1 GENERAL

1.1 CROSS REFERENCES

General
Conform to the Preliminaries.

Conform to the Environmental Management section of the Invitation to Tender document.

Related worksections
Conform to associated worksections as follows:

1.2 STANDARD

General
Materials and construction: To AS 3700.

1.3 INTERPRETATION

Definitions

Bedding:
- Face shell: Covering the parts of a hollow unit which are connected by webs, but not the webs themselves with mortar.
- Full: Covering the entire plan area of a solid unit with mortar.

Brickwork and blockwork types:
- Prestressed: Brickwork and blockwork in which some or all cavities or cores are reinforced with stressed tendons.
- Reinforced: Brickwork and blockwork in which some or all grouted cavities or cores are reinforced with steel reinforcement.
- Special: Brickwork and blockwork with specified strength values higher than those specified in AS 3700 and which is tested during its construction to verify that those values have been achieved.
- Standard: Brickwork and blockwork which is not tested for specified strength values.

Compressive strength:
- Bricks or blocks: The characteristic unconfined compressive strength when tested in accordance with AS/NZS 4456.4.
- Brickwork or blockwork: The characteristic unconfined compressive strength determined in accordance with AS 3700.

Face units: Bricks or blocks used in facework, including purpose-made units such as squints, sills and thresholds.

Facework: Brickwork or blockwork in which the form, or form and colour, of the face units and joints is visible in the completed works.

Joint:
- Bed joint: Joint formed by the mortar on which the bricks and blocks are laid.
- Control joint: Joint constructed in brickwork or blockwork to control and absorb movements in it.
- Flush joint: Joint that is finished flush with the surface of the bricks or blocks.
- Perpend: Joint formed between adjacent bricks or blocks laid in the same course.
- Raked joint: Joint that is raked out to a specified depth behind the face of the bricks or blocks.
- Tooled joint: A joint, including flush joint and raked joint, in which the surface is trowelled or ironed to a smooth, dense finish.

Ties:
- Cavity tie: Tie connecting two leaves of masonry that are separated by a cavity of any width.
- Head and column tie: Tie connecting masonry to a structural support.
- Type A tie: Tie not required to have specific seismic design characteristics.
- Type B tie: Tie required to have specific seismic design characteristics.
- Veneer tie: Tie connecting a masonry veneer to a frame or wall designed to resist lateral forces.
2 QUALITY

2.1 INSPECTION

Hold points

Witness points
Give sufficient notice so that inspection may be made at the following stages:
- Bottoms of cavities, after cleaning out.
- Bottoms of core holes, before grouting.
- Control joints, ready for insertion of joint filler.
- Damp-proof courses, in position.
- Flashings, in position.
- Lintels, in position.
- Structural steelwork, including bolts and shelf angles, in position.

2.2 TESTS

Durability
If masonry durability tests are required, test to verify conformance as follows:
- Standard: To AS 3700 Appendix FA.
  - Acceptance criteria:
    - Class M2: 0.5 mm.
    - Class M3: 0.3 mm.
    - Class M4: 0.1 mm.

Special brickwork or blockwork
If special brickwork or blockwork is required, test to verify conformance with the Brick and block performance schedule as follows:
- Compressive strength: To AS 3700 Appendix C.
- Flexural strength: To AS 3700 Appendix D.

2.3 SAMPLES

Brick or block unit samples
Submit face units of each type illustrating the range of variation available, including colour, texture, surface irregularities, defective arrises, and shape.
- Number of each type: 6.

Facework sample panels
Provide, in a suitable position approved by the Principal, a sample panel of each type of facework including face or pointing mortar. If approved by the Principal, the sample panel shall form part of the completed contract works and serve as a future reference for balance of work throughout the construction stage.
- Minimum size (face of panel) (mm): 1200 mm high x 1190 mm long.

Facework set-out
Demonstrate a trial set-out of 2 courses for each panel of facework.

Sand samples
Submit a 2 kg sample of each type of sand required to be of a particular colour, grade or source.

2.4 SUBMISSIONS

Type tests
Submit type test reports to verify conformance of the following:
- Additives.
- Damp-proof courses.
- Flashings.
- Proprietary cold-formed lintels.
- Wall ties.

2.5 TOLERANCES

General
Conform to the Tolerances table.

<table>
<thead>
<tr>
<th>Tolerances table</th>
<th>Position or dimension</th>
<th>Permissible deviation (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavity width</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

NATSPEC 3
18 November, 2003
<table>
<thead>
<tr>
<th>Position or dimension</th>
<th>Permissible deviation (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal or vertical position of a surface relative to a plane surface (bow) when measured as described in AS 3700 Appendix G</td>
<td>3</td>
</tr>
<tr>
<td>Horizontal position at its base or at each storey level of any brick or block specified or shown in plan</td>
<td>15</td>
</tr>
<tr>
<td>Plumb in the total height of the building</td>
<td>25</td>
</tr>
<tr>
<td>Plumb of a storey relative to a vertical line through the base of the member</td>
<td>10</td>
</tr>
<tr>
<td>Position of a bed joint relative to horizontal, or from the level required</td>
<td>10 mm in any 10 m length, 15 mm in total</td>
</tr>
<tr>
<td>Position of any exposed brick surface relative to any adjacent exposed brick surface (the bow provision above also applies)</td>
<td>2</td>
</tr>
<tr>
<td>Relative position of bearing walls in adjacent storeys intended to be in vertical alignment</td>
<td>10</td>
</tr>
<tr>
<td>Relative thickness of perpends in any walls</td>
<td></td>
</tr>
<tr>
<td>Reinforcement and tendons:</td>
<td></td>
</tr>
<tr>
<td>- Across thickness of walls</td>
<td>5</td>
</tr>
<tr>
<td>- Along the length of a wall or up the height of a wall</td>
<td>50</td>
</tr>
<tr>
<td>- In a column or pier</td>
<td>5</td>
</tr>
<tr>
<td>Thickness of bed joint</td>
<td>3</td>
</tr>
<tr>
<td>Thickness of perpend</td>
<td>5</td>
</tr>
<tr>
<td>Thickness of perpend in any wall</td>
<td>5</td>
</tr>
</tbody>
</table>

3 EXECUTION

3.1 MATERIALS AND COMPONENTS

Bricks and blocks
Standard: To AS/NZS 4455.
Durability: Below damp-proof course, use “Exposure” category to AS/NZS 4456.10 Appendix A (Salt attack resistance categories).
Minimum age of clay bricks: 7 days.

Corrosion resistance
Built-in steel products: Conform to the Corrosion resistance table.
- Distance to water: To the mean high water mark.
- External: Includes external leaf and air spaces behind single skin brickwork or blockwork walls.
- Internal: Includes building fabric protected from salt and moisture by vapour barriers, sarking, sheathing and building wraps.

Corrosion resistance table

<table>
<thead>
<tr>
<th>Corrosivity category</th>
<th>Situation</th>
<th>Lintels</th>
<th>Wall ties, connectors and other structural accessories</th>
<th>Flashings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Internal</td>
<td>Galvanize after fabrication 300 g/m²</td>
<td>Galvanize after fabrication 300 g/m²</td>
<td>Metallic coated sheet Z275/AZ150</td>
</tr>
<tr>
<td></td>
<td>More than 10 km from water not subject to breaking surf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More than 1 km from salt water subject to breaking surf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Galvanize after fabrication 300 g/m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metallic coated sheet Z275/AZ150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In line galvanized sections with after fabrication coating repair ILG/150</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Corrosivity

category

Situation

Lintels

Wall ties,
connectors and
other structural
accessories

Flashings

<table>
<thead>
<tr>
<th>Corrosivity category</th>
<th>Situation</th>
<th>Lintels</th>
<th>Wall ties, connectors and other structural accessories</th>
<th>Flashings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>External</td>
<td>Galvanize after fabrication 300 g/m²</td>
<td>- Galvanize after fabrication 300 g/m²</td>
<td>Metallic coated sheet Z450/AZ200</td>
</tr>
<tr>
<td></td>
<td>Internal</td>
<td>Galvanize after fabrication 300 g/m²</td>
<td>- Galvanize after fabrication 300 g/m²</td>
<td>Metallic coated sheet Z275/AZ150</td>
</tr>
<tr>
<td>Medium</td>
<td>Internal</td>
<td>Galvanize after fabrication 300 g/m²</td>
<td>- Galvanize after fabrication 300 g/m²</td>
<td>Metallic coated sheet Z275/AZ150</td>
</tr>
<tr>
<td>High</td>
<td>Internal</td>
<td>Galvanize after fabrication 300 g/m²</td>
<td>- Galvanize after fabrication 470 g/m²</td>
<td>Metallic coated sheet Z450/AZ200</td>
</tr>
<tr>
<td></td>
<td>External</td>
<td>- Stainless 316 metallic coated sheet</td>
<td>- Stainless 316 Engineered polymer</td>
<td>Metallic coated sheet AZ200 plus organic coating</td>
</tr>
</tbody>
</table>

Connectors and accessories
Standard: To AS/NZS 2699.2.

Flashings and damp-proof courses
Standard: To AS/NZS 2904.

Mortar mixing
Measure volumes using buckets or boxes. Machine mix for at least six minutes.

Mortar materials
Additives or admixtures:
- Air-entraining agents: To AS 1478.1.
- Methyl-cellulose water thickeners: To be designed for use in brickwork or blockwork.
- Plasticizers or workability agents: To be designed for use in brickwork or blockwork.
- Pigments: To BS EN 12878 or NZS 3117.
Lime: To AS 1672.1.
Masonry cement: To AS 1316.
Portland cement: To AS 3972.
- Type: GP.
Proportions: Conform to the Mortar mix table.
Sand: To be fine aggregate with a low clay content and free from efflorescing salts, selected for colour and grading.
Water: To be clean and free from any deleterious matter.
White cement: To have iron salts content ≤ 1%.

Mortar mix table

<table>
<thead>
<tr>
<th>Mortar class to AS 3700</th>
<th>Bricks or blocks</th>
<th>Water thickener</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>Concrete</td>
<td>Calcium silicate</td>
</tr>
</tbody>
</table>
TIVOLI CARPARK SITE DEVELOPMENT, 218-242 LITTLE COLLINS STREET, MELBOURNE
CONTRACT NUMBER 59/3/8228A
BRICK AND BLOCK CONSTRUCTION

Bricks or blocks

| Masonry cement | M3 | 1:0:4 | 1:0:4 | n/a | No |
| M4 | 1:0:3 | n/a | n/a | No |

| Portland cement | M1 | 0:1:3 | n/a | n/a | No |
| M2 | 1:2:9 | n/a | n/a | No |
| M3 | 1:1:6 | 1:1:6 | n/a | Optional |
| M4 | 1:0:5 | 1:0:5 | 1:0:5 | Yes |

Protection from contamination
Protect masonry materials and components from ground moisture and contamination.

Steel lintels
Angles and flats: To AS/NZS 3679.1.
Cold formed proprietary lintels: To be designed to AS/NZS 4600.
Corrosion protection: To AS/NZS 2699.3.
Galvanizing: Do not cut after galvanizing.

Wall ties
Standard: To AS/NZS 2699.1.
- Non-seismic areas: Type A.
- Seismic areas: Type B.
Strength classification:
- Cavities > 60 mm wide: Heavy duty.
- Masonry veneer: Light duty.
- Normal cavity construction and at abutments: Medium duty.

3.2 BRICKWORK AND BLOCKWORK

Bond
Stretcher bond.

Building in
Embedded items: Build in wall ties and accessories as the construction proceeds. If it is not practicable to obtain the required embedment wholly in the mortar joint in hollow unit brickwork or blockwork, fill appropriate cores with grout or mortar.
Steel door frames: Fill the backs of jambs and heads solid with mortar as the work proceeds.

Construction at different rates or times
If two or more adjoining sections of masonry, including intersecting walls, are constructed at different rates or times, rake back or tie the intersections between those sections so that monolithic structural action is obtained in the completed work.

Holes and chases
If not required, do not cut holes and chases.

Joining to existing
Do not tooth new masonry into existing work.

Joints
Lay solid and cored units on a full bed of mortar. Face-shell bed hollow units. Fill perpends solid. Cut mortar flush.
- Externally: Tool to give a dense water-shedding finish.
- Internally: If wall is to be plastered, rake not more than 10 mm to give a key.
- Thickness: 10 mm.
Joints and cutting
Set out bricks or blocks with joints of uniform width and minimise cutting of masonry units.

Monolithic structural action
General: Provide brick or block header units, except in stretcher bond facework.
Location:
- At engagement of engaged piers.
- At engagement of diaphragms with the leaves in diaphragm walls.
- At intersections of flanges with shear walls.
- At intersections with supporting walls and buttresses.
- Between leaves in solid masonry construction.

Rate of construction
Regulate the rate of construction to eliminate joint deformation, slumping or instability.

Rods
76 mm high units: 7 courses to 600 mm.
90 mm high units: 6 courses to 600 mm.
190 mm high units: 3 courses to 600 mm.

Weather protection
Keep the top surface of brickwork and blockwork covered to prevent the entry of rainwater.

3.3 FACEWORK
Cleaning
Clean progressively as the work proceeds to remove mortar smears, stains and discolouration. Do not use acid.
Do not erode brickwork or blockwork.

Colour mixing
If the colour of the face units is visible, evenly distribute the colour range of units and prevent colour concentrations and “banding”.

Commencement
Commence at least 1 full course for blockwork, or 2 full courses for brickwork, below adjacent finished ground level.

Double face walls
Select face units for uniform width and double-face qualities in single-leaf masonry with facework both sides.
Before starting, obtain a ruling as to which is the preferred wall face, and favour that face should a compromise be unavoidable.

Perforations
If perforations would otherwise be visible, use solid face units.

Perpends
Vertically align perpends in alternate courses.

Sills and thresholds
Solidly bed sills and thresholds and lay them so that the top surfaces drain away from the building. Set out so that no unit is cut smaller than 3/4 full width.

3.4 SUBFLOOR WORK
Access openings
In internal walls, leave door width openings beneath doorways to give access to underfloor areas.

Air vent locations
Cavity walls: Provide matching vents in the internal leaves located as near as practicable to the vents in the external leaves.
Location: Below damp-proof course, within 600 mm of corners, elsewhere as required by ventilation rate, to internal and external walls.
Ventilation rate: At least 7300 mm$^2$ free ventilation area per linear metre of wall.

Air vent types
Blockwork:
- Concrete framed: Bronze wire mesh in concrete frame 390 x 190 mm.
- Vent blocks: Purpose-made vent blocks.

3.5 CAVITY WORK
Cavity clearance
Keep cavities clear at all times.
Cavity fill
Fill the cavity to 1 course above adjacent finished ground level with mortar weathered towards the outer leaf.

Cavity width
Brick or block walls: 50 mm.

Openings
Do not close the cavity at the jambs of external openings.

Wall ties connectors and accessories
Install to prevent water passing across the cavity.

3.6 DAMP-PROOF COURSES

Location
General: Provide damp-proof courses as follows:
- At timber floors: In the first course below the level of the underside of ground floor timbers in internal walls and inner leaves of cavity walls.
- Cavity walls built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf 1 course above.
- Masonry veneer construction: In the bottom course of the outer leaf, continuous horizontally across the cavity. Fasten to the inner frame 75 mm above floor level.
- Walls adjoining infill floor slabs on membranes: In the course above the underside of the slab in internal walls and inner leaves of cavity walls. Project 40 mm and dress down over the membrane turned up against the wall.

Height: Not less than
- 150 mm above the adjacent finished ground level;
- 100 mm above sandy well-drained areas that extend to the full depth of the footing system;
- 75 mm above the finished paved or concrete area; or
- 50 mm above the finished paved or concreted area and protected from the direct effect of the weather.

Installation
Lay in long lengths. Lap full width at angles and intersections and at least 150 mm at joints. Step as necessary, but not exceeding 2 courses per step. Sandwich damp-proof courses between mortar.
- Junctions: Preserve continuity of damp-proofing at junctions of damp-proof courses and waterproof membranes.
- Location: At least 150 mm above adjacent finished ground level.

3.7 FLASHINGS

Location
Provide flashings and weatherings as follows:
- Floors: Full width of outer leaf immediately above slab or shelf angle, continuous across cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf 2 courses above. Where the slab supports the outer skin and is not rebated, bed the flashing in a suitable sealant.
- Under sills: 30 mm into the outer leaf bed joint 1 course below the sill, extending up across the cavity and under the sill.
- Over lintels to openings in cavity walls: Full width of outer leaf immediately above the lintel, continuous across cavity, turned 30 mm into the inner leaf 2 courses above. Extend at least 50 mm beyond the lintels.
- Over lintels to openings in masonry veneer construction: Full width of outer leaf immediately above the lintel, continuous across cavity. Turn up against the inner frame and fasten to it. Extend at least 50 mm beyond the lintels.
- At abutments with structural frames or supports: Vertical flashing in the cavity using 150 mm wide material, wedged and grouted into a groove in the frame opposite the cavity.
- At stiles where cavities are closed: Full height flashing extending 75 mm beyond the closure into the cavity, interleaved with the sill and head flashing at each end. Fix to frame stiles.

Installation
General: Sandwich flashings between mortar except where on lintels or shelf angles. Bed flashings, sills and copings in one operation to maximise adhesion.
Pointing: Point up joints around flashings, filling voids.

Weepholes
Location: Provide weepholes to external leaves of cavity walls in the course immediately above flashings, and cavity fill, and at the bottoms of unfilled cavities.
Form: Open perpends.
Maximum spacing: 720 mm.
3.8 WALL TIES

Location
Provide wall ties in conformance with the Wall tie spacing table and as follows:
- Opposite vertical lateral supports.

Installation
Embedment: At least 50 mm into mortar and ensure mortar cover is 15 mm minimum to the outside face of the mortar.
Flexible types: If ties or anchors extend across control joints, use ties or anchors which do not impair the effectiveness of the joint.
Water transmission: Install to prevent water passing across the cavity.

Wall tie spacing table

<table>
<thead>
<tr>
<th>Location requirements</th>
<th>Maximum interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generally</td>
<td>Around openings and joints</td>
</tr>
<tr>
<td>76 mm high bricks</td>
<td></td>
</tr>
<tr>
<td>- vertically</td>
<td>7 courses</td>
</tr>
<tr>
<td>- horizontally</td>
<td>2½ bricks</td>
</tr>
<tr>
<td>90 mm high bricks</td>
<td></td>
</tr>
<tr>
<td>- vertically</td>
<td>6 courses</td>
</tr>
<tr>
<td>- horizontally</td>
<td>2 bricks</td>
</tr>
<tr>
<td>190 mm high blocks</td>
<td></td>
</tr>
<tr>
<td>- vertically</td>
<td>3 courses</td>
</tr>
<tr>
<td>- horizontally</td>
<td>1 block</td>
</tr>
<tr>
<td>Masonry veneer walls</td>
<td></td>
</tr>
<tr>
<td>- Top row of ties</td>
<td>Half the horizontal spacing and locate within 300 mm of top of wall</td>
</tr>
<tr>
<td>- First row of ties above a horizontal floor support where veneer continues past support</td>
<td>Half the horizontal spacing and locate within 300 mm of support</td>
</tr>
</tbody>
</table>

3.9 CONTROL OF MOVEMENT

Ageing of concrete
Minimum age of concrete supports to clay bricks: 28 days.

Contraction joints for concrete and calcium silicate masonry
Maximum length of continuous wall: 8 m.
Minimum width of control joint: 10 mm.

Filler material
Provide compatible sealant and bond breaking backing materials which are non-staining to masonry. Do not use bituminous materials with absorbent masonry units.
- Bond breaking materials: To be non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: To be closed-cell or impregnated, not water-absorbing.

Fire rated control joints
If a control joint occurs in an element of construction required to have a fire resistance rating, construct the control joint using fire stopping materials so that the fire resistance rating of the element is not reduced.
- Fire stopping: To AS 4072.1.

Joint filling
Installation: Clean the joints thoroughly and insert an easily compressible backing material before sealing.
Sealant depth: Fill the joints with a gun-applied flexible sealant for a depth of at least two-thirds the joint width.

3.10 BED JOINT REINFORCEMENT

Location
If required, locate as follows:
- In first 2 bed joints above and below head and sill flashings to openings.
- In first 2 bed joints above and below openings.
- In second bed joint below top of wall.
3.11 REINFORCED AND GROUTED BLOCKWORK

General

Provide reinforcement and/or grouting in conformance with the Reinforced and grouted blockwork schedule.

Cleaning core holes

Provide purpose-made cleanout blocks or machine cut a cleaning hole at the base of each grouted core. Locate on the side of the wall which is to be rendered or otherwise concealed. Cover the hole with formwork and grout the core.

Grouting

Commencement: Do not commence until grout spaces have been cleaned out and the mortar joints have attained sufficient strength to resist blow-outs.

Height of lift: Limit the height of individual lifts in any pour to ensure that the grout can be thoroughly compacted to fill all voids and ensure bond between grout and masonry. Compact by vibration or by rodding.

Topping up: On the completion of the last lift, top up the grout after 10 min to 30 min, and vibrate or rod to merge with the previous pour.

3.12 STEEL LINTELS

Location

Provide 1 lintel to each wall leaf in conformance with the Steel lintel schedule.

Installation

General: Do not cut on site. Keep lintels 6 mm clear of heads of frames. Pack mortar between the angle upstand and supported masonry units. Install the long leg vertical.

Minimum bearing each end:

- Span \( \leq 1000 \text{ mm} \): 100 mm.
- Span \( > 1000 \text{ mm} \): 150 mm.

Propping: To prevent deflection or excessive rotation, temporarily prop proprietary cold-formed lintels until the masonry reaches its required strength.

- Minimum propping period: 7 days.

3.13 ARCHES

Arch voussoirs

Cut units using a masonry saw.

Shapes and dimensions

Form arches using solid or cored (not hollow) masonry units.

3.14 BAGGING

Dry bagging

Application: Apply laying mortar to the surface using a hessian bag or similar. Flush up irregularities, but leave the minimum amount of mortar on the surface.

Preparation: Cut joints flush before bagging.

Textured bagging

Application: Apply laying mortar to the surface using a sponge float. Flush up irregularities, but leave approximately 2 mm of mortar on the surface. When initial set is reached, texture using a hand bristle brush.

Preparation: Cut joints flush before bagging.