897. 13 DPWH
12.22.2016

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
Manila

21 DEC 2016

DEPARTMENT ORDER)
No. 230)
Series of 2016 12.22.16)

SUBJECT: DPWH Standard Specification for ITEM 1046 – Masonry Works

In line with the mandate of the Department in providing effective standard specifications in the implementation of various infrastructure projects and in view of the need of setting a standard specification for masonry works, the attached **DPWH Standard Specification for Item 1046 – Masonry Works** is hereby prescribed, for the guidance and compliance of all concerned.

The specification shall form part of the on-going revision of the DPWH Standard Specifications for Public Works Structures (Buildings, Ports and Harbors, Flood Control and Drainage Structures and Water Supply Systems), Volume III, 1995 Edition.

This Order shall take effect immediately.

RAFAEL C. YABUT
Senior Undersecretary
Officer-in-Charge

Department of Public Works and Highways
Office of the Secretary
WIN6U01396

DPWH Standard Specification for
Item 1046 – Masonry Works

1046.1 Description

This Item shall consist of furnishing of all necessary materials, tools, equipment and labor necessary to complete the execution of the masonry works using Concrete Hollow Blocks and Louver Blocks as shown on the Plans and herein specified.

1046.2 Material Requirements

1046.2.1 Hydraulic Cement

Hydraulic Cement shall conform to the applicable requirements of Item 700, Hydraulic Cement.

1046.2.2 Aggregates

Aggregates shall conform to the applicable requirements of Item 405, Structural Concrete.

1046.2.3 Water

Water shall conform to the applicable requirements of Item 714, Water.

1045.2.4 Reinforcing Steel

Reinforcing steel shall conform to the applicable requirements of Item 710, Reinforcing Steel and Wire Rope.

1046.2.5 Mortar

Mortar shall consist of sand, cement and water conforming to the requirements of Item 405, Structural Concrete, mixed in the proportion of one (1) part cement to three parts sand by volume, and sufficient water to obtain the required consistency.

1046. 2.6 Concrete Hollow Blocks and Louver Blocks

Width, height and length of concrete hollow blocks and louver blocks shall be ±3.20mm from the specified dimension shown on the Plans.

1046.2.6.1 Load-Bearing Concrete Hollow Blocks

Load-bearing concrete hollow blocks shall conform to the physical requirements of the Tables below as prescribed on ASTM C 90, Standard Specifications for Load-bearing Concrete Masonry Units.

Table 1046.1 Minimum Thickness of Face Shells and Webs

Nominal Width (W) of Units, mm	Face Shell Thickness (t_{fs}), min., mm	Web Thickness (t_w)	
		Webs, min., mm	Equivalent Web Thickness, min., mm/linear m
76.2 and 102	19	19	136
152	25	25	188
203	32	25	188
254 and greater	32	29	209

Table 1046.2 Strength, Absorption, and Density Classification Requirements

Density Classification	Oven-Dry Density of Concrete, kg/m³	Maximum Water Absorption, kg/m³		Minimum Net Area Compressive Strength, MPa (Psi)	
	Average of 3 Units	Average of 3 Units	Individual Units	Average of 3 Units	Individual Units
Lightweight	Less than 1680	288	320	13.1 (1900)	11.7 (1700)
Medium Weight	1680 to less than 2000	240	272	13.1 (1900)	11.7 (1700)
Normal Weight	2000 or more	208	240	13.1 (1900)	11.7 (1700)

1046.2.6.2 Non-load bearing Concrete Hollow Blocks and Louver Blocks

Non-load bearing concrete hollow blocks shall be clearly marked to prevent their use as load bearing units.

a. **Type I, Moisture-Controlled Units** – Units shall conform to the requirements of Tables 1046.3, 1046.4 and 1046.5.

b. **Type II, Non-moisture-Controlled Units** – Units designated as Type II shall conform to the requirements of Table 1046.4.

Table 1046.3 Weight Classification

Weight Classification	Oven-Dry Density of Concrete, kg/m³
Lightweight	Less than 1680
Medium Weight	1680 to less than 2000
Normal Weight	2000 or more

Table 1046.4 Strength Requirements

	Compressive Strength (average net area min.,) MPa (Psi)
Average 3 Units	4.14 (600)
Individual Unit	3.45 (500)

Table 1046.5 Moisture-Content Requirements for Type I Units

Total Linear Drying Shrinkage, %	Moisture Content, max, % of Total Absorption (Average of 3 Units)		
	Humidity Conditions at Job Site of Point of Use		
	Humid[B]	Intermediate[C]	Arid[D]
Less than 0.03	45	40	35
0.03 to less than 0.045	40	35	30
0.045 to 0.065, max	35	30	25

Note: [B] Mean annual relative humidity above 75%
[C] Mean annual relative humidity 50 to 75%
[D] Mean annual relative humidity less than 50%

1046.2.7 Other Constituents

Air-entraining agents, coloring pigments, integral water repellents, finely ground silica, and other constituents, shall be previously established as suitable for use in concrete masonry and shall conform to applicable ASTM standards or shall be shown by test or experience not to be detrimental to the durability of the concrete masonry units or any material customarily used in masonry construction.

1046.3 Construction Requirements

1046.3.1 Mixing

Concrete shall be mixed well using the proportion specified by the Engineer. Hand mixing shall be done, using shovels, on a level concrete slab or steel plate. Mix aggregate and cement until the color is uniform. Spread the mixture out, sprinkle water over the surface and mix. Continue with this process until the right amount of water has been mixed in. Mixture shall be free from impurities such as dirt and grass.

If batch mixer is used, accurate timing and measuring devices shall be observed as per manufacturer's recommendation.

1046.3.2 Moulding

Hand operated machines shall be used as manufacturer's recommendation.

The mould of a powered machine should be filled until six (6) to eight (8) cycles of compaction are required to bring the compacting head to its stops.

Demoulding or removal of the mould shall be done carefully so that the fresh blocks are not damaged. Fresh blocks shall be protected from rain with plastic sheets or any suitable covering during the first day and from the drying effects of the sun and wind until curing starts.

1046.3.3 Curing

After being removed from the mold, the Concrete Hollow Blocks (CHB) and Louver Blocks shall be covered with a plastic sheet or tarpaulin and kept damp and shaded for at least seven (7) days in order to effectively cure. This can be achieved by continually spraying them with water or keeping them under water in tanks.

1046.3.4 Installation

1. All masonry work shall be laid true to line, level, plumb and neat in accordance with the Plans.

2. Units shall be cut accurately to fit all plumbing ducts, opening for electrical works, and all holes shall be neatly patched.

3. No construction support shall be attached to the wall except where specifically permitted by the Engineer.

4. Masonry unit shall be sound, dry, clean and free from cracks when placed in the structure.

5. Proper masonry units shall be used to provide for all window, doors, bond beams, lintels, plasters etc., with a minimum of unit cutting.

6. Where masonry units cutting is necessary, all cuts shall be neat and true to line.

7. Units shall be placed while the mortar is soft and plastic. Any unit disturbed to the extent that the initial bond is broken after initial positioning shall be removed and re-laid in fresh mortar.

8. Mortar should not be spread too far ahead of units, as it will stiffen and loose plasticity, especially in hot weather. Mortar that has stiffened should not be used. ASTM C 270 requires that mortar be used within 2½ hours of initial mixing.

1046.3.5 Reinforcement for Concrete Hollow Blocks

Reinforcement shall be done in accordance with the structural plans as to size, spacing and other requirements of Item 404 – Reinforcing Steel under Section 404.3 – Construction Requirement.

Reinforcement shall be clean and free from loose, rust, scales and any coatings that will reduce bond.

1046.3.6 Finish and Appearance

1. All units shall be sound and free of cracks or other defects that interfere with the proper placement of the unit or significantly impair the strength or permanence of the construction. Minor cracks, incidental to the usual method of manufacture or minor chipping resulting from customary methods of handling in shipment and delivery, are not grounds for rejection.

2. Where units are to be used in exposed wall construction, the face or faces that are to be exposed shall not show chips or cracks, not otherwise permitted, or other imperfections when viewed from a distance of not less than 6.1 m under diffused lighting.

    a. Five percent of a shipment containing chips, not larger than 25.4 mm in any dimension, or cracks not wider than 0.5 mm and not longer than 25% of the nominal height of the unit, is permitted.

3. The color and texture of units shall be specified by the purchaser. The finished surfaces that will be exposed in place shall conform to an approved sample, consisting of not less than four (4) units, representing the range of texture and color permitted.

4. A shipment shall not contain more than 5% of units, including broken unit that do not meet the requirements of the above provisions.

1046.3.7 Sampling and Testing for Concrete Hollow Blocks and Louvers

Method of Sampling for Quality Test shall be as follows:

1. One (1) Quality Test for every 10,000 units or fraction thereof.
2. Six (6) specimens to be submitted for one (1) quality test in which three (3) specimens for Compression Test and the remaining three (3) for Moisture Content and Water Absorption.

Units shall be tested in accordance with ASTM C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units and ASTM C 426, Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.

1046.3.8 Storage and Handling of Masonry Works

The blocks shall be stored in such a way as to avoid contact with moisture at site. They shall be stock-piled on planks or other supports free from contact with ground and covered to protect against wetting. The block shall be handled with care and damaged units shall be rejected.

1046.4 Method of Measurement

The work to be paid for under this Item shall be the number of square meters of masonry units that are satisfactorily accepted and completed.

1046.5 Basis of Payment

The accepted quantity, measured as prescribed in Section 1046.4, Method of Measurement shall be paid for at the contract unit price for Masonry Works which price and payment shall include the cost of furnishing all labor, materials and equipment necessary to complete the work.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
1046 (1) a	CHB Load-Bearing (including Reinforcing Steel), 100 mm	Square Meter
1046 (1) b	CHB Non-Load Bearing (including Reinforcing Steel), 150 mm	Square Meter
1046 (2) a	CHB Load-Bearing (including Reinforcing Steel), 100 mm	Square Meter
1046 (2) b	CHB Non-Load Bearing (including Reinforcing Steel), 150 mm	Square Meter
1046 (3)	Louver Block	Square Meter

References:

1. *ASTM C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units*
2. *ASTM C 426, Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units*
3. *ASTM C 129, Standard Specification for Nonloadbearing Concrete Masonry Units.*
4. *ASTM C 90, Standard Specifications for Loadbearing Concrete Masonry Units.*
5. *ASTM C 270, Standard Specifications for Mortar for Unit Masonry.*
6. *DPWH Standard Specification for Highways, Bridges and Airports, Vol, II*
7. *Internet: http://www.afrisam.co.za/media/13734/How_to_make_concrete_bricks_and_blocks.pdf*
8. *Internet: National Concrete Masonry Association, www. ncma.org*
9. *Internet: https://www.sheltercluster.org/sites/default/files/docs/Key%20Messages%20CHB%20V1.1.pdf*
10. *Internet: http://photos.state.gov/libraries/manila/681079/aventuradohj/ATTACHMENT%206.pdf*