C41
Repairing/ renovating/ conserving masonry

Generally/ preparation

110 Scope of work

1. Records of masonry to be repaired: Before starting work, use measurements and photographs as appropriate to record bonding patterns, joint widths, special features, etc.
2. Identification of masonry units to be removed, replaced or repaired: Mark clearly, but not indelibly, on face of masonry units or parts of units to be cut out and replaced. Transcribe markings to drawings/ photographs.

120 Site inspection

1. Purpose: To confirm type and extent of repair/ renovation/ conservation work shown on drawings and described in survey reports and schedules of work.
2. Parties involved: Contract administrator, Contractor's representative
3. Timing: At least 2 working days before starting each section of work
4. Instructions issued during inspection: Confirm in writing, with drawings and schedules as required, before commencing work

140 Record of work

1. General: Record work carried out to masonry clearly and accurately using written descriptions, sketches, drawings and photographs, as necessary.
2. Documentation: Submit on completion of the work.

Workmanship generally

150 Power tools

1. Usage for removal of mortar: Not permitted

160 Protection of masonry units and masonry

1. Masonry units: Prevent overstressing during transit, storage, handling and fixing. Store on level bearers clear of the ground, separated with resilient spacers. Protect from adverse weather and keep dry. Prevent soiling, chipping and contamination. Lift units at designed lifting points, where provided.
2. Masonry: Prevent damage, particularly to arrises, projecting features and delicate, friable surfaces. Prevent mortar/ grout splashes and other staining and marking on facework. Protect using suitable nonstaining slats, boards, tarpaulins, etc. Remove protection on completion of the work.

170 Disturbance to retained masonry

1. Retained masonry in the vicinity of repair works: Disturb as little as possible.
2. Existing retained masonry: Do not cut or adjust to accommodate new or reused units.
3. Retained loose masonry units and those vulnerable to movement during repair works: Prop or wedge so as to be firmly and correctly positioned.

180 Workmanship

1. Skill and experience of site operatives: Appropriate for types of work on which they are employed.

1.1. Documentary evidence: Submit on request.

185 Adverse weather

1. General: Do not use frozen materials or lay masonry units on frozen surfaces.
2. Air temperature: Do not bed masonry units or repoint:
   2.1. In cement gauged mortars when ambient air temperature is at or below 3°C and falling or unless it is at least 1°C and rising, unless mortar has a minimum temperature of 4°C when laid and the masonry is adequately protected.
   2.2. In hydraulic lime:sand mortars when ambient air temperature is at or below 5°C and falling or unless it is at least 3°C and rising.
   2.3. In nonhydraulic lime:sand mortars in cold weather, unless approval is given.
3. Temperature of the work: Maintain above freezing until mortar has fully set.
4. Rain, snow and dew: Protect masonry by covering during precipitation, and at all times when work is not proceeding.
5. Hot conditions and drying winds: Prevent masonry from drying out rapidly.
6. New mortar damaged by frost: Rake out and replace.

190 Control samples

1. General: Complete an area of each of the following types of work, and arrange for inspection before proceeding with the remainder: Brickwork stitch and repointing.

Materials/ production/ accessories

215 Material samples

1. Representative samples of designated materials: Submit before placing orders.
   1.1. Designated materials: Brickwork replacement and mortar.
2. Retention of samples: Unless instructed otherwise, retain samples on-site for reference. Protect from damage and contamination.

220 Recording profiles

1. Profiles: Take measurements from existing masonry units, as instructed, to allow accurate matching of replacements.
2. Recording in situ: If there are no suitable joints to allow use of inserts, seek instructions.
3. Drawings and templates: Prepare as necessary. Templates must be clearly and indelibly marked to identify use and location.

265 Salvaged and second hand bricks

1. Condition
   1.1. Free from matter such as mortar, plaster, paint, bituminous materials and organic growths.
   1.2. Sound, clean and reasonably free from cracks and chipped arrises.

Dismantling/ rebuilding

310 Dismantling masonry for reuse

1. Masonry units to be reused: Remove carefully and in one piece.
   1.1. Treatment: Clean off old mortar, organic growths and dirt, and leave units in a suitable condition for rebuilding.

1.2. Identification: Mark each unit clearly and indelibly on a concealed face, indicating its original position in the construction. Transcribe makings to drawings/ photographs.

Replacements and insertions

330 Preparation for replacement masonry

1. Defective material: Carefully remove to the extent agreed. Do not disturb, damage or mark adjacent retained masonry.
2. Existing metal fixings, frame members, etc.: Report when exposed.
3. Redundant metal fixings: Remove.
4. Recesses: Remove projections and loose material; leave joint surfaces in a suitable condition to receive replacement units. Protect from adverse weather if units are not to be placed immediately.

365 Replacement of bricks

1. Mortar: As section Z21.
   1.1. Standard: BS EN 998-2
   1.2. Mix: 1:1:6 cement:lime:sand and to match surrounding.
2. Joints: To match surrounding.

385 Laying replacement masonry units

1. Exposed faces of new material: Keep to agreed face lines.
2. Faces, angles and features: Align accurately. Set out carefully to ensure satisfactory junctions with existing masonry and maintain existing joint widths.
3. Joint surfaces: Dampen to control suction as necessary.
4. Laying units: On a full bed of mortar, all joints filled.
5. Exposed faces: Keep clear of mortar and grout.

Mortar repairs

510 Preparation for mortar repairs

1. Repair area: Scribe area of masonry to be removed using straight horizontal and vertical lines parallel to joints. Where repair area abuts joints, maintain existing joint widths and do not bridge joints.
2. Decayed masonry: Cut back carefully to a minimum depth of 20 mm to a sound background. Where the depth of removal exceeds 50 mm, seek instructions.
3. Precautions: Do not weaken masonry by removing excessive material. Do not damage adjacent masonry.
4. Top and vertical reveals of repair area: Undercut.

520 Mortar repairs

1. Undercoats: As section Z21.
   1.1. Mix: 1:1:6 cement:lime:sand and to match surrounding.
   1.2. Building up: In layers where necessary, each layer not exceeding 12 mm.
2. Finishing coat: To match approved samples.
   2.1. Mix: 1:1:6 cement:lime:sand and to match surrounding.

540 Applying mortar

1. Surfaces to receive mortar: Clean, and free from dust and debris. Dampen to control suction.
2. Applying coats: Build up in layers to specified thickness. Apply mortar firmly, ensuring good adhesion with no voids. Form a mechanical key to undercoats by combing or scratching to produce evenly spaced lines.
3. Allow each layer to achieve an initial set before applying subsequent coats. Prevent each layer from drying out rapidly by covering immediately with plastics sheeting and/ or dampening intermittently with clean water.
4. Finishing mortar coat: Form accurately to required planes/ profiles, and finish flush with adjacent masonry.
5. Protection: Protect completed repairs from adverse weather until mortar has set.

550 Scraped finish to mortar repairs

1. Procedure: Finish final coat of repair mortar proud of existing masonry face. When mortar is set, but not too hard, scrape back to required face line using fine saw blade or other suitable means, to achieve required finish.

Crack repairs/ ties/ reinforcement

690 Making good to injection and insertion holes

1. Preparation: Clean out holes thoroughly.
2. Repair mortar: To match existing masonry units/ joints in colour and texture. Fill holes and finish mortar neatly and flush with surrounding masonry.
3. Finished appearance: Obtain approval for first 3nr holes before completing the remainder.

Pointing/ repointing

810 Preparation for repointing

1. Existing mortar: Working from top of wall downwards, remove mortar carefully, without damaging adjacent masonry or widening joints, to a minimum depth of twice joint thickness.
    1.1. Loose or friable mortar: Seek instructions when mortar beyond specified recess depth is loose or friable and/ or if cavities are found.
2. Raked joints: Remove dust and debris.

820 Pointing

1. Preparation of joints: Rake out existing mortar, Carefully brush away loose mortar, Dampen joints, as necessary, to control suction
2. Mortar: As section Z21.
    2.1. Mix: 1:1:6 cement:lime:sand and to match surrounding.
3. Joint profile/ finish: To match surrounding.

840 Pointing with tools/ Irons

1. General: Press mortar well into joints using pointing tools/ irons that fit into the joints, so that they are fully filled.
2. Face of masonry: Keep clear of mortar. Use suitable temporary adhesive tape on each side of joints where necessary. Finish joints neatly.

860 Brushed finish to joints

1. Timing: After initial mortar set has taken place remove laitance and excess fines by brushing, to give a coarse texture. Do not compact mortar.

Ω End of Section

H11
Curtain walling

General requirements/ preparatory work

210 Design

1. Curtain walling and associated features: Details to match the existing/surrounding installations in all respects.
2. Related works: Coordinate in the detailed design.

220 Specification

1. Compliance standards: BS EN 13830 and The Centre for Window and Cladding Technology (CWCT) 'Standard for systemised building envelopes'.
2. Reference information: For the duration of the contract, keep available at the design office, workshop and on site copies of:
   2.1. The CWCT 'Standard for systemised building envelopes'.
   2.2. Publications invoked by the CWCT 'Standard for systemised building envelopes'.

230 Information to be provided during detailed design stage

1. Submit the following curtain walling particulars
   1.1. A schedule of detailed drawings and dates for submission for comment.
   1.2. A schedule of loads that will be transmitted from the curtain walling to the structure.
   1.3. Proposed fixing anchor details relevant to structural design and construction.
   1.4. A detailed testing programme in compliance with the main contract master programme.
   1.5. A detailed fabrication and installation programme in compliance with the main contract master programme.
   1.6. Proposals to support outstanding applications for Building Regulation consents or relaxations.

235 Information to be provided before commencement testing or fabrication of curtain walling

1. Submit the following curtain walling particulars
   1.1. Detailed drawings to fully describe fabrication and installation.
   1.2. Detailed calculations to prove compliance with design/ performance requirements.
   1.3. Project specific fabrication, handling and installation method statements.
2. Certification for incorporated components manufactured by others confirming their suitability for proposed locations in the curtain walling.
   2.1. Recommendations for spare parts for future repairs or replacements.
3. Recommendations for safe dismantling and recycling or disposal of products.

250 Product samples

1. General: Before commencing detailed design, submit labelled samples of: sheet panelling .

260 Samples of fixings

1. General: During detailed design, submit labelled samples of each type of fixing anchor, including casting-in restraints and shims, together with manufacturers' recommended torque figures.

Design/ performance requirements

305 CWCT 'Standard for systemised building envelopes'

1. General: Unless specified or agreed otherwise comply with:
   1.1. Part 2 - 'Loads, fixings and movement'.
   1.2. Part 3 - 'Air, water and wind resistance'.
   1.3. Part 4 - 'Operable components, additional elements and means of access'.
   1.4. Part 5 - 'Thermal, moisture and acoustic performance'.
   1.5. Part 6 - 'Fire performance'.
   1.6. Part 7 - 'Robustness, durability, tolerances and workmanship'.
2. Project performance requirements specified in this subsection: Read in conjunction with CWCT performance criteria.

313 Integrity

1. Requirement: The curtain walling must resist wind loads, dead loads and design live loads, and accommodate deflections and movements without damage.
2. Design wind pressure: Calculate in accordance with: BS 6399-2.
3. Impact performance:
   3.1. Safety impact requirements: To match existing.
   3.2. Serviceability impact requirements: To match existing.
   3.3. External impact exposure: In accordance with CWCT TN 75: To match existing.
   3.4. Hard and soft body impact loads - curtain walling to BS EN 14019: To match existing.
   3.5. Hard and soft body impact loads - glass to BS EN 12600: To match existing.
   3.6. Hard body impact tests - In accordance with CWCT Standard test methods for building envelopes and TN 76 (curtain wall).
   3.7. Soft body impact tests: To match existing.
4. Permanent imposed loads: To match existing.
5. Temporary imposed loads: To match existing.

320 Deflection under dead loads

1. Requirement: Framing members parallel to the curtain walling plane must not:
   1.1. Reduce glass bite to less than 75% of design dimension.
   1.2. Reduce edge clearance to less than 3 mm between members and immediately adjacent glazing units, panel/ facing units or other fixed units.
   1.3. Reduce clearance to less than 2 mm between members and movable components such as doors and windows.

325 Deflection under wind load

1. Requirement: To CWCT 'Standard for systemised building envelopes' clause 3.5 2 and the following additional requirements: To match existing.
2. Additional stiffness to CWCT 'Standard for systemised building envelopes' clause 3.5 4.2: To match existing

330 General movement

1. Requirement: Curtain walling must accommodate anticipated building movements as follows: To match existing .

332 Appearance and fit

1. Requirement: Design curtain walling system:
    1.1. To ensure position and alignment of all parts and features as shown on preliminary design drawings.
    1.2. To accommodate deviations in the primary support structure.
2. Primary support structure: Before commencing installation of curtain walling system, carry out survey sufficient to verify that required accuracy of erection can be achieved.
    2.1. Give notice: If the structure will not allow the required accuracy or security of erection.
    2.2. Design tolerances: To match existing.
3. Maximum permitted component and installation tolerances: To match existing.

390 Avoidance of condensation

1. Requirement: Notional psychrometric conditions under which condensation must not form on building interior surfaces of framing members or any part of infill panels/ facings are:
    1.1. Notional outdoor psychrometric conditions as BS 5250.

410 Sound transmittance

1. Minimum weighted sound reduction index (Rw) to BS EN ISO 717-1
    1.1. Between internal and external surfaces of curtain walling: To match existing.
2. Minimum weighted standardized level difference (DnTw) to BS EN ISO 717-1
    2.1. Between adjacent floors abutting curtain walling: To match existing.
    2.2. Between adjacent rooms on same floor abutting curtain walling: To match existing.

420 Fire resistance of curtain walling

1. Standard: To BS EN 13501-1.
    1.1. Minimum periods and criteria: To match existing.
    1.2. Direction: To match existing.
    1.3. Basis of verification: To match existing.

426 Reaction to fire of curtain walling

1. Standard: To BS EN 13501-1.
    1.1. Class: To match existing.

430 Fire stopping

1. Locations: At junctions of curtain walling with compartment or separating walls and floors.
2. Materials and methods of fixing: To ensure fire resistance not less than that specified for compartment or separating walls and floors when tested from both sides.

437 Louvres

1. Performance classification to BS EN 13030.
    1.1. Discharge operation: To match existing.
    1.2. Water penetration class: To match existing.

1.3. Discharge/ entry loss coefficient class: To match existing.

440 Durability

1. Relevant agents or degradation mechanisms: To match existing.
2. Design life of the curtain walling system: To match existing.
3. Secondary components: Submit details together with required maintenance regime, replacement periods and methods of replacement.

450 Safety

1. Finished surfaces of curtain walling: Accessible internal and external areas must not:
   1.1. Have irregularities capable of inflicting personal injury.
   1.2. Release irritant or staining substances.

Testing

510 Comparison (type) testing

1. Requirement: To CWCT 'Standard for systemised building envelopes', part 8.
2. Test results and reports: Before commencement of curtain walling fabrication and installation, submit proof of compliance with this specification.

520 Project testing (site)

1. Test results and reports: Before installation of general areas of curtain walling, submit proof of compliance with this specification.

530 Testing authority

1. Requirement: Project testing must be carried out by a United Kingdom Accreditation Service (UKAS) approved independent laboratory.

655 Wind load fatigue test, small specimen

1. Requirement: To CWCT 'Standard for systemised building envelopes', 'Standard test methods for building envelopes' Section 14.

Products

710 Aluminium alloy framing sections

1. Standard: To relevant parts of BS EN 515, BS EN 573, BS EN 755 and BS EN 12020.
2. Alloy, temper and thickness: Suitable for the application and specified finish.
3. Structural members: To BS EN 1999-1-1.

712 Aluminium alloy sheet

1. Standards: To relevant parts of BS EN 485, BS EN 515 and BS EN 573.
2. Alloy, temper and thickness: Suitable for the application and specified finish.

715 Carbon steel framing sections/ Reinforcement

1. Standards: To relevant parts of BS 7668, BS EN 10029, and BS EN 10210.
2. Thickness: Suitable for the application, and for galvanizing or other protective coating.

717 Carbon steel sheet

1. Standards: To relevant parts of BS 1449-1, BS EN 10048, BS EN 10051, BS EN 10111, BS EN 10131, BS EN 10132, BS EN 10139, BS EN 10140, BS EN 10149, BS EN 10209 and BS EN 10268.
2. Grade and thickness: Suitable for the application, and for galvanizing or other protective coating.

720 Stainless steel sheet

1. Standards: To relevant parts of BS EN 10029, BS EN 10048, BS EN 10051, BS EN 10095 and BS EN ISO 9445.
2. Grade: To BS EN 10088-2, austenitic 1.4301 (304) generally, 1.4401 (316) when used externally or in severely corrosive environments.
3. Thickness: Suitable for the application.

730 Mechanical fixings

1. Stainless steel: To BS EN ISO 3506, grade A2 generally, grade A4 when used in severely corrosive environments.
2. Carbon steel: To BS 4190 and suitable for galvanizing or other protective coating.
3. Aluminium brackets, rivets and shear pins: To relevant parts of BS EN 755.

732 Adhesives

1. General: Not degradable by moisture or water vapour, or exposure to UV light.

735 Fixing anchors

1. Type and use: Reviewed and approved by fixing manufacturers. Submit confirmatory information on request.
2. Dimensions: Not less than recommended by their manufacturers.
3. Adjustment capability: Sufficient in three dimensions to accommodate building structure and curtain walling fabrication/ installation tolerances.

750 Infill panels/ Facings

1. Tolerances
    1.1. Deviation in size (maximum): ± 1 mm.
    1.2. Deviation in flatness from plane per 2 m length (maximum): ± 1 mm.
2. Rigidity: Adequate to comply with design/ performance requirements.
3. Fire performance: To match existing.

760 Gaskets

1. Material
    1.1. Noncellular rubber to BS 4255-1.
    1.2. Cellular rubber to ASTM-C509-06.
2. Continuity: Outer gaskets of single front sealed curtain walling systems and inner gaskets of drained and ventilated or pressure equalized curtain walling systems must be formed in a complete frame with sealed joints. Vulcanized rubber gaskets must have factory moulded corner joints.
3. Durability: Resistant to oxidation, ozone and UV degradation.

770 General sealants

1. Selection: In accordance with BS 6213 from:
   1.1. Silicone.
   1.2. One part polysulfide.
   1.3. Two parts polysulfide.
   1.4. One or two parts polyurethane.
2. Classification and requirements: To BS EN ISO 11600.
3. Reaction to contact products and finishes: Stable and compatible.

772 Curtain walling joint assembly sealants

1. Material: One part, low modulus silicone to BS EN ISO 11600, type F or G. Neutral curing where in contact with or close proximity to other products that may be adversely affected by acetoxy curing.
2. Manufacturer: Contractor's choice

Finishes

810 Protective coating of carbon steel framing sections/ Reinforcement

1. Treatment: One of the following to all surfaces:
   1.1. Hot dip galvanized to BS EN ISO 1461.
   1.2. An appropriate equivalent coating to BS EN ISO 12944-5 or BS EN ISO 14713-1, -2 and -3.

820 Protective coating of carbon steel mechanical fixings

1. Treatment: One of the following to all surfaces:
   1.1. Hot dip galvanized to BS EN ISO 1461.
   1.2. Sherardized to BS 7371-8, Class 30 coating thickness and passivated.
   1.3. Zinc plated to BS EN ISO 2081, coating designation Fe//Zn//C for an iridescent (yellow passivate) chromate conversion coating or Fe//Zn//D for an opaque (olive green) chromate conversion coating.

830 Powder-coating

1. Requirement: As section Z31.

840 Anodizing

1. Requirement: As section Z33.

850 Polyvinylidene fluoride (PVDF)-coating of aluminium alloy

1. Standard: To BS 4842 or AAMA 2604-20, subject to minimum coating thicknesses recommended by the manufacturer on significant surfaces.
   1.1. Applicator:
      1.1.1. Product reference:
2. PVDF resin content of coatings: Not less than 70%.
3. Process: Prepare base metals, prime, PVDF-coat, test samples, protect components and repair damage in accordance with manufacturer's recommendations.
4. Sequence: Wherever possible, apply coatings after fabrication is complete.
   4.1. Fabrication of prefinished lengths: Submit proposals beforehand.

4.2. Uncoated edges: Invisible in completed assemblies.

860 Treatment of timber cut on site

1. Requirement
   1.1. Cutting and machining: Carry out as much as possible before full treatment of raw materials.
   1.2. Minor cutting drilling: Treat exposed timber surfaces with two flood coats of a solution recommended by main treatment solution manufacturer.
   1.3. Extensive processing should not be allowed.

Fabrication and installation

910 Generally

1. Electrolytic corrosion: Prevent. Submit proposed methods.
2. Fixings: Concealed unless indicated on detailed drawings. Where exposed they must match material and finish of the products fixed.
3. Fabrication: Machine cut and drill products in the workshop wherever possible.
4. Identification of products: Mark or tag to facilitate identification during assembly, handling, storage and installation. Do not mark surfaces visible in the completed installation.

912 Metalwork

1. Requirement: As section Z11, unless specified otherwise in this section.

917 Fixings/ Adhesives application

1. Requirement: As section Z20, unless specified otherwise in this section.

920 Sealant application

1. Requirement: As section Z22, unless specified otherwise in this section.

925 Structural sealant/ bonded glazing

1. Curing: Do not transport units until structural bonding sealant has adequately cured for the period stated in the project specific approval.

930 Assembly

1. General: Carry out as much assembly as possible in the workshop.
2. Joints (other than movement joints): Rigidly secured, reinforced where necessary and fixed with hairline abutments.
3. Displacement of components in assembled units: Submit proposals for reassembly on site.

955 Fixing anchor installation

1. Site drilling or cutting into structure: Submit proposals for positions other than shown on detailed drawings.
2. Concrete supporting structure
   2.1. Cast-in inserts: Provide detailed locational information. Protect cavities in inserts from entry of concrete.
   2.2. Edge fixing distances: Not less than recommended by fixing anchor manufacturers.
3. Corrective fabrication: Minimize. Where necessary, submit proposals.

970 Curtain walling installation

1. Securing to fixing anchors: Through holes formed during fabrication only.
2. Tightening mechanical fasteners: To manufacturer's recommended torque figures. Do not overtighten fasteners intended to permit differential movement.
3. Protective coverings: Remove only where necessary to facilitate installation and from surfaces that will be inaccessible on completion.

975 Welding

1. In situ welding: Permitted, subject to completion of and compliance with a 'hot work permit' form

978 Installing fire and smoke stops

1. Fire and smoke stops: To be located at all junctions between the curtain wall and compartment or separating walls and floors. To be installed strictly in accordance with manufacturers' guidelines and as recommended in CWCT Technical Note TN 98.
2. Installer qualification: To be a member of a UKAS-accredited installer scheme.

980 Interfaces

1. Flashings, closers, etc: Locate and form correctly to provide weathertight junctions with the curtain walling.

982 Ironmongery

1. Assembly and fixing: Accurately, using fasteners with matching finish supplied by ironmongery manufacturer.
2. Completion: Check, adjust and lubricate as necessary to ensure correct functioning.

985 Maintenance

1. Maintenance manual: Incorporate details within the Building Manual in accordance with CWCT 'Standard for systemised building envelopes' clause 7.6.1.
    1.1. Materials certification and test reports to be included:

Ω End of Section

H43
Metal insulating sandwich panel cladding/ roofing

General requirements

165 Contractor's design

1. Design responsibility: To ensure match with existing installations in all respects.
2. Design standard: In accordance with BS 5427.
3. Product specification and requirements: To BS EN 14509.
4. Structural and fire requirements
   - 4.1. Generally: As section B50.
   - 4.2. Modifications:
   - 4.3. Design: Complete the design in accordance with the designated code of practice to satisfy specified performance criteria.

167 Completion of design

1. Requirement: Complete the detailed design to satisfy specified performance criteria and coordinate with the detailed design of related and adjacent work.
   - 1.1. Design standard: In accordance with BS 5427.
   - 1.2. Product specification and requirements: To BS EN 14509.
2. Structural requirements: As section B50.

172 Thermal bridging

1. Requirement: Complete the design of the cladding/ roofing system to avoid excessive thermal bridging.

175 Product samples

1. General: Before commencing detailed design, submit labelled samples of the following: panels and louvres.

Design/ performance requirements

185 Performance compliance

1. Verification: Before commencing fabrication, submit evidence based on laboratory testing or computer modelling.

187 Deflection of metal cladding/ roofing

1. Standard: Calculation or test in accordance with BS EN 14509.
2. Wall cladding: Maximum permitted deflection under distributed loads as a multiple of span and due to:
   - 2.1. Wind load: To match existing.

198 Water penetration

1. Requirement: Under site exposure conditions, moisture must not penetrate onto internal surfaces, or into cavities not designed to be wetted.

200 Avoidance of interstitial condensation

1. Requirement: Determine interstitial condensation risk of cladding system using the method described in BS 5250 Annex D. If necessary, provide a vapour control layer and/ or revise thermal insulation to ensure that damage and nuisance from interstitial condensation does not occur.

202 Avoidance of surface condensation

1. Requirement: Determine surface condensation risk of cladding system using the method described in BS EN ISO 13788. If necessary, revise thermal insulation to provide satisfactory temperature factor (fmin). Ensure that damage and nuisance from surface condensation and does not occur.

Fixing cladding/ roofing

215 Painting structure

1. Sequence: Paint outer surface of supporting structure before fixing cladding/ roofing.

219 Fasteners

1. Unspecified fasteners: Recommended for the purpose by the cladding/ roofing manufacturer.

221 Fittings and accessories

1. Unspecified fittings and accessories: Recommended for the purpose by the cladding/ roofing manufacturer.

223 Prevention of electrolytic action

1. Isolating tape: Type recommended by cladding/ roofing manufacturer.
    1.1. Location: To contact surfaces of supports and sheets of dissimilar metals.

410 Fixing panels and sheets generally

1. Cut edges: Not permitted
2. Penetrations: Openings to minimum size necessary.
    2.1. Edge reinforcement: Trimming plates
3. Orientation: Exposed joints of side laps away from prevailing wind unless shown otherwise on drawings.
4. Panel and sheet ends, laps and raking cut edges: Fully supported and with fixings at top of lap.
5. Fasteners: Drill holes. Position at regular intervals in straight lines, centred on support bearings.
    5.1. Position of fasteners in oversized drilled holes: Central.
    5.2. Fasteners torque: Sufficient to correctly compress washers.
6. Debris: Remove dust and other foreign matter before finally fixing panel and sheets.
7. Completion: Check fixings to ensure watertightness and that panels and sheets are secure.
8. Cut edges: Paint to match face finish.

540 Abutments

1. Junctions with flashings: Weathertight and neatly dressed down.

670 Documentation

1. Certificates, records, guarantees and other documents: Submit on completion.

Ω End of Section

Z20
Fixings and adhesives

Clauses

10 Fixings and fasteners generally

1. Integrity of supported components: Select types, sizes, quantities and spacings of fixings, fasteners and packings to retain supported components without distortion or loss of support.
2. Components, substrates, fixings and fasteners of dissimilar metals: Isolate with washers or sleeves to avoid bimetallic corrosion.
3. General usage: To recommendations of fastener manufacturers and/ or manufacturers of components, products or materials fixed and fixed to.
4. Fixings: To be in straight lines, at regular centres.

25 Fastener durability

1. Materials: To have:
    1.1. Bimetallic corrosion resistance appropriate to items being fixed.
    1.2. Atmospheric corrosion resistance appropriate to fixing location.
2. Appearance: Submit samples on request.

30 Fixings through finishes

1. Penetration of fasteners and plugs into substrate: To achieve a secure fixing.

35 Packings

1. Materials: Noncompressible, corrosion proof.
2. Area of packings: Sufficient to transfer loads.

40 Cramp fixings

1. Fasteners: Fix cramps to frames with screws of same material as cramps.
2. Fixings in masonry work: Fully bed in mortar.

50 Pelleted countersunk screw fixings

1. Finished level of countersunk screw heads: Minimum 6 mm below timber surface.
2. Pellets: Cut from matching timber, grain matched, glued in to full depth of hole.
3. Finished level of pellets: Flush with surface.

55 Plugged countersunk screw fixing

1. Finished level of countersunk screw heads: Minimum 6 mm below timber surface.
2. Plugs: Glue in to full depth of hole.
3. Finished level of plugs: Projecting above surface.

60 Applying adhesives

1. Surfaces: Clean. Regularity and texture to suit bonding and gap filling characteristics of adhesive.
2. Support and clamping during setting: Provide as necessary. Do not mark surfaces of or distort components being fixed.
3. Finished adhesive joints: Fully bonded. Free of surplus adhesive.Ω End of Section

Z21
Mortars

Cement gauged mortars

135 Site made lime:sand for cement gauged masonry mortars

1. Permitted use: Where a special colour is not required and in lieu of factory made ready-mixed material.
2. Lime: Nonhydraulic to BS EN 459-1.
   2.1. Type: CL 90S.
3. Mixing: Thoroughly mix lime with sand, in the dry state. Add water and mix again. Allow to stand, without drying out, for at least 16 hours before using.

160 Cements for mortars

1. Cement: To BS EN 197-1 and CE marked.
   1.1. Types: Portland cement, CEM I.
      1.1.1. Portland limestone cement, CEM II/A-L or CEM II/A-LL.
2. Portland slag cement, CEM II/B-S.
3. Portland fly ash cement, CEM II/B-V.
   3.1. Strength class: 32.5, 42.5 or 52.5.
4. White cement: To BS EN 197-1 and CE marked.
   4.1. Type: Portland cement, CEM I.
   4.2. Strength class: 52.5.
5. Sulfate resisting Portland cement
   5.1. Type: To BS EN 197-1 Sulfate resisting Portland cement, CEM I/SR and CE marked.
6. To BS EN 197-1 fly ash cement, CEM II/B-V and CE marked.
   6.1. Strength class: 32.5, 42.5 or 52.5.
7. Masonry cement: To BS EN 413-1 and CE marked.
   7.1. Class: MC 12.5.

Lime:sand mortars

310 Lime:sand mortar mixes

1. Specification: Proportions and additional requirements for mortar materials are specified elsewhere.

320 Sand for lime:sand masonry mortars

1. Type: Sharp, well graded.
   1.1. Quality, sampling and testing: To BS EN 13139.
   1.2. Grading/ Source: As specified elsewhere in relevant mortar mix items.

345 Admixtures for hydraulic lime:sand mortars

1. Air entraining (plasticizing) admixtures: To BS EN 934-3 and compatible with other mortar constituents.
2. Prohibited admixtures: Calcium chloride, ethylene glycol and any admixture containing calcium chloride.

350 Storage of lime:sand mortar materials

1. Sands and aggregates: Keep different types/ grades in separate stockpiles on hard, clean, free-draining bases.
2. Ready prepared nonhydraulic lime putty: Prevent drying out and protect from frost.
3. Nonhydraulic lime:sand mortar: Store on clean bases or in clean containers that allow free drainage. Prevent drying out or wetting and protect from frost.
4. Bagged hydrated hydraulic lime: Store off the ground in dry conditions.

360 Making lime:sand mortars generally

1. Batching: By volume. Use clean and accurate gauge boxes or buckets.
2. Mixing: Mix materials thoroughly to uniform consistency, free from lumps.
3. Contamination: Prevent intermixing with other materials, including cement.

370 Site prepared nonhydraulic lime:sand mortars

1. Mixing: Mix materials thoroughly by compressing, beating and chopping. Do not add water.
   1.1. Equipment: Roller pan mixer or submit proposals.
2. Maturation period before use (maximum):

380 Ready to use nonhydraulic lime:sand mortars

1. Manufacturer: Contractor's choice
2. Materials: Select from:
   2.1. Lime putty slaked directly from quicklime to BS EN 459-1 and mixed thoroughly with sand.
   2.2. Quicklime to BS EN 459-1 slaked directly with sand.
3. Maturation period before use (maximum): Seek instructions

390 Knocking up nonhydraulic lime:sand mortars

1. Knocking up before and during use: Achieve and maintain a workable consistency by compressing, beating and chopping. Do not add water.
   1.1. Equipment: Roller pan mixer or submit proposals.

400 Making hydraulic lime:sand mortars

1. Mixing hydrated hydraulic lime:sand: Follow the lime manufacturer's recommendations for each stage of the mix.
   1.1. Water quantity: Only sufficient to produce a workable mix.
2. Working time: Within limits recommended by the hydraulic lime manufacturer.

Ω End of Section

Z22
Sealants

Clauses

31 Joints

1. Primer, backing strip, bond breaker: Types recommended by sealant manufacturer.

Execution

61 Suitability of joints

1. Presealing checks
    1.1. Joint dimensions: Within limits specified for the sealant.
    1.2. Substrate quality: Surfaces regular, undamaged and stable.

62 Preparing joints

1. Surfaces to which sealant must adhere
    1.1. Remove temporary coatings, tapes, loosely adhering material, dust, oil, grease, surface water and contaminants that may affect bond.
    1.2. Clean using materials and methods recommended by sealant manufacturer.
2. Vulnerable surfaces adjacent to joints: Mask to prevent staining or smearing with primer or sealant.
3. Backing strip and/ or bond breaker installation: Insert into joint to correct depth, without stretching or twisting, leaving no gaps.
4. Protection: Keep joints clean and protect from damage until sealant is applied.

63 Applying sealants

1. Substrate: Dry (unless recommended otherwise) and unaffected by frost, ice or snow.
2. Environmental conditions: Do not dry or raise temperature of joints by heating.
3. Sealant application: Fill joints completely and neatly, ensuring firm adhesion to substrates.
4. Sealant profiles
    4.1. Butt and lap joints: Slightly concave.
    4.2. Fillet joints: Flat or slightly convex.
5. Protection: Protect finished joints from contamination or damage until sealant has cured.

Ω End of Section

Z31
Powder coatings

To be read with preliminaries/ general conditions.

120 Powder coating materials

1. Selected manufacturer: Submit details before commencement of powder coating including:
   1.1. Name and contact details.
   1.2. Details of accreditation schemes.
   1.3. Technical data of product including current Agrément certificates.

210 Working procedures

1. Comply with the follow following standards.
   1.1. Aluminium components: To BS 6496 or BS EN 12206-1.
   1.2. Steel components: To BS EN 13438.
   1.3. Safety standards: To British Coatings Federation 'Code of safe practice: Powder coating. Application of coating powders by electrostatic spraying'.
   1.4. Health and safety guidance: Health and Safety Executive 'Reducing risk associated with using coating powders - employers' web page.

220 Powder coating applicators

1. Applicator requirements
   1.1. Approved by powder coating manufacturer.
   1.2. Currently certified to BS EN ISO 9001.
   1.3. Comply with quality procedures, guarantee conditions, standards and tests required by powder coating manufacturer.
   1.4. Selected applicator: Submit details before commencement of powder coating including:
      1.4.1. Name and contact details.
      1.4.2. Details of accreditation schemes.

225 Guarantees

1. Powder coating manufacturer and applicator guarantees
   1.1. Submit sample copies before commencement of powder coating.
   1.2. Submit signed project specific copies on completion of work.

230 Control samples

1. Sequence: Prior to ordering materials for the works, obtain approval of appearance for:
   1.1. Powder coated samples: Of various grades and forms of background metal to be used, showing any colour, texture and gloss variation.
   1.2. Fabrication samples: Showing joint assembly, how powder coating is affected and how any cut metal edges are finished and protected.
   1.3. Where manual application is required, controlled samples should be coated and inspected for colour and gloss stability.
2. Samples to include the following information
   2.1. Product reference.
   2.2. Colour.

2.3. Reference number.
2.4. Name.
2.5. Gloss level.

240 Qualicoat quality assurance system

1. Requirement: Powder and coating application to the following designated components is to be tested and approved in accordance with the Qualicoat system.

250 Component design

1. Condition of components to be powder coated
   1.1. To comply with relevant recommendations of BS 4479-1, -3, and -4.
   1.2. Of suitable size to fit plant capacity.
   1.3. Of suitable thickness to withstand oven curing.

310 Pretreatment of aluminium components

1. Condition of components to be pretreated
   1.1. Free from corrosion and damage.
   1.2. All welding and jointing completed and finish off as specified.
   1.3. Free from impurities including soil, grease and oil.
   1.4. Suitable for and compatible with the pretreatment process.
2. Conversion coating requirements
   2.1. Chromate system: To BS 6496 or BS EN 12206-1.
   2.2. Chromate-free system: To BS EN 12206-1. Submit details before using.
3. Rinsing requirements: Use demineralized water. Drain and dry.

320 Pretreatment of steel components

1. Condition of components to be pretreated
   1.1. Free from corrosion and damage.
   1.2. All welding and jointing completed and finish off as specified.
   1.3. Free from impurities including soil, grease and oil.
   1.4. Suitable for and compatible with the pretreatment process.
2. Conversion coating requirements: To BS EN 13438.
3. Rinsing requirements: Use demineralized water. Drain and dry.

430 Extent of powder coatings

1. Application: To visible component surfaces, and concealed surfaces requiring protection. Coated surfaces will be deemed 'significant surfaces' for relevant BS 6496 or BS EN 13438 performance requirements.

435 Application of powder coatings

1. Surfaces to receive powder coatings: Free from dust or powder deposits.
2. Powder colours: Obtain from one batch of one manufacturer.
3. Commencement of powder coating: To be continuous from pretreatment.
4. Components to be installed on site in order of application.
5. Jig points: Not visible on coated components.

6. Curing: Controlled to attain metal temperatures and hold periods recommended by powder coating manufacturer.
7. Stripping and recoating of components: Only acceptable by prior agreement of powder coating manufacturer. Stripping, pretreatment and powder coating are to be in accordance with manufacturer's requirements.
8. Overcoating of components: Not acceptable.

440 Performance and appearance of powder coatings

1. For aluminium components
   1.1. Standard: To BS 6496 or BS EN 12206-1.
2. For steel components
   2.1. Standard: To BS EN 13438.
3. Visual inspection after powder coating: Significant surface viewing distances to be as specified in the relevant Standard, unless specified otherwise.
4. Colour and gloss levels: To conform with approved samples.

450 Aluminium alloy fabrications

1. Units may be assembled
   1.1. Before powder coating.
   1.2. From components powder coated after cutting to size.
   1.3. Where approved, from components powder coated before cutting to size.
2. Exposure of uncoated background metal: Not acceptable.
3. Assembly sealants: Compatible with powder coatings. Obtain approval of colour if sealants are visible after fabrication.

460 Steel fabrications

1. Unit assembly: Wherever practical, before powder coating.
2. Exposure of uncoated background metal: Not acceptable.
3. Assembly sealants: Compatible with powder coatings. Obtain approval of colour if sealants are visible after fabrication.

470 Fixings

1. Exposed metal fixings: Powder coat together with components, or coat with matching repair paint system applied in accordance with the powder coating manufacturer’s recommendations.

480 Damaged components – repair or replacement

1. Before delivery to site: Check all components for damage to powder coatings. Replace damaged components.
2. Site damage: Submit proposals for repair or replacement.

510 Protection

1. Powder coated surfaces of components: Protect from damage during handling and installation, or by subsequent site operations.
2. Protective coverings must be
   2.1. Resistant to weather conditions.
   2.2. Partially removable to suit building in and access to fixing points.
3. Protective tapes in contact with powder coatings must be

3.1. Low tack, self adhesive and light in colour.

3.2. Applied and removed in accordance with tape and powder coating manufacturers' recommendations. Do not use solvents to remove residues as these are detrimental to the coating.

4. Inspection of protection: Carry out monthly. Promptly repair any deterioration or deficiency.

520 Protection in hazardous locations

1. Minimum thickness of 60 microns across significant and/ or primary surfaces.
2. Minimum thickness of 25 microns on non-significant and/ or secondary faces ensuring a coherent film layer.
3. All cut edges, drilled holes and mitres to be fully sealed.
4. Cleaning: Carried out once every three to twelve months (dependent on proximity to pollutant).

535 Documentation

1. Submit the following information for each batch of powder coated components
   1.1. Supplier.
   1.2. Trade name.
   1.3. Colour.
   1.4. Type of powder.
   1.5. Method of application.
   1.6. Batch and reference number.
   1.7. Statutory requirements.
   1.8. Test certificates.
   1.9. Maintenance instructions.

540 Completion

1. Protection: Remove any protective coverings.
2. Cleaning and maintenance of powder coatings: Carry out in accordance with procedures detailed in powder coating manufacturer and applicator guarantees.

Ω End of Section

Z33
Anodizing

To be read with preliminaries/ general conditions.

110 Anodic coating

1. Selected anodizer: Submit details before commencement of anodizing, including:
   1.1. Name and contact details.
   1.2. Details of accreditation schemes.
   1.3. Technical data of product including current Agrément certificates.

210 Working procedures

1. Standard: To BS 3987 for anodic coatings on wrought aluminium.

220 Anodizer requirements

1. Processing
   1.1. Approved: By the Aluminium Finishing Association.
   1.2. Certified: To BS EN ISO 9001.
   1.3. Anodizing plant: Each anodizer to use only one plant.

230 Guarantees

1. Anodizer guarantees: Submit sample copies before commencement of anodizing.
2. Project specific guarantees: Submit signed copies on completion of work.
3. Guarantees to cover
   3.1. Life expectancy.
   3.2. Colour: Opacity and consistency.
   3.3. Texture: Gloss, satin or matt.
   3.4. Quality of coating.

240 Control samples

1. Sequence: Prior to ordering materials for the works, obtain approval of appearance for:
   1.1. Anodic coated samples: Showing colour and texture variation.
   1.2. Fabrication samples: Showing joint assembly, how anodic coating is affected and how cut metal edges are finished and protected.

255 Quality assurance system

1. Requirement: Powder and coating application to the following designated components is to be tested and approved in accordance with the Qualanod system.

270 Component design

1. Condition of components to be anodized
   1.1. To comply with relevant recommendations of BS 4479-1, and -5.
   1.2. Of suitable size to fit plant capacity.

310 Pretreatment

1. Condition of components to be anodized
   1.1. Free from corrosion and damage.
   1.2. Suitable for and compatible with the pretreatment and anodizing process.
2. Process: In accordance with the specification requirements for the finish.

410 Extent of anodic coatings

1. Application: To visible component surfaces, and concealed surfaces requiring protection. Coated surfaces will be deemed 'significant surfaces' for relevant BS 3987 performance requirements.

420 Application of anodic coatings

1. Surfaces to receive anodic coatings: Clean.
2. Commencement of anodic coating: To be continuous from pretreatment.
3. Jig points: To be agreed. Not on visible areas of anodic coated components.
4. Use of touch-up paint: Not acceptable.

430 Performance and appearance of anodic coatings

1. Standard: To BS 3987.
2. Visual inspection after anodizing: Significant surfaces to be free from visible coating/ defects when viewed from a distance of not less than 5 m for external and 3 m for internal applications.

440 Fabrication

1. Units may be assembled
   1.1. Before anodizing, providing sufficient drainage holes are included in components to fully drain components.
   1.2. From components anodized after cutting to size.
   1.3. Where approved, from components anodized before cutting to size.
   1.4. Exposure of uncoated background metal: Not acceptable.
   1.5. Assembly sealants: Compatible with anodic coatings. Obtain approval of colour if sealants are visible after fabrication.

450 Damaged components – repair/ replacement

1. Before delivery to site: Check all components for damage to anodic coatings. Replace damaged components.
2. Site damage: Submit proposals for repair or replacement.

510 Protection

1. Anodic coated surfaces of components: Protect from damage during handling and installation, or by subsequent site operations.
2. Protective coverings: Must be:
   2.1. Resistant to weather conditions.
   2.2. Partially removable to suit building in and access to fixing points.
3. Protective tapes in contact with anodizing to be
   3.1. Low tack, self adhesive and light in colour.
   3.2. Applied and removed in accordance with tape and anodizers recommendations.
4. Inspection of protection: Carry out weekly. Promptly repair any deterioration or deficiency.

530 Documentation

1. Submit the following information for each batch of anodic coated components
   1.1. Supplier.
   1.2. Trade name.
   1.3. Colour (if required).
   1.4. Batch and reference number.
   1.5. Statutory requirements.

540 Completion

1. Protection: Remove.
2. Cleaning and maintenance of anodic coatings: Carry out in accordance with procedures detailed in anodizer's guarantees.

Ω End of Section