MASONRY DETAILS
FOR
RESIDENTIAL CONSTRUCTION

by

Dr. M.A. Hatzinikolas, P.Eng.

Canadian Masonry Research Institute
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Acknowledgements

The details contained in this publication were drafted by Mr. Thomas Nicoll C.E.T. of Cadd-abilities Design, Drafting & Inspection Services and reviewed by Mr. R. Pacholok, M.Sc., P.Eng. of Fero Corp. and Mr. Gary Sturgeon, M.Sc., P.Eng. Code Development Engineer for the Masonry Council of Canada. We would like to express our appreciation for their input.

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Printed in co-operation of the Masonry Institute of British Columbia. For masonry technical input in British Columbia please call Mr. Bob Martin, P. Eng., (604) 291-1458 at Masonry Institute of British Columbia, 3636 East 4th Avenue, Vancouver, B.C., V5M 1M3

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Recommended Components And Accessories For Constructing Masonry Veneers

Mortar
Use Type S or Type N mortar mixed in proportions by volume as per CSA Standard A179 "Mortar and Grout for Unit Masonry".

Mortar Proportions by Volume

<table>
<thead>
<tr>
<th>Mortar Type</th>
<th>Portland Cement</th>
<th>Hydrated Lime or Lime Putty</th>
<th>Aggregate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>1</td>
<td>1/2</td>
<td>4-1/2</td>
</tr>
<tr>
<td>N</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

OR

<table>
<thead>
<tr>
<th>Mortar Type</th>
<th>Portland Cement</th>
<th>Masonry Cement</th>
<th>Aggregate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>1/2</td>
<td>1 (Type H)</td>
<td>4-1/2</td>
</tr>
<tr>
<td>N</td>
<td>0</td>
<td>1 (Type H)</td>
<td>3</td>
</tr>
</tbody>
</table>

Ties
For cavities less than or equal to 25 mm, 22 gauge corrugated strips can be used to fasten the wall to the backup system. Corrugated strips should be hot dip galvanised for corrosion protection. They should be fastened to the wood frame by means of galvanised spiral nails penetrating a minimum of 63 mm into the wood frame. The position and placing of the corrugated strip should be as shown in Figure 18, adopted from CSA Standard A370 "Connectors for Masonry".

Figure 19: Corrugated Strip Tie Installation Guidelines
The guidelines for installation and limitations of the corrugated strip ties as stated in CSA Standard A370-M84 should be followed.

Standard corrugated strip ties normally used to connect masonry veneer to its structural backing in buildings not exceeding 11 m in height, shall have corrugations over at least the embedment length and the following characteristics:
(a) thickness: 0.76 ± 0.05 mm;
(b) width: 22 ± 2 mm;
(c) wavelength of corrugations: 10 ± 1 mm; and
(d) depth of corrugations from crest to trough: 2 to 3 mm.

Where standard corrugated strip ties are used to connect masonry veneer to a structural backing
(a) the ties shall be embedded at least 50 mm in masonry units;
(b) the maximum unsupported length of tie between the veneer and its structural backing shall be 25 mm;
(c) strip ties shall be connected directly to the studs or other structural backing; and
(d) strip ties shall not be bent or sloped between the veneer and the structural backing, except as specified in Clause 9.2.1.3.

Where standard corrugated strip ties are to be connected to steel studs, the load capacity and performance of the fasteners used shall be determined by physical testing in accordance with Clause 11.

The maximum spacing for standard corrugated strip ties where pressure on the veneer does not exceed 1.4 kPa shall be as follows:

<table>
<thead>
<tr>
<th>Maximum cavity width mm</th>
<th>Horizontal</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a) 400</td>
<td>600</td>
</tr>
<tr>
<td>or (b) 600</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

Flashing and weep holes should be incorporated into the veneer wall at the base level. Flashing should also be installed at the window sills and wherever angle iron is used to support the veneer. Good quality flashing materials installed with slope and a drip edge this will ensure proper drainage and durability.
Masonry Units

The details contained in this booklet are applicable for tyndall stone, burned clay units and concrete bricks. For projects incorporating long walls and where the walls are supported by flexible structural components, control joints must be incorporated into the wall assemblies.

Caution: The use of used masonry units (reclaimed bricks) requires careful selection of the units to ensure that these units were meant for exterior application. Reclaimed backup bricks deteriorate very rapidly when used in exterior applications. Units new and old used to construct backup walls must satisfy the existing (current) manufacturing standards especially current durability requirements.

Flashing

A sheet of impervious material built into the structure to prevent moisture penetration and/or to direct water which may penetrate the veneer to the outside. Suitable materials to be used for flashing shall not be less than the following.

- Polyethylene sheet 0.15 mm;
- Sheet lead, 1.73 mm;
- Galvanised steel, 0.33 mm;
- Copper, 0.36 mm;
- Copper, 0.05 mm laminated to felt or kraft paper;
- Zinc, 0.46 mm, and
- Poly(vinyl chloride), 0.50 mm
Construction Details for Residential Buildings

Following figures show the construction details for residential buildings.

Figure 1  Building elevation
Figure 2  Brick veneer over garage door opening
Figure 3  Typical brick angle support detail for garage opening
Figure 4  Brick veneer supported by truss (typically over attached garages)
Figure 5  Alternate brick veneer supported by truss (typically over attached garages)
Figure 6  Section through brick veneer supported by truss (typically over attached garages)
Figure 7  Section through alternate brick veneer supported by truss (typically over attached garages)
Figure 8  Typical wall section
Figure 9  Alternate brick detail at soffit
Figure 10  Typical steel shelf angle brick support
Figure 11  Typical concrete foundation wall brick support detail
Figure 12  Wall section with insulation in the cavity
Figure 13  Steel shelf angle brick support detail with cavity insulation
Figure 14  Steel shelf angle brick support detail at stud wall for window openings
Figure 15  Brick shelf angle support detail for bay window
Figure 16  Section through typical brick shelf angle support detail for bay window
Figure 17  Typical brick angle support detail for bay window
Figure 18  Window opening with loose angle iron lintel

Tables 1 presents the spacing of anchors to be used to anchor the brick veneer support steel shelf angle to the concrete wall and Table 2 presents the Maximum allowable spans for steel shelf angles supporting the brick veneer.
Brick veneer over garage door opening

Figure 2

CONTROL JOINT

TIE SPACING
600 mm O.C. VERTICAL
300 mm O.C. HORIZONTAL (MAXIMUM)
FROM THE EDGE OF THE OPENINGS

CONTINUOUS STEEL ANGLE

x

x
CASE # 1
NO CAVITY INSULATION

SECTION X - X

CASE # 2
CAVITY INSULATION

Figure 3  Typical brick angle support detail for garage opening
Figure 4  Brick veneer supported by truss (typically over attached garages)
Figure 5  Alternate brick veneer supported by truss (typically over attached garages)
Figure 6  Section through brick veneer supported by truss (typically over attached garages)
Figure 7
Section through alternate brick veneer supported by truss (typically over attached garages)

50 x 50 x 10 mm CLIP ANGLES FASTENED WITH 10 mm DIAMETER LAG BOLTS @ 75 mm LONG

DOUBLE STUD FRAMING

L100 x 100 x 10 CONT. STEEL BRICK SUPPORT ANGLE C.W. THRU BOLTS @ 400 mm O.C.

L100 x 100 x 10 CONTINUOUS BRICK SUPPORT ANGLE C.W. THRU BOLTS @ 400 mm O.C. ADD DOUBLE SOLID BLOCKING BETWEEN STUDS AS SHOWN

FLASHING

ROOFING PAPER
PLYWOOD SHEATHING
ROOF TRUSSES

Typically over Attached Garages
TYPICAL BRICK ANGLE SUPPORT DETAIL
AT STUD WALL FOR WINDOW OPENINGS

BRICK VENEER
25 mm AIR SPACE
RIGID INSULATION
BUILDING PAPER
EXTERIOR SHEATHING
STUD WALL
BATT INSULATION
VAPOR BARRIER
DRYWALL

BRICK TIES
SPACED 400 mm O.C. HORIZONTAL
600 mm O.C. VERTICAL

TYPICAL BRICK ANGLE SUPPORT DETAIL

WEEP HOLES @ 600 mm O.C.
FLASHING
RIGID INSULATION
DAMP-PROOFING

Figure 8   Typical wall section
Figure 10  Typical steel shelf angle brick support
Figure 12  Wall section with insulation in the cavity
Figure 13  Steel shelf angle brick support detail with cavity insulation
Figure 14  Steel shelf angle brick support detail at stud wall for window openings
Figure 15  Brick shelf angle support detail for bay window
Figure 16  Section through typical brick shelf angle support detail for bay window
Figure 17  Typical brick angle support detail for bay window
Figure 18  Window opening with loose angle iron lintel
Table 1  Anchoring on concrete basement wall 90 mm x 90 mm x 10 mm angle iron to provide support for brick veneer

<table>
<thead>
<tr>
<th>Height of Brick, m</th>
<th>Spacing</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Drop-In Anchor</td>
<td>Wedge Anchor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/2&quot; Dia.</td>
<td>5/8&quot; Dia.</td>
<td>1/2&quot; Dia.</td>
</tr>
<tr>
<td>1.2</td>
<td>1.10 m</td>
<td>1.20 m</td>
<td>1.20 m</td>
</tr>
<tr>
<td>1.8</td>
<td>0.70 m</td>
<td>1.20 m</td>
<td>1.10 m</td>
</tr>
<tr>
<td>2.4</td>
<td>0.50 m</td>
<td>0.90 m</td>
<td>0.80 m</td>
</tr>
<tr>
<td>3.0</td>
<td>0.45 m</td>
<td>0.70 m</td>
<td>0.60 m</td>
</tr>
<tr>
<td>3.6</td>
<td>0.35 m</td>
<td>0.60 m</td>
<td>0.50 m</td>
</tr>
<tr>
<td>Min. Embedment</td>
<td>50 mm</td>
<td>60 mm</td>
<td>60 mm</td>
</tr>
<tr>
<td>Min. Edge Distance</td>
<td>65 mm</td>
<td>80 mm</td>
<td>65 mm</td>
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</table>
### Table 2
**Maximum Allowable Spans for Steel Lintels**  
Supporting Masonry Veneer---with Imperical Equivalents

<table>
<thead>
<tr>
<th>Minimum angle size</th>
<th>Brick thickness</th>
<th>Stone thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>75 mm</td>
<td>90 mm</td>
</tr>
<tr>
<td></td>
<td>3 Inches</td>
<td>3-5/8 Inches</td>
</tr>
<tr>
<td></td>
<td>Span</td>
<td>Span</td>
</tr>
<tr>
<td>90x75x6.0</td>
<td>2500&quot;</td>
<td>--</td>
</tr>
<tr>
<td>3.5x3x0.25</td>
<td>8 ft 4 in</td>
<td>8 ft 1 in</td>
</tr>
<tr>
<td>90x90x6.0</td>
<td>2600&quot;</td>
<td>2500</td>
</tr>
<tr>
<td>3.5x3.5x0.25</td>
<td>8 ft 5 in</td>
<td>8 ft 10 in</td>
</tr>
<tr>
<td>100x90x6.0</td>
<td>2800&quot;</td>
<td>2700</td>
</tr>
<tr>
<td>4x3.5x0.25</td>
<td>9 ft 3 in</td>
<td>8 ft 10 in</td>
</tr>
<tr>
<td>125x90x6.0</td>
<td>3300&quot;</td>
<td>3100</td>
</tr>
<tr>
<td>5x3.5x0.25</td>
<td>10 ft 10 in</td>
<td>10 ft 4 in</td>
</tr>
<tr>
<td>150x90x6.0</td>
<td>3700&quot;</td>
<td>3500</td>
</tr>
<tr>
<td>6x3.5x0.25</td>
<td>12 ft 3 in</td>
<td>11 ft 8 in</td>
</tr>
</tbody>
</table>

Adopted from CSA standard CAN3-A370-M84, "Connectors for Masonry"
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