External Steel Staircase and Railing Structures
Design Guidelines and Specifications

CHILD DAY CARE CENTRE,
MOSTA TECHNOPARK

L30 STAIRS/ LADDERS/ WALKWAYS/ HANDRAILS/ BALUSTRADES .................. 2
L35 FIXED UTILITARIAN ACCESS SYSTEMS ....................................................... 6
Z11 PURPOSE MADE METALWORK ................................................................... 17
Z20 FIXINGS/ADHESIVES .................................................................................... 22
Z21 MORTARS ........................................................................................... ........ 25
L30 STAIRS/ LADDERS/ WALKWAYS/ HANDRAILS/

BALUSTRADES

- Refer to detail below for sectional and elevation detailed sketches.

PRELIMINARY INFORMATION/ REQUIREMENTS

110 DESIGN
- Design standard: The following items have been designed to BS 5395 where applicable: internal and external railings.
- Completion of design: Finalize details to meet structural and safety requirements of BS 5395.

130 SITE DIMENSIONS
- Procedure: Before starting work on designated items take site dimensions, record on shop drawings and use to ensure accurate fabrication.
- Designated items: internal galvanised steel railings for staircase and slab edge including wooden grab rail.

COMPONENTS

570 PURPOSE MADE RAILING FOR INTERNAL STAIRCASE AND SLAB EDGE
- Component material, grade and finish as delivered: low carbon (mild) steel, galvanised to BS EN ISO 1461, as per Section Z11.
- Grab rail: in timber, as per detail drawing listed above.
  - Wood species: Beech – ‘Fagus’.
  - Appearance class to BS EN 942: J30.
  - Moisture content: 9-13%
  - Finish as delivered: transparent (natural or dark stained colour/grain), subject to client’s approval.
- Main Vertical Posts: Rectangular hollow sections, galvanised, primed, painted in ‘silver metallic’. 
- Brackets: in galvanised steel work to match railing, as per detail drawing below.
- Workmanship: Refer to the relevant section, as follows:
  - Metalwork: To Section Z11.
  - Paintwork: To include priming and application by spray.
  - Paint colour: subject to client’s choice; contractor to prepare sample area for approval.
- Other requirements: Bolt assemblies in galvanised steelwork.
- Fixing: Bracketed to side of staircase or slab edge as per detail drawing below.

![Diagram of handrail system]

NOTES:
1. Wooden handrail
2. 10mm galvanised steel solid bars
3. 10mm x 40mm galvanised steel plate
4. 10mm galvanised steel anchored to the concrete with 4 no. Ø12mm anchor bolts
5. 40mm galvanised steel square hollow section

600 RAMP HANDRAIL GUARDING SYSTEM
- Method of provision: Fabricated off-site and assembled on site.
- Dimensions: to be fixed on top of parapet wall following inclined ramp perimeter, approx. 500mm high from top of wall.
  [Refer to sketch drawing below]
- Basic component material: Galvanised carbon steel sections as per clause 420.
- Hand Rail: Circular hollow sections, galvanised, primed, painted in ‘charcoal grey’ to match new apertures.
- Verticals: Circular hollow sections, galvanised, primed, painted in ‘charcoal grey’ to match new apertures.
- Rods: Circular hollow rods, galvanised, primed, painted in ‘charcoal grey’ to match new apertures.
- Assembly connectors: Galvanised and painted bolts, if necessary.
- Fixing to parapet wall structure: Galvanised and painted bolts.
- Accessories: nil

**NOTES:**

1. 50mm diameter 3mm thickness galvanised circular hollow section
2. 40mm diameter galvanised steel circular hollow section
3. 10mm diameter galvanised steel rods
4. End fixing plate w/ bolts

ALL elements to be galvanised, primed and painted in ‘charcoal grey’ to match new apertures

**INSTALLATION**

**610 MOISTURE CONTENT**

- Temperature and humidity: Monitor and control internal conditions to achieve specified moisture content in wood components at time of installation.
620 PRIMING/ SEALING/ PAINTING

- Surfaces inaccessible after assembly/ installation: Before fixing components, apply full protective/ decorative treatment/ coating system.

630 CORROSION PROTECTION OF DISSIMILAR MATERIALS

- Components/ substrates/ fasteners of dissimilar materials: Isolate using washers/ sleeves or other suitable means to separate materials to avoid corrosion and/ or staining.

640 INSTALLATION GENERALLY

- Fasteners and methods of fixing: To section Z20.
- Structural members: Do not modify, cut, notch or make holes in structural members, except as indicated on drawings.
- Temporary support: Do not use stairs, walkways or balustrades as temporary support or strutting for other work.
L35 FIXED UTILITARIAN ACCESS SYSTEMS

GENERAL REQUIREMENTS/ INFORMATION

150 EXTERNAL STAIR SYSTEM
- Method of provision: Fabricated off-site and assembled on site.
- Dimensions: Approx. 3.4m by 4.8m measured externally.
  [Refer to tender drawing 0332-G-087-00]
- Basic component material: Galvanised carbon steel sections as per clause 420, galvanised, primed, painted in ‘charcoal grey’ to match new external apertures.
- Treads: Galvanised open bar grating, galvanised, unpainted, as shown on tender drawing.
- Stringers: Channels; size to be established by manufacturer’s designer.
- Landings: Galvanised open bar grating, to match treads.
- Guarding system: Handrail as per clause 170.
- Assembly connectors: Galvanised and painted bolt assemblies.
- Fixing to superstructure: Holding down bolts in ground slab and expanding bolts in concrete platform structure, as per manufacturer’s design.
- Accessories: Chequer plate trim along outer edge of treads and landings grating.

170 STAIRS HANDRAIL GUARDING SYSTEM
- Method of provision: Fabricated off-site and assembled on site.
- Dimensions: outer and inner perimeters.
  [Refer to tender drawing 0332-G-087-00]
- Basic component material: Galvanised carbon steel sections as per clause 420.
- Handgrab: Rectangular hollow sections, galvanised, primed, painted in ‘green’ to match existing steelwork within site.
- Handrails: Vertical solid circular rods, galvanised, primed, painted in ‘green’ to match existing steelwork within site.
- Assembly connectors: Galvanised and painted bolts.
- Fixing to parent structure: Galvanised and painted bolts.
- Accessories: nil
190 STEEL GATE - ACCESS GUARDING SYSTEM

- Method of provision: Fabricated off-site and assembled on site.
- Dimensions:
  - Access Ramp — 1200mm wide x 1100mm high
  - Fire escape staircase — 1200mm wide x 1100mm high
  [Refer to sketch drawing below]
- Basic component material: Galvanised carbon steel sections as per clause 420.
- Frame: Rectangular hollow sections, galvanised, primed, painted in ‘green’ to match existing steelwork within site.
- Rails: Vertical solid circular steel rods, galvanised, primed, painted in ‘green’ to match existing steelwork within site with bottom flat bar.
- Assembly connectors: Galvanised and painted bolts.
- Fixing to parent structure: Galvanised and painted bolts.
- Accessories: Locking set to provide security system

NOTES:
1 Rectangular hollow section supports
2 Hinges 2 in no.
3 Rectangular hollow section frame structure
4 Steel rods/bars
5 Lock set

ALL elements to be galvanised, primed and painted in ‘green’ to match existing steel structure
SYSTEM PERFORMANCE

210 DESIGN

- Design: Manufacturer to design, manufacture, erect and certify structure.
- Design standards:
  - Straight stairs and winders: In accordance with BS 5395-1.
- Proposals: Submit drawings, technical information, calculations and manufacturers’ literature.

240 STRUCTURAL DESIGN

- Design standard: BS 5950-1 and Eurocode EC3.
- Deflections (maximum): As per design code specifications.
- Characteristic loads: Superimposed 5kN/sqm; Wind load 1.1kN/sqm.

250 EXTERNAL STAIRCASE PERFORMANCE CRITERIA

- Requirements: Fire escape staircase.

420 CARBON STEEL COMPONENTS

- Grade: steel to be galvanized S275 J0, external.
- Options: 2 and 5, galvanized.
- Solid plates: to BS 4592-5.
- Open bar gratings: to BS 4592-1
  - Depth of load bearing bars to be determined from manufacturer’s loading tables.
- Stair System and Handrail Finish: galvanized, primed and painted.
  - Columns and stringers in ‘charcoal grey’.
  - Handrails in ‘green’ to match existing metalwork.
  - Open bar grating galvanized, unpainted.
- Ramp Handrail Finish: galvanized, primed and painted.
  - Handrails in ‘charcoal grey’ to match new external apertures.
- Fixings: Refer to Section Z20.
- Source: Obtain steel from a source accredited to a national or internationally accepted quality standard. Steel sections and plates are to be obtained from the same source.
- Other requirements: Steel to be hot-dip galvanized to have a carbon equivalent value not exceeding 0.44.
- All steel sections, plates and components are to be accompanied with the supplier’s certificate of quality.
FABRICATION

475 GENERALLY

- The manufacturing/fabrication facility is to be accredited to a national or international quality standard. Submit proof of accreditation with tender offer.
- Fabrication is to be carried out to the requirements of the National Structural Steelwork Specification for Building Construction (NSSS), 5th Edition, BCSA & SCI publication no. 203/07.

480 NOTIFICATION OF COMMENCEMENT

- Give notice: Before fabrication is due to start.
  - Period of notice (minimum): Fifteen working days.

490 MARKING

- Identifying and recording materials and components:
- Location of marks:
  - Generally: Visible for checking after erection.
- Steel to be blast cleaned, pickled, and galvanized: Marked so that subsequent treatment cannot obliterate the marking.

495 HARD STAMPING

- Usage: Not permitted.

510 END CONNECTIONS

- Angle web cleats: Project 10 mm beyond ends of simply supported members.

515 HOLLOW SECTIONS

- Insides of sections: Debris and moisture removed before sealing ends and openings.

525 STEELWORK THAT IS TO BE GALVANIZED

- Cutting, drilling and shop welding: Complete before galvanizing.
- Vent and drain holes: Provide as necessary.
  - Locations: Submit proposals.
  - Sealing: not required.

535 SHOP INSPECTION

- Give notice: Before fabricating arrange for the Project team to visit the fabrication facility.
  - Period of notice (minimum): 30 days.
WELDING

655 SITE WELDING
- Usage: Not permitted.
- All welding procedures and testing shall be carried out in accordance with the requirements of the National Structural Steelwork Specification for Building Construction (NSSS), 5th Edition, BCSA & SCI publication no. 203/07, and the relevant British Standards.
- All welders carrying out works on this contract are to be certified to BS EN 287-1.

670 ADDITIONAL WELDS
- Welds (including tack welds) not indicated on drawings: Not permitted without approval.

690 FINISHED WELDS
- Finished welds: Carefully dressed to remove slag without deforming surface of weld.

BOLT ASSEMBLIES

700 GENERALLY
- All bolts, bolting procedures and tests shall be carried out in accordance with the requirements of the National Structural Steelwork Specification for Building Construction (NSSS), 5th Edition, BCSA & SCI publication no. 203/07, and the relevant British Standards.

710 BOLT GRADE
- Bolts to be minimum grade 8.8

702 NON-PRELOADED BOLT/ SCREW ASSEMBLIES
- Nuts and washers: To suit grade of bolt, as NSSS, clause 2.7.

715 HOLDING DOWN SYSTEMS
- The contractor is to liaise with the civil works contractor to ensure that any holding down systems are manufactured, delivered, checked, erected and cast into the concrete ring beams at the appropriate stage within the programme of works, such that no delays are created.

735 SPRING WASHERS
- Standard: To BS 4464.

770 GALVANIZED COATING TO BOLT ASSEMBLIES
- Standard: To BS 7371-6.
- Galvanizing: Applied by fastener manufacturer. Passivated and lubricated if no additional coatings are specified. Nuts tapped after galvanizing.
- Use/ location: All shop and site connections.

**STORAGE AND ASSEMBLY**

880  GENERALLY

- All structural steel at the site shall be stored and handled so that sections are not subjected to excessive stresses and damage. The component parts shall be assembled in such a manner that they are neither twisted nor deformed or otherwise damaged and shall be so prepared that the specified cambers, if any, are provided. All tubular members shall be sealed so as to prevent the access of moisture to the inside of these members.
- The Contractor shall be solely responsible for any damage done to the structure before erection and any members which have been distorted before erection shall be straightened or replaced at the Contractor’s expense as directed by the Project Manager.

890  STORAGE OF GALVANIZED STEELWORK

- Galvanized steelwork shall be supported off the ground with items separated by wooden battens allowing free circulation of air. Avoid “ponding” (retention of standing water) by laying down sections to ensure adequate drainage.
- Ensure adequate care in handling to minimise mechanical damage.

**DESIGN OF THE ERECTION PROCESS**

905  OUTLINE METHOD OF ERECTION

- A detailed method of erection of the various parts of the works is to be submitted with the tender offer. This shall include:
  - A list of plant that has been assumed during the design of the erection process
  - The proposed sequence of erecting the structure.
  - Clear instruction as to how the individual components are to be handled, lifted and fastened into place.
  - Any assumed temporary supports and the load resistance that such temporary supports are to provide.

910  PRE-ERECTION CHECKS

- Scope: At least 7 days before proposed erection start date, check the following:
  - Foundations and other structures to which steelwork will be attached: Accuracy of setting out.
  - Holding down bolts: Position, protruding length, slackness and condition.
- Inaccuracies and defects: Report without delay.
- Obtain permission to commence erection from the Project Manager.
920 SETTING OUT
- The contractor shall be responsible for supervising the accuracy of the relevant setting out of works necessary in the fabrication shop and on site. The contractor shall also check and liaise with other contractors and obtain the approval of the Project Manager as regards the foundations and other structures to which the steelworks will be attached. The positioning and levelling of all steelwork, etc., the plumbing of stanchions and the placing of every part of the structure with accuracy and as required by the relevant specifications shall be the responsibility of the erection contractor and in accordance with the approved drawings and to the satisfaction of the Project Manager.
- Permissible deviations: comply with the requirements of NSSS Section 9.

925 MODIFICATIONS
- Steelwork: Do not modify without approval.
- Temporary fabrication/erection attachments: Do not remove.

932 TEMPORARY SUPPORT
- Elements to be supported during the erection process are to be clearly indicated in the drawings submitted by the contractor at tender stage. Methods of supporting these members temporarily are to be clearly detailed in the tender submission.
- Bracing/Restraints: Provide as necessary until permanent connections can be made.

940 COLUMN BASES
- Levels: Adjust using steel shims or folding wedges no larger than necessary.
- Location of shims/wedges: Position symmetrically around perimeter of base plate. Do not use a single central pack.
- Give notice: If space beneath any column base is outside specified limits for bedding thickness.
- Accuracy of erection: Check, and correct errors before filling and bedding beneath bases and carrying out other adjacent work.

943 PROPRIETARY FILLING/BEDDING OF COLUMN BASES
- Bedding thickness range: 25-40mm.
- Preparation: Concrete surfaces scarified to provide a good mechanical key.
- Bolt pockets and spaces beneath base plates: Completely filled with expansive grout, such as SIKAGROUT 312 or an equivalent product, to be approved by the Project Manager.
TESTING

965 TESTING
- Testing: Tests on welds will be carried out by an independent accredited external body at random on components during and after fabrication, before galvanising. Components failing such tests will need to be re-welded and re-tested before being accepted.
- Tests: As per NSSS Section 11.
- Certificates: To be issued by independent accredited body.

975 PRODUCTS
- Steel: Submit test certificates.
- Bolt Assemblies: Submit test certificates from supplier/manufacturer.

PROTECTIVE COATING SYSTEMS

1000 ACCREDITATION OF COATING MANUFACTURER
- Submit certificates of accreditation of coating manufacturer with tender offer.

1035 INSPECTION OF COATING WORK
- Work in progress: Permit coating manufacturer to inspect and take samples of products.
- Testing: Inspection and testing of works in progress and finished works by an accredited independent body at the coating manufacturer.
- Notice: Give notice of dates for:
  - Start of surface preparation and coating.
  - Coated members or components leaving the works.
  - Period of notice (minimum): 5 working days.

1050 INSPECTION AND TESTING FOR LIQUID METAL ASSISTED CRACKING (LMAC)
- Visual inspection: Inspect galvanized surfaces for cracks or indications of LMAC cracking.
  - Extent: All galvanized steelwork
  - Timing: Before erection of steelwork or application of other coatings.
  - Inspector: Submit, on request, evidence of training and competence in visual inspection for LMAC.
- Sites of suspected defects: Remove zinc coating by grinding back to bright metal for a distance of not less than 50 mm around each defect and from a similar area on opposite face of member.
- Nondestructive testing:
  - Test locations: Areas where LMAC is suspected following visual inspection, and corresponding areas of members with similar detailing.
Test methods: Magnetic particle inspection to BS EN 1290, Eddy Current Inspection to BS EN 12084, Ultrasonic testing to BE EN 1714, as instructed by the Project Manager.

- Inspection and test reports: Submit as soon as available.
- Inspection and testing shall be at the contractor’s expense.
- Repairs and recoating: Submit proposals. Repairs and re-coating shall be re-tested before erection.

1010 GALVANIZING TO CHEMICALLY CLEANED STEEL

- Use/ location: All structural steel members.
- Preparation: Chemical cleaning.
- Galvanizing: All steelwork will be To BS EN ISO 1461.
  - Minimum mean coating thickness: 85 micrometres.

1020 GALVANIZING TO BLAST CLEANED STEEL

- Preparation: Blast cleaning to BS EN ISO 8501-1, preparation grade Sa2½ using chilled angular iron grit grade G24 to give a coarse surface profile, followed by chemical cleaning.
- Galvanizing: To BS EN ISO 1461.
  - Minimum mean coating thickness: 140 micrometres.

1060 SHOP PAINTING WITH AN APPROVED PAINT SYSTEM

- Use/ location: All structural and non-structural steelwork
- Shop preparation: Blast clean to BS EN ISO 8501-1, preparation grade Sa2.5
- Shop applied primer:
  - High solid epoxy zinc phosphate primer
  - Minimum dry film thickness: 100 micrometres
- Shop applied finish:
  - High solid aliphatic polyurethane finish
  - Minimum dry film thickness: 100 micrometres
  - Colour: Green RAL 6001
- Details of paint manufacturer, primer/ sealer, any intermediate coat, top coat and their respective methods of application are to be submitted for approval prior to fabrication of any components on which the paints will be used.

1070 JUNCTIONS WITH CONCRETE

- Exposed steelwork partially embedded or encased in concrete: Apply two coats of bituminous coating locally to the steel/concrete junction.
- Bituminous coating: to BS 6949, type 1, class A
EXECUTION

1100 EXECUTION GENERALLY

- Structural members: Do not subject to non-design loading. Do not modify, cut, notch or make unspecified holes.
- Frameworks: Assemble and brace, including temporary members required for installation.
- Temporary support: Do not use access systems as temporary support or strutting for other work.
- External durability of fastenings: Corrosion resistant material or with a corrosion resistant finish.
- Bolted joints:
  - Contact between dissimilar metals: Avoid.
  - Bolts and washers: Select types, sizes and quantities of fasteners or packings and spacings to retain supported components without distortion or loss of support.
- Welded joints:
  - Standards:
    - Aluminium alloys: TIG or MIG welding to BS EN 1011-4.
    - Carbon steel: Metal arc welding to BS EN 1011-1 and -2.
    - Stainless steel: TIG welding to BS EN 1011-3.
  - Surfaces to be jointed: Clean.
  - Tack welds: Use only for temporary attachment.
  - Traces of flux residue, slag and weld spatter: Remove.
  - Surface of welds: Grind smooth.
  - Joints: Fully bonded with no holes of cracks.
- Finished components:
  - Free: From distortion, cracks, burrs and sharp arises.
  - Corner junctions of identical sections: Mitre.
  - Handrails: Smooth and continuous, with no sharp edges.

1140 MARKING OF ANCHOR DEVICES

- Provision: Provide on or near each anchor device a label or other clear marking giving:
  - Manufacturer’s name and telephone number.
  - Serial number and year of manufacture of device.
  - Maximum number of personnel that may be attached to the device at any one time.
  - Requirements for energy absorbers, ground clearance, etc.
- Anchor devices intended solely for use with personal protective equipment: Indicate restriction of use by pictogram or other suitable marking on or near the device.

1160 ANCHORING

- Fixing positions: Coordinate location of holding down bolts and wall fixings with services fixing positions.
COMPLETION

1210  CLEANING
   ▪ General: Clean surfaces and wipe down finishes.

1220  INSPECTION
   ▪ Notice for inspection (minimum): 5 working days

1230  DOCUMENTATION
   ▪ General: After commissioning/testing of the equipment provide as installed drawings for inclusion in the Building Manual.
      o Number of sets: 3.
   ▪ Drawing content:
      o Contractor’s name and contract number.
      o Location and date of installation.
      o Manufacturer’s name, model and type numbers.
      o General arrangement of the complete installation.
   ▪ Operation and maintenance instructions: Submit.
   ▪ Record drawings: Submit.
Z11 PURPOSE MADE METALWORK

- To be read with Preliminaries/ General conditions.

PRODUCTS

310 METAL PRODUCTS
- Standards: Generally, as specified in the following clauses.
- Fasteners: Generally, same metal as component, with matching coating and finish.

320 STEEL LONG AND FLAT PRODUCTS
- Hot rolled structural steels (excluding structural hollow sections and tubes): To BS EN 10025-1.
- Fine grain steels, including special steels: To BS EN 10025-3 and -4.
- Improved atmospheric corrosion resistance: To BS EN 10025-5.

330 STEEL PLATE, SHEET AND STRIP
- Plates and wide flats, high yield strength steel: To BS EN 10025-6.

340 HOT ROLLED STEEL PLATE, SHEET AND STRIP
- Flat products, high yield strength for cold forming: To BS EN 10149-1, -2 and -3.
- Low carbon steel sheet and strip for cold forming: To BS EN 10111.
- Narrow strip, formable and general engineering purposes: To BS 1449-1.8 and BS 1449-1.14.

350 COLD ROLLED STEEL PLATE, SHEET AND STRIP
- Steel sections: To BS EN 10162.
- Flat products, high yield strength micro-alloyed steels for cold forming: To BS EN 10268.
- Low carbon steel flat products for cold forming: To BS EN 10130 and BS EN 10131.
- Uncoated mild steel narrow strip for cold forming: To BS EN 10139 and BS EN 10140.
- Narrow strip, general engineering purposes: To BS EN 10132-1, -2, and -3.
- Low carbon steel flat products for vitreous enamelling: To BS EN 10209.
360 STEEL COATED FLAT PRODUCTS

- Hot dip zinc coated low carbon steel sheet and strip for cold forming: To BS EN 10327 and BS EN 10143.
- Hot dip zinc coated structural steel sheet and strip: To BS EN 10143 and BS EN 10326.
- Hot dip zinc-aluminium (za) coated sheet and strip: To BS EN 10326 and 10327.
- Hot dip aluminium-zinc (az) coated sheet and strip: To BS EN 10327.
- Organic coated flat products: To BS EN 10169-1.

370 STEEL STRUCTURAL HOLLOW SECTIONS (SHS)

- Non alloy and fine grain steels, hot finished: To BS EN 10210-1 and -2.
- Non-alloy and fine grain steels, cold formed welded: To BS EN 10219-2.
- Weather resistant steels, hot finished: To BS 7668.

380 OTHER STEEL SECTIONS

- Equal flange tees: To BS EN 10055.
- Equal and unequal angles: To BS EN 10056-1 and -2.
- Wire, mild steel for general engineering purposes: To BS 1052.
- Wire and wire products, general: To BS EN 10218-2.
- Tubes:
  - Seamless circular: To BS EN 10297-1.
  - Seamless cold drawn: To BS EN 10305-1.
  - Welded and cold sized square and rectangular: To BS EN 10305-5.
  - Welded circular: To BS EN 10296-1.
  - Welded cold drawn: To BS EN 10305-2.
  - Welded cold sized: To BS EN 10305-3.

400 STAINLESS STEEL PRODUCTS

- Chemical composition and physical properties: To BS EN 10088-1.
- Sheet, strip and plate: To BS EN 10088-2.
- Semi-finished products bars, rods and sections: To BS EN 10088-3.
- Wire: To BS EN 10088-3.
- Tubes:
  - Welded circular: To BS EN 10296-2.
  - Seamless circular: To BS EN 10297-2.

410 ALUMINIUM ALLOY PRODUCTS

- Designations:
  - Designation system, chemical composition and forms: To BS EN 573-1 to -4.
  - Temper designations: To BS EN 515.
- Sheet, strip and plate: To BS EN 485-1 to -4.
Cold drawn rods, bars and tubes: To BS EN 754-1 and -2.
Extruded rods, bars, tubes and profiles: To BS EN 755-1 and -2.
Drawn wire: To BS EN 1301-1, -2 and -3.
Rivet, bolt and screw stock: To BS 1473.
Structural sections: To BS 1161.

420 COPPER ALLOY PRODUCTS
- Sheet, strip, plate and circles for general purposes: To BS EN 1652.
- Sheet and strip for building purposes: To BS EN 1172.
- Rods: To BS EN 12163.
- Profiles and rectangular bars: To BS EN 12167.
- Wire: To BS EN 12166.
- Tubes: To BS EN 12449.

FABRICATION

510 PREPARATION FOR APPLICATION OF COATINGS
- General: Complete fabrication, and drill fixing holes before applying coatings.
- Paint, grease, flux, rust, burrs and sharp arrises: Remove.

515 FABRICATION GENERALLY
- Contact between dissimilar metals in components: Avoid.
- Finished components: Rigid and free from distortion, cracks, burrs and sharp arrises.
  - Moving parts: Free moving without binding.
- Corner junctions of identical sections: Mitre.
- Prefinished metals: Do not damage or alter appearance of finish.

520 COLD FORMED WORK
- Profiles: Accurate, with straight arrises.

525 ADHESIVE BONDING
- Preparation of surfaces of metals to receive adhesives:
  - Degrease.
  - Abrade mechanically or chemically etch.
  - Prime: To suit adhesive.
- Adhesive bond: Form under pressure.
530 THERMAL CUTTING OF STAINLESS STEEL
- Carbonation in the heat affected zone: Remove, after cutting.

535 WELDING AND BRAZING GENERALLY
- Surfaces to be joined: Clean thoroughly.
- Tack welds: Use only for temporary attachment.
- Joints: Fully bond parent and filler metal throughout with no inclusions, holes, porosity or cracks.
- Surfaces of materials that will be self-finished and visible in completed work: Protect from weld spatter.
- Flux residue, slag and weld spatter: Remove.

540 WELDING OF STEEL
- Method: Metal arc welding to BS EN 1011-1 and -2.

545 WELDING OF STAINLESS STEEL
- Method: TIG welding to BS EN 1011-3.
- Butt welds: Double bevel.

550 WELDING OF ALUMINIUM ALLOYS
- Method: TIG or MIG welding to BS EN 1011-4.

555 BRAZING
- Standard: To BS EN 14324.

565 FINISHING WELDED AND BRAZED JOINTS VISIBLE IN COMPLETE WORK
- Butt joints: Smooth, and flush with adjacent surfaces.
- Fillet joints: Neat.
- Grinding: Grind smooth where indicated on drawings.

570 LIQUID ORGANIC COATING FOR ALUMINIUM ALLOY COMPONENTS
- Standard: To BS 4842.

575 ZINC AND CADMIUM PLATING OF IRON AND STEEL SURFACES
- Zinc plating: To BS EN 12329.
- Cadmium plating: To BS EN 12330.

580 CHROMIUM PLATING
- Standard: To BS EN 12540.
585  GALVANIZING

- Standard: To BS EN ISO 1461.
- Vent and drain holes:
  - Location: As shown on the drawings.
  - Sealing after galvanizing: Required. Submit proposals.

590  VITREOUS ENAMELLING

- Standard: To BS EN 14431.
- Substrate metal: Carbon steel or cast iron.
Z20 FIXINGS/ADHESIVES

- To be read with Preliminaries/General conditions.

110 FIXING GENERALLY
- Use fixing and jointing methods and types, sizes, quantities and spacings of fastenings which are suitable having regard to:
  - Nature of and compatibility with product/material being fixed and fixed to,
  - Recommendations of manufacturers of fastenings and manufacturers of components, products or materials being fixed and fixed to,
  - Materials and loads to be supported,
  - Conditions expected in use,
  - Appearance, this being subject to approval.

130 FASTENINGS FOR MATERIALS AND COMPONENTS:
- Forming part of external construction but not directly exposed to the weather to be of corrosion resistant material or have a corrosion resistant finish.
- Directly exposed to the weather to be of corrosion resistant material.

140 FIXING THROUGH FINISHES
- Ensure that fastenings and plugs (if used) have ample penetration into the backing.

150 PACKINGS:
- Provide suitable, tight packings at fixing points to take up tolerances and prevent distortion.
- Use noncompressible, rot proof, noncorrodible materials positioned adjacent to fixing points.
- Ensure that packings do not intrude into zones which are to be filled with sealants.

160 CRAMP FIXING:
- Fix with stainless or galvanized steel strip cramps as BS 1243 vertical twist ties except with no twist, split one end only and once bent.
- Position cramps 150 mm from each end of jambs and at 600 mm maximum centres.
- Secure cramps to frames with two sherardized screws and fully bed in mortar.

170 NAILING:
- Nails: To BS 1202.
- In joints, use not less than two nails and opposed skew nailing unless specified otherwise.
- Drive nails fully in without splitting or crushing the material being fixed.
- Punch nail heads below surfaces which will be visible in the completed work.

180 MASONRY NAILS:
- Do not use without approval.

210 PLUGS:
- Proprietary types selected to suit the background, loads to be supported and conditions expected in use.
- Locate plugs accurately in correctly sized holes in accordance with manufacturer’s recommendations.

220 SCREW FIXING:
- Screws: To BS 1210.
- All screws to have clearance holes. Screws of 8 gauge or more and all screws into hardwood to have pilot holes about half the diameter of the shank.
- Before using brass, aluminium or other soft metal wood screws precut the thread with a matching steel wood screw.
- Do not hammer screws unless specifically designed to be hammered.
- Countersink screw heads not less than 2 mm below timber surfaces which will be visible in completed work unless specified otherwise.
- Washers and screw cups, where specified, to be of the same material as the screw.

230 PELLETING
- Countersink screw heads 6 mm below timber surface and glue in grain-matched pellets not less than 6 mm thick, cut from matching timber. Finish off flush with face.

250 POWDER ACTUATED FIXING SYSTEMS:
- Do not use without approval.
- Tools to be to BS 4078:Part 2 and Kitemark certified.
- Fasteners, accessories and consumables to be types recommended by the tool manufacturer.
- Tools to be used in accordance with BS 4078:Part 1. Operatives to be trained and certified as competent by tool manufacturer.
- Ensure that operatives take full precautions against injury to themselves and others.
- Remove all unspent cartridges from the site when no longer required.
- Apply zinc rich primer to heads of fasteners used externally, in external walls or in other locations subject to dampness.
- Use top hat section plastics washers to isolate cartridge fired nails from stainless steel components fixed externally, in external walls or in other locations subject to dampness.

510 ADHESIVES:

- Adhesive types: As specified in the relevant section.
- Surfaces to receive adhesive to be sound, unfrozen, free from dust, grease and any other contamination likely to affect bond. Where necessary, clean surfaces using methods and materials recommended by adhesive manufacturer.
- Surfaces to be of sufficient smoothness and evenness to suit gap filling and bonding characteristics of adhesive. Adjust as necessary.
- Ensure that operatives observe manufacturer's and statutory requirements for storage and safe usage of adhesives.
- Do not use adhesives in unsuitable environmental conditions or beyond the manufacturer's recommended time period.
- Apply adhesives using recommended spreaders/applicators to ensure correct coverage. Bring surfaces together within recommended time period and apply pressure evenly over full area of contact surfaces to ensure full bonding.
- Remove surplus adhesive using methods and materials recommended by adhesive manufacturer and without damage to affected surfaces.
Z21 MORTARS

- To be read with Preliminaries/General conditions.

110 MORTAR MIX PROPORTIONS
- These and other particular requirements are specified elsewhere.

120 SAND FOR MORTAR:
- To BS 1200 unless specified otherwise.
- Sand for facework mortar to be from one source, different loads to be mixed if necessary to ensure consistency of colour and texture.
- When a range is specified (e.g. 1:1:5-6) use lower proportion of sand for Grade G sands and higher proportion for Grade S.

131 LIME BASED MORTARS
- Use ready-mixed lime:sand to BS 4721. Coloured mortar, where required, to be made using a proprietary coloured ready-mixed lime:sand, colour to approval where not specified.

150 SITE PREPARED LIME:SAND MIX
- When a special colour is not required, lime:sand mix may be prepared on site in lieu of ready-mixed material by:
  - Thoroughly mixing lime putty, ready-prepared to BS 890, with sand, or
  - Thoroughly mixing hydrated lime powder to BS 890 with sand, first in the dry state and then with water. The volume of lime specified can be increased by up to 50% to improve workability. Keep for at least 16 hours before use and prevent from drying out.

160 CEMENT FOR MORTAR
- When not specified otherwise, to be Portland cement or Portland blastfurnace cement, to class 42.5 or 52.5, manufactured and supplied under the BSI Kitemark scheme for cement. All cements must comply with the appropriate British Standard.

170 RETARDED READY-MIXED MORTARS MAY BE USED PROVIDED THEY ARE:
- Of materials and proportions specified in this section and to BS 4721.
- Used within the working time and site temperatures recommended by the manufacturer and not remixed on site.
- Obtained from an approved manufacturer
180 ADMIXTURES

- Do not use in mortar unless specified or approved. Do not use calcium chloride or any admixtures containing calcium chloride. Admixtures, if specified, to be to BS 4887.

210 MAKING MORTAR:

- Keep plant and banker boards clean at all times.
- Measure materials accurately by volume using clean gauge boxes. Proportions of mixes are for dry sand; allow for bulking if sand is damp.
- Mix ingredients thoroughly to a consistency suitable for the work and free from lumps. Mortars containing air entraining admixtures must be mixed by machine, but do not overmix.
- Use mortar within about two hours of mixing at normal temperatures. Use retarded mortar within the time and site temperatures recommended by the manufacturer. Mortar may be retempered to restore workability, but only within these time limits.