TRADE OF PLASTERING

PHASE 2

Module 2

External Work

UNIT: 1

Fix Rules and Render Walls

Produced by

SOLAS

An tSeirbhís Oideachais Leanúnaigh agus Scileanna
Further Education and Training Authority

In cooperation with subject matter expert:

Terry Egan

Some images & text courtesy of Gypsum Industries Ltd.

© SOLAS

Table of Contents

Introduction

Welcome to this section of your course which is designed to introduce you the learner, drawing sections, ratios and proportions, poor quality sand and frost action.

Unit Objective

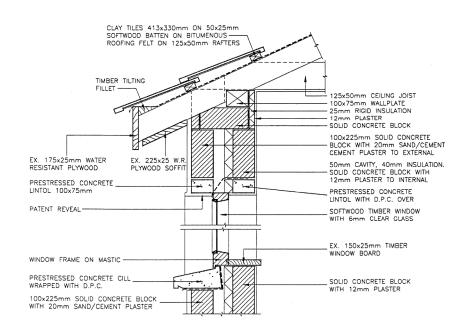By the end of this unit each apprentice will be able to:

- Interpret and draw section through walls
- Ratios and proportions
- State the effects of poor quality sand
- Identify the effects of frost action and water/cement ratio

1.0 Interpret and Draw Section Through Walls

Key Learning Points

- Sections through walls of domestic type dwellings at cill, head and eaves level in orthographic projection

1.1 Sections Through Walls of Domestic Type Dwellings in Orthographic Projection

2.0 Ratios and Proportions

Key Learning Points

- Ratio and proportion relating to materials

2.1 Ratio and Proportion Relating to Materials

A ratio is one method of describing one quantity in relation to another. For example, if mortar is made from a mixture of sand and cement in the ratio of 7 to 2, this requires that for every seven parts of sand used in the mix, two parts of cement must be added, giving a total of nine parts. The ratio 7 to 2 can be written as either 7/2 or 7:2 and means that the '7' quantity is to be 3 ½ times larger than the '2' quantity. The ratio 7 : 2 could also be written as 3.5:1.

Example:

Suppose that a bonus of €180 is paid to plasterer and his helper, and they decide between them that a fair method of dividing the money would be in the ratio of 7:2; that is, for every €7 the plasterer gets, the helper receives €2.

To find how much each man receives, the money is first divided into nine equal parts (7+2=9) with the plasterer receiving 7 parts and the helper 2:

€180÷9 = €20

20 x 7 = €140 Plasterer's bonus

20 x 2 = €40 Helper's bonus

The ratio can also be found if only the quantities are known; for example, the helper may have felt that €40 was not a fair share and convinced the plasterer to give him another €20. The helper now receives €40 + €20 = €60 and of course, the plasterer share is reduced by €20 to €120. The ratio now is 120/60 or 120:60, which can be better expressed as 2/1 or 2:1. Notice how, as one bonus increases, the other decreases. There are often more than two quantities involved in a ratio, but the procedure is nevertheless the same.

Example:

A painter needs 1 litre of paint to be mixed from four different colours in the ratio of 68:7:4:1. How much of each colour should be mixed? (Remember 1 litre = 1,000 millilitres)

68 + 7 + 4 + 1 = 80   Add together the ratios

1,000 ml / 80 = 12.5 ml   this is each part or share.

Colour A: 68 x 12.5 ml = 850 ml

Colour B: 7 x 12.5 ml = 87.5 ml

Colour C: 4 x 12.5 ml = 50 ml

Colour D: 1 x 12.5 ml = 12.5 ml

The answer can be checked by adding the quantities together

850 ml + 87.5 ml +50 ml + 12.5 ml = 1,000 ml or 1 litre.

Exercises

1. 30 buckets of mortar are required with a ratio of sand to cement of 4:1. How many buckets of sand and how many buckets of cement are required?

2. A bonus of €100 is to be divided between a foreman and a painter in the ratio of 3:2. How much will each person receive?

3. Concrete is made up from aggregate, sharp sand and cement in the ratio of 6:3:1. How much of each would be required to make a cubic meter of concrete?

4. Divide 200kg in the ratio 1:3:4.

5. Divide 350 in proportional parts of 3, 8, 12 and 18.

6. It takes six men to plaster a wall in five hours, how long will it take four men to do the same area.

7. In a plastering training unit 33 hours were allotted to cover scudding, floating, skimming and theory, in the proportion of 1:6:8:9. How much time was devoted to each subject?

8. Divide the number 231 into three parts in the proportions 7:11:15.

9. A person divides €350 among four friends in parts in the proportions of their ages, 18, 19, 20 and 21 years respectively. How much will each get?

10. Divide €60.00 between two people A and B in the ratio 5:7.

3.0 State the Effects of Poor Quality Sand

Key Learning Points

- Analysis of sand: silt test, bulking and efflorescence
- Importance of good quality sand

3.1 Analysis of Sand: Silt Test, Bulking and Efflorescence

Sand should not contain any chemical impurities which might adversely affect the cement, or contain excessive silt or clay particles, as these will prevent a good bond between the cement and the grains of sand and lead to shrinkage and cracking occurring. When the sand is rubbed between the fingers it should not stain the hands, and if on inspection there is doubt as to the cleanliness, a settling test should be carried out.

Silt Test

About 50mls of a solution of common salt in water (1 teaspoonful to 0.5 litres of water) is placed in a 250ml measuring cylinder. Sand is added gradually until the volume of sand is about 100mls. The volume is then made up to 150mls by adding more salt solution. The mixture is well shaken up and then the cylinder is placed on a level surface and gently tapped until the sand is level. After 3 hours the silt will settle out on top of the sand and can be expressed as a percentage of the height of the sand itself. The amount of clay and silt should not exceed 8%. N.B. the presence of salt causes the colloidal particles, which would remain in suspension, to coagulate and deposit with the silt.

Bulking of Sand

Dry sand and saturated sand have approximately the same volume. Damp sand however will show a considerable increase in volume. This is most marked when the water content is 5% to 10% of the dry weight, when the increase in volume may be as much as 30%. 160 inundated.

This phenomenon is known as 'bulking' and is more pronounced in fine sand. Allowance should be made for this factor when measuring out sand in order to avoid a deficiency of sand in a mix. This may be done by increasing the depth of the gauge box for the sand by the required amount. The amount of bulking may be found by measuring out a sample of sand, the saturating it with water and noting the decrease in volume.

Efflorescence in Buildings

The term efflorescence is used in building work to describe the deposition of soluble salts on the surface of materials. This happens when the solvent, water, evaporates, leaving the solid salts behind. Furthermore, they tend to accumulate as more solution is drawn to the area by capillarity.

These salts can be seen each time the surface dries, usually as an unattractive white powder.

Efflorescence may affect the brickwork of new buildings. The salts may be present in the bricks themselves, in the sand used for the mortar, or in both. However, they may also originate from outside, for example, they may be absorbed in solution from the ground. This explains why efflorescence is often beneath a ground level damp-proof course.

3.2   Importance of Good Quality Sand

Grading

The size of the grains should vary from 4.7mm down, with a good proportion of larger grains. Such sand is said to be well graded, the smaller grains fill the spaces between the larger grains and a strong, workable mix can be obtained with the minimum of cement.

The specific area (surface area) of sand is an important factor in deciding the proportions of a mix. The surfaces should all be coated with cement paste for maximum strength. The surface area per unit weight of volume is doubled when the particle size (linear) is halved. It follows that sand should not contain too high a proportion of fine particles.

Sand having grains that are all one size is known as uniform sand and will tend to give poor workability and produce a weak, porous mix.

Sand may be tested for grading by passing samples through a nest of sieves, the amount (by weight retained on each sieve being about equal for well graded sand. A poorly graded sand may be improved by mixing with a different sand to obtain a better balance of particle size.

Storage

Sand should be kept clean on site and not allowed to become contaminated with soil or rubbish. Stockpiles should be on a hard, clean surface, e.g. concrete or steel sheet, with the surface sloping outwards to facilitate drainage. Partition walls around the stockpile will ensure the sand is not mixed with different size aggregate.

4.0 Identify the Effects of Frost Action and Water/Cement Ratio

Key Learning Points

- The effects on external renderings of frost and weather conditions

4.1 The Effects on External Renderings from Weather Conditions

In Ireland frost damage is rare in normal external walls. Trouble can occur, however, in walls exposed to both frost and rain. Frost attack occurs when the wall is saturated. So walls are more vulnerable in parapets, freestanding and retaining walls where exposure conditions cause continual saturation.

To carry out work during prolonged cold weather, provide additional protection to susceptible materials to be used for work in progress and ensure both new and partially completed work is protected against frost.

- Do not use frozen materials.
- Do not apply plaster onto frozen backgrounds.
- Materials applied should have completed the initial set before freezing occurs.
- Protect work against freezing whenever possible.

SOLAS

An tSeirbhís Oideachais Leanúnaigh agus Scileanna
Further Education and Training Authority

27-33 Upper Baggot Street
Dublin 4