Finishing Construction Work Level II

Learning Guide#100

Unit of Competence: Prepare & apply grout, Adhesive and sealant

Module Title: Preparing & applying grouting, Adhesive and sealant

LG Code: EIS FCW2 M01 LO1-LG-100

TTLM Code: EIS FCW2 M01 TTLM 0919v1

LO 1: Select grout and sealant

Instruction Sheet	Learning Guide 100

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

1.1 Selecting grout and sealant

1.2 Identifying substrate for tiling work

1.3 selecting primers and adhesives

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Select Grout and sealant in accordance with specifications.
- Identify Substrate from working drawings.
- select Primers and adhesives in accordance with specifications.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information “Sheet
4. Accomplish the Self-check
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet
6. Do the “LAP test” (if you are ready).

Information Sheet-1	Selecting grout and sealant

1.1. Selecting grout and sealant

1.1.2. Grout

Many tiling projects fail (and sometimes fall) due to improper choice of mortar and grout. Mortar is what makes the tile stick. Grout is the filler applied between the tile spaces to fill and seal the gaps. There's a product for every type of tile and tile location. If you prepare properly and select the right products, you'll have years to enjoy your tiling job.

Before you shop for mortar or grout, you'll need to know:

Tile material – stone, ceramic, glass, metal different tiles types have different requirements.

Tile size - larger, heavier tiles need specific mortar types. Mosaic tiles can suffice with a less powerful adhesive.

Where it's going – is the area, indoors or out, wall or floor, wet or dry? Note: submerged areas such as pools and fountains require specific mortars.

What you're applying tile to - drywall, backer board, other tile?

The square footage of the area being tiled – you need to know how much to buy.

Types of grout

Grouts are generally classified as **sanded** (cementitious) or **un sanded**. Both can be used indoors or out and on walls or floors. Use sanded grout for grout joints 1/8 inch up to 5/8 inch. Use un sanded grout for grout joints up to 1/8 inch. Grout is available premixed and ready to use or in powder form (mixed with water as you need it). If you use powdered grout, take care not to use too much water when mixing as this could weaken the grout. Read and follow the product instructions carefully.

Acrylic grout is an option for wet areas. It's intended to be mildew-resistant and retains its color well.

Epoxy grout is perhaps less DIY-friendly than the other grouts available. It's a common choice for countertops due to its hardness. Epoxy grout doesn't need to be sealed

Sealing grout

Sealing grout as a final step prevents staining and keeps out moisture. Make sure you get the correct sealer for your grout and that the grout has cured before you apply it. See the grout package label for details.

Grout is a particularly fluid form of concrete used to fill gaps. Grout is generally a mixture of water, cement, and sand, and is employed in pressure grouting, embedding rebar in masonry walls, connecting sections of pre-cast concrete, filling voids, and sealing joints such as those between tiles. It is often color tinted when it will remain visible, and sometimes includes fine gravel when being used to fill large spaces such as the cores of concrete blocks). Unlike other structural pastes such as plaster or joint compound, correctly mixed and applied grout forms a waterproof seal.

Although both grout and its close relative mortar are applied as a thick emulsion and harden over time, grout is distinguished by its high viscosity and lack of lime (added to mortar for pliability); grout is thin so it flows readily into gaps, while mortar is thick enough to support not only its own weight, but also that of masonry placed above it.

Grout varieties include tiling grout, flooring grout, resin grout, non-shrink grout, structural grout and thixotropic grout.

Tiling grout is often used to fill the spaces between tiles or mosaics, and to secure tile to its base. Although un grouted mosaics do exist, most have grout between the tesserae. Tiling grout is also cement-based, and comes in sanded as well as un sanded varieties. Sanded variety contains finely ground silica sand; un sanded is finer and produces a non-gritty final surface. They are often enhanced with polymers and/ or latex.

There are three general approaches when it comes to selecting grout: match the tile, contrast with the tile, or go neutral. Let the selection of your grout be as important as tile selection and you'll be able to achieve the perfect design.

Grout is a thin mortar used to fill the spaces between tiles and support them on the surface of installation. Generally speaking, it is a cement-based material and comes in various colors and shades. Grout constructs hard, dense joints that will keep your tiles from expanding and shifting with the change in temperature and moisture level.

Your considerations when selecting a grout will depend on your specific job, but it’s good to think through at least five important categories:

- Types of grout
- Choosing a color
- Performance properties
- Ease of installation
- Cleaning grout

Choosing types of grout

There are three traditional types of grout available for tile installation, but sub-categories and grouts engineered toward color-consistency or durability are on the market, as well. While you should always research a grout that caters to your specific project, the basic three types are sanded, non-sanded, and epoxy.

Sanded grout

- Best used for any spacer size larger than 1/8th
- Resistant to cracking and shrinking

Non-sanded grout

- Best used for any spacer between 1/16th – 1/8th
- Often used with most stone tiles with easily scratched surfaces (i.e. – limestone, marble)

Epoxy

- Non-porous alternative to sanded and non-sanded grout
- Short working-time during installation; must be used quickly to avoid drying out/stiffness
- Easier to clean but more expensive to buy and install

With recent advances in grout technology, there are options on the market that combine the benefits of epoxy and urethane grouts in a single product. Newer products can offer a more consistent color-lasting guarantee and durability that wards off mold and mildew that naturally occur from traditional grout – particularly grout that isn't actively maintained with a sealant.

Choosing a color

Grout color is an important consideration for your tile installation. The grout color you choose is going to frame and divide your tiles, so the decision deserves some forethought. In determining the grout color that's right for your design, consider whether you'd like the grout to be matching, contrasting or an accent tone.

Matching

if you match your tile and grout colors, your lines blend together, and the grout is less noticeable. It creates a less pronounced and more continuous appearance in your design.

Contrasting

Contrasting your grout against your tile will draw attention to your pattern and layout. This is a technique seen frequently, e.g. – light tiles with dark grout. Contrasting, bold choices can add a distinct look and charm to a design.

Accent

Choosing a grout color can be a challenge when you have multi-colored tile or a mosaic tile with several hues in a color family. In this case, any grout color in the spectrum of colors of the tile will accent and complement the overall installation job nicely.

Considering performance/sealing

Even though grout can enhance the aesthetics of a design, it's really there to keep your tiles securely in place and maintain a quality installation. Because tile and stone products are often a lifetime choice, it's imperative that the grout you choose perform well long term against moisture, stain and mold.

It's crucial to seal grout that is not epoxy-based, especially in high-traffic and moisture-prone areas such as the bathroom or kitchen. Not only will a sealant protect the grout from absorbing moisture and picking up particles in the air, but it will help maintain the color by preventing unnecessary stains.

You can use tile and stone in an array of places (walls, floors, wet areas, outside, etc depending on product specifications), but depending on the location, they may be exposed to moisture, which can lead to issues of mold and mildew. It's crucial to consider location and moisture level when selecting grout. Most grouts are porous and can retain moisture unless they are epoxy-based or are installed with a sealant.

Many grouts are naturally porous and absorb spills, so beware of potential staining issues when selecting grout. From stains associated with heavy foot traffic to those associated with

spills of liquids and beverages, grout can be a harbinger of unwanted discoloring, so rely on your installers' expertise to minimize potential risks.

Installing grout

Crossville highly recommends working with experienced, certified tile contractors to achieve the best installations possible. If you do choose to do it yourself, there are an array of installation guides and best practice resources available online.

Grout's propensity to crack is one reason it's wise to rely on a trained professional for your installation. Grout can crack due to movement of flexible substrates, poor bonding during installation, the wrong kind of grout being used for grout joint widths, missing expansion joint in large area installations, as well as inadequate grout coverage/fill-in. Experienced professionals are more likely to avoid these common errors, resulting in a better quality, longer lasting and worry-free tile project.

If you are determined to DIY, you can find grouting tips and techniques anytime through online searches. An important key to successful grout installation is to select the right grout for your space's aesthetic and performance needs. Next, you need to have the proper tools on hand and must take time to read all the grout manufacturer's supplied instructions prior to starting your project. The extra time you take to carefully follow step-by-step pays off in the end when your grout work effectively and beautifully complements your design.

Cleaning grout

Because most grout is cementations and, thus, porous, sealing is an excellent option for ensuring grout installations stay as clean as possible Even sealed grout requires maintenance to look and perform great long term.

Clean your tile and grout installations regularly, being sure to use non-acidic, phosphate-free cleaners. Occasional, intensive cleaning is advisable, using a specially formulated tile and grout cleaner (there are several on the market today).

Epoxy grouts are not porous and require less cleaning, balancing their initial costs and installation challenges they require. Be sure to follow the manufacturer's official cleaning recommendations for epoxy grouts to maintain installation integrity long term.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is Grout?*?(5points)*
2. What is the considerations when selecting a grout will depend on your specific job? (5points)

Note: **Satisfactory rating - 5 and 10 points** **Unsatisfactory - below 5**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Identifying substrate

1.2. Identifying substrate

Substrates may be porous or impervious, smooth or rough, or dusty and powdery. Without applying a primer, the substrate may either draw the liquid from the adhesive or screed mix (porous surfaces), prevent the adhesive or screed from bonding onto the surface (dusty or powdery surfaces), or be too smooth or dense for the adhesive or screed to form an adequate bond onto the substrate (smooth, impervious surfaces).

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the purpose of substrate? (5points)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	selecting primers and adhesives

1.3 selecting primers and adhesives

Adhesive may be used interchangeably with **glue**, **cement**, **mucilage**, or **paste**, and is any substance applied to one surface, or both surfaces, of two separate items that binds them together and resists their separation. Adjectives may be used in conjunction with the word "adhesive" to describe properties based on the substance's physical or chemical form, the type of materials joined, or conditions under which it is applied.

Adhesive &primer selection involves the following considerations:

1. **Substrates:** What are you trying to bond? Are the surfaces the same or dissimilar, porous or smooth? Are you covering a large area? Do you have heat or solvent sensitive surfaces?

2. **Application restrictions:** How do you intend to apply the adhesive- examples: spray, roll, heat gun, cartridge, squeeze bottle?

3. **Use Requirements:** How does the bonded piece get used? How much strength is required? For example, bonding wood requires much more strength than decorative paper crafts do. What kind of environments might it see? Will it experience temperature extremes or water/steam?

Types of adhesives

There are a large number of adhesive types for various applications. They may be classified in a variety of ways depending on their chemistries (e.g. epoxies, polyurethanes, polyimides), their form (e.g. paste, liquid, film, pellets, tape), their type (e.g. hot melt, reactive hot melt, thermosetting, pressure sensitive, contact, etc.), or their load carrying capability (structural, semi-structural, or non-structural).

Structural adhesives refer to relatively strong adhesives that are normally used well below their glass transition temperature, an important property for polymeric materials, above which polymers are rubbery and below which they are glassy. Common examples of structural adhesives include epoxies, cyanoacrylates, and certain urethanes and acrylic adhesives.

Such adhesives can carry significant stresses, and lend themselves to structural applications.

For many engineering applications, semi-structural (applications where failure would be less critical) and non-structural (applications of facades, etc. for aesthetic purposes) are also of significant interest to the design engineer, and provide cost-effective means required for assembly of finished products. These include contact adhesives where a solution or emulsion containing an elastomeric adhesive is coated onto both adherents', the solvent is allowed to evaporate, and then the two adherents are brought into contact. Examples include rubber cement and adhesives used to bond laminates to countertops.

Pressure sensitive adhesives are very low modulus elastomers which deform easily under small pressures, permitting them to wet surfaces. When the substrate and adhesive are brought into intimate contact, Vander Waals forces are sufficient to maintain the contact and can provide relatively durable bonds for lightly loaded applications. Pressure sensitive adhesives are normally purchased as tapes or labels for non-structural applications, although can also come as double-sided foam tapes which can be used in semi-structural applications. As the name implies, hot melts become liquid when heated, wetting the surfaces and then cooling into a solid polymer. These materials are increasing used in a wide array of engineering applications using more sophisticated versions of the glue guns widely used by consumers. Anaerobic adhesives cure within narrow spaces deprived of oxygen; such materials have been widely used in mechanical engineering applications to lock bolts or bearings in place. Cure in other adhesives may be induced by exposure to ultraviolet light or electron beams, or may be catalyzed by certain materials such as water which are ubiquitous on many surfaces.

Adhesives of various chemistries are available in many different forms as well.

For **structural applications**, adhesives are available as pastes, liquids, films, and supported films. The latter are supported on loose knit or mat scrim cloth to improve the handling properties and also to offer some measure of thickness control. Many of these adhesives produce little or no out-gassing when cured, significantly reducing the likelihood of voids within the adhesive. It is important that these adhesives be kept dry, as absorbed moisture can create significant void problems. **Thermosetting structural adhesives** are normally available in two-part forms that are mixed through carefully controlled stoichiometry into a product that cures within the desired time window. One-part forms are also available in which the resin and hardener (cross-linking agent) are already mixed together. These one-part forms must be kept at sufficiently low temperature that the reaction does not occur prematurely, sometimes utilizing latent cross-linking agents that are not active at low

temperatures. One-part thermosetting adhesives often have limited shelf life, and often must be stored at low temperatures, but do offer very high performance capabilities. Pot life refers to the time after a two-part adhesive is mixed during which it is workable and will still make a satisfactory bond. Materials with too short of a pot life will harden too fast, and do not give the workers sufficient time to assemble the product. An excessively long pot life may delay the cure time and slow the assembly process.

Adhesives may be applied in a variety of ways depending on the form it comes in. Adhesives may be spread on a surface manually, or may be dispensed using a variety of sophisticated nozzles and robotic equipment that is currently available. Maintaining adhered cleanliness, providing proper jigs and fixture during cure, and providing adequate cure conditions may all be important considerations for certain types of adhesives.

The **glass transition temperature** is one of the most important properties of any polymer, and refers to the temperature vicinity in which the amorphous portion of the polymer transitions from a hard, glassy material to soft, rubbery material. Although specific temperatures are often quoted for the glass transition temperature, it is important to remember that this transition temperature is a rate dependent process. For thermosetting structural adhesives, the glass transition temperature should normally be 50°C higher than the expected service temperature. Unless there are significant exotherms associated with the cure process, the glass transition temperature of an adhesive seldom exceeds the cure temperature. High performance structural bonds often require an elevated temperature cure to provide a sufficiently high Tag in a reasonable cure time. One concern with such conditions, however, is the residual stress which may develop with an assembled joint is cooled from the cure temperature to the service conditions.

For example, silly putty at room temperature will readily flow when pulled slowly, will bounce like a rubber ball when dropped on the floor, or can shatter in a brittle fashion when struck with a hammer.

The glass transition temperature of epoxies and other adhesives can be significantly reduced by moisture absorption, a factor which should be considered when designing for humid applications

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the considerations when selecting Adhesive &primer*? (5points)*
2. List types of adhesives? (5points)

Note: **Satisfactory rating - 5 and 10 points** **Unsatisfactory - below 5**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Answer keys for learning guide -100

Self check 1

1/ grout are the filler applied between the tile spaces to fill and seal the gaps.

2/

- ✓ Types of grout
- ✓ Choosing a color
- ✓ Performance properties
- ✓ Ease of installation
- ✓ Cleaning grout

Self check 2

1. Substrates may be porous or impervious, smooth or rough, or dusty and powdery.

Self check 3

1.

- ✓ Substrates
- ✓ Application restrictions
- ✓ Use Requirements

2.

- ✓ Epoxies
- ✓ Polyurethanes
- ✓ Polyamides