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Prepared by
Dr. Youcef Kamal

BUILDING STONES

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BUILDING STONES

Definition of Building Stones:

Building stones are natural materials used in construction to erect walls, foundations, facades, and other structural elements. They are primarily extracted from quarries and chosen for their physical and aesthetic properties suitable for construction. The main characteristics of building stones are their strength, durability, and ability to withstand structural loads. They can be made of various types of rocks, including limestone, sandstone, granite, marble, basalt, and other rock formations.

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Definition of Building Stones:

Building stones can be used in different forms, whether rough, partially cut, or fully cut depending on the requirements of the construction project. They can be shaped into different dimensions and finishes to suit the specific needs of architectural design. Building stones are therefore natural and versatile construction materials used to create strong, durable, and aesthetically pleasing structures. They are essential in many types of construction projects, from individual homes to commercial and institutional buildings.

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Natural Stone Masonry:

Natural stone masonry refers to structures built using uncut or partially cut natural stones. This method of construction is ancient and has been widely used throughout history to erect buildings, retaining walls, fortifications, and other types of structures. Here are some important characteristics and aspects of natural stone masonry:

Materials: Natural stone masonry is built from natural rocks such as granite, limestone, sandstone, basalt, marble, and other types of stones that can be found locally. The stones can be used as they are, with their natural shape and size, or partially cut for better fit in construction.

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Natural Stone Masonry:

Assembly: Stones are assembled using traditional construction methods such as mortar or "dry" stacking, where stones are simply stacked on top of each other without mortar. Assembly can be done using stones of varying sizes to create a rustic look or using stones of similar size for a more uniform appearance.

Joints: Joints between stones can vary in thickness and finish, depending on architectural style and aesthetic preferences. Joints can be filled with mortar to strengthen the structure and prevent water infiltration, or left open for a more rustic look.

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Natural Stone Masonry:

Molding: Although stones used in natural stone masonry are generally not carved to include sculpted or profiled details, some stones may feature interesting natural shapes that add ornamentation to the structure.

Stability: Natural stone masonry can be very stable and durable, especially when stones are carefully selected and assembled. However, stability can be affected by factors such as material quality, soil conditions, and structure design.

Maintenance: While natural stone masonry is generally robust, it requires regular maintenance to prevent damage from weathering, vegetation growth, and other factors. This may include repointing damaged joints, cleaning stone surfaces, and repairing structural damage.

Natural stone masonry is often used in the construction of historical buildings, retaining walls, fences, and other structures where their natural beauty and strength contribute to creating an authentic and enduring ambiance.

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The Separation Technique

Dimension stone refers to natural rock extracted and cut to specific dimensions. Its separation requires precise and meticulous methods such as sawing and precision drilling.

Production of Dimension Stone

The production of dimension stone begins with the extraction of large blocks of natural rock through cutting or separation. The size of each block depends on various factors such as the homogeneity of the stone, the skills of the quarry operator, and the intended final use. The physical characteristics of the rock, market size, and financial resources of the operator influence the design and capacity of the quarry.

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Production of Dimension Stone

Blocks are handled carefully to avoid fragmentation, then transported to processing plants. After various processing stages, the blocks are cut to the required dimensions, then polished or sharpened. Quarries often cater to local demand and may have multiple sites for different types of stone. Stone waste is recycled into construction aggregates.

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Production of Dimension Stone

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Extraction of Natural Stone:

.1. Extraction of Natural Stone Natural: stone is extracted from quarries, and this operation can be carried out using various methods such as explosives blasting, helical wire sawing, and the use of steel wedges.

1.1. Explosives Blasting: Numerous deep and narrow holes are drilled into the rock. At the bottom of these holes, explosives (TNT) are placed and connected to a detonator by wires or fuses for ignition. This process is suitable only for extracting rough-cut stones intended for use in:coarse masonry construction,rockfilling,crushing and cement manufacturing. Indeed, this method weakens the structure of the stone.

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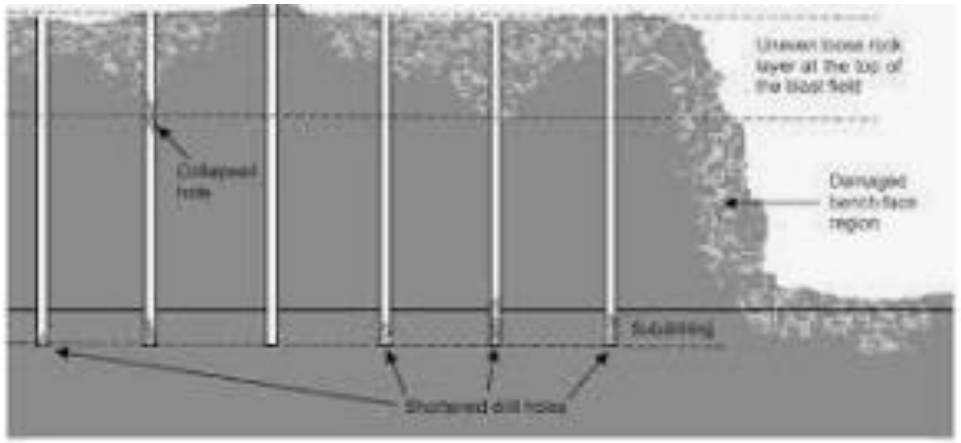
Extraction of Natural Stone:



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Extraction of Natural Stone:

.1.2. Helical Wire Sawing: This involves an steel wire that cuts through the rock, while a jet of water carrying rough sand is directed into the saw cut; it is actually the sand that cuts through the rock, not the wire.

.1.3. Extraction with Steel Wedges or Spigots: Holes are first drilled along the chosen separation line, then steel wedges (spigots) are driven in using a hammer weighing around twenty kilograms.

.2. Working of Natural Stone: The large blocks extracted are then cut by splitting or sawing using saws arranged on a single frame (armature) or a diamond dust-coated disc saw. Natural stone can then be shaped according to its nature and intended use. Thus, a stone block can be worked with a bush hammer, a chisel, etc. The surface of the stone can also be planed, smoothed, honed, or polished to a matte or glossy finish.

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Extraction of Natural Stone:

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Extraction of Natural Stone:

.3. Commercial Form of Natural Stone:

Generally, natural stone is cut or sawn into large blocks, either at the quarry or in the workshop; it is sawn into slabs or slices, primarily in thicknesses of 2, 3, and 4cm for stones to be polished; and 5, 6, 8, 10, 12, 15, 16, 18, 20, 22, 25, 28, and 30 for stones to be carved. In commerce, the cubic meter (m3) is used as the unit for construction stones, and the square meter (m2) is used for polished stones.

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Extraction of Natural Stone:

Characteristics, Properties, and Uses:

The use of rocks must meet the following requirements:

- Homogeneity of constitution
- Compression resistance
- Resistance to atmospheric agents' attack
- Resistance to water absorption
- Workability, i.e., the stones must be easily workable.

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General Principles of Natural Stone Execution:

The execution of natural stone involves several general principles to ensure a quality and durable final result. Here are some of these principles:

Material selection: Choosing the right types of natural stone based on their physical and aesthetic characteristics, as well as their suitability for the specific project. This may include considerations such as abrasion resistance, compression strength, flexural strength, as well as porosity and color.

Planning and design: Developing detailed plans and precise specifications for the use of natural stone in the project. This includes designing stone elements, construction details, as well as coordinating with other materials and components of the project.

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General Principles of Natural Stone Execution:

Substrate preparation: Ensuring that the surface on which the natural stone will be installed is clean, flat, sturdy, and properly prepared to receive the stone coverings. This may involve leveling work, structural reinforcement, and application of appropriate primer coatings.

Proper installation: Following the installation techniques recommended by natural stone manufacturers, which may vary depending on the type of stone, its format, and its specific application. This may include the use of special mortars or adhesives, as well as laying methods such as mortar bed, sand bed, or mechanical fixing system.

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General Principles of Natural Stone Execution:

Joint management: Properly managing joints between stone elements to ensure a watertight and aesthetic installation. This may involve choosing the appropriate type of joint (e.g., open joints, closed joints, expansion joints) and using jointing materials compatible with the stone and its environment.

Protection and maintenance: Implementing appropriate protection measures to prevent damage during construction and delivery, as well as regular maintenance programs to ensure the long-term durability and beauty of natural stone.

Environmental considerations and sustainability: Ensuring that the use of natural stone complies with environmental and sustainability standards, promoting responsible extraction practices, waste recycling, and the use of environmentally friendly products and techniques.

Projects involving natural stone can benefit from high-quality, durable, and aesthetically pleasing installation.

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Stone Masonry:

Stone masonry is a traditional construction technique that involves the use of carefully cut and assembled natural stones to form strong and durable structures. Here are some important aspects of stone masonry:

Stone selection: Stones used for stone masonry are chosen based on their quality, shape, and size. They must be strong enough to bear structural loads and withstand weathering. Stones are often cut according to their specific use in construction.

Stone cutting and preparation: Stones are cut to the required dimensions for construction. This may involve the use of traditional tools such as chisels and hammers, as well as modern machinery for more precise cuts. Stones are also often prepared to create regular and aesthetic joints between them.

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Stone Masonry:

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Stone Masonry:

Stone assembly: Cut stones are assembled to create solid and stable walls. Different assembly techniques may be used, such as "mortar bed" where stones are fixed with mortar, or "dry" where stones are simply stacked on top of each other without mortar.

Joints: Joints between stones are often filled with mortar to reinforce the structure and prevent water infiltration. Joints can be finished in different ways for varied aesthetic results, such as "flush joint" or "tooled joint."

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Stone Masonry:

Finishing: Once stone masonry is completed, finishes can be applied to enhance the aesthetic appearance and durability of the structure. This may include brushing, sanding, or chiseling stone surfaces to create interesting textures.

Maintenance: Stone masonry requires regular maintenance to ensure its longevity. This may include repointing damaged joints, cleaning stone surfaces, and repairing damage caused by weathering or normal wear and tear.

Stone masonry is valued for its durability, beauty, and timeless character, and it is often used in the construction of historical buildings, monuments, and prestigious architectural structures.

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Stone Dressing

Stone dressing refers to the arrangement and organization of cut stones in a masonry structure, typically to form walls, arches, or other architectural elements. Here are some common principles and techniques used in stone dressing:

Regular vs Irregular Dressing: Regular dressing involves using stones of similar dimensions, uniformly arranged to create clean lines and regular patterns. Irregular dressing, on the other hand, employs stones of varied sizes, arranged more freely, often resulting in a rustic and organic appearance.

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Stone Dressing

Courses and Joints: Stones are laid in horizontal rows called courses. The joints between stones can vary in thickness and finish depending on the structure's style and aesthetic preferences. Joints may be filled with mortar or left open, based on architectural style and design requirements.

Moldings: Moldings refer to the sculpted or profiled details of stones, such as chamfers, moldings, and projections, which add ornamentation and character to the structure.

Corner Assembly: The corners of the structure are often reinforced using specially cut stones called cornerstones or quoins. These stones are often shaped to fit snugly into the corners, ensuring the solidity and stability of the structure.

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Stone Dressing

Alignment and Leveling: Precise alignment of stones and proper leveling of courses are essential to ensure the stability and aesthetics of the structure. Tools such as string lines, bubble levels, and other measuring instruments are often used to ensure correct dressing.

Types of Dressing: There are different types of stone dressing, such as opus incertum (randomly arranged stones of varied sizes and shapes), opus quadratum (rectangular stones laid in regular lines), and opus reticulatum (stones arranged in diamonds or lattice patterns).

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Stone Dressing

Finishes: Stones can be left in their natural state or undergo various finishes such as brushing, polishing, chiseling, or sandblasting to create decorative textures and patterns.

Stone dressing is a craft that requires expertise and precision to create solid, aesthetic, and durable structures. It is often used in the construction of historical buildings, monuments, and prestigious architectural structures for its traditional appearance and timeless character.

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Arrangement of Stones in a Wall

Appareillage, also known as masonry layout, refers to how stones are arranged to form a wall. This practice plays a crucial role in the aesthetics, stability, and durability of the construction.

Types of Stones Used

Various stones can be used to construct the facing of a wall, each offering distinct characteristics and diverse aesthetic possibilities.

Panneresse: This type of stone features a face whose dimensions fall between the smallest and largest. This intermediate face is typically chosen as the facing, providing a uniform and regular surface for the wall.

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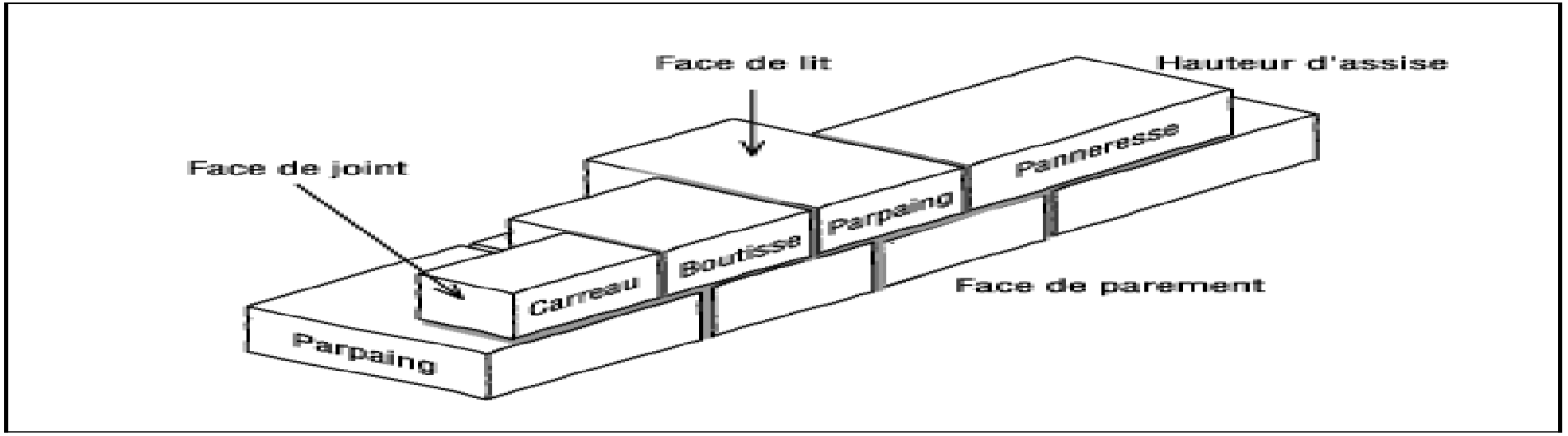
Arrangement of Stones in a Wall

Types of Stones Used

Parpaing: Parpaings are stones that offer facing on each side of the wall. In other words, these stones traverse the entire thickness of the wall, providing a uniform appearance on both sides.



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Arrangement of Stones in a Wall

Types of Stones Used

Boutisse: Boutisses are characterized by a face with reduced dimensions that is used as facing. This arrangement gives the wall a textured and rustic appearance, adding character to the structure.

Carreau: Unlike other types of stones, carreaux are distinguished by significantly larger facing dimensions compared to joint or tail dimensions. This arrangement creates a striking visual effect and can be used to highlight patterns or architectural details.

craftsmen can create walls that not only meet structural requirements but also add a distinct aesthetic to the built environment.

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Arrangement of Stones in a Wall