

TRADE OF PLASTERING

PHASE 2

Module 3

Slabbing, Skimming, Dry Lining and Floors

UNIT: 4

Metal Stud Partitions

Produced by

SOLAS

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Introduction

Welcome to this section of your course which is designed to introduce you the learner, to identify the fire ratings of plaster, the components of metal stud partitions, to interpret and draw metal stud partitions and calculate labour and materials costs.

Unit Objective

By the end of this unit each apprentice will be able to:

- Identify the fire ratings of materials used in plaster
- Identify the components used in metal stud partition
- Interpret and draw metal stud partition
- Calculate cost of labour and materials

1.0 Fire Ratings of Materials Used In Plaster

Key Learning Points

- Fire ratings, combustion, use of non-combustible materials, expansion resulting from heat on metal, plaster and concrete

1.1 Fire Ratings, Combustion, Non-Combustible Materials and Expansion

Expansion

Most substances expand on heating and contract on cooling. If the natural expansion and contraction of a body are restricted then very large forces may occur. Different substances expand by different amounts and the co-efficient of linear thermal expansion is a measure of the relative change of length.

A steel bar increases its length by 12/100 000 for each degree of temperature rise. Concrete expands at a similar rate to steel The expansion of aluminium is about twice that of steel and the expansion of plastics is up to ten times that of steel.

Allowances must be made in construction for the effect of expansion, particularly for concrete, metals and plastics. The results of destructive expansion can be seen in the twisted girders of a building after a fire.

Plasters are non-combustible and contribute to the fire resistance of wood, steel and other components in a building.

Plasterboard is designated a 'material of limited combustibility' within the Building Regulations 1985. The exposed plasterboard surfaces achieve a Class O rating as a result of their performance when tested to BS 476: Parts 6 and 7.

Gypsum plasters give good fire protection, owing to the unique behaviour of gypsum in high temperatures. Base Coat Plaster, like all gypsum plaster, is non-combustible when tested in accordance with BS476; Part 4; 1970. Its surface is therefore designated Class O in accordance with the requirements of the Proposed Building Regulations

The fire resistances of imperforate metal stud partitions are the results of tests to BS 476: Part 8: 1972, or BS 476: Part 22: 1987, or assessments based on these tests. Elements of structure such as compartment walls required by national Building Regulations to be constructed of non-combustible materials or 'materials of limited combustibility', should be installed without timber sole plates. All metal stud partitions are tested for fire resistance without timber sole plates. However, if a timber sole plate is included, the plasterboard linings should be fixed tightly to the floor to protect the sole plate on each side.

2.0 Components Used In Metal Stud Partition

Key Learning Points

- Metal Stud partition

2.1 Metal Stud Partition



Metal stud partitions are lightweight, non-loadbearing and quickly assembled on site. They provide low cost partitions suitable for all types of buildings. The system consists of tapered edge plasterboards screw-fixed to lightweight metal sections, and is suitable for direct decoration. The partition is extremely versatile and can provide high levels of fire resistance and sound insulation whilst satisfying stability requirements.

When completed, these lightweight partitions weigh much less than masonry partitions of comparable thickness, thus effecting savings in structural design.

The system easily allows for the inclusion of services during construction.

The performances claimed for this partition system can be achieved only if fixing recommendations are strictly observed.

BS 1230: Part 1: 1985 Specification for plasterboard excluding materials submitted to secondary operations.

BS 2989: 1982 Specification for continuously hot-dip zinc coated and iron-zinc alloy coated sheet steel.

BS 7364: 1990 Specification for galvanised steel studs and channels for stud and sheet partitions and linings using screw fixed gypsum wallboards.

BS 5750: Part 2: 1987 Specification for production and installation. All plasters and plasterboards are manufactured under this quality assurance system, which is approved by the BSI.

Composition

A flush finish is obtained on both sides by using tapered edge wallboard or fireline board, 12.5mm or 15mm thick. When these are jointed in the recommended manner a smooth, seamless surface is obtained which can be decorated with most proprietary finishes.

The partition thickness depends on the sound insulation and fire resistance requirements.

The dimensions of the plasterboards used in metal stud partitions are given in table 1, and the sizes of the studs and channels in table 2.

Dimensions of Plasterboards Used In Metal Stud Partitions

Description	Thickness mm	Width mm	Length mm
Tapered Edge Wallboard	12.5	1200	2350-3600
	15	1200	2400-3000
Tapered Edge Fireline board	12.5	1200	2400-3600
	15	1200	2400-3600

Key

S = Stud section

C = Channel section - 32mm flange

DC = Deep channel section - 50mm flange

EDC = Extra deep channel section - 70mm flange

*Studs are also available in 0.7mm metal thickness for increased structural performance.



- Determine and mark the wall position and make allowance for openings.
- Fix 50mm, 62mm, and 72mm Floor & Ceiling Channels along their centre line to the floor and ceiling at 600mm centres with suitable fixings.
- 94mm and 148mm Floor & Ceiling Channels require two rows of staggered fixings, each at 600mm centres. Each row staggered by 300mm.
- For partition heights between 4200mm and 8000mm Deep Flange Floor & Ceiling Channel (DC) should be used at head and base.
- For partitions above 8000mm Extra Deep Flange Floor & Ceiling Channel (EDC) should be used at head and base.
- On uneven floors, a timber sole plate, 38mm deep x width of stud, may be required.
- On new concrete or screeding, consider installing a damp proof membrane to the full partition width before locating the floor channel or sole plate.

Channel depths at the partition head may need increasing where deflection head detailing is required.

Accessories

Screws

Drywall screws are self-drilling and self-tapping with countersunk Phillips heads 25mm for the first layer of 12.5mm or 15mm board. 32mm for the first layer of 19mm plank. 36mm for a second layer of 12.5mm board over 12.5mm board. 42mm for a second layer of 12.5mm board over 19mm plank, or a second layer of 15mm board over 15mm board.

Fixing Channel

Used for medium to heavyweight fixtures to the face of partitions and to provide horizontal end support to the face layer plasterboards where the partition height exceeds the length of board being used.

Jointing Compounds

Air drying jointing compound – Easy to sand (Sheet rock and Profim).

Edge bead (optional) - A perforated channel section to protect and give a featured edge to plasterboard.

Sealant (optional) - Used to seal airpaths.

Control joint (optional) - A section installed in the partition to allow for movement within the run of the partition.

Timber sole plate (optional) - Prepared width timber 38mm thick × width of floor channel.

Performance

Fire Protection

Plasterboard is designated a 'material of limited combustibility' within the Building Regulations 1985. The exposed plasterboard surfaces achieve a Class O rating as a result of their performance when tested to BS 476: Parts 6 and 7.

Fire Resistance

The fire resistances of imperforate metal stud partitions are the results of tests to BS 476: Part 8: 1972, or BS 476: Part 22: 1987, or assessments based on these tests.

Elements of structure such as compartment walls required by national Building Regulations to be constructed of non-combustible materials or 'materials of limited combustibility', should be installed without timber sole plates. All metal stud partitions are tested for fire resistance without timber sole plates. However, if a timber sole plate is included, the plasterboard linings should be fixed to protect the sole plate on each side.

Sound Insulation

To achieve optimum sound insulation it is most important that the partition is made airtight. Most junctions can be sealed by standard jointing materials. However, gaps in excess of 6mm beneath the plasterboard linings at floor level need to be completely filled to the face of the partition with joint filler or jointer during the jointing process and after the application of sealant. Small gaps at the base, or other airpaths which may occur in the partition, can be sealed with sealant.

The standard of sound insulation achieved on site may be influenced by flanking transmission. Therefore, care should be taken to ensure that the associated structure is suitable to achieve the level of sound insulation required.

Dry Lining

This is a means of achieving a wall surface that is quickly ready for decoration without the use of the traditional ‘wet’ 2 or 3 coat plastering method. There are various methods that may be used, wallboards nailed to timber grounds that are fixed to the brickwork or blockwork, wallboards fixed on a bed of plaster immediately onto the wall face, several proprietary methods use metal channels, clips etc., to secure the wallboards.

One of the most frequently used forms of dry lining is the application of tapered edge wallboard to any internal wall face, using small perforated fibreboard pads, or dots, aligned to set the levels. Dabs of bonding compound hold the boards in position, the joints being filled and finished to provide a flush dry surface that is ready for decoration the following day. This dry lining method can be applied to brick, breeze or clinker blocks, lightweight blocks or concrete, and can be used on any wall surface where plaster would be appropriate.

Tapered Edge Wallboards

These are available in thicknesses of 9.5mm and 12.7mm, lengths are 2400mm. The widths obtainable are 900mm and 1200mm. The boards are fixed vertically and the length of the boards used must be approximately 25mm less than the finished floor to ceiling height. Boards are easily cut to any dimension. Wherever possible the cut edges should occur at internal angles where they are readily mastered. The use of the 300mm grid as recommended by BS 4011 (Coordination of Dimensions in Buildings) will help to keep cutting to a minimum. In general an allowance of 20mm for the thickness of finish to the walls should be satisfactory but this could be insufficient if the backing wall is badly out of line.

The Dry Lining Method

The technique may be broken down into three distinct phases:

1. Preparation – Correcting irregularities of the wall and establishing the basis of a true surface
2. Fixing the wallboards – Securing the boards and securing perfect alignments
3. Joint treatment – Joint filling and surface finish

Preparation

Most brick, block or concrete walls need ‘straightening’, in traditional work this is done by the application of the floating coat. With the dry lining method this is achieved by applying and lining up a series of ‘dots’. These ‘dots’ are small pads of thin bitumen impregnated fibreboard 75mm × 50mm bedded to the wall with thistle board finish plaster. The use of ‘dots’ is based on the ‘dotting’ system employed in good quality traditional plastering.

The procedure is to mark the walls vertically at 450mm centres. The wall is then checked with a straight-edge or line to find the high spots.

Using these high spots as a guide for the level to be set, the ‘dots’ are then placed in the following sequence:

1. Place two dots at each angle; make sure that they are plumb. The top ‘dot’ should be 225mm from the ceiling level and the bottom ‘dot’ 100mm from the floor level.
2. Assuming a 2350mm height, place intermediate ‘dots’ at each angle.
3. Repeat this procedure at 1800mm centres, carefully lining through from the ‘dots’ at the angles.
4. Repeat this pattern around the room.
5. Return and apply intermediate ‘dots’ on each line marked on the wall, lining them up with the existing ‘dots’.

Vertically the ‘dots’ should not be placed at more than 1050mm and ceiling heights in excess of 2400mm will therefore require a further row of ‘dots’. ‘Dots’ at a junction between boards should be placed to bridge the joints. ‘Dots’ on or close to high spots should be bedded with a minimum amount of plaster. At the high spots on the wall, the plaster bed of the pads should never be less than 3mm thick. Care in carrying out this preliminary work is essential, and will mean time saved later when the boards and jointing are applied

Fixing the Wallboards

Allow the ‘dots’ to set hard. This takes about one hour, but in practice there is no waiting time because by the time the ‘dotting’ is well advanced boarding can commence on the first ‘dots’. Using neat board finish plaster, apply a series of plaster dabs between the ‘dots’. Each dab should be the length of a plasterer's trowel and thick enough to stand proud of the ‘dots’. There should be a gap of 50mm to 75mm between the dabs. The width of the dab should not be more than 50mm to 75mm. Apply it with the trowel and use the edge of the trowel to cut back the plaster in a sweeping movement, leaving a crest of plaster.

Apply dabs for one board at a time, and make sure that dabs adjacent to joints between boards are kept back from the edge of the board by approximately 25mm.

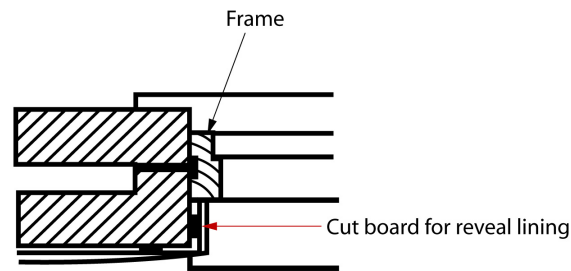
Attention to these simple details will ensure a perfect bond between wallboard and wall

The next operation is to place the wallboard in position. The wallboard should always be at least 25mm shorter than the floor to ceiling height. Place the wallboard in position with the bottom end resting on a foot-lifter. Tap the board back firmly with a straight edge until it is tight against the ‘dots’. Lift the board gently with the foot lifter until it is tight up to the ceiling.

As the board is tapped tightly against the ‘dots’ the projecting plaster dabs flatten out on contact with the back of the board and this ensures firm adhesion. Ensure that the leading edge of the board is plumb and central down the third line of ‘dots’ then use double-headed nails to secure the board by driving them into the ‘dots’. Nailing is normally only required at the edges of the boards. Drive the nails home until the first head has slightly dimpled the paper surface of the plasterboard. The object of the nails is to hold the board firmly whilst the plaster is setting. The boards cannot therefore be moved accidentally during the setting period. When the plaster has set (in about 1 hour) the nails are removed by a twist and a pull with pliers, and may be used again.

Further dabs are now applied and the second board is fixed in the same manner, care must be taken to ensure that the boards are lightly butted at the joints. This procedure is followed until the next internal angle is reached. If it is necessary at this point to reduce the width of a board, the cut edge should be placed to the internal angle.

Window Reveals and Soffits



Plan section of reveal

Cut the narrow widths of plasterboard for reveals and window head so that they project slightly from the wall face. Fix the reveal lining by applying plaster dabs to the back of the wallboard and pressing directly into position. Care must be taken to ensure that the board is plumb and true. The 'dots' on the window wall are then positioned lining up to the leading edge of the reveal lining. The lining to the window head is similarly placed in position, fixed directly to the soffit and temporarily supported. Boarding should now proceed from the window outwards, and the facing boards should be fixed to master the leading edge of the reveal linings. Fix the facing boards last. It is likely that those boards will have to be cut to fit and a cut edge will therefore butt against a tapered bound edge at the joints (or one cut edge and one tapered edge), lightly sandpaper the cut edges to remove the paper burrs. Allow a 3mm gap where one or two cut edges occur.

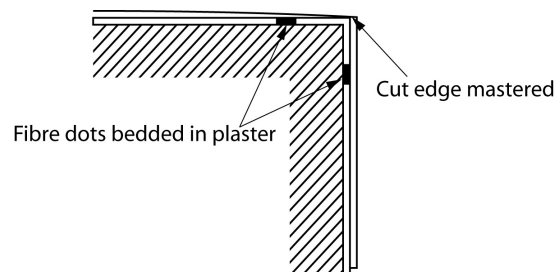
Doorways

Boarding should start from the door casing outwards and the panel above the door fixed last.

Narrow Widths or Short Returns

These are roughly defined as being up to 450mm in width. No dots are necessary when fixing such widths. Wallboards cut to size, should be bedded direct to the wall with board finish plaster.

External Angles



Plan section of external corner

Wherever possible, external angles should be formed as that the edge of at least one of the two boards involved is a bound edge. This bound edge should always be fixed to master the cut edge.

Door Frames

In general, an allowance of 20mm for the thickness of the finish to the walls should be satisfactory, but this may be insufficient if the brickwork or blockwork is badly out of line.

Joint Treatment



1. Apply a thin band of air drying jointing compound or joint filler, using the 200mm jointing tool, into the trough of the tapered edge joint. Next, cut the joint tape to the required length and with the 50mm taping knife press the tape into the band of filler. A further application of filler is then applied immediately over the joint tape with the jointing tool to bring this flush with the surface of the board. Before the joint filler commences to stiffen, use the jointing sponge to wipe off surplus material from the edges of the joint, taking care not to disturb the main joint filling. Should the filling set with slight projections, they may be cut back with the taping knife.
2. When the filler has set hard (about 1 hour) apply a thin layer of joint finish in a broad band about 200mm to 250mm wide using the jointing tool. Immediately feather out the extreme edges of this application using the jointing sponge with light circular strokes. After this application has partially dried, a further application of joint finish should be made and surplus material removed with the jointing sponge as has been described.
3. As soon as the final application of joint finish has dried, dip the jointing sponge into a very thin slurry of joint finish and distribute the slurry over the entire board surface using light circular strokes. The object of this final operation is to even up the difference in texture between the jointed area and the surface of the wallboard.
4. Prepared cut edges should be wetted sufficiently to reduce suction and the joint filled flush with joint filler. After the joint has set, a thin layer of joint finish should be applied and joint tape bedded as tightly as possible onto it ensuring that at the same time any air bubbles are completely eliminated. An application of joint finish should be made over the tape in a band about 150mm wide, the edges of this should be feathered out with the jointing sponge. When this has dried, a second application of joint finish should be made in a broad band about 200mm to 250mm wide and the edges again feathered out. The operation is completed by the application of thin slurry over the entire wallboard as before.

Internal & External Angles

a) Reinforced with joint tape.

Most internal and external angles will have at least one cut edge. The angles should be reinforced with joint tape bedded in joint finish. After the tape has dried out, two applications of joint finish should be applied as in ordinary jointing, taking care that the first application is feathered out to the thickness of the paper on both sides of the angle and that the second application is feathered out slightly further. In the case of the angle between the wall and ceiling where the ceiling has been plastered, the same procedure should be adopted. Where two tapered edges meet to form an internal or external angle, the joint is treated in the same way as a plain tapered edge joint.

b) Reinforced with Flex Corner Tape (External Angles Only).

Flex corner tape consists of a strong paper tape 54mm wide to which two parallel steel strips are bonded. When creased at the joint between the steel strip and applied to the corner, a straight and robust angle is produced.

The reinforcement should always be applied as follows:

1. Pull out the tape from the dispenser, cut to exact length required and crease firmly between the steel strips.
2. Apply joint filler in a 50mm wide band on each side of the angle using the jointing tool and press the corner tape firmly into position making sure that the arris is perfectly straight.
3. Strike off the excess joint filler and use this to cover the edges of the tape on each side of the angle. The moistened jointing sponge can be used for this operation and to feather out the extreme edges. After the joint filler has set, cover the tape with a thin layer of joint finish using the jointing tool and immediately feather out with light circular strokes of the jointing sponge.

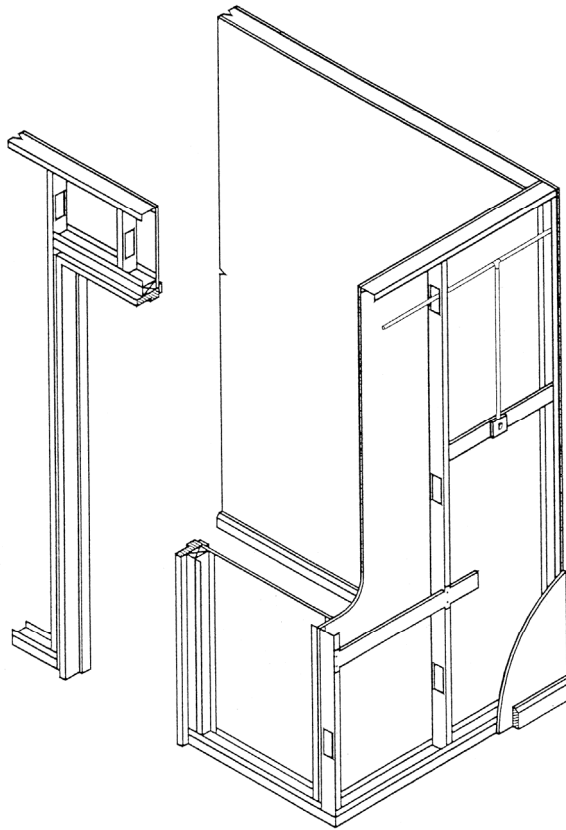
If the angle requires maximum reinforcement then a metal angle bead can be used. It consists of a perforated galvanised steel angle strip, the arris being formed by a quarter-round metal bead which is left exposed. It is fixed and finished in the same manner as the flex corner tape.

3.0 Interpret and Draw Metal Stud Partition

Key Learning Points

- Elevation and sections of metal stud partitions

3.1 Elevation and Sections of Metal Stud Partitions



4.0 Cost of Labour and Materials

Key Learning Points

- Measurement of work, costing of labour and materials including profits and overheads

4.1 Measurement of Work, Costing of Labour and Materials

6mm Skim Coat of Plaster to Plasterboard Walls

Board finish plaster is €480.00 per tonne.

Method

a) Materials:

Cost of board finish plaster delivered to site per tonne = €480.00

Allow 1 hour per tonne to unload and stack = €16.90

= €496.90

Coverage of board finish plaster 6mm thick is approx. 185m² per tonne

Therefore cost per m² = €496.90 ÷ 185 = €2.68

Allow 5% waste = 0.67

Material cost per m² = €3.35

b) Labour:

Based on 3:1 gang. Hourly cost €72.40, assume output per skilled operative for 6mm skim coat of plaster is 0.35 hr per m².

Therefore cost per m² = (€72.40 × 0.35) ÷ 3 = €8.44

Total Rate = 3.35 + 8.44 = €11.79 per m²

Floating coat plaster is €513.00 per tonne

Skim coat plaster is €480.00 per tonne

Method

a) Materials:

Cost of floating coat plaster delivered to site per tonne = €513.00

Allow 1 hour per tonne to unload and stack = €16.90

=529.90

Coverage of floating coat 11mm thick per tonne of plaster is approx. 117m².

Therefore cost per m² = €529.90 ÷ 117 = €4.52

Allow 5% waste = 0.11 + 4.52 = €4.63

Skim coat:

Cost of skim coat plaster delivered to site per tonne = €480.00

Allow 1 hour per tonne to unload and stack = €16.90

= 496.90

Coverage of neat plaster finishing coat 2mm thick is approx. 450m² per tonne.

Therefore cost per m² = €496.90 ÷ 450 = €1.10

Allow 5% waste = 0.50 + 1.10 = 1.60

Total material cost per m² is 1.60 + 4.63 = €6.23

b) Labour:

Assume labour cost as before for 13mm thick.

Two-coat work per m² at = €11.79

Total Rate = 11.79 + 6.23 = €18.02 per m²

Sheet Material

In order to determine the number of sheets of plasterboard required to cover a room either:

- Divide area of a room by area of sheet, or
- Divide width of room by width of board and divide length of room by length of board. Convert these numbers to the nearest whole or half and multiply them together.

Example

To calculate the number of 2400 mm x 1200 mm plasterboard required to cover the floor area of 2.05 x 3.6m.

Number of board required = Area of room/Area of board

$$\text{Area of room} = 2.05 \times 3.6 \text{ m} = 7.38 \text{ m}$$

$$\text{Area of board} = 2.4 \times 1.2 = 2.88 \text{ m}$$

$$\text{Number of sheets} = 7.38/2.88 = 2.5625 \text{ approximately } 3 \text{ boards}$$

Costing Materials

This can be carried out once the required quantities of material have been calculated. It is a simple matter of finding out prices and multiplying these by the number of items required.

Example

Suppose you were asked to find the total price of four 2400 x 1220 plasterboard, the typical extract of the supplier's price list these are €10.97 each including VAT

$$\text{Total price} = \text{Price per boards} \times \text{Number of boards} = €10.97 \times 4 = €43.88$$

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