

F	Masonry
F10	Brick/ Block walling
F11	Glass block walling
F20	Natural stone rubble walling
F21	Natural stone/ashlar walling/dressings
F22	Cast stone ashlar walling/ dressings
F30	Accessories/Sundry items for brick/ block/stone walling
F31	Precast concrete sills/lintels/copings/features
G	Structural/Carcassing Metal/ Timber
G10	Structural steel framing
G11	Structural aluminium framing
G12	Isolated structural metal members
G20	Carpentry/Timber framing/First fixing
G30	Metal profiled sheet decking
G31	Prefabricated timber unit decking
G32	Edge supported/Reinforced woodwool/rock fibre decking
H	Cladding/Covering
H10	Patent glazing
H11	Curtain walling
H12	Plastics glazed vaulting/walling
H13	Structural glass assemblies
H14	Concrete rooflights/pavement lights
H20	Rigid sheet cladding
H21	Timber weatherboarding
H30	Fibre cement profiled sheet cladding/covering/siding
H31	Metal profiled sheet cladding/covering/siding
H32	Plastics profiled sheet cladding/covering/siding
H33	Bitumen and fibre profiled sheet cladding/covering
H40	Glass fibre reinforced cement panel cladding/features
H41	Glass fibre reinforced plastics panel cladding/features
H42	Precast concrete panel cladding/features
H43	Metal panel cladding/features
H50	Precast concrete slab cladding/features
H51	Natural stone slab cladding/features
H51	Cast stone slab cladding/features
H60	Plain roof tiling
H61	Fibre cement slating
H62	Natural slating
H63	Reconstructed stone slating/tiling
H64	Timber shingling
H65	Single lap roof tiling
H66	Bituminous felt shingling
H70	Malleable metal sheet prebonded coverings/cladding
H71	Lead sheet coverings/flashings

H72	Aluminium strip/sheet coverings/flashings
H73	Copper strip/sheet coverings/flashings
H74	Zinc strip/sheet coverings/flashings
H75	Stainless steel strip/sheet coverings/flashings
H76	Fibre bitumen thermoplastic sheet coverings/flashings
H90	Tensile fabric coverings
H91	Thatch roofing
H92	Rainscreen cladding
J	Waterproofing
J10	Specialist waterproof rendering
J20	Mastic asphalt tanking/damp proofing
J21	Mastic asphalt roofing/insulation/finishes
J22	Proprietary roof decking with asphalt finish
J30	Liquid applied tanking/damp proofing
J31	Liquid applied waterproof roof coatings
J32	Sprayed vapour control layers
J33	In situ glassfibre reinforced plastics
J40	Flexible sheet tanking/damp proofing
J41	Built up felt roof coverings
J42	Single layer polymeric sheet roof coverings
J43	Proprietary roof decking with felt finish
J44	Sheet linings for pools/lakes/waterways
K	Linings/Sheathing/Dry partitioning
K10	Plasterboard dry linings/partitions/ceilings
K11	Rigid sheet flooring/sheathing/decking/sarking/linings/casings
K12	Under purlin/Inside rail panel linings
K13	Rigid sheet fine linings/panelling
K14	Glassfibre reinforced gypsum linings/panelling/casings/mouldings
K15	Vitreous enamel linings/panelling
K20	Timber board flooring/decking/sarking/linings/casings
K21	Wood strip/board fine flooring/linings
K30	Panel partitions
K32	Panel cubicles
K33	Concrete/Terrazzo partitions
K40	Demountable suspended ceilings
K41	Raised access floors
L	Windows/Doors/Stairs
L10	Windows/Rooflights/Screens/Louvres
L20	Doors/Shutters/Hatches
L30	Stairs/Walkways/Balustrades
L40	General glazing
L41	Lead light glazing
L42	Infill panels/sheets

M	Surface Finishes
M10	Cement:sand/Concrete screeds/toppings
M11	Mastic asphalt flooring/floor underlays
M12	Trowelled bitumen/resin/rubber-latex flooring
M13	Calcium sulphate based screeds
M20	Plastered/Rendered/Roughcast coatings
M21	Insulation with rendered finish
M22	Sprayed monolithic coatings
M23	Resin bound mineral coatings
M30	Metal mesh lathing/anchored reinforcement for plastered coatings
M40	Stone/Concrete/Quarry/Ceramic tiling/Mosaic
M41	Terrazzo tiling/In situ terrazzo
M42	Wood block/Composition block/Parquet flooring
M50	Rubber/Plastics/Cork/Lino/Carpet tiling/sheeting
M51	Edge fixed carpeting
M52	Decorative papers/fabric
M60	Painting/Clear finishing
M61	Intumescent coatings for fire protection of steelwork
N	Furniture/Equipment
N10	General fixtures/furnishings/equipment
N11	Domestic kitchen fittings
N12	Catering equipment
N13	Sanitary appliances/fittings
N15	Signs/Notices
N16	Bird/vermin control
N20	Special purpose fixtures/furnishings/equipment
P	Building Fabric Sundries
P10	Sundry insulation/proofing work/fire stops
P11	Foamed/Fibre/Bead cavity wall insulation
P20	Unframed isolated trims/skirtings/sundry items
P21	Door/Window ironmongery
P22	Sealant joints
P30	Trenches/Pipeways/Pits for buried engineering services
P31	Holes/Chases/Covers/Supports for services
Q	Paving/Planting/Fencing/Site furniture
Q10	Kerbs/Edgings/Channels/Paving accessories
Q20	Granular sub-bases to roads/pavings
Q22	Coated macadam/Asphalt roads/pavings
Q23	Gravel/Hoggin/Woodchip roads/pavings
Q24	Interlocking brick/block roads/pavings
Q25	Slab/Brick/Sett/Cobble pavings
Q26	Special surfacings/pavings for sport/general amenity

Q30	Seeding/Turfing
Q31	External planting
Q32	Internal planting
Q35	Landscape maintenance
Q40	Fencing
Q41	Barriers/Guardrails
Q50	Site/Street furniture/equipment
R	Disposal Systems
R10	Rainwater pipework/gutters
R11	Foul drainage above ground
R12	Drainage below ground
R13	Land drainage
R14	Laboratory/Industrial waste drainage
R20	Sewage Pumping
R21	Sewage treatment /sterilization
R30	Centralised vacuum cleaning
R31	Refuse chutes
R32	Compactors/Macerators
R33	Incineration plant
S	Piped Supply Systems
S10	Cold water
S11	Hot water
S12	Hot and cold water (self contained specification)
S13	Pressurised water
S14	Irrigation
S15	Fountains and water features
S20	Treated/Deionised/Distilled water
S21	Swimming pool water treatment
S30	Compressed air
S31	Instrument air
S32	Natural gas
S33	Liquefied petroleum gas
S34	Medical/Laboratory gas
S40	Petrol/Diesel storage/distribution
S50	Vacuum
S51	Steam
S60	Fire hose reels
S62	Wet risers
S63	Sprinklers
S64	Deluge
S65	Fire hydrants
S70	Gas fire fighting
S71	Foam fire fighting

T	Mechanical Heating/Cooling/Refrigeration Systems
T10	Gas/Oil fired boilers
T11	Coal fired boilers
T12	Electrode/Direct electric boilers
T13	Packaged steam generators
T14	Heat pumps
T15	Solar collectors
T16	Alternative fuel boilers
T20	Primary heat distribution
T30	Medium temperature hot water heating
T32	Low temperature hot water heating
T32	Low temperature hot water heating (self-contained specification)
T33	Steam heating
T40	Warm air heating
T41	Warm air heating (self-contained specification)
T42	Local heating units
T50	Heat recovery
T60	Central refrigeration plant
T61	Chilled water
T70	Local cooling units
T71	Cold rooms
T72	Ice pads
T90	Heating systems – domestic
U	Ventilation/Air Conditioning Systems
U10	General ventilation
U11	Toilet ventilation
U12	Kitchen ventilation
U13	Car parking ventilation
U14	Smoke extract/Smoke control
U15	Safety cabinet/Fume cupboard extract
U16	Fume extract
U17	Anaesthetic gas extract
U20	Dust collection
U30	Low velocity air conditioning
U31	VAV air conditioning
U32	Dual-duct air conditioning
U33	Multi-zone air conditioning
U40	Induction air conditioning
U41	Fan-coil air conditioning
U42	Terminal re-heat air conditioning
U43	Terminal heat pump air conditioning
U50	Hybrid system air conditioning
U60	Air conditioning units
U70	Air curtains

V	Electrical Supply/Power/Lighting Systems
V10	Electricity generation plant
V11	HV supply/distribution/public utility supply
V12	LV supply/public utility supply
V20	LV distribution
V21	General lighting
V22	General LV power
V30	Extra low voltage supply
V31	DC supply
V32	Uninterruptible power supply
V40	Emergency lighting
V41	Street/Area/Flood lighting
V42	Studio/Auditorium/Arena lighting
V50	Electric underfloor/ceiling heating
V51	Local electric heating units
V90	Electrical installation (self-contained specification)
W	Communications and Security Systems - Domestic
W10	Telecommunications
W11	Paging/Emergency call
W12	Public address/Conference audio facilities
W20	Radio/TV/CCTV
W21	Projection
W22	Information/Advertising display
W23	Clocks
W30	Data transmission
W40	Access control
W41	Security detection and alarm
W50	Fire detection and alarm
W51	Earthing and bonding
W52	Lightning protection
W53	Electromagnetic screening
W54	Liquid detection alarm
W60	Central control/Building management
X	Transport Systems
X10	Lifts
X11	Escalators
X12	Moving pavements
X13	Powered stairlifts
X14	Fire escape chutes/slings
X20	Hoists
X21	Cranes
X22	Travelling cradles/gantries/ladders
X23	Goods distribution/Mechanised warehousing
X30	Mechanical document conveying
X31	Pneumatic document conveying

X32	Automatic document filing and retrieval
Y	Services Reference Specification
Y10	Pipelines
Y11	Pipeline ancillaries
Y20	Pumps
Y21	Water tanks/cisterns
Y22	Heat exchangers
Y23	Storage cylinders/Calorifiers
Y24	Trace heating
Y25	Cleaning and chemical treatment
Y30	Air ductlines/ancillaries
Y40	Air handling units
Y41	Fans
Y42	Air filtration
Y43	Heating/Cooling coils
Y44	Air treatment
Y45	Silencers/Acoustic treatment
Y46	Grilles/Diffusers/Louvres
Y50	Thermal insulation
Y51	Testing and commissioning of mechanical services
Y52	Vibration isolation mountings
Y53	Control components – mechanical
Y59	Sundry common mechanical items
Y60	Conduit and cable trunking
Y61	HV/LV cables and wiring
Y62	Busbar trunking
Y63	Support components – cables
Y70	HV switchgear
Y71	LV switchgear and distribution boards
Y72	Contactors and starters
Y73	Luminaires and lamps
Y74	Accessories for electrical services
Y80	Earthing and bonding components
Y81	Testing and commissioning of electrical services
Y82	Identification – electrical
Y89	Sundry common electrical items
Y90	Fixing to building fabric
Y91	Off-site painting/Anti-corrosion treatments
Y92	Motor drives – electric
Z	Building Fabric Reference Specification
Z10	Purpose made joinery
Z11	Purpose made metalwork
Z12	Preservative/Fire retardant treatments for timber
Z20	Fixings/Adhesives
Z21	Mortars
Z22	Sealants
Z31	Powder coatings

Z32	Liquid coatings
Z33	Anodising
