CENTER FOR DISABLED CHILDREN

BUILDING MATERIAL SPECIFICATIONS / CIVIL WORKS,

FIXTURES AND FITTINGS

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SECTION 1 GENERAL SPECIFICATIONS

1.1 General Specifications

1.1.1 Units of Measurements

In general, the units of measurements to be used in connection with this contract are metric units of mm, cm, m Km, N (Newton), Mg (1000 kg) and degrees Celsius (C^o). Decimal points are written as " ".

1.1.2 Programmed for the Execution of the works

The Contractor shall submit to the engineer a fully detailed programme showing the order, the procedure and method by which he proposes to carry out the construction and completion of the Works.

The information to be supplied to the engineer shall include drawings showing the general arrangement of the temporary offices and any other temporary buildings or structures which he proposes to use, together with details of the constructional plant and temporary works, and all other devices which he proposes to adopt for the construction and completion of the whole of the works and, in addition, details of the labor strength, skilled and unskilled, and supervision arrangements.

The manner and the order in which it is proposed to execute the permanent works is subject to adjustment and approval by the Engineer, and the Contract price shall be held to include any necessary adjustment required by the Engineer during the course of the work.

1.1.3 Faulty works

Any work, which fails to comply with these Specifications, shall be rejected and the Contractor shall, at his own expense, repair any defects, as directed by Engineer satisfaction.

1.1.4 Advertising, Boarding, etc.

No advertising material whatever will be permitted to be displayed on the site except that:

The contractor shall construct two boards, carrying information supplied by and erected in the locations specified by the Employer. The wording shall be presented in such a way as to be legible at a distance of 100 meters. The cost of these boards will be included in the Contractor's rate in Bill of Quantities.

1.2 Submissions to the Engineer

1.2.1 Written Authority

"Order in writing" shall mean any document or letter signed by the Engineer and posted or delivered to the contractor and containing instructions, guidance or directions to the contractor for the execution of the Contract.

Whenever the word approved, directed, authorized, required, permitted, ordered, instructed, designated, considered, necessary, prescribed, or words (including nouns, verbs, adjectives and adverbs) of like important are used, it shall be understood that the written approval, direction,

authority, requirement, permission, order, instruction, designation, prescription, etc. of the engineer is implied unless another meaning is plainly intended

1.2.2 **Submissions to the Engineer**

The contractor should submit to the engineer every additional work; a detailed drawing and the work should begin only after Engineer approval.

The contractor should sign proposals, details, sketches, accounts, informations, materials, test certificate, whenever requires by Engineer. The engineer will accept every submission and if appropriate will be answered to the contractor in accordance to any proper clause of contract conditions. Every submission should be done due to dates agreeing with engineer and referring the approved program and necessary time that the engineer needs to submit those works.

Samples

The contractor should provide samples, labeled due to all fittings, accessories, and other issues might be asked from the engineer for inspection.

The samples should be submitted to the Engineer's office.

The drawings of implemented works and measurement hand-book

The contractor will prepare and submit to the Engineer three groups of work documentations due to the project. This material should contain a drawing set of the implemented project, the additional drawings made during work implementation approved by the engineer, and the measurement handbook per each work volume.

SECTION 2 SITE CLEARENCE AND DEMOLITION

2.1. Clearance of site

2.1.1. Clearance of site

At the commencement of the contracts, unless otherwise specified or directed, the Contractor shall remove all vegetation and all objectionable organic material from the construction area, and burn or dispose of all such debris in tips to be provided by the contractor.

2.1.2 Scaffolding

Large excavation including top soil removing, executed by hand or machine in terrain of whatever nature, compactness, or degree of saturation (shaley even if compact, sandy, gravely or rock terrain), including the cutting and removing of roots, stumps, rock and materials with a dimension not exceeding 0,30 m3, including allowance for the protection of underground structure such as drains, pipelines, etc, and including the location resulting material within the work site.

2.1.3 Removal of trees and stubs higher than 1.5m

Generally should be taken care, during clearance works not to damage those trees, which do not obstacle in rehabilitation and construction of a new building. In case when their removal is necessary, should be taken adequate precaution in order that during their falling down they will not damage persons or the objects around. So, for the trees higher than 10 m, their cut should

be done parted into 3 m. The cut part should be tied with a rope or balanced cable and should be trailed by rope or balanced cable form the part where the personnel or objects are safe.

2.1.4 Removal of structures, fences etc.

The Contractor shall carefully take down and clear only such buildings, or other structures directed by the engineer. The components shall dismantled, cleaned and stacked in separate heaps. Materials, which in the opinion of the Engineer are not fit for re-use shall be removed from the site to a tip, provided by the contractor. Materials, which are re-usable, shall remain the property of the Employer and shall be preserved and protected by the Contractor until removed by the Employer or until the expiration of the Contract.

2.1.5 Building, fences and structures protection

During demolition work, the contractor should take adequate precautions in order to protect the buildings, fences, surrounding walls and structures near the object, where are executing these demolition works.

Over- loading of any part of the structure by debris and materials shall be avoided. When materials or debris are lowered, care shall be taken to prevent the material swinging, falling or being projected in such a manner that it creates a danger to the safety of personnel, the surrounding structure of public property of any kind.

When mechanical plant such as cranes, hydraulic and excavators and rock breakers are used for demolition, care shall be taken to ensure that no part of such machines can come into contact with or in close proximity to overhead or underground electricity or telephone wires or cables. The contractor shall in sufficient time prior to the commencement of the works, inform the relevant Authority so the Authority my take necessary steps for rerouting the cables.

2.1.6 Protection of cleared site

Suitable nets, protective hoarding and barriers shall be erected by the Contractor to prevent accidental harm to persons or damage to property by falling or flying materials and debris.

2.2 DEMOLITION WORKS

2.2.1 Scaffolding

Any scaffolding required shall be designed and erected in accordance with the relevant standards. An experienced and competent scaffolder shall carry out erection of scaffolding and it shall be of an independent tied type. The Contractor shall ensure that all necessary adjustment is required to the scaffolding to ensure its stability is made as the work proceeds. Care shall be taken that the load of any debris collecting on a scaffold does not exceed the loading for the design. All measures necessary shall be taken to prevent debris from being accidentally dislodged from the platform. Scaffolds shall at all times during use be suitable for the purpose for which they are intended and shall comply with any local Authority requirements.

Where necessary, the scaffolding will be protected on the perimeter to roadways and passageways should be taken precautions in order to make a surrounding of the object, and also the whole scaffolding protection fixed by protecting netting in order to eliminate material swinging and including required signal, illumination and the conditions of technical standards.

Steel scaffolding of trestle type, in accordance with local standards and regulation, including the supply of support, maintenance, assembly, anchorage, dismantling etc. To a maximum

height of 12 m, of horizontal elements should have vertical balustrade, to a min. height 15 cm and also protecting netting.

Steel scaffolding framed and braced, in accordance wit local standards and regulations, including transport supply, maitenance, assembly, anchorage, dismantling etc. To a maximum height of 12 m, of horizontal elements should have vertical balustrade, to a min. height 15 cm and also protecting netting.

2.2.2 Supervision

The contractor shall appoint a competent and experienced person trained in the type of operation being used for demolition to supervise and control the work on site.

2.2.3 Method of demolition

The contractors proposed method of demolition would be such that where part of the structure is to remain, the method adopted for removal must ensure that no damage or weakening of the remaining structure occurs. The contractor shall take adequate precautions to ensure the stability of that part which remains. The method employed shall be subjected to the Engineers approval.

Where demolition work cannot be done safely from a part of the structure, a suitable working platform must be used. The structure shall generally be demolished in reverse order to that of construction. Steel and reinforced concrete structural members shall be lowered to the ground or be cut into lengths appropriate to the weight and size of member before being allowed to fall. Debris shall be allowed to fall freely only where there is no danger of damages occurring to the retained structures.

When building demolition or its elements cannot be done without problems divided from structure part, it will be use an appropriate working method. Steel elements and concrete structures strengthened will be put on the ground or will be cut horizontally, due to wideness and measurements in order not to swing down. Wood elements can be swang from upstairs, only when they don’t represent danger for the other part of the structure. When the elements are demolished, should be taken precautions in order not to risk the other constructive holding elements and to do not damage the other elements.

Generally, demolition work shall commence by removing as much dead load as possible without interfering with the main structural members. Temporary works shall be designed to carry the required loads under the most severe conditions. Sections to be demolished shall be supported by suitable lifting equipment then cut and lowered to the ground under control.

2.2.4 Safety

The contractor shall ensure that the plant and equipment is:

a) Of an appropriate type an standard having regard to the location and type of work involved

b) In charge of a competent and experienced operator.

Maintained in good working condition at all times.

2.3 Demolition of Buildings Elements

2.3.1 Dismantling of roofing and terraces

The dismantling of roofing in “Marsigliese” or “Roman” tiles and of associated timber structure, including battens, linings or boarding, structural framing composed by trusses, beams, or joists, flashing, roof gutters, gutters and relative fastenings, chimneys, including scaffolding, the stacking of materials within the worksite, and the selection, cleaning and stacking of materials within the worksite, and the selection, cleaning and stacking of Marsegliese tiles to be re-used, and the provision of all requirements not specified for the satisfactory completion of the work.

The dismantling of roofing in shingles or laminated steel sheeting and of associated timber structure, including battens, linings or boarding, structural framing composed of trusses, beams or joists, flashing, roof gutters, gutters and relative fastening, chimneys, including scaffolding, the stacking of materials within the worksite, and the provision of all requirements not specified for the satisfactory completion of the work.

The demolition of ceiling linings of whatever type including supporting beams and joints, plaster and electrical work; including scaffolding the stacking of materials within the worksite and the provision of all requirements not specified for the satisfactory completion of the work

The removal of waterproofing membranes from terraces including up-turns, also where the up-turns are found against chimneys, composed of three layers of bituminous felt, including the removal of the capping or related metal fascias to adjacent parapets, and the stacking of the resulting material within the worksite.

The demolition of render at vertical surfaces to a height of at least 30 cm, for the installation of new waterproofs membranes, including all requirements to complete the work in a satisfactory manner.

2.3.2 Demolition of stone masonry

The demolition, total or in part, of stone masonry, by whatever means, including rendered work, of any form, thickness, height or depth of wall, including scaffolding, necessary reinforcing for the consolidation of the structure or surrounding buildings; the reparation of damages caused to third parties for breakage and normal repair in the course of work to service supplies both public and private (drainage, water, light), with the relocation of material within the worksheet, and including the provision of all requirements not specified for the satisfactory completion of the work.

2.3.3 Demolition of brick masonry

The demolition by whatever means, total or in part of brickwork or pre- cast terracotta, included rendered work or tiled work, of any form, thickness height or depth of wall, including scaffolding, necessary reinforcing for the consolidation of the structure or surrounding buildings; the reparation of damages caused to third parties for breakage and normal repair in the course of work to service supplies both public and private (drainage, water, light, etc.), without allowing for salvage and cleaning of material re-use, but with the relocation of material within the worksite, and including the provision of all requirements not specified for the satisfactory completion of the work.

2.3.4 Removal of flooring

The removal of flooring of whatever type, including the removal of bedding mortar and the location of resulting material within the worksite.

2.3.5 Removal of wall tiling

Removal of wall tiles of whatever type, including the removal of bedding mortar, the cleaning, washing with water under pressure and the location of resulting material within the worksite, and including all requirements to prepare the surface for re-tiling.

2.3.6 Removal of windows and doors

The removal of windows and doors of whatever type, including architrave's, beadings etc, with the storage of materials within the worksite including the eventual selection (to be decided by the Supervisor of Works) and stacking within the worksite in the specified location for re-use.

2.3.7 Removal of metal grating

Removal of metal grating of whatever type and the relocation within the worksite, including eventual selection (to be decided by the Supervisor of Works) and stacking within the worksite in the specified location for re-use.

SEKSIONI 3 EARTHWORKS, EXCAVATIONS AND FOUNDATIONS

3.1 Earthworks

3.1.1 Formations prepare

Formations prepare includes these works:

- Introduction and precision of installed net underground as i.e.: water supply pipes, outlet pipes, electric and telephony cable etc.
- Terrene measurement and soil testing.
- Deforestation and roots removal from terrene.
- Soil removal by humus and its transport or re-using.
- Whole foundation digging up to the necessary deepness.

3.1.2 Sloping elaboration.

In cases of sloping terrene are used three following methods:

- Slope leveling according the lowest terrene point.
- Terrene backfilling by surplus material, up to highest terrene point
- Digging and backfilling according the average point.

Each of these cases will be used depending on soil type, on support ability terrene and of building loading will be construct in that terrene.

3.1.3 Soil works drenaging

Drainage can be a drainiging net or only a drain. As drainiging net materials might be used plastic pipes, concrete pipes or clay pipes. The pipes should be placed through open drains, leveled and presses as required. The pipes should be placed after drain opening and gravel backfilling of a layer at least 7 cm. After pipes placing should be thrown gravel or sand 4/32 of a layer 10 cm in order to protect the pipe. After that the drain will be backfilled by the soil left from digging.

The drainage by drains is realized by opening first the drains and then filled by gravel. The drains according the request should have one of this surfaces: 20x30, 30x40 ose 30x60 cm. The distance between drains should be determined according to ground filter coefficent.

3.1.4 Soil work protection

The people that are not included in project construction should be well protected by soil works, and the staff working in project realization should be as well protected. Care should be taken from the foundation diggings.
Protection of the pedestrians can be realized throughout building an encirclement (fence, wire net etc), which does not allow them (especially children) to risk. Warning Signs boards should be hanged, in order to forbid the pedestrians pass inside the encirclement.
The wholes and the workers are working in it should be protected from downfall. Moat stair per each whole depends on soil quality by min. 45^{o} up to max. 60^{o}.
If the soil contains minerals, which by water contact loose the stability, then the soil and particularly moat should be well protected by rain, equipped by support reinforcement according KTZ.

3.1.5 Soil works during frost periods

Soil works can be executed during winter period as well, where the temperatures are under 0^{o} C.

3.2 Excavations for foundations and basis

3.2.1 Excavations

Excavations for foundations or underneath works of 1,5 m thickness from earth basis, in whatever kind of ground and consistence, dried or moistened (of argil and if is compacted, sand, gravel, stones etc,) including cutting and extraction of the roots, stumps, stones, and parts of a volume till 0.30 m^3, obligations accomplishments regarding underground constructions as waste drainages, drainages in general etc.

3.2.2 Fillings

Stone layer and selected brick masonry peaces, in well-compacted layers, without dust, render and organic materials, that result by described demolitions in the above-mentioned articles. The Supervisor will first check all materials that result from demolitions, and he will authorize their utilization.

3.2.3 Utilization of Excavated material

Suitable material and the material recovered from temporary work shall be utilized for backfill. Any surplus material shall be disposed of any shortfall made up with suitable fill.

3.2.4 Backfilling around structures

The material shall be placed simultaneously on both sides of an abutment, wall or pier. The backfilling shall be carried out with an approved material in horizontal layers not exceeding 150mm in depth after compaction.

3.3 Standards foundations

3.3.1 Concrete foundations

Foundations executed in concrete type – 100 in dosage per m3 and poured in thick layers well vibrated, with dimensions and shape as indicated in the relevant drawings, including the scaffolding, formwork, propping and all requirements to complete the works in a first-class manner.

3.3.2 Foundations in stone masonry and concrete

Buildings foundations and basis of butoconcrete, limestones in the following proportions not exceeding 20 cm per m^3: concrete M 100, 0.77 m^3 and stone with concrete in dosage of 0.37 m3, including formworks, propping and all requirements to complete the work in a first-class manner.

3.3.3 Column Foundations & Pile Caps

Pile caps realized and suitably reinforced due to the instructions of the project, in concrete M 200, realized in thin layers and well vibrated, in dosage of concrete M 20 inert, including reinforcement, formworks, proppings, and any other obligation and skill for work accomplishment.

3.4 Foundations ancillaries

3.4.1 Waterproofing of footings

The vertical waterproofing of footings in hot fixed bitumen, formed from a layer of bitumen emulsion and two layers of bitumen M3 with 3.8 kg per sqm, including all requirements to complete the work in a workmanlike manner.

3.4.2 Waterproofing of foundations

3.4.2.1 Foundation waterproofing in buildings without basement

In buildings without basement waterproofing of the upper horizontal level in foundations will be in plinth altitude by mortar, concrete, sand 1:2. mortar will be added as needed to the cerezit. This waterproofing layer should be connected to floor waterproofing and to external vertical side of foundations, which is in the middle of plinth level.

3.4.2.2 Foundation waterproofing in buildings with basement

Buildings with basements:

a) Waterproofing of horizontal foundation in basement floor waterproofing altitude will be as paragraph 3.4.2.1.

b) Waterproofing of external foundation masonry side. This is connected to horizontal level waterproofing and is no less than 10 cm over pavement altitude.

3.4.2.3 Waterproofing manner

Before waterproofing foundation works and other sub-terrenean structures, the place should be cleaned from scaffoldings, which creates obstacles in waterproofing layers.

During waterproofing of foundation horizontal sides to be followed these conditions:

a) Leveling of foundation surface;

b) Before putting polished cement layer, will be its moisturizing;

c) Mortar should be prepared by 1 part cement and 2 part cleaned and rough sand (taken in volume) and polish to be built in thickness 20 – 30 mm and leveled. In places by dense humidity to be added to cement quantity, 8 up to 10 % waterproofing solution.

Vertical sides of basement masonry will be waterproofed by bitumen (primer), bitumen-waterproofing membrane etc. Due to project forecast, in accordance to the level of sub-terrenean waters and terrene conditions.

Waterproofing will be from downside to upside. Waterproofing layer by bitumen-waterproofing membrane or bitumen (primer), should be protected due to project notes usually by brick masonry of thickness 12 cm. Outside protection masonry will be placed clay in wideness 30 – 50 cm, well pressed. Waterproofing-bitumen membrane layers are placed horizontally, considering overlapping and non-accordance of layers.

3.4.3 Perimeter and superficial drainage

The perimeter drainage shall be realised along the foundations, but not on them. This drainage is composed of ring line with out let pipes and control traps.

If under the building floor there is a capillary layer, then it is needed ring drainage with tubes as in the figure No.1.

In cases when the drainage is realised under the foundation basis, the foundation basis should be deeper.

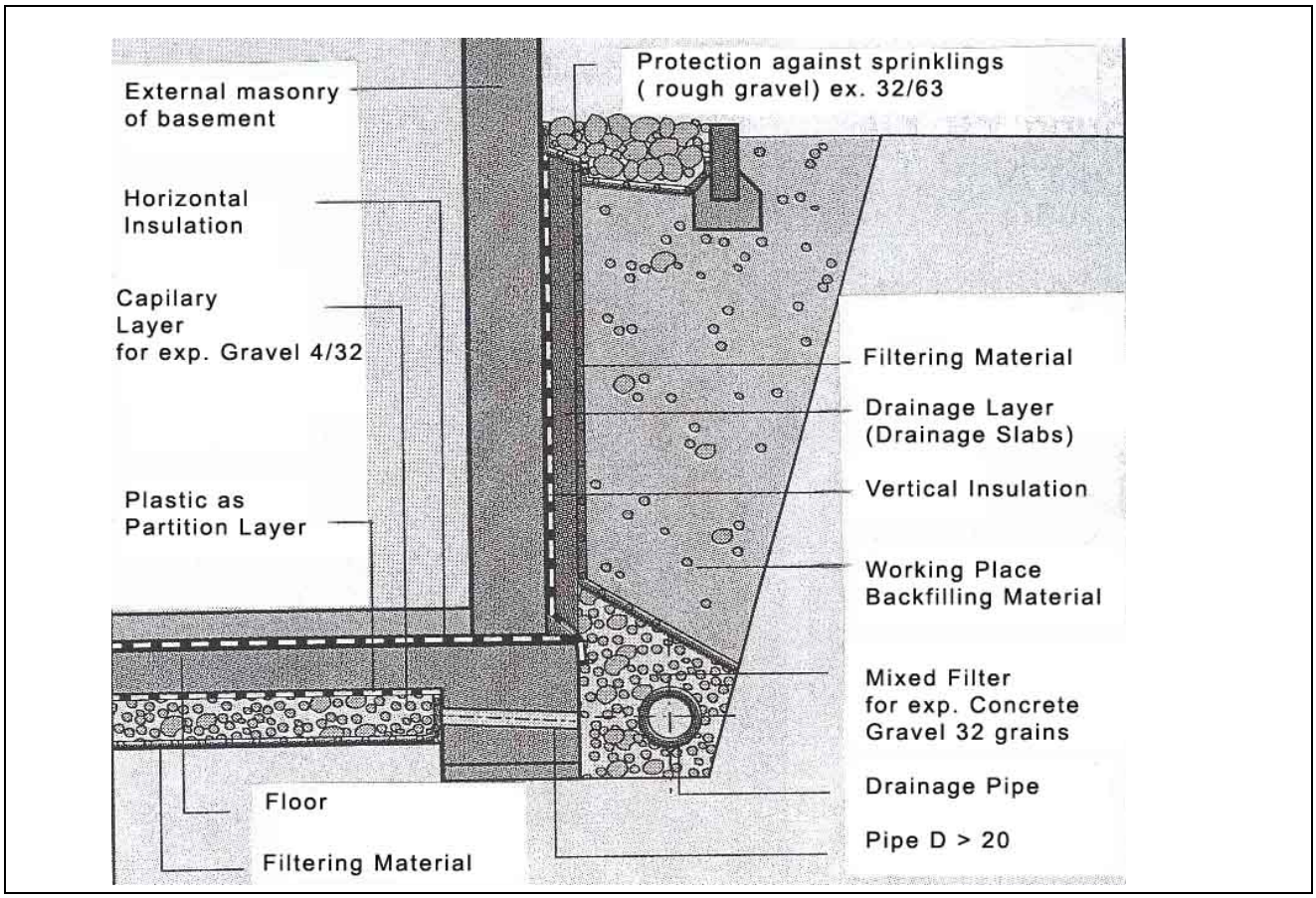
The pipes shall be laid form the lowest to the highest point, straight sloped, on a gravel filtering layer 15 cm thick and shall be covered about 25 cm with the same filtering material. Also, should be considered that the tube basis should be min. 20 cm under floor level, in order that water gets away easily from the capillary layer.

Pipe dimensions should be min. 50 mm; the gravel that shall be used for filtering layer should be of grains not smaller than 3.2 mm.

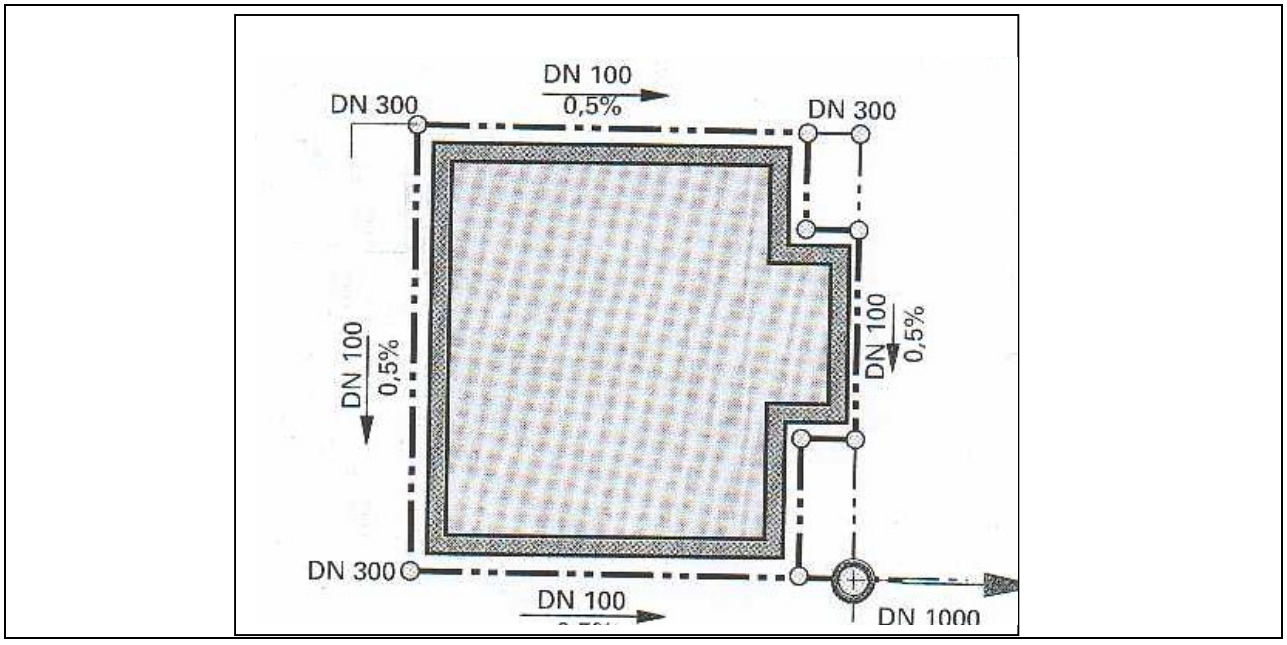
Except the perimeter drainage, big role in the foundation drying has played the superficial drainage, which shall be realised as following.

In the whole floor surface shall be realised a drainage layer and on it shall be laid a partition layer in order to avoid the floor concrete intrusion into the drainage layer. If for the drainage process shall be used gravel for concrete 3,2 mm then the drainage layer thickness should be min. 30 cm thick and if it will be used gravel 4 – 32 mm, the bedding shall be realised casting only 10 cm in the whole surface. Under the drainage bedding shall be laid drainage pipes. The diameter and distance between them is depending by the water quantity. The drainage pipes shall be encircled with gravel filtering layers and connected to the perimeter drainage pipes.

In the figure No. 2 is presented a laying manner of drainage pipes



Drawing No.1



Drawing No. 2

SEKSIONI 4 CONCRETE, FORMWORKS AND REINFORCEMENT

4.1 In situ-concrete

4.1.1 General requirements for concrete

Concrete aggregate shall consist of sharp sand or crusher dust, crusher gravel and other solutions for propping, water penetration and to enable the work in low temperatures according technical requirements of the project.

4.1.2 Materials

- Concrete elements

  Concrete elements shall consist of sharp sand or crusher dust, or mixture of these, and hard durable crushed locally occurring stone. All aggregates shall be free from clay and all other impurities. The coarse part of the aggregate shall be roughly cubical in shape and not spherical. The grading of the aggregate shall have the certificate of the place where they are taken from.

- Cement

  The contractor shall supply with each consignment of cement a copy of the invoice stating the quantity delivered, the maker's name and also the maker's certificate showing that each consignment has been tested and analyzed and conforms to the Standard. The cement shall be subject to such Standard test as the Engineer may deem necessary and he may reject any cement, which proves unsatisfactory notwithstanding the maker's certificate.

  For more details regarding the cement type that shall be utilized for concrete production, see 4.1.4, because for different concrete types shall be utilized different cement types.

- Water for concrete

The water that shall be used for the concrete production should be free of substances that damage it, such as: acids, alkalis, clays, lubrificants and other organic substances. In general, the water of population supplying system (potable water) is recommended for utilization in concrete production.

4.1.3 Storage of Materials

The storage of materials that shall be used in concrete production should fulfill the following conditions:

- The cement and its ingredients should be stored in order to be divided from the other materials, which are not suitable for concrete production and damaged its quality.

- The cement should be stored in dried spaces which keep it away from water rain moistening.

4.1.4 Classification of concrete

4.1.4.1 Concrete type 100, with aggregates all-in: 240-kg cement (concrete type 300); 1,05 m^3 gravel; 0,19-m^3 water.

4.1.4.2 Concrete type 100 slump 3 – 5 cm. aggregates max. size 20 mm, clean sharp sand (2,6 mod.): 240 kg cement (concrete type 300); 0,45 m^3 sand; 0,70 m^3 aggregate; 0,19 m^3 water.

4.1.4.3 Concrete type 150 slumps 3 – 5 cm. aggregates max. size 20 mm, clean sharp sand (2,6 mod.): 260 kg cement (concrete type 400), 0,44 m³ sand, 0,70 m³ aggregate, 0,18 m³ water.

4.1.4.4 Concrete type 200 slump 3 – 5 cm. aggregates max. size 20 mm, clean sharp sand (2,6 mod.): 300 kg cement (concrete type 400), 0,43 m³ sand, 0,69 m³ aggregate, 0,18 m³ water.

4.1.4.5 Concrete type 250 slump 3 – 5 cm. aggregates max. size 20 mm, clean sharp sand (2,6 mod.): 370 kg cement (concrete type 400), 0,43 m³ sand, 0,69 m³ aggregate, 0,18 m³ water.

4.1.4.6 Concrete type 300 slump 3 – 5 cm. aggregates max. size 20 mm, clean sharp sand (2,6 mod.): 465 kg cement (concrete type 400), 0,38 m³ sand, 0,64 m³ aggregate, 0,195 m³ water.

4.1.5 Concrete production

The concrete of the defined type should be prepared by the designer and according to the mixture recapture of materials in support of the rules given in KTZ 37 – 75 “Concrete design”.

During the concrete preparation should be followed the rules given in chapter 6 “Concrete preparation” of KTZ 10/1-78, paragraphs 6.2, 6.3 and 6.4.

4.1.6 Placing of concrete

Placing of concrete produced in work shall be realised according to possibilities and conditions when it shall be placed. Generally, to this aim shall be used fixed cranes placed in the object and truck mounted concrete pump.

Very important during the concrete layer is the duration from producing to laying, which shall be as short as possible.

Also, during the concrete laying is very important a best possibly vibration, during this process.

4.1.7 Construction joints

Construction joints shall be used without interruptions, if it is possible. In cases when this is not necessary or obligatory, then shall be taken all precautions to realise the joining of both construction joints in different periods.

The interruption of construction joints works is to determined due to the possibilities, realising:

- Iron sheet in a width of 10 cm and thickness of 4 mm, from which 5-cm in the fresh concrete and concreted, while other 5-cm serve for the next concrete casting.

- Eaves line, which should be laid according to producer specifications.

4.1.8 Protection

Fresh concrete should be protected against these influences:

- Rainfall and humidity, covering the concreted surface with plastics and other waterproof materials.

- Frost (during the producing process, augmenting solutions against low temperatures, which enable the concrete casting till zero temperature.

- High temperatures. The concrete shall be protected against high temperatures, sprinkling it with water, in order to avoid possibly cracklings.

4.1.9 Adverse weather conditions

The concrete producing and placing is not recommended in adverse weather conditions.

The concrete producing and placing is prohibited in cases of torrential rainfall, because the big volume of water in the concrete layer removes the cement and so the concrete looses the requested concrete type.

In cases of low temperatures - 4º C, it is recommended to avoid the concrete casting, but if this is necessary, then shall be taken the precautions that during the process of concrete producing shall be also augmented the solution against frost in appropriate quantity, recommended by the producer of this solution.

Concrete production and elaboration in high temperatures can influence negatively the chemical reaction of the cement to other concrete elements. For that reason, it shall be protected against high temperatures. Protection way against high temperature can be done in such a way that fresh concrete be protected against sunshine, covering it with plastics, sawdust, sprinkling with water. Another contribution for concrete elaboration in high temperatures is coloration in white of the water reservoir and continuously sprinkling with water.

Pipes and Conduits

Pipes and various drainage that make possible building supply (water, wastewater, electricity, etc.) if possible shall not be concreted, to enable the homogeneity of the concrete parts, which are designed as scaffolding, concrete elements. In cases when, this condition cannot be fulfilled, then shall be consulted the constructive engineer.

In cases when it is needed to pass through masonry or other concrete slabs, then during the designing phase, it is necessary the considering of these exits and planning/accounting by the constructive engineer and their insulation. Also during the concrete placing it is needed the preparation of these exits, throughout will pass through the pipes and other supplying drainage.

4.1.10 Testing of concrete

When the concrete is produced, it shall be tested if it fulfils the criteria according to the project requirements.

After producing and placing, it shall be taken a concrete sample to make the labour testing and the results shall be delivered to the Supervisor.

4.2 Concrete elements and sub-elements

4.2.4 In – situ Lintelns

Lintels for the width of the wall allowing for a seating of 25 cm both sides, of thickness according to the width of opening, appropriately reinforced, within a height of 4 m, cast in concrete type 200 with dosage per m^3, including scaffolding, formwork, propping, steel reinforcing and all requirements to complete the work in a first class manner.

4.2.5 Pre –cast Lintelns

Supply and placing of pre-cast lintel s, within a width of 40 cm and variable sessions, with concrete type 200, regularly reinforced and according the instructions in the project, mixed with cement mortar 1:2, including steel reinforcement, reinforcement works and all requirements to complete the work in a workmanlike manner.

4.2.6 In –situ Beams r

Concrete beams appropriately reinforced, within a length of 4 m, formed from concrete type 200 with dosage per m3, including scaffolding, formwork, propping, steel reinforcement and all requirement to complete the work in a first class manner.

4.2.7 Ring Beams

Ring beams to the full width of the wall with a height of 15 cm and 20 cm, suitably reinforced according to KTZ and STASH, realised with concrete (type 150 of 200) poured in thin layers well vibrated, including scaffolding, formwork, propping, steel reinforcing and all requirement to complete the work in a first class manner.

4.2.8 Columns

Concrete columns, suitably reinforced and according to the indications of the drawings, within a height of 4 m, formed from concrete (type 200) poured in thin layers well vibrated, with dosage per m^3 as indicated in 4.2.4, including scaffolding, formwork, propping, steel reinforcing and all requirement to complete the work in a first-class manner.

4.2.9 Type “SAP” Slab

Supply and installation of type “SAP” slab, installed on masonry walls previously prepared with levelling in cement (type1: 2), with dosage per m3, anchor-fixed to the ring beam, appropriately reinforced, in concrete (type 200) poured in place, laid in the layers well vibrated, with dosage per m3 as indicated in 4.a.4, which, according to the required span, will be reinforced with steel and supplementary slab, including scaffolding, formwork, propping, steel reinforcing and all requirement to complete the work in a first-class manner.

4.2.10 Pre-cast slab

Slabs in pre-cast concrete to a variable height from 11 cm to 16 cm installed on ring beams previously executed, including the laying of elements and the pouring of a covering slab in concrete type 250 or 300.

4.2.11 Structural slab in reinforced concrete

Structural slab in reinforced concrete poured in concrete (type 200) according to project, in thin layers well vibrated, including steel reinforcing, formwork, propping, scaffolding and all requirements to complete the work in a workmanlike manner.

4.2.12 In situ reinforced concrete stairs

Stairs for each floor shall be realised with ramps, with toothed sloped elements, with respective landing and support beams. The banisters shall be concreted at the same time with the ramp. Concrete type 200 to 250, including formwork, propping, scaffolding, foundation diggings, reinforcement iron, and all other requirements to complete the work in a workmanlike manner.

4.2.13 Repairing of existing stairs

Stairs system with removal of all the missing or damaged parts, cleaning, washing it with water under pressure; realised with concrete with dosage according to 4.1.4.4 and similar to the existing part in good condition, including formwork, propping and all the requirements to complete the work.

4.2.14 Fascia in the main entrance

The fascia in building entrance realised in reinforced concrete slab, which is as one with reinforced concrete part of building corpus and can be concreted in consul beam form or supported on a consul beam. Concrete type 200 till 250. The works can be realised including formwork, propping, scaffolding, and excavations for basements, reinforcement steel, and all the other requirements to complete the work.

4.2.15 Reinforced concrete structure

Building part in reinforced concrete structure, constructed separately from masonry, foreseeing a technical eaves in a height of over 40 m. Reinforced concrete structure shall be formed of beams, columns, foundation pillars, stairs connected to one other skeleton; and realised: monolithic, in concrete type 200 to 250. These structures shall be realised commencing from the basements.

4.3 Formwork and concrete finish

4.3.1 Preparation of formwork

Formworks shall be prepared of wood or steel and are ready or shall be prepared in the object.

Surfaces of formwork that are to be in contact with fresh (wet) concrete shall be so treated as to ensure easy release and non-adhesion of concrete to formwork during stripping.

Before reuse, all formwork shall be reconditioned and all form surfaces that are to be in contact with the concrete shall be thoroughly cleaned without causing damage to the surface of the formwork.

4.3.2 Removal of formwork

Formwork shall not be removed before the concrete has attained sufficient strength to support its own mass and any loads that may be imposed on it.

This condition shall be assumed to require formwork to remain in place, after placing of the concrete, or the appropriate minimum period of time given in Table 4.4.1, unless the contractor can prove to the satisfaction of the Engineer that shorter periods are sufficient to fulfil this condition.

Minimum period before striking formwork using ordinary Portland cement.

Minimum period before striking

Type of formwork		
Surface temperature of concrete	16°C	7°C
Vertical formwork to column,	3 days	5 days
Walls and large beams	2 days	3 days
(Lateral formwork)		
Soft formwork to slabs	4 days	7 days
Props to slabs	11 days	14 days
Soft formwork to beams	8 days	14 days
Props to beams	15 days	21 days

Note:

The Engineer may allow a shorter period, when using Rapid Hardening Cement.

For cold weather periods should be increased by ½ day for each day the temperature falls between 7°C and 2°C, and one day for each day on which the temperature drops below 2°C.

Formwork shall be removed carefully so that chock and damage to the concrete are avoided.

4.3.3 Surface classification of concrete elements

Classes of finishes are divided in two groups:

- Leaving the concrete surface after formwork removal in the same statement as after the concrete casting process.
- Concrete surface elaboration with plastering or coating.

Regarding the first group it might be considered that during the formwork placing, they should be polished and levelled and oiled with special oil for the formwork, in order that after the formwork removal, the concrete surface is polished. Also, during the concrete laying it should be uniform vibrated. Regarding the second group, the process is similar with masonry surfaces.

4.4 Reinforcement

4.4.1 Materials

Steel works for all reinforced concrete structures and metal components, that are to be produced in site, by considering steel that complies all the requirements and without rust presence, in sizes and shapes according to the indications of drawings and technical legal standards for bending, joints and taking into consideration the providing with certificates from labs to verify that the steel fulfils the verified conditions to be used for the concerned work and including all other requirements not specified.

4.4.2 Storage

Steel storage in site shall be made in such a way, in order to avoid its damage (shall be distorted, because this would extend the duration of the pre-stressed reinforcement) impediment of the works or of other construction materials.

4.4.3 Bending of reinforcement

a) Reinforcement shall be bent to the dimensions shown on the bending schedules.

b) Except as allowed for below, all bars shall be bent cold and bending shall be done slowly, a steady, even pressure being used. Hot bending is not allowed.

c) No flame cutting of high tensile bars shall be permitted except with the approval of the Engineer. Bears already bent may not be straightened and re-used.

4.4.4 Placing and fixing

Reinforcement shall be positioned as shown on the Drawings and maintained in this position throughout concrete casting operations. It shall be secured by tying at intersections with 1,25 mm or greater diameter annealed wire or by the use of clips.

4.4.5 Cover

The term cover in this context shall mean the minimum clear thickness of concrete between the surface of the reinforcement and the face of the concrete.

The minimum cover shall be according to the KTZ norms.

4.4.6 Splicing

Splicing or joining of reinforcing bars shall be made only as and where shown on the Drawings or as shown drawings approved by the Investor.

The length of the overlap in a splice shall not be less than that shown on the working Drawings.

4.4.7 Steel bearing and pre-tentioning

Apiece of iron (with diameter smaller than 8 mm) shall be transported in round shape. For this, he should be beard in the construction site. Its bearing can be made through practical methods as for example: the fixing of one side in a certain point and extraction of the other side through different mechanisms. Also in polygons shall be realised the pre-tentioning of different elements, due to project requirements. This working process shall be executed very carefully and under observation of the head of workings.

SECTION 5 CONSTRUCTION STRUCTURE

5.1 MASONRY AND WALL PARTITIONS

5.1.1 Mortar for masonry in dosage per 1 m³ shall be realised of:

5.1.1.1 Lime mortar type 15 with river sand (which porosity of 40% and water content with relevant increasing of volume by 20%) mixed in proportion of cement: lime: sand = 1: 0, 8: 8. 110 lt hydrated lime, 150 kg cement (type 300), 1.29 m^3 sand.

5.1.1.2 Lime mortar type 25 with river sand (which porosity of 40% and water connect with relevant increasing of volume by 20%) mixed in proportion of cement: lime: sand = 1: 0,5: 5,5. 92 lt hydrated lime, 212 kg cement (type 300), 1,22 m^3 sand.

5.1.1.3 Lime mortar type 15 with clean sharp sand (to have a porosity of 35%) mixed in proportion of cement: lime: sand = 1: 0,8: 8. 105 lt hydrated lime, 144 kg cement (type 300), 1,03 m^3 sand.

5.1.1.4 Lime mortar type 25 with river sand (to have a porosity of 35%) mixed in proportion of cement: lime: sand = 1: 0,5:5,5. 87 lt hydrated lime, 206 kg cement (type 300), 1,01 m^3 sand.

5.1.1.5 Lime mortar type 1:2 with clean sharp sand (to have a porosity of 35%) mixed in proportion of cement: sand = 1:2. 527 kg cement (type 400), 0,89 m^3 sand.

5.1.2 Clay brick specifications

The brick as construction element shall fulfil the following conditions for anti-seismic constructions:

- Resistance during pressing, which shall be for bricks 75 kg/cm²; for hollow bricks 80 kg/cm²; for red bricks for ceiling 150 kg/cm²
- Resistance during cutting, which shall be: for all hollows brick 20 kg/cm².
- Inter spaces percentage, which shall be: for brick 0-25 %; and for all the hollow bricks 25-45 %
- The thickness of perimeter and internal parapet for bricks shall not be lower than 20 mm and for all the hollow bricks; the thickness of perimeter parapet shall not be lower than 15 mm and of the internal meat, not lower than 9 mm.
- The surface of a hole shall be max. 4.5 cm².
- Hygrophility in percentage shall be from 15 – 20 %.

5.1.3 External brick masonry (type 25 cm)

Brick masonry of uniform or variable thickness to a height of 3m for external work, in full brick and lime mortar (type 25) with the following dosage per m^3: n. 400 bricks, 0.25 m3 lime mortar, 38 kg cement (type 400), to any thickness including material for toothing, vertical openings, edges, off-sets, scaffolding and all requirements to complete the work in a workmanlike manner. On ground floor bedding shall be laid on a layer of cement mortar (type 1:2), 2 cm thick minimum.

5.1.4 External hollow brick masonry

Hollow brick masonry of constant or variable thickness to a height of 3m. for external work, in pre-cast terracotta and lime mortar (type 25) with the following dosage per m^3 : n. pre-cast terracotta bricks, 0,29 m3 lime mortar, 44 kg cement (type 400), to any thickness, including material for toothing, vertical openings, edges, off-sets, scaffolding and all requirements to complete the work in a workmanlike manner. On ground floor bedding shall be laid on a layer of cement mortar (type 1:2), 2 cm thick minimum.

5.1.5 Brick masonry (12 cm)

Masonry in brick with a thickness of 12 cm and lime mortar (type 25) according to 5.1.1 with the following dosage per m³ n. 424 bricks, 0.19 m³ lime mortar, 29 kg cement (type 400) and water.

5.1.6 Internal brick masonry

Brick masonry with a thickness of 25 cm and lime mortar (type 25) with the following mortar dosage per m^3: n. 400 bricks, 0.25 m^3 lime mortar, 29 kg cement (type 400) and water, to any thickness including material for toothing, vertical openings, edges, off-sets, scaffolding and all requirements to complete the work in a workmanlike manner. On ground floor bedding, shall be levelled a cement mortar layer 1:2, 2 cm thick minimum.

5.1.7 Internal hollow brick masonry (11 cm)

Hollow brick masonry in (6 divisions) with a thickness of 11 cm and lime mortar (type 25) with the following dosage per m³: n.177 hollow bricks, 0,10 m³ lime mortar, 14 kg cement (type 400) and water, including any requirement of materials for toothing, edges, vertical openings, off-sets, scaffolding and all requirements to complete the work in a workmanlike manner. On ground floor bedding, shall be levelled a cement mortar layer 1:2, 2 cm thick minimum.

5.1.8 Internal hollow brick masonry (20 cm)

5.1.9 Masonry in hollow brick (6 divisions) with a thickness of 20 cm and lime mortar (type 25) with the following dosage per m³: n.172 hollow bricks cope, 0,12 m³ lime mortar, cement type 400 and water, including all details and requirements for toothing, vertical openings, edges, off-sets, scaffoldings and anything else necessary to complete the masonry. On ground floor bedding shall be levelled a cement mortar layer 1:2, 2 cm thick minimum.

5.1.10 Double brick masonry

As shown in the above-presented cases, but here we have two brick masonry lines placed very closely to one other and connected in a workmanlike manner.

5.1.11 Double brick masonry

As shown in the above-presented cases, but here we have two hollow brick masonry lines placed very closely to one other and connected in a workmanlike manner.

5.1.12 Rings beam masonry

General:

1. Materials and production of rings beam:

   Cement, water, sand and aggregates for concrete production, note point 4.1

   Hollow brick rings beams are pre-prepared or can be prepared in the site. Rings beam made by approved labs shall be supported with certificate, which shall be presented to the Supervisor.

Rings beam placing shall be made in formwork as the requested measures well poured and pressed with the help of the vibrator.

2. Composition and mixture:

   Concrete beam usually composed of Portland and other fine and rough approved aggregates, with grain max. 10 mm; beams mixture that shall be used on masonry construction should be 1: 2: 4, cement quantity shall not be less than 225 kg per m^3 of the concrete.

3. Beams resistance should be for interspaced beams 7 N/ mm²; for solid beams 10 N/ mm²; for hollow beams 5 N/ mm².

4. After the rings beams are installed, they should be moistened with water for a 10 days period and it shall be used only after 30 days from manufacturing date.

5. The lime mortar for rings beam masonry should be composed of 1: 4 (1 part of common cement Portland and 4 pieces sand, which shall be previously cleaned. If the lime mortar is not mixed with mechanical mixers, shall be completely mixed 2 times dried and 2 times after water augmentation in a clean, waterproof platform. The lime mortar, which begins to freeze or has been mixed more than 30 minutes before, shall not be used or re-mixed.

6. Placing of ring beams

   a) All the ring beams dimensions should be as in the Drawings indicated dimensions

   b) The walls should be built suitably, no one side should be 1 meter lower than the other side, only with Supervisor approval. The works realised in differently levels shall not be accepted. In cases of cavity walls, both thicknesses should be max. approximately 400 mm.

   c) Ring beams rows should be suitably levelled. The vertical eaves should be clearly realised, as well as door-, window- and edge angels should be suitably locked.

   d) All the walls should be placed in conformity with the technical conditions KTZ.

   e) All ring beams should be moistened before being used in the masonry. The upper row of the ring beams placed in the masonry should be moistened, before the installing of the new masonry on it. Wall sides should be cleaned and without mortar sprinkles on it.

   f) All the ring beams should be previously with lime mortar well laid before the other row laying and all the eaves should be closed and constant in the whole masonry thickness of a row.

   g) In the previously plastered walls, horizontal eaves should not be filled in a depth of 15 mm.

   h) The ring beam should be connected to the reinforced concrete column every 2 rows through galvanised iron rails: 3 mm thick; 10 cm should be inserted in the column and 15 cm should be extended along the row.

Rings beams masonry with dimensions 0.4 x 0.25 x 0.19 m and lime mortar m-25 according to point 5.1.1 with dosage per m³: rings beams 52 peace, 0,103 m³ mortar, 400 cement and water, including all requirements for toothing, edges, vertical openings, scaffolding and anything else necessary to complete the bedding in a workmanlike manner. Regarding the first row of the ground masonry, the socket surface should be levelled with a cement mortar layer 1:2 in a thickness of min. 2 cm.

5.1.13 External stone masonry

Stone masonry of uniform or variable thickness to a height of 3 m for external work in good quality limestone, of a suitable dimension and lime mortar (type 25), according to 5.1.1 with the following dosage per m³: 1,05 m³ stone, 0,33 m³ lime mortar, 48 kg cement (type 400) to any thickness, including material for toothing, vertical openings, edges, off-sets, scaffoldings, and all requirements to complete the work in a workmanlike manner. On ground floor bedding, shall be levelled a cement mortar layer 1:2, 2 cm thick minimum.

Every one meter height of the stone masonry, shall be realised a concrete rings beam in concrete type 100 in a height of 10 - 15 cm.

5.1.14 Dry wall partitions (rigips)

Rigips usage on masonry construction is suitable only for partitions walls internal the building.

It can be used in both cases:

- For space partitions
- For damaged masonry reconditioning (wall covering)

Rigips usage is allowed mainly for dried environments, but rarely also for wet spaces. In cases of moistened space usage, rigips slabs should be signed specially by the manufacturer, through which is permitted its usage in such spaces.
Installation methods of rigips masonry should be made according to the manufacturer instructions. Although, their installation is not too different from one to another manufacturer of rigips systems, it very important the following of the installation instructions, which are given and warranted by the manufacturer.
Dry wall partition is composed of these components:

- Rigips slabs:

Generally, the slabs have these dimensions: 62.5 cm x 250 cm and 125 cm x 250 cm, while the thickness is of 12,5 mm or 15 mm. To achieve a better quality of the masonry, regarding fireproof and sound insulator is possible the double-layer planking and the filling of the inter space between both sides with thermo insulation material and sound insulator. The manufacturer should sign the slabs for dried or moistened spaces.

- Support constructions are in two types divided According the material used on this objective:
  - Rigips metal standards are of 50, 75 or 100 mm for rails placed up and down, while the rails placed in the above-mentioned rails have a thickness of 48.8, 73.8 or 98.8 mm. Regarding to this see the figure No. 1;
  - Wood (beat) in dimensions depending by thermo insulation material and sound insulation. Regarding to this see No. 2.

Support construction in vertical direction shall be placed each 62,5 cm. This construction and the rails placed up and down, increase the stability level of the constructing masonry.

- Thermo insulating material, fireproofing and sounds insulating.

This material fulfils the all three above-mentioned functions. The material shall be placed between the slabs and the support construction. Its thickness shall be min. 50 mm in order to guarantee a sound insulation in only 50 db that is conforming the approved norms. He should

resist to the fire min. 30 minutes. This material is composed mainly of natural mineral wool or other components, which exist in the market and that, are in conformity with the above-mentioned conditions.

- Other materials needed for these dry walls are screws, nails, gips dust to fill the eaves, etc

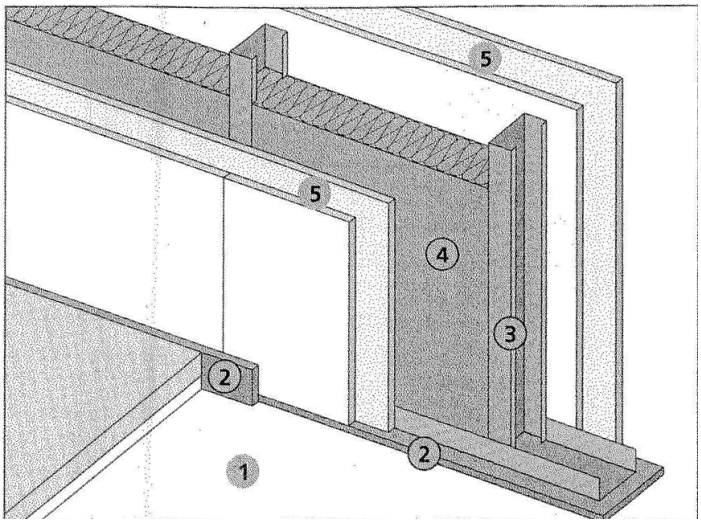
The combination of the above-mentioned components enables diversity in the construction of such masonry. Below are mentioned some combinations, which are possible if it will be used a metallic support construction:

- Single support construction, single slabs.
- Single support construction, double slabs
- Double support construction with inter space, single or double slabs

Rigips system can be used also in cases of the reconditioning of damaged masonry. Then the support construction is supported on the existing masonry and only after that shall be installed the slabs. If there is need, between the old/damaged masonry and the slab, can be installed the thermo insulation material in order to increase the insulation quality.

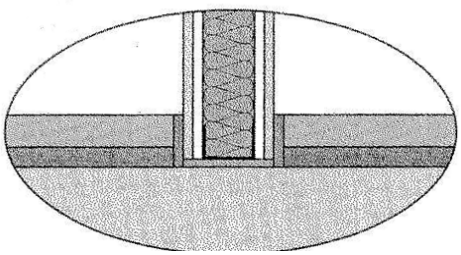
The system of the rigips masonry can be elaborated as any other masonry type. It can be painted in whatever colour and on it can be realised hydraulic and electric works, and can be installed all the types of clay slabs.

Figure No. 1



1) flooring
2) partition / insulation layer to flooring
3) sub-construction of metal
4) layer of thermo insulation material layer
5) rigips slabs (double)

Figure No. 2 (here enclosed itemised detail of vertical cutting)



5.1.15 Fireproof walls

Due to international norms, fireproof of construction materials shall be divided in these classes.

Fireproof class	Fireproof in minutes
F 30	min. 30 minutes
F 60	min. 60 minutes
F 90	min. 90 minutes
F 120	min. 120 minutes
F 180	min. 180 minutes

Architect / engineer has to determine the fireproof class, according to the place where this masonry shall be constructed.

Fireproof masonry requirements are as follow:

- Fire insulation in that part of the building, where it has been spread, till the people are out of danger and fire distinguishing has arrived.
- Load capacity of the masonry, to what class it belongs, shall be secured during that time.

Each building shall be divided in fire spaces, through which shall be placed masonry of F 90 class. Those pieces should locate and insulate the fire and avoid its dissipation all over the building, until the fire extinguishing take precautions against the fire.

Fireproof masonry shall be built mainly for the spaces where is deposited the fuel, installed the transformer and generator. In the above-mentioned cases, it is needed a fireproof class of F 90.

In cases when the material of the masonry is not part of one suitable class, then exist some possibilities to increase the fireproof class:

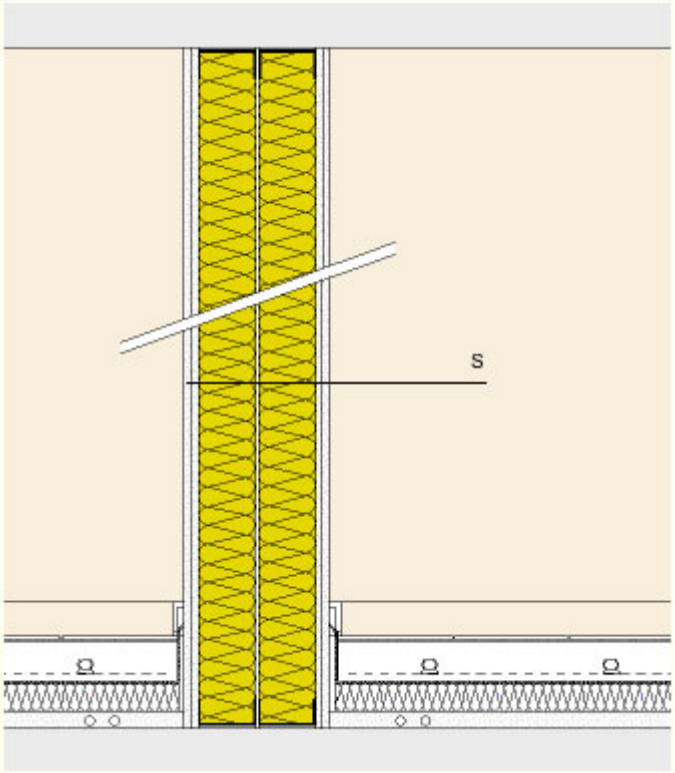
Masonry plastering with lime mortar, which is composed of aggregates such as for example mineral wool, and special solutions. (Vermiculite or Perlite)

The coating of existing masonry with concrete slabs

The masonry coating with rigips slabs or similar

Masonry sprinkling with a chemical material, so it can be developed the fire insulating.

In the following photo there is an example of rigips masonry, which is part of F 90 class. (Masonry is composed of 4 slabs (rigips) in a thickness of 12,5 mm and of 20-cm thermo insulation material).



5.2 ROOFING

5.2.1 New terraces

Thermo insulation

Thermo insulation shall be realised using thermo insulating materials (penoconcrete or polisterol) sloped in the areas of the hydro insulating layers.
Cover with mortar layers sloped as requested, in a width of minimum 3cm, realised with cement mortar (type 1:2), levelled for the installation of the insulating layer.

Hydro insulation

Hydro insulation shall be laid on a dried surface, previously levelled, including vertical surface covered with bituminous layer as first coat. On this layer shall be laid two bituminous sheets, with mineral fibber, each in a width of min. 3 mm, spliced with fire, with overlapped membranes placed in the suitable edges, on sloped or vertical surface, ensuring that the coverage of the joint elements is 12 cm.

The protection of the waterproof membrane for plane, vertical or sloping surfaces, will be executed with a cement slab 3 cm thick (cement mortar type 1:2), slabs or cement mortar layer be realised in square form 2 x 2 m, construction joints spaced at 2 cm, shall be bitumen, according to the indications in the drawings.

The installing of copying with incorporated water drips, in concrete appropriately reinforced, prefabricated or cast in situ, according to the indications in the drawings, concrete (type 200) in dosage per m^3 as indicated in 4.1.4, including formwork, propping and all requirements to complete the terrace in a workmanlike manner.

In cases when the terrace hydro insulation is executed when the bitumen waterproofing membrane layer has no cement polish, then shall be installed a layer of 5 cm, spherical gravel of 32 mm –64 mm, which serves for the protection of bitumen waterproofing membrane.

5.2.2 Vertical and horizontal roof guttering

Horizontal roof guttering

Shall be realised giving a slope of 1% towards a gutters. Horizontal roof gutters are made of PVC or of galvanised sheet iron. Roof gutters in galvanised sheet with a minimum thickness of 0,8 mm, formed from pressed elements with a minimum overlap of 5 cm and suitably soldered, with the outside edge formed 2 cm lower than the internal edge, complete with appropriate accessories. The type of roof guttering shall be in accordance to indications in the drawings and shall be fixed using galvanised wire and gutter fixings positioned at a maximum of 70-cm. In the objects with terrace can be used also concrete gutters. All the concrete gutters shall be insulated with guano in their internal edge. Where the guttering is positioned between a parapet and the roof will be of galvanised iron sheet, according to indications in the drawings.

Vertical Gutters

They serve for the unloading of roof and terrace waters, and in cases of bad functioning they should be dismantled and replaced with new ones.

Vertical gutters for unloading of roof and terrace waters shaped in galvanized steel by a minimum thickness of 0.6 mm and diameter of 10 cm, meanwhile vertical gutters of PVC with dimensions from 8 till 12 cm will serve a roof area from 30 up to 60 m².

Each gutter will collect the waters of roof or terrace in no greater than 60 m².

The gutters will be positioned at the external face of the building using galvanized steel pipe, covered by hot-fixed bituminous membrane 3 mm thick, placed within the sections of the wall parapet, giving a slope of 1%, towards a galvanized rain-head, in accordance to indications in the drawings.

The lower part of the gutter to a height of 2 m will be realized by PVC heavy pipes with his final part by bending at $90^{O,}$ well fixed to the wall by appropriate accessories in galvanized steel.

5.3 METALIC STRUCTURES

5.3.1 General Informations

By steel projection constructions, should be considered the requirements of work features construction, throughout respective instructions in accordance to these technical conditions.

Steel construction solidity and resistance should be warranted during exploiting process, and during transport and mounting.

5.3.2 Production

Steel production should be of licensed companies and they should warranty steel quality (chemical compound, power/ weight, etc).
The steel using in support constructions, should fit the respective standards requirements and should give warranty regarding limit flowing and max. compound of sulfur and phosphor; meanwhile for welding construction, for max. compaund of carbon as well.

Cutting, welding and steel elements binding will be executed by contractor company site and they can be carried into site or be executed inside work place (in object).
In any case the works before element welding should be revised by Supervisor and should be protocoled.

5.3.3 Welding

Welding prepare includes the final shape of details before welding. The surface sides of welding parts should be prepared according welding procedures and the shapes given in table 6,7,8 of K.T.Z. 206-80 or in any other European norm/standard.
After welding, the details should be thermically treated, in order to reduce the internal partitions, to avoid cracks and to improve physical-mechanical features.
During work implementation for steel welding should be held a technical document with dates for used materials certificate, work diary, etc.

5.3.4 Bolt binding

Steel elements can be bind/spliced throughout bolts.
Bolt binding should respond the contemporan norms and standards (EC 3 or a similar norm).
Bolts quality is very important and the last one as well, they should fit the above-mentioned norms and standards. The fulfilling of resistance conditions for bolt binding is very important. The type of pressure situation and binding group, should fulfill the required/necessary conditions, from norms/standards are these:

- Pulling
- Cutting
- Pressing

During work implementation for steel bolt binding should be held the technical with dates for the certificate of used material, work diary etc.

The way of binding (welding or bolting) should be decided by the constructor engineer as required.

5.3.5 Erection

The erections of steel material are executed due to architect/engineer projects. The engineer should supervise the erection work. The staff hired should be of the right experience in this field

5.3.6 Protection from atmospheric agents

Steel protection is realized in two ways:

- Steel painting in some layers, which are used as anti-corrosion. This is realized by painting, diving or by sprinkling into layers. One of layers is the basis; the other one is used as element decor and might be of different colors.

Before placing the layers, the material under them should be elaborated dust free, oil free and rust free.

- Metal layer: this layer is permanent. The steel should be dived into hot zinc (450 °C) and its surface should be dust free, oil free and rust free. Another layer can be used as steel element decoration (as color).

It is strictly forbidden steel oil painting for concrete casting.

SEKSIONI 6 FINISHES

6.1 Wall finishes

6.1.1 Internal plastering in new constructions

Preparations of walls and ceilings with a first rough-cast of render, using a fluid cement mortar for improving the adherence of the render and to reinforce the surface, including scaffolding and all requirements not specified for the satisfactory completion of the work.

Plastering composed of one layer of lime mortar (type 25) 2 cm thick with the following dosage per sqm: 0,005 m³ clean sharp sand; 0.03 m³ lime mortar, (type 1:2), 6.6 kg cement (type 400), water, with the appropriate profiles and guides (mortar beam of 15 cm thickness every1 till 1,5 m) applied to walls and ceilings and trowel finished to a smooth surface, including scaffolding, and all requirements to complete the work in a first class-manner.

6.1.2 External plastering in new construction

Preparation of walls and ceilings with a first rough- cast of render, using a fluid cement mortar for improving the adherence of the render and to reinforce the surface, including scaffolding and all requirements not specified for the satisfactory completion of the work.

Plastering composed of one layer of lime mortar (type 25) 2 cm thick with the following dosage per sqm: 0,005 m³ clean sharp sand; 0.03 m³ lime mortar, 7.7 kg cement (type 400), water, with the appropriate profiles and guides (mortar beam of 15 cm thickness every 1 till 1,5 m) applied to walls and ceilings and trowel finished to a smooth surface, including scaffolding, and all requirements to complete the work in a first class-manner.

6.1.3 Fine lime plaster on walls

Fine lime plaster on walls, with appropriate lime on wall surfaces previously plastered and leveled, with dosage: fine lime 3 kg per sqm. The height of lime plaster for corridors and offices is to be decided by the engineer including all other necessary requirements to consider the fine lime plastering completed in a first class manner and ready for painting with synthetic enamel.

3-Color wash painting in internal surfaces

At the beginning will be done the mixture of color wash, which is packed in 5 liters boxes. Color liquid will be hollowed with water in 20-30 %. The pigment then will be mixed till the right color is reached and approved by work Supervision and after that the two coats of surface painting will be done.

The hollow color wash norm of 1-liter, which will be used for 4-5 sqm. This norm depends on the rigidity of the painted surface.

Color acrylic painting in external surfaces

The surfaces not intended to be paint (doors, windows etc) throughout protective papers should be protected before painting process.

The pre-painting of cleaned surfaces by hollow adhesive will be done at the beginning of painting process. A mixture of 1 kg adhesive with 3-liter water is needed for the pre-painting. Then only single coat pre-painting can be done.

The mixture norm of 1-liter of adhesive and water is used for a surface of 20 sqm.

After it will be painted with acrylic color. This color is different from color wash because it has different oils as ingredients, which help in light and humidity resistance.

First the mixture of acrylic color with water will be done. Color liquid will be hollowed with water in 20-30 %. The pigment then will be mixed till the right color is reached. The painting is two coated. The norm is 1-liter of hollow acrylic color, which will be used in 4-5 sqm. This norm depends on the rigidity of the painted surface.

The staff hired for painting, should be experienced in this field and should follow all technical conditions of painting due to KTZ and STASH.

6.1.4 Color wash painting in New Constructions

The contractor shall submit to the engineer for approval the brand and quality of the paints be proposes to use.

All paints shall be products that have satisfactory field service. The mixing of different brands before or during application will not be permitted. Mixing and applications of paint shall be in accordance with the manufacturers specifications concerned and to the approval of the engineer. Ironmongery and accessories, machine surface, plates lighting fixtures and similar items in place prior to cleaning and painting, which are not intended to be painted, shall be removed or protected prior to painting operations and repositioned upon completion of painting work as directed Cleaning solvents shell be of low toxity. Cleaning and painting shall be so programmed in a way that dust and other contaminates from the cleaning process will not fall on wet or newly painted surface. Brushes, pails, kettles etc used in carrying out the work shall be clean and free from foreign matter. They should be thoroughly cleaned before being used for different types or classes of material.

The staff hired for painting, should be experienced in this field and should follow all technical conditions of painting due to KTZ and STASH.

6.1.5 Painting of the dry wall partitions

Before dry wall partitions painting process, their finishes should be all concluded (gaps filling, bolts places, corners etc).

Wall painting process by color wash painting is as point 6.1.8.

6.1.6 Enamel Painting in New Constructions

Filling and fine-coating timber or metal surfaces with appropriate filer to prepare the surface for enamel painting.

Timber, metal surfaces or the walls will be painted with synthetic enamel with dosage 0.2 kg per sqm for each coat giving a perfect finish and all requirements to complete the work in workmanlike manner.

6.1.7 Painting of steel works

Filling and fine-coating timber or metal surfaces with appropriate filer to prepare the surface ready for enamel painting.

All metal surfaces shall be pre-treated with a single coat of lead primer or suitable oil-based anti-rust with the dosage of 0.08 kg per sqm.

Timber, metal surfaces or the walls will be painted with synthetic enamel with dosage 0.2 kg per sqm for each coat giving a perfect finish and all requirements to complete the work in workmanlike manner.

6.1.8 Painting of wood surfaces

Wood surface painting has two intentions:

- Decor intention.
- Resistance increase (of humidity, intensive light-protection, infection wood protection and the protection of poisonous fungus infection)

The materials used in painting of wood surfaces as usual should fulfill two criterias. All the colors appropriate for wood painting, equipped as well by the certificate should be used.
The works will be executed due to the architect/Supervisor's requirements, but wood surface should be paint at least twice (in same cases of even more times as per the architect/ Supervisor's requirements).

6.1.9 Wall covering with slabs of granulated stone, of marble, of stone, etc.

Regarding wall cobering with different tile material should be considered the wall type. Walls are external and internal.

It should be considered as well the wall material (rigips, concrete, masonry wall, etc.). According to the constructive wall materials and its surface, wall-tiling methods are classified into two groups:

- Slab splicing by mortar (for unleveled surfaces)
- Slab splicing by compo (for leveled surfaces)

Regarding splicing of different types of slabs by mortar, the work should follow these conditions:

The basis, in which different slabs type will be spliced, should be cleaned from dust and static.

Mortar composition is equal as described above in point 6.2.1. Mortar thickness should be no less than 15 mm. When mortar is used in external wallpapering it should be frost resistant and water-drawing coefficient in percentage should be les then 3 %. The mortar should fulfill, heating isolation and resistance criteria notice.

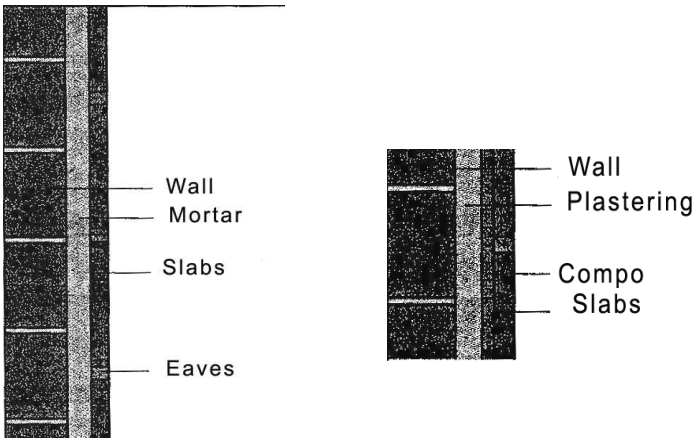
Slabs splicing by compo, is realized when basis surface is leveled. Compo can be used as needed in thickness of 3 mm up to 15 mm. All the above-mentioned mortar criterias are valid for compo as well.

After mortar or compo is dried, the planned gaps should be fulfilled by a special material (soil cement).
Edge gaps and wall link should be filled by an elastic solution (as silicon).
Per each surface of 30 m² papered by different slabs, it is necessary mobile gaps placing.

Work criterias in gress slabs should follow the criterias mentioned in point 6.2.4 and 6.2.5.

All the slabs should be frost resistant and be of a high resistance as well.

Slabs' covering is explained in the following drawing.



6.2 Floor finishes

6.2.1 Floor with granulated stone casting

Floor with granulated stone casting:
The dosage per sqm of 1 cm floor thickness with granulated stone casting is composed by these materials norms: 13 kg cement type 400, 0.002 m³ granulate and water, including formworks, proppings and any other obligation to complete the work in a workmanlike manner. Granulate type should be first approved by the architect/Supervisor, after that can be dropped on the layer.

6.2.2 Ceramic tile flooring

The location and extent of ceramic tile floor shall be under these conditions:

- The tiles should not be spliced at the temperatures under 5 °C or in humidity cases. There should not be used freezing materials, when the temperature is under 5 °C or the spliced tiles on frozen surface. Fabricator's instructors, regarding material requirements in high or low temperatures should be observerd.

- The construction joints tiles should be parallel to building walls. The cutting of tiles should be done near the wall, and the cutting tiles should be as big as possible.

- Layer tiles should be of bastard mortar of 2 cm thickness. After tiles are placed onto mortar layer, and after being dried up for no less then 24 hours, the gap should be filled with a special material (soil cement). After construction joints are filled between the tiles they should be cleaned from dust and construction joints material.

- Layer tolerances should meat these conditions. It is allowed a divergence of max height +/- 3 mm in a distance of 2 m.

6.2.5 Flooring in Gres Tiles

Tile classification will be done due to these criterias:
- The manner of tile shaping
- Water drawing

- Tile dimensions
- Surface qualities
- Chemical features
- Physical features
- Safety against frost
- Weight/surface load
- Sliding coefficient

The following tables describe some of these criterias.

Water taking in % of tile dimension	
Class	Water-drawing (E)
I	E < 3 %
II a	3 % < E < 6 %
II b	6 % < E < 10 %
III	E > 10 %

Loadings classes/ load		
Class	Load	Using area, i.e.
I	Very light	Bedrooms, bathrooms
II	Light	Sitting-rooms, except kitchens and halls
III	Medium	Sitting-rooms, balcony, hotels, bathrooms
IV	Heavy	Offices, halls, shops
V	Very heavy	Gastronomy, public buildings

Considering the needs and criterias to be met, tile should be chosen for each space. The above-mentioned criterias and tables might be useful for their choice.

For schools and kindergartens, the tiles should be of V Classes, by rough surface, in order to provide a safe walking without sliding.

By humidity surroundings (WC, bathrooms and showers) tiles of 1 class should be placed to provide a water-drawing coefficient <3 %.

For this reason before theb work begins, the contractor should represent to Supervisor some tile samples, with their production certificate and only after his approval it is allowed the lay them due to, the technical conditions and producer recommendations.

6.2.6 Parquet flooring

Flooring in parquet of thickness 20 – 22 mm, in seasoned pine, tongue or grooved, in lengths 40cm and of width 6 cm, laid in herring-bone or bonded pattern with perimeter border, including fixing battens in Pine (dimension 5 x 7 cm) laid in a bedding of cement mortar at suitable centers; filled and sanded, and smoothing, sealing and protected with primer and two coating hands of transparent.

6.2.7 PVC and/or linoleum Flooring

The linoleum or PVC will be used in schools (mainly in labors) or kindergarten except tile requirements described in point the 6.2.5., which should fulfill also the following conditions:

- Insulation electric resistance min. 200 min. Ω
- Sound absorption factor min. 3 dB
- Insulation termich factor min. 0,12 m²k/W
- Flammability coefficient B1 (DIN 4102)

Before the work begins, the contractor should represent to the Supervisor an example of the material, which will be used in the production certificate, which should fit the above conditions and after its approval to be laid.
The floor laying by linoleum or PVC should be done by a specialized staff and according to the technical conditions.
Before laying the linoleum and PVC the floor should be well cleaned with water under pressure and be well dried.

6.2.8 Skirting and floor junctions accessories

Vertical skirting due to the floor laying are:

- Ceramic, for the floor by ceramic tiles. They are of dark color or the same to the tiles laid on the floor, of height 8 cm and thickness 1.5 cm, spliced by mortar or compo. The mortar for skirting should be in a dosage per sqm: cleaned sand 0.005 m³; cement 400, 4 kg and water including plastering, cleaning and any other obligation for the completion of the work in a first class manner.
- By wooden float for parquetry floor. Wooden floats are of the same material with parquet, fixing should be done carefully after placement, leveling; plastering and wood polish using special transparent color.
- With PVC float road for PVC or linoleum floor. The placing manner should be done due to the producer's recommendations and by an experienced staff

6.2.9 Waterproofing for flooring

The waterproofing is to be laid on a dry surface, previously leveled, and including the vertical surfaces, treated with a first layer by bituminous primer coat and layer composed of two membranes bitumen reinforced with mineral fibbers, each with the thickness of 3 mm, fixed by torch, with the membranes placed at right angles to each other on plane, sloping or vertical surfaces, ensuring that the cover of joints has a minimum of 10cm and also to be raised vertically in the sidely walls of min 10 cm.

6.2.10 Parquetry floor for gym halls

Specification and orders for parquet floor:

Floor has to meat the requirements for sport places and gymnasiums. The carrying out of the surface deposition consists of hard wood veneers for example: Beech or equivalent one. These are stuck on a hardboard (1x1m and 15 mm strong).

The size of the individual parquet plates must not exceed 1x1m.

The surface occurred strongly and at least with one double surface sealing.
At the misplace are to glue together all punches in a joint less way and may be it no unevenness at the rabbets'.
The ground has to be scrubled and to be cleaned, before the final sealing of the surface.

The surface is to be deleted with sealing enamel at least twice and treated.

The leveling of the surface may be 2 mm in a length of max. 10 m.

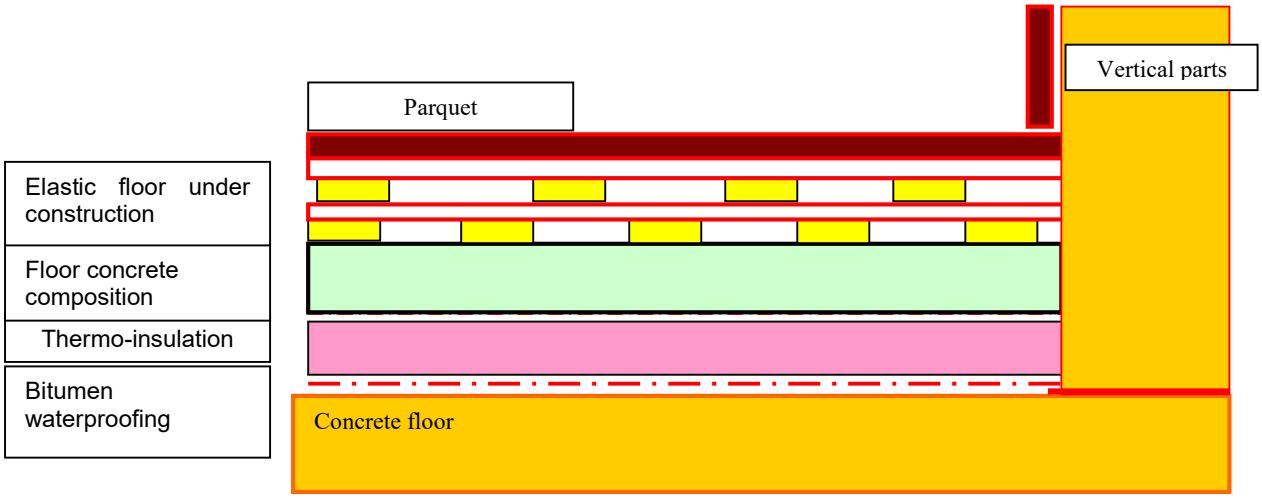
Sub-structure constructions:

- Bottom cover concrete At Least 15cm strong (B200)
- Moisture closure · (at least 2 bitumen seal railroad situations)
- Thermal insulation · (polystyrene plate 5cm) ·
- PVC film (at least 0.02mm strong)
- Composition floor · (At least 5cm strong)

1. Construction of a swinging-ground construction:

- Base Swinging parts: b= 4-10cm; H= 20-40mm; distance= approx. 30cm
- Lower Swinging-Ground Frames from swinging-ground frame boards 18-23mm larch boards b=10-14cm; H=18-23mm, distance=ca. 30cm) ·
- Upper Swinging-Ground Frames from swinging-ground frame boards 18-23mm larch boards b=10-14cm; H=18-23mm, distance=ca. 30cm) ·
- Basic wood for floor (b=10-15cm; H=18-23mm, distance= max. 5cm rabbet distance between timber flooring (Sub floor) ·
- Delivery and move from wood floor H=12mm; L=30cm; floor B=5cm onto existing sub floor attached surface (Bonded and nailed onto groove and feathers with steel pens) is anti-slip and to carry out with twofold enamel sealing.

Drawing 1

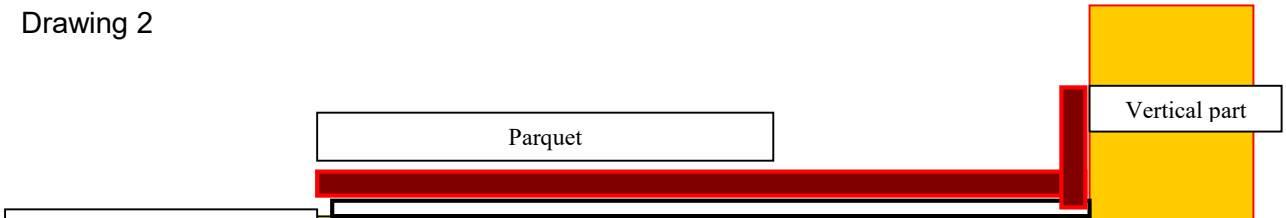


2. Construction of a system-elastic ground construction:

- Expanded plastics- Elastic shift 5 mm strong
- Grid board 30/30cm approx. 16 mm strong
- Pressure-distribution-flat approx. 13 mm ·
- Delivery and move of beech wood floor of H=12mm; L=30cm; floor B=5cm onto existing sub floor attached surface (Bonded and attached to groove and feathers with steel pens) is anti-slip and to carry out with twofold enamel sealing

Swinging-ground construction:

Drawing 2



6.3. Stair Finishes

6.3.1 Concrete steps in terrazzo

The finishing of concrete steps in terrazzo in the following dosage per sqm of floor thickness 1 cm is: 13 kg cement type 400, 0.002 m³ terrazzo, and water, including formwork, propping and all requirements to complete the work in a workmanlike manner.

6.3.2 Concrete steps in marble or local stone

For concrete steps in marble should be foreseen these works:

First the concrete steps should be well cleaned and the place should be leveled. Then the concrete steps should be painted by cement milk, which enable the splice of marble steps.
Marble tiles can be spliced by mortar or compo in cases of leveled concrete tiles. Marble steps splicing does not change from tiles splicing in wall, which is thoroughly described in point 6.1.14.

6.3.4 PVC and/or linoleum steps finishing

Linoleum or PVC, which will be used in steps covering, except tile requirements for tiles describing in point 6.2.5, should fulfill also the following conditions:

- Electric insulation resistance min. 200 min. Ω
- Infflamibility coefficient B1 (DIN 4102)

The contractor, before the work begin should represent by the Supervisor an example of the material, which will be used in the production certificate, which should fit the above conditions and after approval to begin the laying.
The floor laying by linoleum or PVC should be done by a specialized staff and according to technical conditions.
Before laying the linoleum and PVC the floor should be well cleaned with water under pressure and be well dried.

The steps should be leveled, if not they should have a thin concrete layer or a similar material, in order to realize the proper level. Linoleum or PVC will be spliced then on the existing concrete layer, or on the new-levelled layer. Compo should be used in dosage of 400 kg/m².

6.3.5 Metallic banisters (handrails)

Handrails perform various functions in the constructions. They offer support and security while walking on the stairs. They also play a special role in the beauty and the architectonic view of a construction. Handrails have to be at least 100 cm high. In cases when the length of the stairs is more than 12 m, handrails must be 110 cm high. The range 100/110 cm shall olso depend on the space of the resting ground.

Handrails are mounted on or by the sides of the stairs. They must be properly fixed in order to guarantee their stability and firmness. The handrails shall be either covered with wooden elements or secured with wooden or metal bars. The space between them must be less than 12 cm.

In cases when the stairs are wider than 100 cm, in order to secure a safe walk, it is necessary that handrails be mounted at the walls on the other side of the stairs. The handrails on the stairs shall not be lower than 75 cm and higher than 110 cm. In the cases of schools those shall be placed at a hight of 80 cm. These handrails shall have a distance of at least 4 cm from the walls.

Handrails should be made of a material and shape as to allow a gentle and harmless touch. It is recommended that they be made of wood in order to avoid the cold impression created by the steel rails.

A sample of metal banisters can be seen in the following pictures.




6.3.6 Skirting and other accessories

Skirting according to the type of stairs coating will be as follows:

- Ceramic tile skirting for stairs with ceramic tiles. With 8cm high and 1.5cm thick dark colour tiles or with tiles of the same colour as those of the stairs, installed with cement mortar 1:2 or with grout, including grouting, cleaning/washing and all requirements to comlete the work in a first-class manner.
- Skirting strips for the stuck timber floors will be of the same material as that of the floors. The wooden skirting strips must be polished and coated with a varnish layer, after being properly fixed.
- PVCskirting for stairs with PVC or linoleum. The installation shall be performed in accordance with the producer's recommendations and by an experienced staff.

Marble skirting for marble coated stairs. The marble skirting tiles shall be 8 cm high and 2cm will be installed (fixed) with cement mortar 1: 2 or with grout.

6.4 Windows and Doors

6.4.1 General information

The window is part of the building and houses. They will provide the light for the internal surface of them. Their sizes vary; depend by architectural composition, size of the internal surface and other requirements of the Designer.

They should be 80 - 90 cm on the floor, depending of the requirement of the Designer.

The windows panels can made in wooden, aluminium, PVC, etc

The windows main parts are:

- the sub-frame to be fixed to the wall by mean of proper steel clamps before plastering;

- the frame to be screwed to the sub-frame after plastering and painting. Following the window design shown in Technical Drawing, the frame will be provided by hinges and lock anchors;
- opening glassed panels complete with hinges and handles fixed by mean of solid strips and transparent sylicon mastic.

6.4.2 Components

The wooden windows in seasoned Pine, treated with a coat preservative, will be composed by:

- a wooden sub-frame (width 3 cm, large as the window subframe) to be fixed to the wall by mean a proper steel before plastering
- a wooden frame (section 7 x 4 cm min.) to be screwed to the sub-frame after plastering and painting. Following the window design shown in Technical Drawing, the frame will be provided by hinges and lock anchors for sash-windows, casement-windows, garret-windows, highlight, etc
- opening glassed panels complete with: hinges, handles, glass panels (4cm thick when transparent and 6 cm thick when wirenet reinforced), fixed by mean of solid wooden strips and transparent silicon mastic, windows-stays by chain or hook.
- Finishing with solid wooden strips all around the window perimether, internal when supplied by “pature”, internal and external when lacking in “pature”.

The windows made up in aluminium alloy profiles are:

- Vertical opening
- Horizontal opening
- Slippery are composed by:
- The aluminium fix frame (depth 61-90 mm) to be fixed to the wall by mean a proper steel before plastering. They are provided with elements for fixing and anchorage to wall structures as well as jutting parts enabling the sliding of sashes.
- The sashes to be screwed to the frame after plastering and painting.
- Water collecting pits
- Accessories
- Slide rollers and blind frame;
- Galvanised steel reinforcement
- Gasket grooves
- Handles and lock anchor
- Glass panels (4cm thick when transparent and 6 cm thick when wirenet reinforced). They will be fixed to the metal frames by mean of aluminium strips and transparent sylicon mastic.

The PVC windows will be composed by:

- the PVC frame (width 58 mm) to be fixed to the wall by mean a proper steel before plastering. The PVC Frame will be provided by hinges and lock anchors
- the sashes to be screwed to the frame after plastering and painting.
- Opening glassed panels (4cm thick when transparent and 6 cm thick when wirenet reinforced) will be hinged to the window by the three point anchored lock and handles.
- Water collecting pits
- Slide rollers and blind frame;
- Galvanised steel reinforcement and other accessories
- Gasket grooves
- Handles and lock anchor
- Special wool pile fin seals for insulation

6.4.3 Windows – Installation

The installation of wooden windows in seasoned Pine will be as follows:

The wooden sub-frame will be fixed to the wall by mean of proper steel clamps before plastering. The wooden frame will be screwed to the sub-frame after plastering and painting. Hinges will provide the frame and lock anchors for sash-windows, casement-windows, garret-windows and highlight.
Opening glassed panels complete with hinges and handle will be fixed by mean of solid wooden strips and transparent silicon mastic, window-stays by chain or hook. Finishing with solid wooden strips all around the window perimether
The **installation of aluminium windows** will be in accordance with requests of Supervisor and technical description as follows:

A solid aluminium sub-frame in light galvanised metal tubular will be carefully fixed with steel clamps to the walls by means of cement mortar (no screw sockets). The fixing must preferably have a distance from the frame corners of no more than 150 mm and between them of no more than 800 mm. The fixed window frame will be screwed to the sub-frame when all plastering and painting works finished. Opening glassed panels will be hinged to the window frame and will be supplied by a three point anchored lock and handle.

Using plastoelastic materials, after having filled any gap with insulating materials, will carry out the sealing between the cases and the building context. Between the inside of the steel frame support and the outside of the aluminium fix frame it is preferable to keep an installation tolerance of 6 mm, considering a protrusion of the fixing spacers of about 2 mm.

The PVC windows should provide perfect sound, air and water insulation. They should provides insulation by a concealed wool pile fins, gasket and adaptors at sash connection.

The fix frame will be provided with elements for fixing and anchorage to the wall structures as well as jutting parts enabling the sliding of sashes.

A solid PVC sub-frame will be carefully fixed with steel clamps to the walls by means of cement mortar (no screw sockets). The fixing must preferably have a distance from the frame corners of no more than 150 mm and between them of no more than 800 mm. The fixed window frame will be screwed to the sub-frame when all plastering and painting works finished. Opening glassed panels will be hinged to the window frame and will be supplied by a three point anchored lock and handle.

Using plastoelastic materials, after having filled any gap with insulating materials, will carry out the sealing between the cases and the building context.

All works of bricklayer and all requirements to complete the work in a first-class manner are included.

6.4.4 Windows – Sills

The sills in white concrete, with water drip, suitable reinforced and cast “in situ”. Smooth finished and dimensioned as in Technical Drawings. They will be realised in concrete (Type 200) with dosage per m3 as follows: 300 kg cement (type 400), 0,43m3 sand, 0,69 m3 aggregate and 0,18 m3 water

As above **but precast** and installed using white cement mortar type 1:2 with clean sharp sand (to have a porosity of 35 %), mixed in proportion of cement: sand =1:2, 527 kg cement (type 400), 0,89 m3 sand

The sills in terrazzo, with water drip, colour indicated in the Technical Drawing or by the Supervisor in the following dosage per sqm: 13 kg cement (type 400), 2 kg terrazzo and water.

Sills will have sharpened angles and will be carefully levigated, polished and treated by linseed oil. Formwork, propping and all requirements to complete the work in a first –class manner are included.

The sills in marble, 3 cm thick min., with colour and long according to the request of Supervisor and Technical Drawings. Smooth finished and dimensioned as in Technical Drawings. They will install using white cement mortar type 1:2 with clean sharp sand (to have a porosity of 35 %), mixed in proportion of cement: sand =1:2, 527 kg cement (type 400), 0,89 m3 sand

The internal wooden sills in solid seasoned Pine wood, 3 cm thick with and long as in in Technical drawings, fixed to the internal wall thickness by mean of plastic plugs and screws. Sills will be painted before fixing with transparent enamel paint, will not stick out the internal wall and will have upper angle carefully sharpened.
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6.4.6 Timber Windows

The supply and installation of windows, for which the dimensions will be taken by the builder, in seasoned pine, treated with a coat of wood preservative, composed by:

- a wooden sub-frame (width: 3cm large as the window sub-frame) to be fixed to the wall by mean a proper steel clamps before plastering

- a wooden frame (sections 7x4 cm minimum) to be screwed to the sub-frame after plastering and painting. Following the window design shown in Technical Drawing, the frame will be provided by hinges and lock anchors for sash-windows, casement-windows, garret-windows, highlight etc.

- opening glassed panels complete with:
- hinges, handles, glass panels (4 mm thick when transparent, 6 mm thick when wire net reinforced), fixed by mean of solid wooden strips and transparent silicon mastic, window-stays by chain or hook.

- Finishing with solid wooden strips all around the window perimeter, internal and external when lacking in “pature”.

- Including work of bricklayer and all requirements to complete the works in perfect way

6.4.7 Aluminium Windows

Supplying and fixing of windows as described in the Technical Drawings and which dimensions will be taken by the Contractor, made up in aluminium alloy profiles according to European Standards EN 573 - 3 and duly pre-painted. Colour will be according to the request of investor.

The fix frames will have a depth of 61-90 mm. They are provided with elements for fixing and anchorage to wall structures as well as jutting parts enabling the sliding of sashes; profile shape is tubular in order to house assembling accessories. Frame profiles will fit with a cover profile overlapping the wall by 25 mm. Mobile frame profiles have a depth of 32 mm and a height of 75 mm with flat or ornamental solution.

Both fix or mobile frames are designed to build thermal break windows and are made up of two aluminium profiles which are joined one another by means of two 15 mm insulating lists made of plastic materials. Thermal break is obtained by inserting 15 mm long and 2 mm thick polyamide strips strengthened with fibre glass.

The profile is designed with a hollow central part for the insertion of the cornier joint bracket (with space for 18 mm high glass housing) and the trolleys for their sliding.

Seal is assured by brushes with stiff central fin. The characteristics of seal against atmospherically agents obtainable by these sections must be provable by the certificate of testing affected by the window frame manufactures or by the profiles producer.

The aluminium sections will be painted by a bake lacquering process. The temperature must not exceed 180 degree, the baking time will be less than 15 minutes. The lacquering thickness should be at least 45 mm. The powders used will be made up of high quality acrylic resins or linear polyesters

A solid sub-frame will be carefully fixed with steel clamps to the walls by means of cement mortar (no screw sockets). The fixing must preferably have a distance from the frame corners of no more than 150 mm and between them of no more than 800 mm. The fixed window frame will be screwed to the sub-frame when all plastering and painting works finished. Opening glassed panels will be hinged to the window frame and will be supplied by a three point anchored lock and handle. Using plastic-elastic materials, after having filled any gap with insulating materials, will carry out the sealing between the cases and the building context. Between the inside of the steel frame support and the outside of the aluminium fix frame it is preferable to keep an installation tolerance of 6 mm, considering a protrusion of the fixing spacers of about 2 mm. Dimensional tolerance and thickness will be according to EN 755 – 9.

Glass panels (4 mm thick min when transparent and 6 mm thick when reinforced by wire net) should be included. They will be fixed to the metal frames by mean of aluminium strips. All works of bricklayer and all requirements to complete the work in a first-class manner are included. Sample of the proposed items will be submitted to the Supervisor for a previous approval.

6.4.8 PVC Windows

Supplying and fixing of windows as described in the Technical Drawings and which dimensions will be taken by the Contractor, made up in PVC profiles according to ISO EN 9002. Colour will be according to the request of Investor. Tones of colours made of Roehm material should be UV-proof and durable to weather conditions.

The PVC sliding windows should provides insulation by a concealed wool pile fins, gasket and adaptors at sash connection. Selection of different beads allows the application of double or single glazing units. Clearance within double-glazing should be 20–24 mm.

The PVC windows systems should provide perfect air and water insulation. They should be water–proof under 500 Pa (equal to a wind speed of 150 km/hr). Tests should be in accordance with DIN 18055. The thermal conductivity coefficient will be 2.0 W (m2 K) which conforms to European Standards. Regarding to sound insulation, The PVC windows should provide sound insulation up to the rank 4 (>40dB)

The fix frames will have a depth of 74-116 mm. They are provided with elements for fixing and anchorage to wall structures as well as jutting parts enabling the sliding of sashes; profile shape is tubular in order to house assembling accessories. Frame profiles will fit with a cover profile overlapping the wall by 25 mm.

Both fix or mobile frames are designed to build thermal break windows. They should offer the applicability of European standard glass sets (Single glazing 4-6 mm, double glazing 20-24 mm, triple glazing 24-28mm), water drainage with water collection pits, 2 degree inclination ensuring perfect water drainage, perfect closing by central locking, wall thickness matching to EN (t=3,1 mm), wind and rain insulation by means of water boards on the external surface, unique groove

design facilitating gasket installation and soft-lines contours. The characteristics of seal against atmospherical agents obtainable by these sections must be provable by the certificate of testing affected by the window frame manufactures or by the profiles producer.

A solid sub-frame will be carefully fixed with steel clamps to the walls by means of cement mortar (no screw sockets). The fixing must preferably have a distance from the frame corners of no more than 150 mm and between them of no more than 800 mm. The fixed window frame will be screwed to the sub-frame when all plastering and painting works finished. Opening glassed panels will be hinged to the window frame and will be supplied by a three point anchored lock and handle. Using plastoelastic materials, after having filled any gap with insulating materials, will carry out the sealing between the cases and the building context.

Glass panels (4 mm thick min when transparent and 6 mm thick when reinforced by wirenet) should be included. According to the request of Investor, The PVC windows can be with double - glazing (20-24 mm) or triple glazing (24-28 mm).

All works of bricklayer and all requirements to complete the work in a first-class manner are included. Sample of the proposed items will be submitted to the Supervisor for a previous approval before the fixing.

6.4.9 Doors-General Information

The doors are part of the building and houses. They will provide the communication for the internal and external surface of them. Their size vary, depend by architectural composition, size of the requirements of the designer. The doors can be made in wooden, metal and aluminum etc.
The doors main parts are:

1. the sub-frame to be fixed to the wall by mean of proper steel clamps before plastering;(the sub-frame can be in wooden, metal or aluminum)
2. the frame to be screwed to the sub-frame after plastering and painting
3. the door can be in wooden, metal and aluminum or PVC supporting by mean of solid strips or steel and other accessories including steel clamps, hinges, lock anchors, screws, handles.

6.4.10 Doors - components

The parts of door are depending by the kind and material of doors. The parts of doors will be for each type of doors as follows:

Internal seasoned Pine wooden Door, treated with a coat of wood preservative, composed by:

- A wooden sub-frame with seasoned Pine wooden (width 3 cm), treated with a coat preservative to be fixed to the wall by mean of proper steel clamps before plastering

- A wooden frame to be screwed to the sub-frame after plastering and painting. Following the doors design shown in Technical Drawing, the frame will be provided by hinges and lock anchors for all kinds of doors.

- Opening wooden panels that are made up in wooden case (minimum size 10 x 4 cm) and horizontal and vertical parts every 40 cm. In under part of doors, the panels will be minimum 20 cm over the under part of doors. The seasoned Pine wooden panels (thickness 3cm) and treated with a coat of wood preservative should be provided by three hinges with minimal length l= 16 cm

- A metallic lockset with three copies of keys type Yale or similar, door handles and push handle

Internal aluminium Door composed by:

- a fixed aluminium sub-frame, type tubes profile, with depth 61-90 mm to be fixed to the wall by mean of proper steel clamps. A cover that will be 25 mm from the walls will cover the fixed profile of subframe.

- a moving aluminium frame with depth 32 mm and height 75 mm to be screwed to the sub-frame after plastering and painting. Following the doors design shown in Technical Drawing, the frame will be provided by hinges and lock anchors for all kinds of doors.

- opening glassed panels should be transparent (minimum thickness will be 4 mm) < They will have a reinforced grid (minimum thickness will be 6 mm). Also, There can be used the wooden laminate cover with minimum thickness t = 1 mm

- A metallic lockset with three copies of keys type Yale or similar, door handles and push handle

External Seasoned Pine wooden Door, treated with a coat of wood preservative, composed by:

- a wooden sub-frame with seasoned Pine wooden (width 3 cm), treated with a coat preservative to be fixed to the wall by mean of proper steel clamps before plastering. The Thickness of subframe will be 3 cm and the width will be in accordance with width of walls.

- a wooden frame to be screwed to the sub-frame after plastering and painting. Following the doors design shown in Technical Drawing, the frame will be provided by hinges and lock anchors for all kinds of doors.

- opening wooden panels that are made up in wooden case (minimum size 10 x 5 cm) and horizontal and vertical parts every 40 cm. In under part of doors, the panels will be minimum 25 cm over the under part of doors. The seasoned Pine wooden panels (thickness 3cm) and treated with a coat of wood preservative should be provided by three hinges

- Two wooden covering with thickness 2- 3 mm. Their size will be depending by the size of doors in accordance with project requirements.

- High safety lockset with three copies of keys, type Yale and other necessary accessories. The lockset should be type circular with steel base and zinc plate of spanner. It will have 5 matchsticks. The depth of spanner will be 12,5 mm and the thickness of cover will be 2mm. The spanner should be made up in steel or brass. The lockset should be with simple combination for people. The lockset should be applicable for the keys, type Yale or similar.

- Hinges in three anchor points (minimum 3 hinges per each part) should complete the armour -plate doors.

- The door should have the respectively handle, a push button with internal handle that will close the external handle. The handle should be moving in the right or left side of door. The external handle will be active. The internal handle will close the spanner. Every handle will use the spanner of doors expect of the case when the external handle is closed by internal side.

6.4.11 Doors - INSTALLATION

The installation of door should be made in accordance with technical condition of installation. The installation is depending by the kind and material of doors. The installation way of doors will be for each type of doors as follows:

Internal seasoned Pine wooden Door, treated with a coat of wood preservative, will be installed as follows:

- a wooden sub-frame with seasoned Pine wooden (width 4 cm), treated with a coat preservative to be fixed to the wall by mean of proper steel clamps before plastering

- a wooden frame to be screwed to the sub-frame after plastering and painting. Following the doors design shown in Technical Drawing, the frame will be provided by hinges and lock anchors for all kinds of doors. There will be fixed all wooden cover and safety band and lockset. The total thickness of doors will be minimum 4,5 cm.

- A metallic lockset with three copies of keys type Yale or similar, door handles and push handle

Internal aluminium Door will be installed as follows:

The installation of internal aluminium door will be in accordance with Technical drawings. For their installation, will be used the installation of aluminium profiles according to europan standards EN 573 - 3. Both part of door (fixed and moved) should be with two aluminium profiles that will be jointed with another aluminium part by two water insulation plastic band.

A fixed aluminium sub-frame, type tubes profile, with depth 61-90 mm to be fixed to the wall by mean of proper steel clamps.

A moving aluminium frame to be screwed to the sub-frame after plastering and painting. Following the door design shown in Technical Drawing, the frame will be provided by hinges and lock anchors for all kinds of doors.

The opening glassed panels should be transparent. They will be fixed in three anchor points. There will be installed a metallic lockset with three copies of keys type Yale or similar, door handles, etc

The armour -plate door will be installed in accordance with technical conditions as follows:

- **a metallic case** will be fixed on the wall by the steel matchstick or concrete part before the plastering of walls. The metallic case should be painted with metallic paint against corrosion before the installation of door. Their size is depending by the thickness of wall. The thickness of steel sheet of case should be minimum 1,5 mm. The width of side part of case should be
- minimum 10 cm and width of centre part will be depending by the width of wall and kind of door. The steel sheet of case should be welding in accordance with Technical Conditions.
- **An armour case** of door that will be fixed to the above metallic case. Hinges and spanner anchor in accordance with data of technical drawings will provide the armour case. In this case will be installed all insurance elements and other necessary accessories.

- **Safety metallic rod** with minimal diameter d= 16 mm should be putting in minimum distance between them L= 30 cm. They will be welded in armour metallic case of door.

- **Polysterol thermal insulation protection** with minimal thickness t = 3 cm that will be installed between safety metallic rods to eliminate all sounds. Their installation will be after the welding of metallic rods and finishing of metallic case of door.

- **Two wooden cover** with thickness t = 2-3 mm (per each side). Their size will be depending by the size of the door that is given by Contractor. The cover can be sheet or with model.

- **High safety lockset** with three copies of keys, type Yale and other necessary accessories will be installed in the door case bysteel screw.

The armour -plate door should be completed with hinges in three anchor points

Finishing with solid wooden strips all around the door perimeter, internal when supplied by reveals internal and external when reveals are missing

All bricklayer work and all requirements to complete the works ina first class manner will be included.

6.4.12 The doors frames

The doors frames are depending by door type and materials that are used for their production. They could be metallic, wood or aluminum. For each doors types, the frames are as follows:
The internal doors by pinewood, treated with wood protective cover, placed in case by pine wood beam 7 x 5 cm and pressed board (with thickness 4 cm) dimensioned according the wall width (considering the increase by wall cover). The frames is well fixed in the wall with screws, iron cramp and covered with lime cement mortar.
The internal doors by aluminum placed in stable frames in the form of tubular profiles by aluminum with dimensions 61-90 mm, which is to be provided by special elements for the fixing and nailing in the walls structure. Stable profiles of frames will be with a cover, which is 25 mm inside the wall.
The outside metallic doors will mount in metallic frame, which is fixed in wall through the steel cramps of concrete casting in the wall before the plastering.
The metallic frame should be painted with metallic color against corrosion, before it will be mounted in object. Its size is depending by wall thickness, where it will be placed. The leaf thickness of case steel should be minimally 1,5 mm. The width of lateral parts of case should be minimally 10 cm while the width is depending by wall width and door type. The steel leafs of frame should welled according to Technical Requirements of Implementation and should be painted with enameled color before the door fixing.

All the works regarding the installation and placing of door cases in object should be done according the supervisor's and project technical requirements.

6.4.13 Internal Doors

a- Internal Doors in solid wood

Supplying and fixing of doors, which dimensions will be taken by the Contractor, in seasoned Pine, treated with a coat of wood preservative, composed by:

- a sub-frame in seasoned pine wood (thickness 3 cm) treated with a coat of wood preservative, dimensioned according to the width of the wall (increased of the various wall coating) strongly anchored to the wall by mean of steel clamps (every meter) and cement mortar.
- A wooden frame to be screwed to the sub-frame after plastering and painting.

Following the door design shown in Technical Drawings, the frame will be provided by hinges and lock anchors for sash- doors, casement-doors, garret-doors, highlight, etc.

- Timber door opening made up by a solid wood frame (10 x 4 cm min. section) with horizontal and vertical members of the same section every 40 cm. In the bottom part the lowest horizontal member will be 20 cm height. Panels of seasoned Pine (3cm thick) treated with a coat of wood preservative and inserted between the wooden members complete the door panel structure which will be provide by 3 hinges 16 cm long min.
- A metal lock and Yale type key in 3 copies, brass door handle and push-plate.
- All works of bricklayer and all requirements to complete the work in a first class manner are included.

As above but with glass panels as described in the Technical Drawings. The glass panels could be transparent (4mm thick min) or wire-net reinforced (6mm thick min.)

As above but for air conditions spaces: In the bottom part of the door panel, a small opening, supplied by a proper grating, aluminium made, is required for the air conditioned system working.

As above but with highlight. The upper part of some of the internal doors to the corridors where indicated in Technical Drawings will have highlight openings, supplied by glass panels reinforced by wire-net.

Sample of the proposed items will be submitted to the Supervisor for a previous approval.

b- Internal Doors "light core"

Supplying and fixing of doors, which dimensions will be taken by the Contractor, in made up by:

- a sub-frame in seasoned pine wood (thickness 3 cm) treated with a coat of wood preservative, dimensioned according to the width of the wall (increased of the various wall coating) strongly anchored to the wall by mean of steel clamps (every one meter) and cement mortar.
- A wooden frame to be screwed to the sub-frame after plastering and painting.Following the door design shown in Technical Drawings, the frame will be provided by hinges and lock anchors for sash- doors, casement-doors, garret-doors, highlight, etc.
- door opening made up by two melamine laminated panels and intermediate solid wooded strips provided by a security lock. The two laminated panels will be 8 mm thick, all door border will be protected by a solid wooden strip and the total thick of the doors will be 4,5 cm min.
- A metal lock and Yale type key in 3 copies, brass door handle and push-plate.
- All works of bricklayer and all requirements to complete the work in a first class manner are included.

As above but with glass panels as described in the Technical Drawings. The glass panels could be transparent (4mm thick min) or wire-net reinforced (6mm thick min.)

As above but for air conditions spaces: In the bottom part of the door panel, a small opening, supplied by a proper grating, aluminium made, is required for the air conditioned system working.

As above but with highlight. The upper part of some of the internal doors to the corridors where indicated in Technical Drawings will have highlight openings, supplied by glass panels reinforced by wire-net.

Sample must be submitted to the Supervisor for a previous approval before fixing.

c- Internal doors aluminium made

Supplying and fixing of aluminium doors as described in the Technical Drawings and which dimensions will be taken by the Contractor, made up in aluminium alloy profiles according to European Standards EN 573 - 3 and duly pre-painted. Colour will be according to the request of Investor.

The fix frames will have a depth of 61-90 mm. They are provided with elements for fixing and anchorage to wall structures as well as jutting parts enabling the sliding of sashes; profile shape is tubular in order to house assembling accessories. Frame profiles will fit with a cover profile overlapping the wall by 25 mm. Mobile frame profiles have a depth of 32 mm and a height of 75 mm with flat or ornamental solution.

Both fix or mobile frames are designed to build thermal break door and are made up of two aluminium profiles which are joined one another by means of two 15 mm insulating lists made of plastic materials. Thermal break is obtained by inserting 15 mm long and 2 mm thick polyamide strips strengthened with fibre glass.

The profile is designed with a hollow central part for the insertion of the cornier joint bracket (with space for 18 mm high glass housing) and the trolleys for their sliding.

Seal is assured by brushes with stiff central fin. The characteristics of seal against atmospherically agents obtainable by these sections must be provable by the certificate of testing affected by the window frame manufactures or by the profiles producer.
The aluminium sections will be painted by a bake lacquering process. The temperature must not exceed 180 degree, the baking time will be less than 15 minutes. The lacquering thickness should be at least 45 mu. The powders used will be made up of high quality acrylic resins or linear polyesters

A solid sub-frame will be carefully fixed with steel clamps to the walls by means of cement mortar (no screw sockets). The fixing must preferably have a distance from the frame corners of no more than 150 mm and between them of no more than 800 mm. The fixed door frame will be screwed to the sub-frame when all plastering and painting works finished. Opening glassed panels will be hinged to the doorframe and will be supplied by a three point anchored lock and handle. Using plastic-elastic materials, after having filled any gap with insulating materials, will carry out the sealing between the cases and the building context. Between the inside of the steel frame support and the outside of the aluminium fix frame it is preferable to keep an installation tolerance of 6 mm, considering a protrusion of the fixing spacers of about 2 mm. Dimensional tolerance and thickness will be according to EN 755 – 9.

Door opening made up by standard aluminium profiles and internal by- laminated wooden panel 100 mm thick min.

A metal lock and Yale type key in 3 copies, brass door handle and push-plate.

As above but with glass panels as described in the Technical Drawings. The glass panels could be transparent (4mm thick min) or wire-net reinforced (6mm thick min.)

As above but for air conditions spaces: In the bottom part of the door panel, a small opening, supplied by a proper grating, aluminium made, is required for the air conditioned system working.

As above but with highlight. The upper part of some of the internal doors to the corridors where indicated in Technical Drawings will have highlight openings, supplied by glass panels reinforced by wire-net.

Samples must be submitted to the Supervisor for a previous approval before fixing.

6.4.14 External Doors

a) External Wooden Doors

Supplying and installation of entry doors in seasoned Pine, treated with a coat of wood preservative, composed by:

- A wooden sub-frame (width 4 cm, large as the door sub-frame) to be fixed to the wall by mean of proper steel clamps before plastering.
- Opening panels with 10 x 5 cm min. timber frame, horizontal and vertical members of the same section and a bottom height 25 cm, divided into panels of seasoned wood treated with a coat of wood preservative complete with: hinges (3 min. for each opening panel), three point anchored lock, three copies of keys and brass handles.
- Finishing with solid wooden strips all around the door perimeter, work of bricklayer and all requirements to complete the works in a first class manner are included.

Sub-frame, where in sight and opening door panels will be duly transparent enamel painted before fixing. Sample of the proposed items will be submitted to the Supervisor for a previous approval.

d) External Wooden Doors with glass panels

As above but with glass panels (instead of wooden panels) where required (4 mm thick when transparent, 6 mm thick when wire-net reinforced), fixed by mean of solid wooden strips and transparent silicon mastic. Glass panels will be installed after the door enamel painting and its fixing.

In both cases the glassed panels transparent and wire a solid steel grating will protect net reinforced. Sample of the proposed items will be submitted to the Supervisor for a previous approval.

c) External Wooden Doors with highlight

As above but with highlight in glassed opening or fixed panels, rebates for fixing glass with timber beading, including lock, hinges and all work of bricklayer, scaffolding and all requirements to complete the work in a first class manner.
Sample of the proposed items will be submitted to the Supervisor for a previous approval.

6.4.15 Doors – Locksets

Supplying and fixing of lockset type Wally or Yale, as described in the Technical Drawings, made up in steel will be in accordance with quality standards ISO 9001. They are composed by:

- Strike
- Latch with their bolts
- Solid steel chassis
- Keys
- Handleset.

The locksets can be:

1) Tubular Locksets,
2) Tubular leversets,

3) Cylindrical locksets
4) Cylindrical leversets.

1- If the Contractor will install **Tubular locksets**, their technical data should be as follows:

- Solid steel chassis and latch case, zinc plated for corrosion
- Guaranteed for over 150 000 life cycles
- Exposed trim should be made of either wrought stainless steel or brass. 2-pieces reinforced knob as standard, esthetic 1 piece knob available upon request,
- Locksets should be keyed alike with deadbolt to improve security,
- Locksets should be master keyed in a simple combination and facility use,
- Locksets should be easy to install.
- The thickness of strike should be 1 mm and the size of strike should be 45mm x 57 mm,
- The depth of latch should be 60 - 70 mm,
- Handing should be fully reversible for left or right hand doors,
- Door thickness adjustable 35 mm to 50 mm as standards or 50 mm up to 70 mm in special cases,
- Yale type keyway is applied as standard but other keyway options are available upon request.

The tubular locksets can use for Entrance, Privacy or Passage.

For Entrance doors will have:

- Deadlocking latch bolt
- The key or thumb-turn locks and unlocks both knobs
- Turning the inside thumb-turn counter-clockwise or the key will lock both knobs. Turning in opposite direction will unlock knobs

For Lavatory or other Privacy doors will have:

- Either knob operates latch bolt unless knobs are locked by inside thumb turn
- A coin inserted and turned in emergency slot will unlock door from outside.

For doors that do not require locking will have:

- Either knob operates latch bolt at all times
- Suitable for use on storeroom, kitchen and children bedroom

2- If the Contractor will install **Tubular leversets (They are especially convenient for children and handicapped)**, their technical data should be as follows:

- Solid steel chassis and latch case, zinc plated for corrosion
- Guaranteed for over 150 000 life cycles
- Exposed trim should be made of zinc die-casting electro-plated or solid brass,
- Locksets should be keyed alike to deadbolt to maximize security,
- Locksets should be easy to install.
- The thickness of strike should be 1 mm and the Diameter of strike should be 67mm. The distance between two strikes should be 35 – 45 mm.
- The depth of latch should be 60 - 70 mm,
- Handing should be right hand as standard,
- Door thickness adjustable 35 mm to 50 mm as standards,
- Yale type keyway is applied as standard but other keyway options are available upon request.
- Backset should be adjustable to either 60 – 70 mm.

The tubular leversets can use for Entrance, Privacy or Passage.

For Entrance doors will have:

- Deadlocking latch bolt
- The key or thumb-turn locks and unlocks both inside and outside trims
- Turning the inside thumb-turn counter-clockwise or the key will lock both trims. Turning in opposite direction will unlock trims

For Lavatory or other Privacy doors will have:
- Inside or outside trims operates latch bolt unless both trims are locked by inside thumb turn,
- A coin or a pin inserted and turned in emergency slot will unlock door from outside.

For doors that do not require locking will have:
- Inside or outside trims operates latch bolt at all times
- Suitable for use on storeroom, kitchen and children bedroom

3- If the Contractor will install **Cylindrical locksets**, their technical data should be as follows:
- Solid steel chassis and latch case, zinc plated for corrosion resistance
- Guaranteed for over 150 000 life cycles
- Exposed trim should be made of either wrought stainless steel or brass.
- 5-pin tumbler cylinder, brass plug with three nickel-plated brass keys
- Locksets should be keyed alike in a group to enhance convenience,
- Locksets should be master keyed in a simple combination for family and facility use,
- Locksets should be easy to install.
- The thickness of strike should be 2 mm and the size of strike should be 28mm x 70 mm,
- The depth of latch should be 12,5 mm,
- Handing should be fully reversible for either right or left hand door,
- Door thickness adjustable 35 mm to 50 mm as standards or 50 mm up to 70 mm in special cases,
- Yale type keyway is applied as standard but other keyway options are available upon request.

The cylindrical locksets can use for Entrance, Privacy, Passage or storeroom.

For Entrance doors will have:

- Deadlocking latch bolt
- Pushing button in inside knob locks outside knob.
- Inside knob always active
- Turning inside knob or key from outside will unlock latch
- Either knob operates latch bolt except when outside knob is locked from inside

For Lavatory or other Privacy doors will have:
- Either knobs operates latch bolt unless outside knob is locked by push-button inside,
- A coin inserted and turned in emergency slot will unlock door from outside.
- Inside knob always active
- Pushing inside button locks the outside knob

For doors that do not require locking will have:
- Either knobs operates latch bolt at all times
- Suitable for use on storeroom, kitchen and children bedroom

For use on storeroom, hotel and exit doors will have:
- Latch bolt operated by inside knob and key from outside
- Inside knob always active
- Outside knob is always rigid

4- If the Contractor will install **Cylindrical leversets**, their technical data should be as follows:

- Solid steel chassis and latch case, zinc plated for corrosion resistance
- Guaranteed for over 150 000 life cycles
- Exposed trim should be made of zinc die- casting lector-plated or solid brass.
- 5-pin tumbler cylinder, brass plug with three nickel-plated brass keys
- Locksets should be keyed alike to deadbolt to maximize security,
- Locksets should be easy to install.
- The thickness of strike should be 2 mm and the size of strike should be 28mm x 70 mm,
- The depth of latch should be 12,5 mm,
- Handing should be fully reversible for right or left hand door,
- Door thickness adjustable 35 mm to 50 mm as standards,
- Yale type keyway is applied as standard but other keyway options are available upon request.

The cylindrical leversets can use for Entrance, Privacy, Passage or storeroom.

All works of installation and all requirements to complete the work in a first class manner should be included.

Sample of the automatic locksets will be submitted to the Supervisor for a previous approval before the fixing.

6.4.16 Hinges

Supplying and fixing of hinges, as described in the technical drawings, made up in steel and covering with brass layer will be in accordance with quality standards OTLAV's. The steel material should provide high resistant of hinges against mechanical shooting, elasticity, long working life (180 000 life cycle).

The hinges should be composed by:

- Matchstick made up in steel and covered with brass layer, type male with filet;
- Matchstick made up in steel and covered with brass layer, type female;
- Four steel screw. They will be used for installation of hinges in object.

The size and Form of parts should be given in Technical drawings.

Two above matchstick will be moved in their part in a way that the doors to move in a easy way at their case. The matchstick will be painted with oil to eliminate the sound during their works.

The hinges that will be used for doors should be composed by two above matchstick and four steel screw. The diameter of matchstick with filet, type male should be 14-16 mm. The length of matchstick is L1 = 60 mm and length of filet will be minimum L2=40 mm. This matchstick will be fileted with door case in accordance with technical drawings. The head form of matchstick will be in same with chess piece. Metallic matchstick, type female will be installed to other part of door by 4 metallic screw
The hinges that are installed in under part of door should be minimum 25 cm over the under part of door case.

The hinges that will be used for windows should be composed by two above matchstick and four steel screw. The diameter of matchstick with filet, type male should be 12-13 mm. The length of matchstick is L1 = 50 mm and length of filet will be minimum L2=30 mm. This matchstick will be fileted with door case in accordance with technical drawings. The head form of matchstick will be in same with circular form. Metallic matchstick, type female will be installed to other part of window by 4 metallic screw. The hinges that are installed in under part of window should be minimum 15 cm over the under part of window case.

Three hinges will be installed in three anchor points of door and window in minimum distance between them as follow:
Lmin = 50 cm for door
L'min=30 cm for window.

The quantity of hinges will be in accordance with project requirement. They will be depending by kind and size of door or windows.

All works of installation and fixing of them in the object should be perfect and in accordance with the project and Supervisor's technical requirements.

A sample of hinge with their quality certificate, origins certificate and warranty certificate must be previously submitted to the Supervisor for initial approval before installation on the object.

6.4.17 Door handle

General

All door/window handles should be of a similar type all over the school area. In order to meet this requirement all door handles should be of such a design that can be used both in dried and humid environments.

The criteria that should be met

All door/window handles should be:

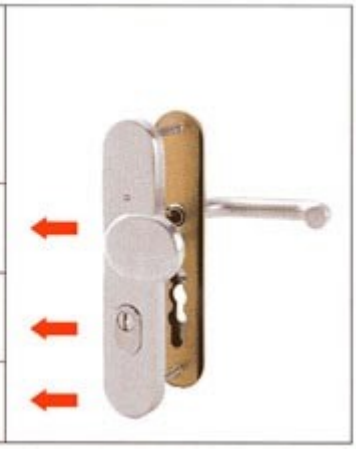
a) With a high level of usage security (longevity while being frequently used)

Handle's durability depends mainly on the materials, that they are made of and also on the way of the handle's connection with the other elements (cylinder, lock) etc.
For this reason a handle produced from a strong and resident material (for example, stainless steel) has to be chosen.

b) With guarantee period for resistance against all charges (it should guarantee durability in all mistreatment cases: hanging, hits, crashes etc)

Considering users of those handles, they should have high resistance coefficients in charges; handles should also resist a child hanging on it.
Due to the European Norms (DIN) there are two resistance levels.
The following table presents the charges for these two levels. We would suggest the level ES2.

Properties	Requirements	
	ES1	ES2
Concentric Tensile Loading	25 kN	40 kN
Tensile Loading of the Barrel	15 kN	17 kN
One Side Tensile Loading	15 kN	20 kN



c) It should not cause any physical damage during the usage.

Regarding this item it could be said that, since these handles will be fixed in doors and windows of kindergartens, elementary schools, secondary schools and high schools, and therefore will be partially used by children, these handles should be chosen appropriately in order not to cause any physical damage to the child. The handle model presented in the following figure meets all the requirements by its part from inside of the classroom, since this part frequently used, especially in emergency cases, for the door is opening from inside of the classroom to outside.

Fixing

All handles before being fixed should be checked by the engineer (supervisor) and only after his approval to be fixed.
The handle fixing should be done in such a manner in order to meet the above-mentioned criteria.
The instructions given by the handle producers must be correctly applied while handle fixing.

6.4.18 Armour plate Doors

Supplying and fixing of external armour-plate doors, as described in the technical drawings will be made in accordance with requirement of Contractor. The armour -plate door should be metallic door that is provided with armour elements. A wooden protection cover will cover the armour -plate door.

The armour -plate door are composed by:

A metallic case that will be fixed on the wall by the steel matchstick or concrete part before the plastering of walls. The metallic case should be painted with metallic paint against corrosion before the installation of door The size of case is depending by the thickness of wall. The thickness of steel sheet of case should be minimum 1,5 mm. The width of side part of case should be minimum 10 cm and width of centre part will be depending by the width of wall and kind of door. The steel sheet of case should be welding in accordance with Technical Conditions.

An armour case of door that will be fixed to the above metallic case. Hinges and spanner anchor in accordance with data of technical drawings will provide the armour case. In this case will be installed all insurance elements and other necessary accessories.

Safety metallic rod with minimal diameter d= 16 mm should be putting in minimum distance between them L= 30 cm. They will be welded in armour metallic case of door during their production in accordance with technical conditions.

Polysterol thermal insulation protection with minimal thickness t = 3 cm that will be installed between safety metallic rods to eliminate all sounds. Their installation will be after the welding of metallic rods and finishing of metallic case of door.

Two wooden cover with thickness t = 2-3 mm (per each side). Their size will be depending by the size of the door that is given by Contractor. The cover can be sheet or with model. The supervisor before their installation will decide their color and model.

High safety lockset with three copies of keys, type Yale and other necessary accessories. The lockset should be type circular with steel base and zinc plate of spanner. It will have 5 matchsticks. The warranty should be 150 000-life cycle. The depth of spanner will be 12,5 mm and the thickness of cover will be 2mm. The spanner should be made up in steel or brass. The lockset should be with simple combination for people.

The lockset should be applicable for the keys, type Yale or similar.

Hinges in three anchor points (minimum 3 hinges per each part) should complete the armour - plate doors.

The door should have the respectively handle, a push button with internal handle that will close the external handle. The handle should be moving in the right or left side of door. The external handle will be active. The internal handle will close the spanner. Every handle will use the spanner of doors expect of the case when the external handle is closed by internal side.

The door should have a glassblower with both side views. (Magic eye)

The case will be painted with emetic transparent paint before the installation of door.

All works of installation of solid wooden band should be in a first class manner and in accordance with the project technical requirements.

All works of installation and fixing of them in the object should be perfect and in accordance with the project and Supervisor's technical requirements.

A sample of armour - plate door must be previously submitted to the Supervisor for approval before installation on the object.

6.5. Ceiling Finishes

6.5.1 Plastering of ceiling

Warning:

All surfaces to be plastered must be previously carefully wet by clean water. Where necessary appropriate additives will be added to water in order to guarantee a perfect plaster issuing. In any case the Contractor is the only responsible of the final issue of the plastering works.

Cement-mortar type 25 with river sand (which porosity of 35% and water content with relevant increasing of volume by 20%) mixed in proportion of cement: lime: sand=1:0.5:5.5, 87 lit hydrated lime, 300kg cement (type 300), 1.01 m^3 sand.

Cement-mortar type 1:2 with clean sand (having a porosity of 35%) mixed in proportion of cement: sand=1:2 527 kg cement (type 400), 0.89 m^3 sand.
Those proportions of using mortar are worth only for 1 m^3. These standards are based on legal manuals and advice books like:
Manual no.1 of "Technical Analysis for the production of building materials, advices and criteria"

Methodology of Work:

-Preparation of ceilings with a first rough-cast coat of render, using a fluid cement mortar for improving the adherence of the render and to reinforce the surface, including scaffolding and all requirements for the completion of the work.

-Plastering composed of one layer of lime mortar (type 25) 2 cm thick with the following dosage per square meter: 0.005 m^3 clean sharp sand , 0.03 m^3 lime mortar (type 1:2), 6.6 kg cement (type 400) water, using appropriate profiles and guides applied to ceilings and trowel finished to a smooth surface, including scaffolding and all requirements to complete the work in a perfect way.

-Painting works of ceiling.
Careful cleaning, bushing and smoothing of all the plastered surfaces to be later on ceilings new painted.
Painting of the ceiling with “hydromat” paint, in two layers minimum. Colours as indicated in technical drawings, to be approved by Contract Administrator.

6.5.2 Drop ceillings

Specifying ceilings

Ceilings are customarily set out so that the cut panels at the perimeter are equal or greater in width than ½ full tile module. They should be cut to a good fit.

On 600mmx1200mm items and plank items the direction of installation should be indicated on the ceilings plans. It is recommended practice to install products with directional face patterns in squire modules, with the direction of the pattern alternating from tile to tile.

The grid is primarily intended to support the distributed load of 4 to 6.5 kg/m^2 from ceiling tiles or panels. This will ensure a deflection of the grid, between points of support, which is visually undetectable. On no account should point loads be placed on reduced height or lightweight cross tees and only very lightweight fittings, of 3 kg or less, should be supported on the grid flanges. Main runners or cross tees which bear on a perimeter trim should be suspended within 600mm so that excessive loads are not transferred into it. However, this dimension may need to be reduced to 450 mm or less if additional loads overlays or service fittings are installed.

Installation conditions

The required stability of site conditions is only likely to be achieved if the building is weatherproff, dried out, fully glazed, and during the winter months some form of dry heating is provided. Increased ventilation should be used to reduce excess heat build up during the day caused by solar heat gain.

Controlled ventilation should be used to disperse moisture-laden air. Mechanical de-humidifiers are designed to reduce the moisture content in the air within the building. The direct burning of fossil fuels such as butane or propane gas is not recommended as these liberate approximately 2.2 liters of water for every 500 g of fuel burnt. It is better to use dry heat such as electricity or indirect hot air and to use de-humidifiers only to reduce the % RH created by moisture emitting from structure.

Maintenance and cleaning

Maintenance on suspended ceilings should only take place after the effect of such work upon the technical functions of the installation (in particular the fire and acoustic performance), has been fully considered. If in doubt, please consult the internal technical sales.
However, when maintenance is necessary, certain procedures should be followed to ensure continued high performance and attractive appearance.

Cleaning

First remove surface dust from the ceiling using a soft brush. Pencil marks, smudges etc. may be removed with an ordinary art gum eraser. An alternative method of cleaning is with a moist cloth or sponge dampened in water containing mild soap or diluted detergent. The sponge should contain as little water as possible. The ceiling must not be made wet. After washing, the soapy film should be wiped off with a cloth or sponge lightly dampened in clear water.

- Abrasive cleaners must not be used.

- Ceramaguard ceilings are unaffected by moisture and can be made damp with no adverse results.
- Parafon Hygien and ML Bio Board can be repeatedly washed and will withstand mild detergent and germicidal cleaners.
- Specialist contractors offer cleaning services using chemical solutions. Where these methods are employed, it is recommended that a trial operation is first carried out so that the result and overall effect can be assessed. It is best in this case to conduct such a test in a non-critical area of building.

6.6 Ceiling Finishes

6.6.1 Cover on angle of the walls

The supply and fixing of cover on the angle of the walls are described in technical specifications that are given by Contractor. They will be made up to aluminium material with profile type **L** in accordance with European standards EN 573-3, The profile will be painted before their installation on the wall. Their colour will be according to the requirement of Investor (usually, can be used the white colour).

The sizes of cover on angle of the walls are 150 cm x 2 x 2 cm. Their form is in it with **L** Profile. The thickness of profile is 2 mm.

Profile consists of two bands with width 2 cm per side. The profile can be with hole with d= 6-8 mm that will be used for fixing of cover on the walls. In this case, the cover will be fixed on the wall before the plastering of walls. Both sides of profile should be covered during the plastering of walls.

The parts of aluminium profiles should be painted during the baking process *lacquering*. Baking temperature should be less than 180 celsius degree and the baking period should be less than 15 min. The profiles will be powdered with first quality of acrylic *resin or linear polyester*.

The covers on the angle of walls are protected by elements that provide their putting and anchoring on the wall structures

The cover will be jointed with wall by a special plastic-elastic material that is used for aluminium profile. The pasting will be made with a brush after the plastering of walls. The characteristics of paste (glue) for resistant against the atmospheric agents should be provided and certified by manufacture.

For protection of walls angle can be used pine wooden cover that are protected by special wooden material (special paint with wooden material). In this case, the thickness of their profile should be 3-5 mm and the sizes should be 150 x 3 x 3 cm. The connection of two wooden bands will be made with small rivets. Their place should be painted after the finish of works. In the connection part, the wooden bands should be cutting in 45 degree.

All works of installation and putting of cover on the angle of walls should be perfect and in accordance with the project and Supervisor's requirements.

A sample of cover on the angle of walls with their quality certificate, origin certificate and warranty certificate must be previously submitted to the Supervisor for approval before installation on the object. Supervisor can required increasing their length till 2 m.

6.6.2 The Glass moulds (glass surface)

The supply and fixing of glass surfaces are described in technical specifications that are given by Contractor. They will be made up to aluminium material with profile in accordance with

European standards EN 573-3. The profile will be painted before their installation on the wall. Their colour will be according to the requirement of Investor (usually, can be used the white colour).

The fixed case of them will have the dimensions that are given in the Technical drawings. They will have the elements that will be used for the fixing and anchoring of glass surfaces on the walls. The forms of profiles are tubular. The dimensions of glass surface profile will be 25 mm biggest that main profile.

The dimensions of moving case profiles are 32 mm x 75 mm (depth is 32mm and height is 75 mm)

Both part of door (fixed and moved) should be with two aluminium profiles that will be jointed with another aluminium part by two-water insulation plastic band with width 15 mm.

A solid sub-frame will be carefully fixed with steel clamps to the walls by means of cement mortar (by me tapa me filete). The fixing must preferably have a distance from the frame corners of no more than 150 mm and between them of no more than 800 mm. The fixed doorframe will be screwed to the sub-frame when all plastering and painting works finished. Opening glass shutters shall be fixed by hinges to the glass frame and shall be furnished with handle and lock anchor. The sealing between the cases and the building context will be carried out, using elastic-plastic materials, after having filled any gap with insulating materials. Between the inside of the steel frame support and the outside of the aluminium fix frame it is preferable to keep an installation tolerance of 6 mm, considering a protrusion of the fixing spacers of about 2 mm. Dimensional tolerance and the thickness shall be according to the European standards.

Glass panels shall be fixed in the metallical frame by aluminium beat in the metallical profiles of the glass and supported by gums. All the works related to the masonry and all the requirements to complete the work should be realised in workmanlike manner.

The Glass moulds are the pieces of glass, either compact or hollow, designated to the construction and obtained by pressing in moulds, from which it takes its definitive shape, a mass of melted glass. Their application are recommended for country houses, apartments, industrial buildings, schools, hospitals etc

They can be in two kinds as follow:

1- Double glass moulds

They are formed by two independent units that are welded together during the manufacturing process, resulting in a single piece which holds inside a dehydrated air chamber at low pressure (0,3 atm). That provides them with very interesting characteristic as thermo and acoustic insulation material.

Their physical properties are:

- Acoustic insulation: *around 45 dB*
- Coefficient of thermo transmission in outside facing: *3 Kcal/h.m2*
- Coefficient of thermo transmission in inside facing: 2 *Kcal/h.m2*
- Fire resistance against fire ¼ hour
- Fire resistant against flames 2 hour

2- Single Moulds

They are the ones constituted by a single compact glass piece

- Acoustic insulation: *around 40 dB*
- Coefficient of thermo transmission in exterior facing: 4 *Kcal/h.m2*
- Coefficient of thermo transmission in internal facing: 3 *Kcal/h.m2*
- Fire resistance against fire ¼ hour
- Fire resistant against flames: 2 hour

The thin-walls made out of glass moulds, due to its strong thickness, should provide:

- Security against assaults
- High index of acoustic attenuation
- Tightness and incombustibility
- Stability against chemical agents
- Thermo insulation

The coefficient of luminous transmission should be 0,8 – 0,9. The maximum sizes of utilization for vertical thin walls fixed in their four sides, are 5 m for double glass moulds and 3 m for the single glass moulds. Regarding the tradable glass moulds, the utilization sizes will depend on type of glass moulds, overweight in kg/m2, dimensions of the hole to be covered and number of supporting points of the plaque.

Usually, the sizes of glass moulds should be 240x240x80 mm or 240x115x80mm.

There are two different systems for the construction with glass moulds nowadays:

1- Traditional system

It is made using iron rods and concrete joints. For its assembly is necessary to observe the following rules:

- Every contact between the iron rounds and the glass pieces should be avoided.
- The panels of translucent concrete will be completely independent, never supporting the mechanical contention efforts of the rest of the work. The dilatation joints should never be placed at a distance of more than 4 m from each other.

2- Tables System

It is based in the placement piece by piece of glass moulds with intercalated PVC joints, that avoid the contact between them, being the whole pattern strongly wedged within a frame of PVC, reaching a definitive tightness and firmness by the application of a special glue.
It can be applied both exterior and interior walls, permitting the construction of big panels in short time, with great easiness and cleanliness and with no need of skilled labour. The TABILUZ panels, as any other glass closing, shouldn't bear any burdens of the structures in which they are integrated. The elements integrated the tables system is made of rigid PVC in grey colour.

The installation of glass moulds should be as follows:

- Preparation of the panel perimeter in the works to the size of the panel so as to receive the PVC frame (this frame has to be perfectly adjusted within the works)
- Cut the frame according to the planned size with an angle of 45 degree, dismembering a piece of the profile wings that form one of the upper angles, in such a manner that allows the introduction of the last line of moulds. These wings should be kept in order to fix them once the building of the thin-wall is ended.
- Bind the frame on the ground fixing its four angles with metallic angle ties
- Place the frame in the hole to mark the fixing point to the work

- Drill and place the plastic stoppers that may receive the screws

- Fixing of the frame to the work (plumbed and levelled)
- Place the first line of glass moulds with its corresponding vertical profiles of joint
- Once finished the first line, the wedged might be done at the end of each line, coinciding with the column trough which the introduction of the last mould has been foreseen
- Placing of the horizontal profile of joint
- The procedure for the following lines will be the same

For placing the last line, the glass moulds might be introduced through the frames angle, which wings have been already, dismembered. Each glass mould of this line will be wedged in the upper part

- The last glass mould will be wedged in the upper part and in the vertical as well
- Fix the dismembered wings with the same sealer used for the joints
- Application of the sealer- stiffener
- For the restoration of the joints, if it is necessary, use silicon oil

6.6.4 Horizontal wall protection

Supplying and fixing the cover of walls described in technical specification given by administrator contractor.
Cover of walls are composed by woods material and these are pre-painted profile before fixing on the walls. Color of cover of walls depend on investor requirement.

Cover of walls have a size 10 - 15 x 2 cm and their length is depened from the room dimensions. Thickness of profile is 2 mm on each side of profile should be a strip form with wide 2 cm from each side or it should be with holes with d = 6 - 8 mm. The hole is using to fix the cover of walls in a first-manner class work. In this case the cover of wall is fixed on the wall before plastering. During plastering two sides of covers are foiling with protection papers.

Horizontal wall protections should be placed in a height of funksion of chair height.
Cover of walls are ensuring with elements that serve for placing and anchoring on wall structure. The sealing between cover of wall and wall will be carry out by using plastic-elastic materials, after having filled any gap by plastering.

We can use the wooden cover of walls in seasoned pine, treated with a coat preservative. In this case the thickness of profiles will be 3-5 mm and size will be 150 x 3 x 3 cm. Joining of two wooden strips will be carry out with small nails and after that it has to plaster and paint. On part of joining the wooden strips has to cut with an angle 45 grades.

All works of installation and putting of cover on the angle of walls should be perfect and in accordance with the project and Supervisor’s requirements.

A sample of horizontal wall protection with their quality certificate, origin certificate and warranty certificate must be previously submitted to the Supervisor for approval before installation on the object.

SECTION 7 GROUND WORKS

7.1 Roads

7.1.1 Subbase and base

Subbase implies the ground over which the base and the layer of the road will be poured. The base will meet the demends and conditions of the ground works as described in the item(6.3.1). The underbase will be leveled and pressed in a maximal tolerance of +/- 3 cm. The slope (gradient) will be taken into consideration while working with the subbase.

The base is the supprting layer of the road. After the excavation of the ground to a depth of approximately 30 cm (to the level of subbase) it will be filled with 0/32 mm up to 0/56 mm gravel material. This material will be placed into well pressed layers. The gradient of at least 1% will be retained even during the laying of the base.

7.1.2 Laying (flooring)

It is prefered that the flooring of passage ways within the courtyard of the school be made of stone tiles and concrete or solid concrete. This will be done in the following manner:
A maximal 5 cm thick sand layer, of a granularity of 2/5 mm to 0/4 mm to be poured on the base over which the stone or concrete tiles are to be placed. A special vibrating machine to be used afterwords to acquire a perfect leveling. Finally the space between the tiles to be filled with 0/1 mm fine sand so as the tiles be best linked with each other and reinforced /stabilise the layer of htese stone or concrete tiles.

Layers of a passageway of this type are shown in the following picture.



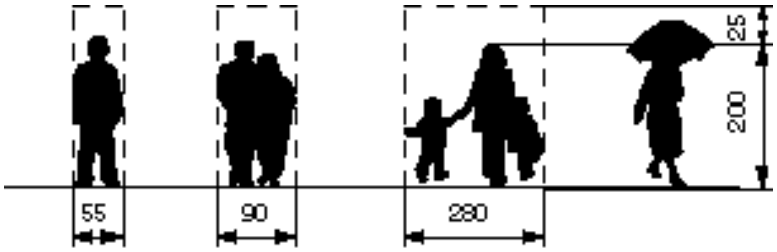
7.1.3 Sewage and drainage

In the case of the application of the above system of passage way (stone and concrete tiles) the needs for planning of sewage abnd drainage are minimal. The stone and concrete tiles with the system of gutters are not in nned of any sewage or drainage because the rain will infiltrate into the gutters.In case of very heavy rain the passageways will be placed at a gradient of 1%. The gradient is performed from one side to the other side if the passage.

7.1.4 Road Signs and Tables (Sign Plates)

All the structures of the Road signs and necessary directional panels (Sign Plates) should be installed ina way that they be resistant against the stress caused by the wind or other stress. (i.e. against the weight of the children hanging over them)
They must be installed on metal posts placed on foundation holes with minimal dimensions of 30 x30 x40 cm and properly filled with concrete.
Signs or directional panels installed ob the metal post must be at a minimal height of 2,25 m from the surface.
Road/ Signs plates to be installed will depend upon the need and traffic regulations and the architect will have to decide accordingly.

Route dimensions in cm to be foreseen are shown in the following picture.



7.2. Parkings

General

The number of parking places must be foreseen in accordance with the existing needs of the object/project. That will be deceded by the architect/supervisor during the designing phase. The number of parking places at schools depends mainly on the number of teachers and their motorizing degree. If there is no sufficient space for parking places, they should not be projected in spaces of other infrastructure. (i.e. roads, parks, landscapes etc.).

7.2.1 Subbase and base

The subbase implies the ground over which the base and the paving (flooring) of the road will be laid. The base shall meet the requirements of ground works as described in item 6(3.1).The subbase must be leveled and pressed at a minimal tolerance of +/- 3 cm. The gradient should be taken into account while working on the subbase.

The base is the supporting base of the road. It must be processed in the following manner:
After the excavation of the ground to a depth of approximately 30 cm (to the level of subbase) it will be filled with 0/32 mm up to 0/56 mm gravel material. This material will be placed into properly pressed layers. The gradient of at least 1% will be kept even during the laying of the base.

7.2.2 Paving (flooring)

Paving of the parking sites is made of with the same material as the paving of roads (as described in point 7.1.2) ot monolithe concrete or paving asphalt. The necessary technical demands as recommended by the projector/supervisor must be observed and fulfilled in cases of other applications in parking pavings.

7.2.3 Road Signs and tables

The same as in 7.1.4.

7.2.4 Sidewalk paving

Sidewalk paving can be peformed in various manners. In spite of the paving manner, the base and subbase must always meet the necessary technical terms related to the presing and good material

7.2.5 Cement (concrete) tiles' flooring

Cement tiles flooring is lengthly described in points 7.1.1 - 7.1.4.

7.2.6 Plished cement flooring

Excavation of earth on the sidewalks at a minimal depth of 30 cm from the ground surface for a certain planned extention. Installing of a 20 cm thick gravel properly pressed and levelled. Installation of 10 cm thick, M150 cement layer, with technical gutters in every 3 m, performed in thin layers and properly vibrated.
Minimal 2 cm thick layer of cement mortar 2:1 to be perfectly polished and levelled, including scaffolding, propping and any other requirements for the satisfactory completion of work..

7.2.7 Concrete bordures for sidewalks

Sidewalks, roads as well as other asphalt, cement tiles or other material, paved parts are to be protected by side supports. The supporting bordures shall be in accord with the above requirements to support the paved surface from the horizontal forces caused by the motion of vertical forces, cars, people etc.

They have the additional function on conveying the roads waters.

The bordure blocks may be installed at the same height of the paved surface or 10cm to 30 cm higher than the surface of the road as might be required.

The bordures' material is to be of cement or stone. Its selection has to be made by the architect/ supervisor together with the client, bearing in consideration that the selected material plys a special role in the surface's decoration.

Materials offered by the marked are of the following type:

- Cement bordure blocks of different dimensions. Those are pre-cast cement pieces (blocks) and should be installed according to the following table:

No.	Bordures in cm (length/thickness/height)	Weight kg/Stk	Need for 1 m
1	dimensions 100/8/20	36	1
	dimensions 1/3 of stone 33/8/ 20	12	3
2	dimensions 100/10/20	46	1
	dimensions 1/3 e gurit 33/10/ 20	15	3
3	dimensions 100/12/20	50	1
	dimensions 1/3 e gurit 33/12/20	17	3
4	dimensions 100/18/20	80	1
	dimensions 1/3 e gurit 33/18/20	26	3
5	dimensions 100/18/25	95	1
	dimensions 1/3 e gurit 33/18/25	31	3
6	dimensions 100/20/15	64	1
	dimensions 1/3 e gurit 33/20/15	21	3

Another type of stone that can be used in the same way as the above mentioned skirtings is that of „cement skirting stone". Turnings and archs can be realized with them. Two samples of such type are shown in the following table. They can be installed in the same way as the above mentioned cement skirting blocks.

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Stone bordure
Format 120 x 180 mm
Hight 600 mm, 800 mm, 1000 mm 1300 mm

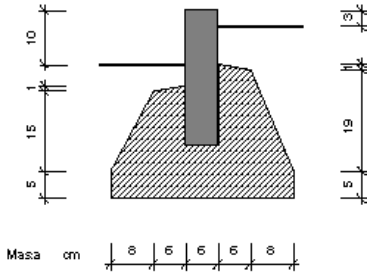


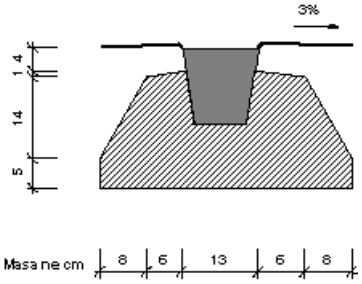
Stone bordure
Format 120 x 120 mm
Hight 400 mm

- The same bordures mentioned above can be found in stone according to the granite material. They meet the same functions as the cement bordure blocks. Their dimensions depend on the market offer which is to be inquired for. Usually they have the same dimensions as those of cement.

The installation of bordure blocks is made in the following manner:
The bordure blocks are to be installed before the surface flooring. A channel is to be opened on the ground with the required dimensions. The channel shall be at least 10 cm wider than the blocks, on both sides. The blocks are laid on the half dried cement mortar poured along the channel. Needed concrete is approximatly 0,05 m³. Cement mortar is poured on both sides so as to properly fix the skirting blocks.

A bourdure blocks installtion scheme together with an example of a road with a granite stone bordure, are shown in the following picture:





7.3. Landscape (systemizing of terrain)

7.3.1 Levelling and preparation of terrain (ground)

A special expert, who will make thedrawings and give instruction for the works, has to be contacted for the landscape works. It is necessary however that we have under consideration some requiremens.

The levelling and preparation of the ground according to need form and budget. If only for decorative purpose it may be left in its existing form. Whatever the levelling of the ground it should be prepared in such a manner as to garantee the protection of the landscape. In case of lack of good soil (humus), such humnus is to be brought from another place and to be laid in a minimal 20 cm thick layer or according to the drawing.

In case of an abundant stone terrain a thicker layer of humus might be needed.

7.3.2 Planting and fertilizing

An agreeculture expert should be consulted for planting and maintaining the landscape. Due space for the normal raising of planted trees and grass, in accordance with their type, should be left. While planting trees it has to be envisaged that they should not obscure or harm the view of the building during the breeding process. Special attention should be shown to the places under the shadow of the trees.
The ground grass shall be selected in accordance with its use and step on. It must satisfy the requirements of the environment.

Landscape maintenance and care is of major importance. It should be regularly watered, trimmed etc.
A landscape classification, falling under 4 categories in accordance with its use, as well as the watering and fertilizing criteria are shown in the following table.

Use/type	**Ground and maintenance requirements**			
	Place /location	Watering/trimming	Physical interference	Fertilization
exhaustion/ step-on few human step-on	Exiting land	No irrigation Trimming to 3-8 cm, 2-6 seasonal trimmings	Not needed	Not needed or light fertilization
exhaustion/ step-on medium ball games	Fertilised or existing land with sufficient features	Necessary irrigation, Trimming to 3-5 cm, Grass grow height 6cm – 8cm..	Sand leveling whenever necessary	2-3 times in season. Total 15-20 g N per m2.
exhaustion/ step-on medium-strong(heavy) sporting places etc.	Natural lighting from the sun, fertilized land, drainage in accordance with the existing land infiltration .	Necessary irrigation, trimming to 4 cm grass height/grow up to 8cm.	Sand leveling whenever necessary ventilation.	3-4 times in season Total 18-25g N per m2.
exhaustion/ step on very strong(heavy) stadiums (etc).	Natural lighting from the sun. Supporting grass layer must have 40-50% pores (holes), 1.45-1.55 kg/dm^3	Necessary irrigation, trimming to 4 cm grass height/grow up to 8cm.	Verticilation occasional sand throwing, according to (need).	3-5 times in season, Total 22-32 g N per m2.

Leveling shall include the following process: the grass to be cut with a special machinery with revolving knifes, to a 1-3 cm thick layer, at short intervals of 2-3 cm. Verticulation is recommended at the start of grass grow(March/April) following the cutting of the grass. This process removes the grown grass lump and prevents water infiltration.

Ventilation: the introduction of oxygen by means to the roots of the grass.

7.3.3 Irrigation (watering) system

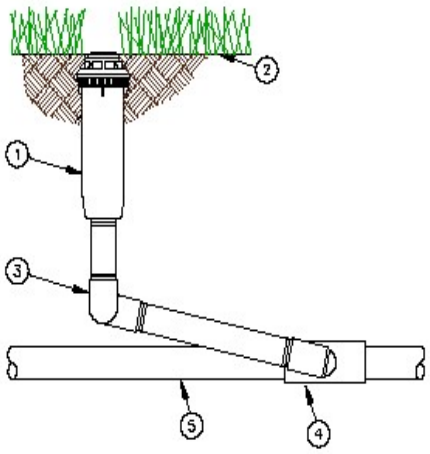
Irrigation plays a major role in the maintenance of the landscape. It should be done according to need, in due time and sufficient quantity 15 – 25 l/m² of water should be used for every irrigation so as to reach the roots of the grass .
An authomatic irrigation system is recommended. In cases when such a system is not possible, simple (common) irrigation is applied. The authomatic system outweighs the common hand system. If such system is connected with one or more sensors, it works automatically and

irrigation is performed according to the ground need. Water is saved in such a case and better irrigation is acquired. Besides that, water-throwing devices rise above the ground surface. Systems of such type are frequently applied in European countries. The mounting of these automatic systems is very simple and can be easily performed without any special knowledge. The drawing (design) of the system elements should be done bt the expert. The producers of these systems offer free-of-charge mounting schemes in case the systems are purchased to their companies. Very often design schemes and softwares are delivered together the purchase systems.

Some types of “water-throwers” are shown in the following table. The designer should select the necessary type for his drawing.

Model	Max.pressure (bar)	Water-throw radius (m)	Water consumption (m3/h)
PK50-AP	3,6 - 7,8	12,5 - 14,3	0,82 - 1,77
PK60-AP	3,6 - 7,8	13,4 - 15,5	1,52 - 3,13
PK70-AP	3,5 - 6,2	16,2 - 19,2	2,39 - 4,72
PK50-AF	3,6 - 7,8	12,5 - 14,3	0,82 - 1,77
PK60-AF	3,6 - 7,8	13,4 - 15,5	1,52 - 3,13
PK70-AF	3,5 - 6,2	16,2 - 19,2	2,39 - 4,72
PK80-AF	3,5 - 6,2	17,3 - 22,4	5,00 - 9,24
K90-P	4,2 - 6,9	25,9 - 30,8	8,4 - 17,78
K90-F	4,2 - 6,9	25,9 - 30,8	8,4 - 17,78

Some details of a presented such system are shown in the following picture:



Where: Number 1 is the vertical part of the equipment
Number 2 is the round level
Number 3 is the joint-angle of the vertical part with the horizontal one.
Number 4 is a Tpiece.
Number 5 is a polyethylene

7.4. Fencing and Gate

7.4.1 Fencing in masonry and steel

The fence is composed by three elements:

The Wall:

Foundation section excavation to a depth of 60 cm from the existing ground level, in terrain of whatever nature and compactness or degree of saturation,wet or dried, inlcuding the cutting and removing of roots, stumps, rocks and materials with a volume not extending 0.3 m^3, consolidation of the foundations, etc. Filling by hand with the same material after the execution of the consolidation of the foundations including the location of the resulting material within the worksite.the foundation wall may be executed in concrete, in concrete blocks or stones (butobeton) including formwork, toothing, propping and all requirements to complete the work in a first class manner.
The fence wall shall be 60 cm high from the ground or road surface.the heght of fenceless walls goes up to 1.8 while that of fensed ones, up to 87 cm.

Columns:

Metallic columns shall be placed at a maximal distance of 3 m to the dimensions of the walls' width. Covers with the dimensions of the columns shall be welded on top of them. Columns shall be properly anchored on the previously built wall. Concrete columns or of the same material as the walls can be used in place of the metallic columns. For a proper steadiness they must be of the same thickness with the wall there are placed on, and of a mnimal width of 30 cm,
In cases when columns are made of stone, concrete or other material,they shall be plastered with a layer of 2 cm m-25 standard mortar. The abovementioned wall shall be plastered in the same way as the columns.

Railing

Railings shall be made of metal (steel) and properly welded/melded with the columns. They shall be painted at least twice with anti corrosion paint. The form and appearance of the railings shall be settled by the architect/engineer and the client. The space between the rails shall not exceede 12 cm, so as to prevent people passing through them.

The minimal fence height (wall+fencing) must be 1.8 m. An examle of such a fencing is shown in the following picture.



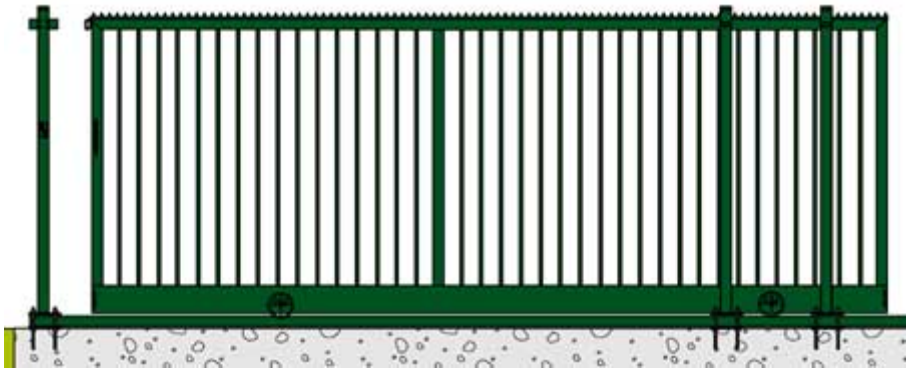
7.4.2 Metallic Gate

Two doors or metallic gate shall be installed. One must fulfill the requirements for car passage while the other requirements for people passage.
The external gate is to be executed in the following manner:
Providing and installation of a hand operated and gliding metallic gate, in metallic frame and metallic profiles of 50x50 mm, supported at the ends with a metal profile 200x50 m, posed at the main entrance.

The second frame shall be composed of 16 mm dm of steel installed and welded according to the drawing. Two small steel wheels will be fixed to the lower part, for the sliding of the gate with L profiles fixed on the same concrete base where the two metallic columns holding all the structure of the gliding gate,are fixed.

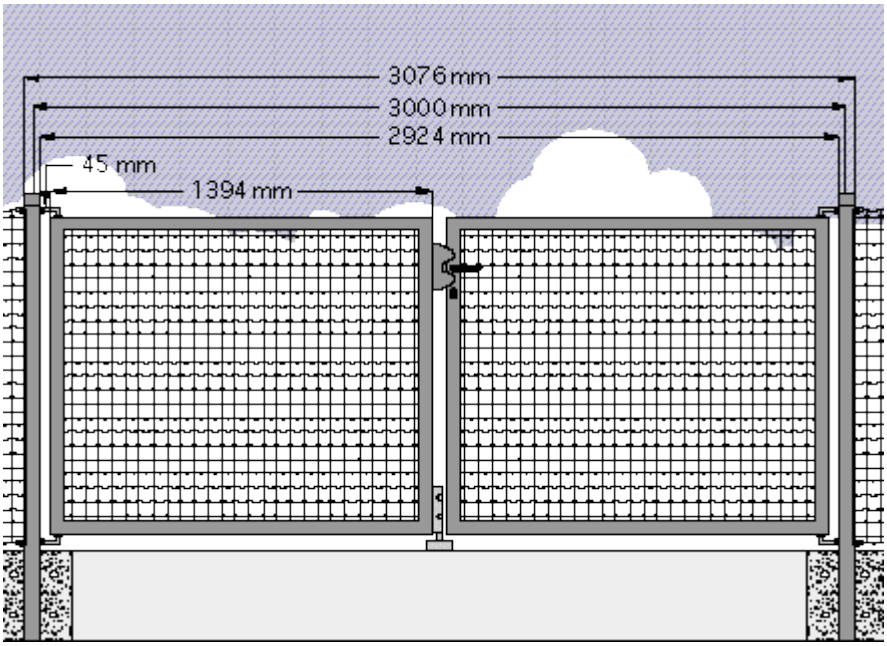
The concrete base (footing) on which the gate will be installed will be depend on its weight, but it shall, at least, have the following dimensions: a minimal depth of 40 cm and a minimal width of 40cm. The engeneer will decide upon the foundation depth depending on the door dimensions and the weight is hoing to bear.

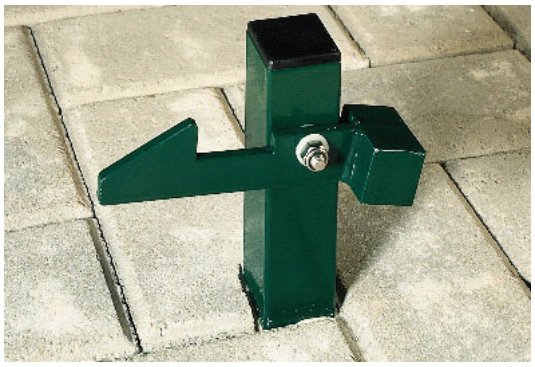
The door shall be equiped with a safety lock, three copies of keys, steady metallic handle and all the other special items for the closing of the door as well as other accessories and any other item to consider it best accomplished and opperational.



The passangers' door shall meet the above requirements. It is recommended however that this door be like in the following oicture. The dimmensions of the door shall be decided by the architect/engeneer together with the client. The following gate system is produced by the „Beakaert" Company.

Some details of this gate are shown in the following picture.







SECTION 8 ELECTRICAL WORKS

8.1. Particular electric specifications

8.1.1 Accessories (general)

Accessories of electric installation shall be specified in detailed manner in the following points of this section.
We are giving here general requirements and technical conditions of applicationneeded to fulfil those accessories and electric installation in general.

Electric installation in general needed to be complete (mounting and materials) as is it shown in sketches and projects, described with specifications or project Instruction.

Mounting must include supplying of electrical energy for all quoted and offered electrical equipment's, installed by others.

Supplying point of equipment must be supply to the terminate box in pack or near closing apparatus (isolating)/ opening.

Position of all points through sketch is approximate and needs to be confirmed from contractor referring to the latter sketch of the project, for all regulations of particular settings.

Specification constitutes a completion of the project sketches. In case of any discrepancy between the sketches and specifications, the person recommending (offering) must give same explanations (in writing) or interpretation from projector before giving his offer (his tender) if this explanation is not required, interpretation of the engineer in the site (work place) will be definitive. Contractor must outline (control) working place before appreciating his aim (scope).

8.1.2 Wire and cables

All wires and cables must have the relevant local authorities approval certificate and the factory test certificate.

Wires must be plain annealed copper conductors, insulated with PVC single core for drawing inside conduits and trunking.

Insulated wires and sheath need to be with colored isolating to identify phase and neuter.

All the cases when PVC cables terminate in a fuse distribution board, electrical equipment etc must be left a freely quantity cable to permit in the future stripping of reconnection wire terminals without causing their withdrawal.

Cables for every section of installation shall be socked closed through tubes and in summary inserting boxes system for that particular separate cable. Cables need to be installed using "loop" system.

Stripping of cable insulation with PVC must be done using a proper tool for stripping and not a knife.

Wires must be colored to be identified. BLACK must be used for neutral conductors; GREEN/YELLOW must be used for earth conductors and RED, BLUE and Yellow for phase conductors. The same colors must be used for connection of the same phase conductors. The same colors shall be used for connection on the same phase of supply throughout the installations.

All single core cables must be delivered in such a way to show the labels of producen, seals or other proof of origin and the contractor, must obtain certificates of routine tests against a given order, when requested by the Engineer.

The number of cables to be installed in conduits or trunking must be such as to permit easy drawing in without damaging the cables and must never be more than 40%. Installation shall comply with the Local Electricity Authority’s regulations

8.1.3 Flexible cables (with some multiple core wires for every wire)

All the cables must have approval certificate from relevant local authority and fabric certificate.

PVC insulation of the cable multiple wire or with single wire easy conductor from temper conductor isolating with PVC upper final sheath must resist 600/1000V.

All the cables put within tubes shall be isolated with high conduction PVC.

Flexible cable consist of multi-striped wire and depending on what we have:

- Three wire cable, 1 neuter, 1 earth (for mono phase system)

- Four wire cable, 3 phase and 1 neuter (for three phase system, without earthing)
- Five wire cable,3 phase and 1 neuter and 1earthing(for three phase system, with earthing)

Flexible cable must have colored wire for identification. BLACK shall be used for neuter conductor, GREEN/YELLOW shall be used for earth conductor and RED/BLUE and YELLOW for phase conductors. Same colors shall be used for connections on the same phase conductors. Same colors shall be used for connections on the same phase of supply throughout the installation.

Any cable smaller than 2.5mm^2 must not be used in the installation, unless it is specifically mentioned. The earth continuity conductor must have a minimum size required by regulations.

8.1.4 Channels and accessories

Electric installation can be done in two ways:
- Under plaster inserted in flexible PVC tube
- Above plaster in PVC channels (is introduced in point 8.1.7)

Accessories of installation under plaster are:
- Flexible tube PVC different dimensions in dependence of dimension and number of wires that shall be put in it.
- Distribution boxes (introduced in point 8.1.5)
- Boxes for fixing plugs or breakers (introduced in 8.1.13 and 8.1.14)

All those must be set before plastering is done.
Electrical installation under plaster must be done according to the following steps:
- Opening of channels in the wall with such a dimension that flexible tube will be freely inserted and such a depth that must draw above final plaster level.
- Put flexible cable and PVC tube which will be temporary fixed with plaster (later close channels with mortar plaster)
- After plastering is done, insert wire or cable with their guide which will be entered freely and leave an adequate amount on both sides to continue the connections and mounting

Flexible tube shall be of type DL 44 Range (NF Range) for corridors and/or of the type DL 50 Range (BR PVC Range) for fabricated rooms of GEWISS-ITALY or another similar producer will be accepted according to the appropriate standards as following:
- Compliance with standards: CEI 23-32
- (Resistance) Firmness of isolation: 100MΩ
- IP rating IP:IP40
- Impact resistance: IK08
- Installation temperature:-5/60C

Channels and putting of PVC flexible tube shall be fixed in distance of 0.4 m suspend ceiling on horizontal runs and lowering for switches and plugs shall be made right vertical and no with angle and arc form

8.1.5 Distribution boxes

Distribution boxes, depending on the system to be used, are under plaster and above plaster so that the way of fixing them is with plaster or screw.

Materials and their technical characteristic are the same as for flexible tube described in the point 8.1.4

Dimensions of distribution boxes vary according to the circumstances and need. They are in circle form, square, rectangle and their shutter covers are with different colors

It is important that connections of wires/cables inside draw boxes shall be realize with joined clamp (point).

8.1.6 Flexible connection

Flexible connections are used usually in laboratories and consist of the electric line runs near device with ending draw box and from here into device that will be connected one flexible connection is used outside wall. For this outlet cable from the draw box must be well insulated within technical condition. Cable is to be with two insulation layers and inside flexible tube. Its connection with the device shall be made in its holder.

8.1.7 System of channels

System of canals channels is frequently used in reconstruction especially when an old electric system have be put out of work and a new one shall be installed without damaging plaster or in construction with dismounting materials.

Systems of channels as system under the plaster with flexible tube have to be completed according to all the technical condition of electrical installation described in the point 8.1.4

System of channels must be on series NP 40/42 produced by GEWISS-ITALY or other producer meating the appropriate standards.

System of channels consist of accessories such as:

- Channels with different dimensions, depending on the number of the wire/ cable plugs, switches etc, to be installed in it, length 2 m
- Corners (serve to form an angle in installation) which depend on the channels is being used
- Deviation in T form
- Draw boxes at different dimensions.

Mounting of channels is to be made by screws, and be put 0.4m under level of ceiling, distribution network and on high plugs/switches for their mounting.

8.1.8 Lamps and Luminaries

The location of luminaries must be as indicated in drawing of electrical engineer. The lighting installation have be carried out using PVC insulate cables type NUM run within PVC conduit concealed inside building plaster or in canals when is system of canals is being used.

The cables must be 1.5mm^2 (minimum) section to suit the circuit loaded, the needed tolerance, being made to ensure that the limit of volt drop for the final sub-circuits. In all instances a separate earth continuity conductor must be installed. No more than three lighting circuits shall be bunched in the same conduit. Luminaries shall be securely fixed on the environment ceiling, suspended or direct on surface of ceiling according to the kind of luminaries and recommendation given from manufacturer (neon together with lamps shall be supplied by the contractor)

Throughout suspended ceiling area where fluorescent luminaries are to be installed, final connections of each luminaries shall be made by means of a three core flexible cable of suitable heat resisting qualities via a plug in ceiling rose connected to the conduit box or cable trunking.
The appearance and light distribution characteristics of all luminaries must comply the detailed information given in this specification. The design and the construction of the luminaries shall be such that lamp cap are not subject to temperature in excess of the continuous running temperatures for which they are designed

8.1.9 Fluorescent Luminaries

Lamps

All fluorescent lamps must be of the hot cathode type except for the area where voltage is not provided.
For general use the lamp characteristics required are as follows, and all lamps must have outputs at least equal to those in the table. All lamps must have identical color rendering and shall be enclosed in envelopes of volumes not less than required by the table below

Characteristics

Nominal Length mm	Watt Power (Watt)	Flux of lightening after 2000 hours	Color temp	Diameter of lamp in mm
1500	58	4500	White	26
1200	36	2800	3600	26
600	18	1100	Degrees	26
300	8	420	K	26

Control gear

Control gear for fluorescent lamps must be electronic ignition inductive choke circuitry engineered to minimize losses, which shall not exceed 8 watts for a 1200 lamp length and 10 watts for a 1500 mm lamp length. The electronic ignition must be asymmetric in application avoiding any possibility of saturation choke resulting in high starting currents. The appearance and light distribution characteristics must comply with information given in the drawings. All fluorescent luminaries shall be provided with power factor correction, which must be correct overall Power factor of fitting to no less than 0.9 lagging. The harmonic content of live current within the lamp shall not exceed 17%. Lamp-holders and other auxiliaries shall be in accordance with C:E:E 12 and each fitting shall be provided with a cartridge type fuse in the gear compartment rated at not less than 5 amps.

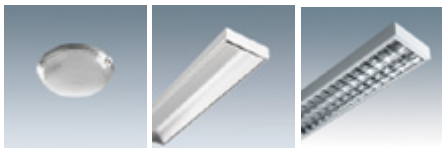
Luminaries and other auxiliary equipment must be manufactured by DISANO ILLUMINAZIONE-ITALY or approved similar as follow:
Type 884 EL Compact, FLC 2-18 D/E, glassed diffuser, electronic initation, white color
Type 784 EL Compact, FLC 2-18 D/E, glassed diffuser, electronic initatin white color
Type 891 Attiva 60, FLC 2-18 L, lamelar diffusion, dark 1,white color
Type 891 Attiva 60, FLC 2-18 L, lamelar diffusion, dark1, white color
Type 791 Attiva 60,FLC 2-18L, lamelar diffuser, dark 1, white color
Type 874 EL Comfort 60,FL4-18, lamelar diffuser, dark 1, white color
Type 814 Comfort, FL 2-36,prismatic diffuser, white color
Type 971 EL Hydro, FL 1-36 or FL 2-36,fabricated in resistant polycarbonate, prismatic transparent diffuser, grey color
Type 1544 Globo, FIC 2-13D, polycarbonate diffuser, white colour.

They must be fabricated from zinc-coated plate or similarly protected steel sheets and must be formed and braced to form a rigid unit. The paint finish must be of high quality to prevent the formation of rust particularly during the period of construction of building.
Any drilling of the metalwork of the luminaries must be followed immediately by treating the raw edges with zinchromate and finished with white synthetic enamel.
Unless otherwise detailed, they must be fixed directly to conduit boxes or lighting trunking and care must be taken to ensure that these are adequately secured to accept the weight of the luminaries.
Luminaries may not be erected until the building is enclosed and waterproof. Damage to luminaries and in particular to their paint finish resulting from premature erection. In such occasions supervisor may require their removal and replacement without any cost to the employer. Control gear and other auxiliary equipment shall be accommodated within each unit so as to permit the dissipation of heat to ensure that the components may operate within their temperature limits.

Each luminary must be provided with a fixed connector block clearly marked for phase, neutral and earth, sized 2.5 mm2 cables in each connector. A suitably rated cartridge fuse shall be provided in the phase line of each luminary to which easy access shall be provided

In the figure below some different types of lamps are shown:


Lightening device in wet conditions


Lightening device above plastering


Lightening device fixed on the ceiling

8.1.10 Halide Lamps

All lamps must be suitable for 220 volts operation and be complete with control gear. The characteristics of metal halide lamps shall be such that they will start with a 10% reduction in rated voltage.
Luminaries and other auxiliary equipment must be manufactured according to the European standards, or approved similar as follow:
Type 1131 Punto, JM-IS glass diffuser, IP55, biege color.

8.1.11 Spot light

Used luminaries powerful spot light are:

- Indoors area (halls) and
- Outside area; in sports ground, in the area in the fron of school, at the main gate of the school luminaries of flower garden etc.

As spotlights for indoor area (gymnastics hall) can be put suspend ceiling or inside wall. They must be put in such a way to light better all the hall and not preventing (blinding) sport persons/students during their exercises.
Number of spotlights depends on:

- The space of the hall that is to be lit
- Type of spotlight
- Power of the spotlight

Below some types of spotlights for indoor halls, with some their technical data are ntroduced.



Weight in Kg	Power Watt	Socket	Color
8.75	MBF 250	E40	Black
9.55	MBF 400	E40	Black
9.80	JM-E 250	E40	Black
11.20	JM-E 400	E40	Black
9.80	SAP-E 250	E40	Black
11.20	SAP-E 400	E40	Black

CARCASS:
Coasting and pressing of aluminium with cold wide sheets
REFLECTOR: with wide radiation from oxidation anode with coasting aluminium and pressed with prism structure, with thickness of the layer6/8❍,looting and painting with high degree.
COVER: protective glass, thickness of the layer 5mm,solid from temperatures and strokes
PAINTING: Powder of polyester, black color solid at corrosion and dew salt.
SOCKET: Ceramic with silver contacts output E40
ELECTRIC COMPLETION: voltage of network 230V/50 Hz, bunching 2 polar +earth, cable section of supply 4mm^2
MOUNTING: suspended or installation on industrial channels.
POWER OF LAMP:MBF250;MBF400;JM-E250;JM400;SAP-E250,SAP-E400.
Below appear an example of universal spotlight that may be mounted both inside and outside.



CARCASS: Casting and pressing aluminium with cold white sheets.
REFLECTOR: Firmness aluminium 99.85,oxidation anode, thickness of the layer 2μ cement with putty and painting
COVER: Protective solid glass, thickness of the layer 5 mm, firmness against temperature and hitting.
PAINTING: Powder of polyester, black color, solid at corrosion and dew salt
SOCKED: ceramic with contact silver, cable bunching.
ELECTRIC COMPLETION: network voltage 230V/50 Hz, bunching 2 polar +earth, cable section of supply max16 mm^2.
PARTICULARITY: Forward side with open type is very practical for maintenance of spotlight.
CLOSING COVERS: isolated from rubber-strap, steal screw not rusting firmness at corrosion and high mechanics, hinge from special steel, isolated, from water and thermic separated from carcass.
POWER OFLAMPS: until 1000w(JM-TS 1000)
Below an example of road spotlight is introduced.



Weight Kg	Watt	Type of xokola	Color
5.10	MBF80	E27	Grey
5.40	MBF125	E27	Grey
5.60	SAP-E70	E27	Grey
5.80	SAP-E100	E40	Grey
5.80	SAP-E150	E40	Grey

Carcass: Pylamid.
REFLECTOR: Firmness aluminium 99.85,oxidation anode, thickness of the layer 6/8μ cement with putty and painting for exact running of light
UPPER COVER: With opening by hinge. From polyamid stabilized at ultra violet ray
COVER: Transparent policarbonat and firmness at breaking, stabilized at ultra violet ray
SOCKED: ceramic with contact silver, output E27 or E40
ELECTRIC COMPLETION: Voltage of network 230/50 Hz, 2 polar bunching+ earth cable section of supply 2.5mm^2
PARTICULAR: Forward side with hinge of opening type is very practical for maintenance of spotlight
CLOSING COVERS: isolated from rubber-strap, steal screw not rusting firmness at corrosion and high mechanics, hinge from special steel, isolated, from water and thermal separated from carcass.
POWER OF LAMP:MBF80;MBF125;SAP-E170;SAP-E100;SAP-E250,SAP-E150.
In below figures introduced some other types of different spotlights



8.1.12 Emergency Lighting and Exit Signs

The emergency lighting package should be mounted at those places, where it is foreseen by electrical projector engineer.
The emergency package should comprise of battery pack complete with a battery charger capable of supplying power for 1 hour and 18 watts light tube.
The emergency luminaries must be manufactured by DIOSANA ILLUMINAZIONE-ITALY or approved similar with follow technical requests.
Type 884 EM, compact, FLC 2-182, electric initation ,glassed diffuser, white color
Type 891 EM 60 active grade, dark 1,FLC 2-182,lamellar diffuser, white color, electric initation.
Type 874 EM 60 comfort grade, dark 1,FLC 4-182, lamellar diffuser, electric initation, white color
Type 2660 EM,evoluzione,FL3-36,lamellar diffuser,dark1,white color.
The location and extent of the exit devises must be as indicated in the project.
Escape or exit lightening should be of the relevant BS standard complete with battery pack,18 wats,1 hours duration.
Cover package must be green color and with respective signs:

- A man running
- Arrow that indicates removal direction.
- Word exit

written in white color.

8.1.13 Light switches

The location of lighting switches indicated according to the project done by the electrical project engineer.

Generally lighting switches throughout the building must be suitable for flush mounting (under plaster) . Flush switch within the building must be as follow:

Play bus range GW 30 011, IP-16, color by architect. The switches must be of the “quick-make slow break” type designed to control AC circuits. They must be rated at a minimum of 10 amps.

Switches must be of the “broad rocker” type gauge to give multiple switch units, until the specifications are produced. Switches must be mounted in an electric network to provide required spreading, when boxes with metallic cable shall be fit flatly on the wall plaster. Switches can be of such a form to be mounted on the layer of plaster. Those kinds of switches are frequently usable in these cases when trunking electrical distribution system is used.

It is also recommended to use it in wood and metal rooms, in transformer rooms of generator.

Switches, according to the position where they are being used and the on-off way of switch are divided:

- One pole switches
- Two poles switches
- Deviat switches
- Switches with signal lamp and time switch

One pole switches must be used usually in a small area where the number of luminaries is small(1or2)

Two poles switches must be used usually in those area where the number of switches is big and can be switch on -off in partial way for example in classes. Where are two rows with luminaries, they can be switch on in alternative way only one raw or both at the same time.

Deviation switches are used in those area where there are two in/out. After they switch on in one in/out coming side and they can be switched off the other in/out coming, or may be used in corridors

Switches with signal lamp and time switches are used in staircases, or corridors.

In following figures are given some different type switches:













8.1.14 Socket outlets and plugs

A complete system of socket outlet units must be provided in the position indicated on the drawings done by the electrical project engineer.
All sockets to be mounted in schools/kindergarten shall be of the earthed type and be protected for children.
Sockets like switches can be the type mounted under or on the plaster.

Sockets are devided according to their functions:

- Voltage socket one, two or three phase
- Phone socket and LAN system
- TV sockets

One phase voltage socket as indicated in the following figure have one pin per phase. one for neutral and one for earth fig 1or earth contact fig 2.



Fig. 1



Fig. 2 Earthing contacts

All sockets unless otherwise specified, must be of 16 amps 2 pin and be out of surface. They must be flush mounted and have a color to match the plates for lighting switches.

All the sockets must be of similar type and specified as follow:
Playbus Range, with safety shutters 250 v, 2P 16A
Playbus Range, with safety shutters 250 v, 2P 16A

Other electrical accessories such as push-buttons, flush mounting box etc must be according to the GEWISS Catalogue generale 2000 or approved similar type.

Two and three phase sockets are used only in laboratories or in workshops and are recommended to be of the type on the plaster as indicated in fig., or down plaster as indicated in fig.2.





Three phases socket above-mentioned is 16A.380V with earth, so cable supplying that is 5 wires 2.5 mm².
In case of three-phase machinery more powerful than in the base of device power are foreseen to be used, electrical engineer must account the dimension of the supply cable and amps of the socket.

Phone socket and LAN system are the same and are detailed described in point 8.6 and 8.7.

TV sockets must be coaxial with direct protection.



8.1.15 Earthing system

All apparatus or their parts not solidly connected to the earth continuity system must be connected to a single earthing point system in an approved manner by solid conductors secured by means of substantial bonding clamps. Where any piece of equipment is connected to water, gas or fuel line, the apparatus shall be bonded to the line using 20mm x 1.5mm tinned copper type or equivalent PVC insulated earth cable. Throughout all conduits and trunking installations a separate protective conductor shall be installed, connected to an earth terminal in each conduit box, and installed within each length of flexible conduit.
Nevertheless the provision of a separate protection conductor, the continuity of the conduit and trunking installation shall be the same standard as though they were the sole protective conductors.

Earth electrodes shall be profile L of galvanized steel 50X 50X5(or galvanized earth electrodes), which must be put at least 2 m deep in the ground. The number of earth electrodes depends on the sort of the site and on Re (earth resistance), which shall be smaller than 4Ω. For this after terminating and fixing electrodes measurements with Re apparatus shall be made and a report shall be held, which shall be introduced to supervisor. In case that Re is more than 4Ω, then the number of electrodes shall be increased to get the required one.

Electrodes shall be placed in rectangle, square and triangle form according to their number but always in a length of 1.50 m from each other. Electrodes shall be connected with each other by means of zinc bond 40x4mm, by means of welding or screw and nut. Connection point of electrodes shall be made with final connection against the rust. From the final point shall be come out with a continuity zinc bond 40mmx4mm and entered in the transformer room and the potential busbar and from there in all equipment's of the transformer room laying a earthing cable with the diameter min.25 mm^2.

From the main Tu distribution panel the earthing shall be spread together with cable and/trunking of neutral and phase, in all off voltage and shall be of dimension min 2.5mm^2.

Metallic parts of installation and other pieces connected with installation shall be eathed in dependent manner from distribution neuter and neuter of the distribution transformer. Continuity of earthing conductor shall be installed in all circuits and to stick in metallic part of fixed luminaries, with clutches of earthing all the sockets and metallic parts of the wall.

All metallic parts of equipment and motors shall be connected with earth system.

8.1.16 Atmospheric protection system

Atmospheric protection system is very indispensable for geographic location and atmospheric condition of Albania.
Atmospheric protective system is and shall be raised dependent, from the earth system and to comply application conditions according to the Local Electricity Authority Regulations.

The value of the resistance of this system shall be smaller than 1Ω. During the system's work (after the electrodes shall be put) shall be carried out the measurements of the R and in the case if that is more than 1Ω, then the number of electrodes shall be increased until required value. The measurements shall be repeated twice. Once with damp ground and another time with dry ground.

Materials that shall be used for this system (bonds, electrodes that shall be inserted in the ground, arrow, fixed bolt etc) shall be made of zinc or galvanized iron. Bands shall be with dimensions of 40 mm x 4mm, or 30 mm x 3mm,or bar with diameter min. 10 mm.
Electrodes shall be with length 1.5 m, as in the cases of using iron of " L" shape (50 x 50 x 4 mm) galvanized, as well as using zinc electrode manufactured from the factory.
Arrow shall be from zinc, for ex. a zinc tube 3/4 which shall be made with peak and have such a length to exit min 0.6 m above the highest point of the object.
Bolt and nut that shall be used to fix the band with electrodes has to be min. M 12

Insatllation of the atmospheric protective system depending on the object can be realized:

- For existing object that shall be reconstructed without have not this protective system.
- For new object that shall be constructed

For existing objects needed:

- A channel with depth of min 0.5 m and with adequate width shall be opened to lay the band, which will be laid in all perimeter of the object, about 1m far
- Extension of the band in all perimeter
- Opening of the holes and putting the electrodes 1.5m in depth 2m, so 0.5m below ground level in four angles of the object, and their connection to the object
- Outlet of electrodes with bonds, at least two angles of the object, (diagonal), up to roof/terrace fixing the band on the wall by means of screw and plastic holders.
- Out coming on roof/terrace connected with each other, forming a "loop" with the same band.
- On the higher point-s of the roof/terrace arrow is fixed, which is connected to the above mentioned "loop".

Note: All the connections shall be made in such a manner to have high conduit and not to have corrosion and oxidation of the connection points.

For new objects a protection system raised the same way as above mentioned: different electrodes and bands shall be put in the ground after being hydro-isolated oll along the perimeter.

8.2 Power Distribution

8.2.1 Low voltage distribution

network projected from by the electrical Engineer and shall comply with all the conditions with the local electricity authorities regulations.
Low voltage distribution starts from the transformer side of low voltage to every socket, switch and luminar. Distribution of low voltage shall be made with trunking or cables, which are described in the point 8.1.2.

8.2.2 The main low voltage panel

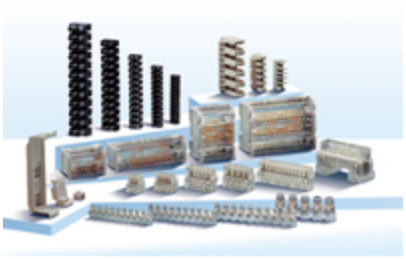
The main low voltage panel shall be put in the transformer room, in the case that it is in the building or in particular building, or in the case that building supplied with low voltage.

The main low voltage panel may be of the type on the plaster(mounted with screw and holder directly on the wall at hight of 0.9 m from the floor level) or under plaster. It shall be metallic, painted, resistant against corrosion, and be locked up.

Its dimensions are in dependence of the electrical device that shall be mounted which are in dependence of the building load.
The main low voltage panel have to contain at least:

- Energy meter
- Main disconnecter 3 phase 400V automation, amper depend on the load
- Three phase automation for every floor (suggested that every floor to be provided with three phases for a better security distribution of the load)
- Ampermeter for every phase with indication on its cover
- Voltmeter with three positions to be measured every phase with indication and commanding in its cover
- Signals of the phases with idication in its cover
- Bunches of the earth connected with earthing system

It's mounting with components, shall be made by an electrical specialist under the supervision of the engineer. All the bunches and cable trunking inside panel shall be made by means of bunching and not nastroband
In following figure are introduced some sort of bunching, fabricated GEWISS-Italy



Metallic panel shall be connected with earthing system.

An instance of the main panel of the low voltage may be of the type VESTA 400 fabricated from A:B:B -Italy or accepted other similar as specified follow:

- Mounting on the surface(manufactured in the fabric from sheets)
- Fabric manufactured with steel sheets baked in the oven
- Frontal control with MCB SACE ISOMAX;S3N-250
- Ampermeter 0-250/s and kwh gauge
- Dimensions :600x400x1800mm

In the following figures introduced some different types of the fabricated low voltage panel GEWISS, Italy.



8.2.3 Distributions panel on floors

Distributions panels on floors are distribution points of low voltage, which except distribution of the voltage for floor make possible selection of the protection.

Those panels are the type that shall be mounted under or above the plaster.

Panels depending on the load may be up to 12 elements for one floor and more than elements for 2 floors, and so on.

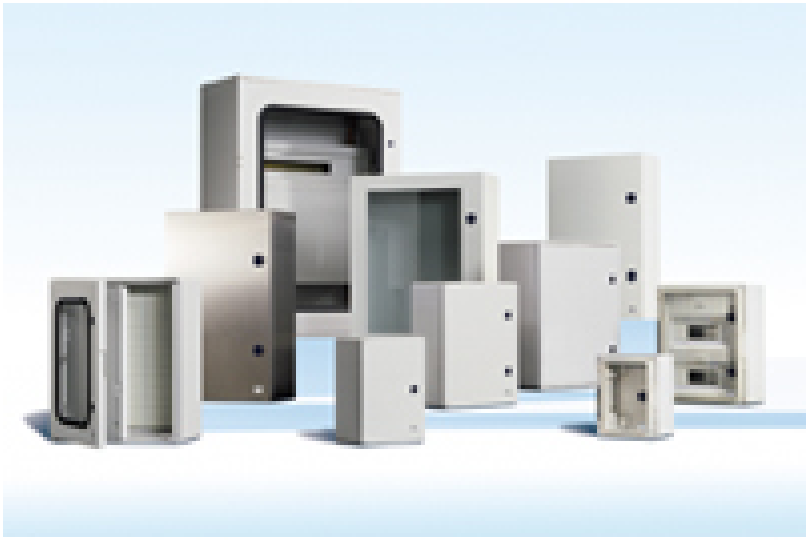
Because those panels are installed in public area (schools/kindergartens), they shall be locked up for security.

Important elements of these panels are:

- Main disconnecter automation 3 phase magneto-thermo with differential protection, amperes depending on the load;
- Signals of the phases(3 pieces)
- Magneto-thermo one phase automation's of the power (sockets), their amperes depending on the sockets that shall be supplied,
- Magneto-thermo automations of the luminaries their amperes depending on the luminaries shall be supplied,

It is recommended that system of luminaries to be separateed from the power system.

Figurative examples of these panels are given below and are GEWISS Italy fabricated, series 40 CD. It is recommended to be use those similar with those that comply with the same conditions.



In the following an above plaster-mounted panel with transparent cover is shown.



TECHNICAL SPECIFICATION	
Min.installing temperatures	-25 °C
Max. installing temperatures	60 °C
IK Code	07
Test of wire warming	750 °C

8.2.4 Boxes of automation switches

Boxes of automation switches are electric panels for particular area, the same as floor panels, with a difference that number of the panels is reduced.
These boxes shall be used in the area of toilets-showers, in different laboratories of the school, in conference hall etc.

In the area of toilets-showers in which boilers are mounted, must be put those boxes and in their consistency shall be a differential protection, and particular automation for every boiler and luminar system.

In following figures some types of automation boxes are introduced which belong to production of GEWISS, Italy and are recommended to be used those or a similar production.





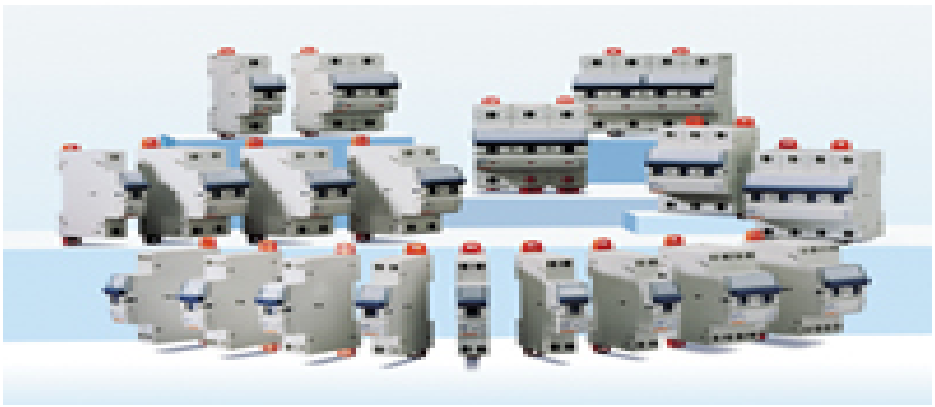
Fig.1. Fig.2.

In figure 1 boxes of automations that put under plaster are introduced and in figure 2 those put above plaster.

Mounting of the boxes on plaster shall be done by means of screw with holders, while these under plaster shall be fixed with plaster and mustn't be above plaster level.

8.2.5 Fuses (automations)

Fuses (automation) are separators of the circuit, which operate in automatic manner in the case of overload and open circuit shortcut. For this the selection of amperes of automation shall consider the protection load.
Automations used in public area are magneto-thermos and with differential protection.
Automations are protective units from overload. They are to be put in the boxes of the automaton switches, in the panels of the floors and in the main panel of the low voltage.
According to the number of the phase they protect one phase and three phase automations.
According to the amperes they are divided :6A:10A; 20A;25A;32A
According to the number of the poles automations divided: one pole, two poles three poles and four poles.
In the following figure a group of automations are introduced, as individual examples of some types to the production GEWISS-Italy, recommended using similar automations.



TypeMTC45,4500C
Tension,magneto-thermic,compact,separater
1P - 1P+N - 2P - 3P - 4P

Technical specification

			
	• Breaking capacity:	4,5 kA
	• On – of characteristics:	C
	• Nominal Tension:	230 - 400 V
	• Frequence:	50 - 60 Hz
	• Isolating tension:	500 V

Compact circuit breaker 1P+N C 6 4.5KA 1M



Compact circuit breaker 3P C10 4.5KA 2M



Compact one-part differential circuit breaker 4P C25 4.5KA AC/0.3



Type,SD,class,AC
Differential circuit breaker 2P - 4P

Technical specification



• Nominal tension:	230 - 400 V	
• Frequence:	50 - 60 Hz	
• Isolating tension:	500 V	

Type,SD,class,AS,(selective)
Differential circuit breaker 2P-4P

Technical specification



• Nominal tension:	230 - 400 V	
• Frequence:	50 - 60 Hz	
• Isolating tension:	500 V	

8.4 Signals of fire protection

8.4.1 Control device

Contractor shall cover installation, test connection and shall guarantee a high quality of the operating signal device towards the fire and alarm system including loudspeakers, luminaries, alarm device, contacts of breaking the glass alarm panel of the fire, charger of the battery, accompanying the relay. Shall be provided and connected in accordance with specifications, at positions shown on the drawings. Installation shall be done with JY-(st)-Y2x1mm2 cable to fire extinguisher and NYMHY 2x1mm, to loudspeaker.
All the signals shall be provided with an indicated arrow of fire place. The main signals shall also be provided connected between terminals in a manner to help commanding of signals unit in previous drawings.
Signals of smoking.
These must operate in a manner to keep a balance between opened and closed room so when smoke fills in an open room it shall have contact to activate the signal. Every signals shall be projected to cover an area of 100 m2.
All the smoking signals are to be installed in a waysuch as to be easily changed and replaced.

8.4.2 Automatic fire detector

Detector operation or calling points will start as follow:

- Head of alarm devices or calling point shall be lit
- Address of the tools, number of area and description of every place shall be given in control unit (and repetition unit).

Detector operation or calling points shall start as follow:

- Head of alarm devices or calling point shall be lit.
- Address of the tools, number of the area and description of every place shall be given in control unit (and repetition unit).
- Alarm shall be transmitted to the fire brigade.
- Loudspeakers of the ground shall sound in continuity.

Loudspeakers in all other areas shall pulse.

8.4.3 Signal Devices

The main signal shall not contain electronic elements or repair components.

An isolation short-circuit shall be installed with trunking to separate fire zones. A maximum of 20 elements shall be installed between insulation.
All the tools shall be supplied with an integral alarm signal. Where signals are installed inside room, it is the same as not functioning. Electric sources, devices of alarm shall be installed out of rooms.

8.4.4 Alarm Bells

Loudspeakers of alarm shall be placed among building. The location shall be assigned to secure:

- Minimum of sound level from 75 db(A) is present in every class.
- Non-Functioning of one bell shall not influence in general level of the signal system
- At least one bell for every fire, to be activated.

Alarm bells shall be synchronized by a motor
Alarm bells shall produce a sound level from 92-94 dB (a)

The writing on the alarm bells shall be in red and in clear form" Fire"

8.5 Telephonic system

Telephonic network system and data communication.

Contractor shall install the telephonic network system with wires and draw boxes in a way to create telephonic communication by wires from source of line to the central apparatus in all building. Wires shall be installed generally in high level of free space of the ceiling.
A particular separation with wires shall be used to keep telephonic system completely separate from other servings. Every wire with three separate parts, mounted in boxes on the wall with telephonic sockets shall be minimum 20mm diameter in all building. No more than 5 exits shall be permitted to be connected in one wire.
For every telephonic exit indicated in drawings, contractor shall provide a socket connected telephonic type with outlet to keep their power.
Contractor shall be consulted with receptive authority before the system installation about their requirements to be accepted by the project Engineer.
For work zone of line exit, eight-positions modeling with nest shall be set, for outlets of three particular categories, in 5UTP cable. Two pairs of four cables shall be used to cover 2 data application and a pair of four cables shall be separated to keep two telephonic lines.(two pair of cables four every outlet). To identify each of four telephonic cables (2 numbers and 2 phones), colors of the nets shall be red four two numbers that shall be applied of data ,and black for 2 telephone lines.

Recommended for installation Horizontal network shall be (3) four pairs 100Ω in twisted form and not isolated (UTP) 24 AWG, category 5 for every phone combined and socket of data communication. The site installation of station shall be indicated in drawings of the electrical engineer.
Contractor shall leave a considerable piece of cable at the exit to carry out easier mountings(at least one meter in the side of work station and three meters in the site of NCR) until complete installation to the cables.
Boxes of sub-distributions.
Boxes of sub-distributions in 6 groups, shall be mounted and shall be of the type DL 50 Range,DL50303,52mm depth, including socket.
Telephone and dates of the sockets.
Telephone and dates of the sockets shall be type Playbus Range,RJ45 category 5, GW30267, white color.

8.6 LAN System(Local Area Network)

8.6.1 Network Distribution

Since information technology is taught in high school as a subject of the education curriculum there is a need for a laboratory, which except of computer installation shall have a LAN network suitable for the school area.
LAN network consists of a server (with Windows2000(win NT) hub, for a fixed number of computers, depending on the class and hub. All the computers shall be supplied with standard network card and cable with connector RJ 45. Computers are with network right determined from central computer(server). Additional devices to be necessary, are network printers ad network scanners, which offer additional possibility for pupils.

8.6.2 Sockets

The terminal sockets are part of the network distribution. They can consist of one or two parts. Sockets of the LAN network is to be set at the same high as voltage sockets recommended at a hight of 0.9 m. They may be of the type below plaster or over it (to be included in the channel system).
Sockets of the network LAN are the same with the telephonic system of the type Playbus Range,RJ45 category 5,GW30267,white color, (or similar with the color of the voltage and phone sockets)

8.7 Three-phase stabilizer with automatic regulation

Voltage stabilizers depending on the voltage supply and the load to be supplyed divided into:

- Three phase stabilizer
- One phase stabilizer

Voltage stabilizers depending on the manner of regulation divided into:

- Stabilizer with hand regulation
- Stabilizer with automatic regulation

Stabilizer with automatic regulation divided according to the manner of regulation into:

- Stabilizer with separate regulation for every phase (regulation for every phase shall be analyzed independents from others)
- Stabilizers with regulation for all the phases in dependence of ones phases (analyzed one phase and in its bases the others are regulated)

Considering the actual electrical energy supply conditions in Albania frequent oscillation of voltage and that three phase system is not symmetric (which shall be symmetric), stabilizers with automatic regulation and separate regulation for every phase are recommended to be used.
Stabilizers to be mounted in schools and kindergartens shall comply with the following criteria:

- Power of stabilizer, in kVA which depend on the load and recommended, be equal to installation power. In cases of having one transformer settled in school and it in its service, then power of the stabilizer shall be equal with the power of transformer.
- Diapason of input voltage, the voltage that shall be stabilized, is to be ± 20% of three phase voltage 380 V and its mono-phase 220 V
- Output voltage shall be 380 V / 220 V tolerance +- 1 %
- Voltage frequency of shall be 50 Hz

Mounting of stabilizer shall be made:

- In cases when there is a transformer in school, in the transformer room, cable shall be inserted in measurements apparatus, from outlet of the low voltage of the transformer and its output run in output of the stabilizer and from here in the main distribution board of the school.
- In the case when the energy supply of the object is provided by a low voltage cable, so the transformer supplyer other consumers, as well, stabilizer shall be mounted in the cabin where the main distribution panel shall be settled and mounted after the measure apparatus of energy and before the main distribution panel.

8.8 Supply system of the medium voltage

8.8.1 Connection point

Connection point with medium voltage is fixed by Electric Section that covers the distribution network area where the object shall be built and depending on the load be supplied with the electrical energy.

Electrical projector of the object shall come to the effective electric section, together with requirement for its power installation.

At the connection point a voltage separator for new shall be put line. In case the connection point is in a pillar, in outside area, earthing of all metallic part must be done (holder construction of the separator, opening system of the separator etc.) and atmospheric protection shall be made .

Technical data of the separator shall be fixed from the projector electrical engineer in the base of existing line where the connection shall be made, to the load that shall supply this line, and the length of the new line.

8.8.2 Line of the medium voltage

Line of the medium voltage that start from the connection point up to the transformer cabin of the object may be build in two ways: aerial or cable. Each of these two manners must comply with the applicationapply conditions of MV of the Local Electricity Authoritys regulations.

In case if the transformer room is settled inside the object, then medium voltage line must be made cable and must be laid according to the technical conditions of the Local Electricity Authority regulations: min 1 m depth, be covered with 20 cm sand, to be settled with bricks, and an tape with the sign "Danger, High Voltage"

Medium voltage cables according to the voltage transmission are divided: 6kV, 10kV,20kV

According to the isolation kind we have: Cable with PVC cloth with metallic sheet screening and clothing with isolated paper and metallic sheet screening.

According to the kind of conductor: with cooper conductor and aluminium conductor.

In this case accounting the dimensions of the cable we have to take into consideration not only the load and the coefficient of changing the earth temperature, but also the coefficient of density of cable in channel.

In case the transformer room is settle out of the object (inside enclosure) but not pass in the yard of the school/kindergarten then medium voltage line may be aerial to be laid according to the technical conditions of the Local Electricity Authority's regulations.

Pillars to be used for these lines must be min 8 m high, in uninhabited area and 10m in a inhabited area (for 6kV voltage).They shall be inserted min 1.5m depth in the ground and to concentrate in a manner to be immovable

Insulators of medium voltage line must be according to the voltage:6kV,10kV, or20kV.

Traverse to be used may be of the type Y or L, according to the case where the distance of the mounting of insulators is to be applied in it. They shall be also galvanized or painted with anti – corrosion paint.

Air or cable line can be done with cooper or aluminium conductor.

Taking into consideration the dimension of air line conductor we must consider not only the load but alsothe coefficient of temperature changing and the influence factor and the manner of laying and density.

8.8.3 Disconector, Fuses, Discharge of low voltage.

Disconector, fuses, discharge of low voltage are devices to be fitted in the transformer room in the base of network voltage and can be at the voltage 6kV,10kV,or 20kV.

Their amperes depend on the load to hold and must be calculated by the projector electrical engineer.

They shall be mounted on a holder metallic construction, which is fixed on the wall of the transformer room and connected with its earthing system.

8.8.4 Transformer

Transformers to be used are lowering.

Transformers can be classifed according to the building type:

- Oil Type
- Dry type

According to the manner of voltage regulation there are:

- Transformer without regulation
- Transformer with scale regulation

Taking into consideration the conditions of electrical energy supply in Albania, the transformers with voltage 3 or 5 scale are recommended.

Its output voltage depends on the communal network voltage and may be 6kV,10kV,or 20kV

Output voltage is a low voltage 380/220V.

Power of the transformer that shall be installed depends on the load to be supplied and in the base of the power it can be settled on the pillar for power up to 220 kVA or in a room with more power according to the local technical conditions for these cases.
Following are introduce some technical conditions that must comply, which are taken from the type of the transformer with oil.

- Power in kVA according to the load
- Uc for transformer up to 630 kVA until 4%.For bigger transformers6%-6.25%.
- CosΦ=0.8
- I_0 in %max .5
- Noises in dB 55, for transformer 25kVA

Detailed introduction is given in the following table.

Power	Uc	V%		Io	Noises
kVA	%	Cos Φ=1	CosΦ=0.8	%	DB
25	4	3.19	4.00	5	55
50	4	2.65	3.91	4.6	57
100	4	2.3	3.79	3.8	60
160	4	2.03	3.68	3.4	64
200	4	1.91	3.62	3	66
250	4	1.82	3.58	2.6	67
315	4	1.75	3.54	2.4	68
400	4	1.67	3.50	2.2	69
500	4	1.61	3.47	2	70
630	4	1.5	3.41	1.9	72
800	6	1.55	4.68	1.8	73

In following table the dimensions for these types of transformers are introduced.

Power	Length	Width	Height	Weight
kVA	mm	mm	mm	Kg
25	950	550	1050	310
50	1000	570	1100	430
100	1150	650	1150	520
160	1200	700	1200	650
200	1250	750	1250	800
250	1300	800	1300	880

315	1350	820	1350	1000
400	1400	850	1450	1250
500	1500	930	1500	1450
630	1600	970	1550	1650
800	1700	1050	1650	2000

SEKSIONI 9 HYDRAULIC AND SANITATION INSTALLATION

9.2.1 Pipes of Water Supply systems

In the water supply systems of buildings will be used PPR (Polypropylene Random) pipes. It will be in accordance with international quality standards ISO 9001 or DIN 8078 (Quality and Test Requirements for pipes). With writing request of supervisor, there can be used stainless steel pipes in a way that conforms to above international standards for quality and test.
Note: The weight of PPR pipes is 15 times less of stainless steel.

The Pipes of water supply systems should be excellent resistant against corrosion and chemical agents, resistant against hot water, low weight, ease of maintenance for repair and transport, simple welding and fast installation, long working life over 30 years.

Properties of PPR pipes are as follows:

- Density of material PPR 0,9 g/cm3
- Temperature of welding 146 grade Celsius
- Thermal conductivity in 20 degree 0,23 W/mK
- Thermal Linear expansion coefficient 1,5 x 0,0001 K
- Measure of elasticity in 20 degree 670 N/mm2
- Stress against leakage in 20 degree 22 N/mm2
- Stress against the broken in 20 degree 35 N/mm2

Diameters of pipes depend from calculation flow of drinking water and flow velocities. The flow velocity should be 0,8-1,4 m/sec.

The lengths of pipes should be 6-12 m. Diameters and thickness should be in accordance with data of technical drawings. All data on diameters, pressure, name of manufacture, year of production, etc should be stamped on every pipe.

Water supply pipes will be installed on parts of building (as columns) where are installed sanitation equipment. They will be installed near of drinking water equipment. They will be installed inside the walls. If the length of them is large, there will be installed the compensatory simple type (with simple bend) or type omega.

Water supply pipes will be connected with sanitation equipments every floor. The connection of water supply pipes with discharge columns should be made with fitting type Tee or bend. If you want to reduce the number of columns, you should put all sanitation equipments in a group for each floor of buildings. All groups should be in a direction of columns. The diameters of vertical columns of water supply should be same in every floor of the building. The diameter of each column should be largest from biggest connection pipes.

The slope of main horizontal lines should be minimum 2 %. The distance between sewerage pipes and water supply connection should be minimum 1 m in horizontal level.

PPR pipes may be connected with electro fusion welding method using special welding equipments. This method guarantee long life of pipes, sure connection and homogenate of welding. The welding process can continue a few minutes (depend from the thickness and diameters of pipes. The cutting of pipes, their welding and other fittings during this process should made with special welding equipment.

The welding process with electro fusion will be as follows:

- Should be prepared the welding equipment with electro fusion methods and their parts for diameters of pipes that we will connect.
- The welding equipment will be connected with electric power in a socket and we will check working lamp.
- We will wait some minutes that the welding temperature will be 260 degree Celsius
- Should be marked the depth of welding with a conductivity pencil.
- The pipes and their fittings should be cleaned before the starting of heating process.
- Start the heating process and welding process. Time of heating, welding and cooling are given in the tables as follows:

Outside Diameter of pipes in mm	Period of heating In sec.	Period of welding process in sec.	Period of cooling in min
16 mm (1/2")	5	4	2
20 mm (3/4")	5	4	2
25 mm (1")	7	4	2
32 mm(1.1/4")	8	6	4
40 mm(1.1/2")	12	6	4
50 mm(1.3/4")	18	6	4
63 mm (2")	24	8	6

- The end of the pipe will put to heating hole of equipment and fitting will put in another side of welding equipment. Ends of pipes and fittings should be welded after their heating (according to the above table). After their welding, The pipes and fitting will be staid some minutes for cooling. Note: For different diameters of pipes have different time for heating, welding and cooling (see table).
- After the finish of this process, Pipes are ready to use.

If will use stainless pipes, their connection will be with filet. Should be sure that the connection has not leakage.

All works of installation should be perfect and in accordance with technical requirements of project and Supervisor.

A sample of drinking water pipe with their quality certificate, origin certificate and warranty certificate must be previously submitted to the Supervisor for the initial approval before installation on the object. Supervisor can make additional test on physical, Mechanical and thermal properties, pressure, leakage, etc (Pressure test is 1.5 time of working pressure).

9.2.2 Fittings for pipes of Water supply

In the water supply networks of building where are used PPR (Polypropylen Random) pipes, the fitting should be made by Polypropylen Random materials. It will be in accordance with international quality standards ISO 9001 or DIN 8078 (Quality and Test Requirements for plastic pipes).

The fittings are as follows:

- Simple elbow with 45 degree and 90 degree
- Elbow with metallic filet, type male and female;
- Simple Tee and Tee with filet type male and female;
- Cross
- Simple socket
- Transition joint hexagon male and hexagon female;
- Reductions, different type;
- Transition Joint two side welded (Dutch type);
- Wall support clamp;
- Crossovers;
- Compensatory type omega;
- End Cup.

The designer should give all types of fittings in Design drawings or technical specification.

In accordance with request of supervisor, can use stainless steel pipes conform above standards for quality and test of pipes. In this case, the fittings should be made by stainless steel.

The fittings of water supply systems should be excellent resistant against corrosion and chemical agents, resistant against hot water, with low weight, ease to maintenance for repair and transport, simple welding and fast installation, long working life over 30 years.

The properties of PPR fittings are as follows:

- Density of material PPR 0,9 g/cm3
- Temperature of welding 146 degree celsius
- Thermal conductivity in 20 degree 0,23 W/m.K
- Thermal linear expansion coefficient 1,5 x 0,0001 K
- Measure of elasticity in 20 degree 670 N/mm2
- Stress against leakage in 20 degree 22 N/mm2
- Stress against the broken in 20 degree 35 N/mm2

The inside diameters and thickness of fittings should be adapted with PPR pipes that are given in the drawings and technical conditions. (Thickness of fittings should be for 1,5 time of pipe pressure). Data on the outside diameters of fittings (elbow, Tee, reduction, socket,etc), pressure, name of manufacter, standards, year of production should be stamped on each piece.

PPR fittings may be connected with electrofuzion welding method using special welding equipment. This method guarantee long life of pipes, sure connection and homogenate of welding.
The welding process can continue a few minutes (depend from the thickness and diameters of pipes. The cutting of pipes, their welding and other fittings during this process should made with special welding equipment.

The welding process with electrofuzion will be as follows:

- Should be prepared the welding equipment with electrofusion methods and their parts for diameters of pipes and fittings that we will connect.
- The welding equipment will be connected with electric power in a socket and we will check working lamp.
- Will wait some minutes that the welding temperature will be 260 degree celsius
- Should be marked the depth of welding with a conductivity pencil.
- The pipes and fittings should be cleaned before the starting of heating process.

- Start the heating process and welding process. Time of heating, welding and cooling are given in the tables as follows:

Outside Diameter of pipes in mm	Period of heating In sec	Period of welding process in sec.	Period of cooling In min.
16 mm (1/2")	5	4	2
20 mm (3/4")	5	4	2
25 mm (1")	7	4	2
32 mm(1.1/4")	8	6	4
40 mm(1.1/2")	12	6	4
50 mm(1.3/4")	18	6	4
63 mm (2")	24	8	6

- The end of the pipe will put to heating hole of equipment and fitting will put in another side of welding equipment. Ends of pipes and fittings should be welded after their heating (according to the above table). After their welding, The pipes and fitting will be staid some minutes for cooling. Note: For different diameters of pipes have different time for heating, welding and cooling (see table).
- After the finish of this process, fittings are ready to use.

If will use stainless steel pipes, the pipes will connect with fittings with filet. In this case, all fittings are metallic with filet. During the jointing process, should be sure that the connection has not leakage.

All works of installation should be perfect and in accordance with technical requirements of project and Supervisor.

A sample of drinking water fittings with their quality certificate, origin certificate and warranty certificate must be previously submitted to the Supervisor for approval before installation on the object. Supervisor can make additional test on physical, Mechanical and thermal properties, pressure, leakage, etc (Pressure test is 1.5 time of working pressure).

9.2.3 Valves

The valves are special tools that shall be used regarding the flowing control in the water pipelines. With the help of the valves it can be changed the flowing quantity or the flowing can be completely interrupted. The valves can be of bronze, pig iron or PPR material. They are spherical, of join type, filleting type or with flangen.
The valves of joining type to the pipes are divided in: with flangen and with fillets.

The valves consist of the following parts:

- Cylindrical body of bronze or pig iron. In this body should be fixed the respective flangen, which enable the valve joining to the network pipeline.
- The sphere, which should enable the opening and closing of the valve. They are of steel or bronze material and should be resistant to the corosion, mechanical attacks, etc.
- The bar, which is connected to the center of the turning, which realises the opening and closing of the disc through routation vertical removal.
- The valve shutter, which is fixed by screws to the cylindrical body of the valve or by filleting.

The valves used in a water supply line shall afford a pressure 1,5 times more than the working pressure. They should face a minimal pressure of 10 atm.

The valves should provide a perfect resistance to the corosion, resistance to chemical agents, light weight, easily repairing and transport, duration over 25 years and resistance to the mechanical attacks.

In special cases, when requested by the design or the supervisor, can be used also one way valves. These are placed in the sucking pipe or in the distribution one. Their installation should be done in the main building entrance.

Regarding the water supply system of the buildings, in cases when shall be utilised plastic tubes PPR (Polipropilen Random), the respective valves can be PPR, which meet the quality conditions according to ISO 9001 and DIN 8078 standard (quality and testing requirements).

All the works related to their installation and placing in situ shall be according to the technical requirements of the supervisor and the design.

A valve sample, which shall be used supported by the quality, origin, testing, and warranty certificate, is to be given to the Supervisor for approval before placing in situ. The supervisor can make suplementary testing regarding their physical-mechanical-tarmac situation, possible flowings and pressure proof after the installation (pressure test shall be done with 1.5 times of the working pressure).

9.2.4 Water Reservoirs

The water Reservoirs should provide the pressure and quantity of water in the building during the day. Their volume and other technical specification (pressure, quantity, etc) should be given by the designer depending from daily water consumes.

The volume of water reservoir should be calculated depending from scheme of project as follows:

a- If will be installed only the water reservoir on the building, the volume of water reservoir will be calculated as follows:
   V = (0,5-0,8) x Qd
   Where Qd is daily quantity given in m3

b- If will be installed the water reservoir and water pump on the building, the volume of water reservoir will be calculated as follows:
   V = (0,2-0,3) x Qd
   Where Qd is daily quantity given in m3

The volume of water reservoir on the building should be less than 25 m3.

If the project has special requirements for protection against the fire, the volume of water reservoir will be calculated for a water reserve of ten minutes that will supply all internal hydrants.

The water reservoir will be made up to plastic materials, steel with zinc covering or stainless steel. Their form can be circular or quadrangle. This form is depending from the installation place and requirement of project. The calculation of thickness for reservoir materials will be depending by the volume of reservoir and their forms but the thickness can not be less than 1 mm.

The water reservoir is composed as follows:

1- Pipe of water supply. In this pipe will be installed a swimming non-return valve
2- Distribution pipe. In this pipe will be installed a non-return valve.
3- Overthrow pipe will be installed not less than 150 mm from the cover of reservoir
4- Discharge pipe will be installed in lowest part of reservoir. It will have a control valve
5- Signal pipe (as request of supervisor) will be installed 20 - 30 mm under the overthrow pipe
6- Swimming Gallant
7- Water boiler

Diameters and lengths of above pipes will be depending by the water volume and the connection with internal water supply network that are given in technical drawings. All pipes should be made up to galvanised steel pipes (in the case of metallic reservoir) or PPR pipes (in the case of plastic reservoir)

The water reservoir will be installed on the special part of building. Depending by the selected scheme, they can be installed on terrace of building or basement of building. They will be installed on the wooden special parts that are connected with a stainless steel sheet with minimum thickness 2mm. This basement of reservoir will protect the slab or other part of building against moisture, leakage or condensation of water.

All works of installation should be perfect and in accordance with technical requirements of project and Supervisor. A catalogue with technical data of water reservoir, quality certificate, origin certificate and warranty certificate with minimum 1 year must be previously submitted to the Supervisor for approval before installation of the pump on the object.

9.2.5 Water pumps

The water pump should provide the requested pressure and quantity of the building during the day. They will be installed in accordance with requirements of project. The pump can be centrifugal type or submersible type. The water pump will have water meter, manometer, the connection pipes with water supply system, electric panel, the electric protection system, automatic thermal protection system and automatic control system.

Requested the designer depending by the daily requirement of water consumer should give pressure, quantity, power and other technical specification in technical drawing.

If the water supply system is foreseen with only pump, The quantity of pump should be equal with maximum water daily quantity per sec.

If the water supply system is foreseen with pump and water reservoir, the quantity of pump should be in accordance with using daily diagram and water supply diagram.

During the calculation of supply height of pump (requested pressure) should be taken in consideration the height of building, water pressure of the external water supply system and water local losses in bend or other parts of building.

The Power of pump will be calculated as follows:

N = Q x H / 102 x n

Where: *Q = water quantity that will be pumped in l/sec*
H = Water supply Height
n = efficiency of pump. The efficiency of pump should be more than 65 %. This will be given by manufacture.

The installation scheme of pump should be given by technical drawings.

If the project has special requirements for protection against the fire, the another pump should be installed as reserve. The characteristic of this pump will be in same with the first pump. Investor or supervisor before the installation of pump in object should give the special requirement for pump.

Diameters and lengths of above pipes will be depending by the type of pump, technical characteristic of pump and the connection with internal water supply network that are given in technical drawings. All pipes should be made up to galvanised steel pipes, PE or PPR pipes

The water pumps should be installed on the special part of building that are suitable for service, warming and without moisture. Depending by the selected scheme, they can be installed on basement of building. They will be installed on the metallic special plates that are jointed with basement. The metallic plate is not connecting with foundation or walls of building. The pump will be installed on the rubber plate, pillow with sand or wooden plate to eliminate the sound during the works of pumps.

All works of installation should be perfect and in accordance with technical requirements of project and Supervisor. A catalogue with technical data of pump, qualities certificate, origin certificate and warranty certificate must be previously submitted to the Supervisor for approval before installation of the pump on the object.

9.2.6 Hot water system

Hot water systems are composed by thermal energy producer, distribution pipes and other equipment for supply of thermal energy.

Thermal energy producer (depending from the source of energy) can be thermal boiler, panel of solar energy or electrical boiler.

Thermal boiler can be used in the case of using as thermal source of coal, diesel or gas. This boiler ca be used in central heating system. In this case, should be foreseen the storage of material and sanitation protection area. The storage place of heating material should be 10-15 % of heating surface. Thermal boiler should be installed in the basement or first floor of building.

Panels of solar energy should be used in the case of using as thermal source of solar energy. They can be used in central or local heating system. Solar panels will be installed on the upper part of building in 45 horizontal degree. Their position will be in the front of south part of building and place with a long time of sunbeam. The condition of their work is water supply during all hours of the day. Their size should be calculated by designer depending from heating surface and the quantity of hot water. The Installation process should be given in the origin certificate by the manufacture.

Electric boiler can be used in the case of using as thermal source of electric energy. They can be used in local heating system. Electric boiler should be putting in every floor near of heating equipment of water. Their size should be calculated by designer depending from heating surface and quantity of hot water. The installation process should be given in the origin certificate by the manufacture.

For hot water system you should made two calculation:

1. **Thermal calculation**. Thermal calculation should be made to calculate the necessary quantity of heat and ventilation of area. During the calculation, should be taken in consideration thermal losses for position of building, his construction, output of heating using and thermal insulation.

2. **Hydraulic calculation**. Hydraulic Calculations should be made to calculate pressure losses during the moving of thermal agent (water) in the pipes of heating network and the size of pipes. The calculations are in same with calculation of drinking water supply system.

Designer should make all calculations. All data for pipes, included installation process, should be given in the notes of drawings.

For the hot water system of buildings will be used PPR (Polypropylene) pipes that will be in accordance with international quality standards ISO 9001 and DIN 8078 (Quality and Test Requirements for pressure and resistant against temperature of PPR pipes).

According to the request of supervisor, the contractor can use stainless steel pipes that are conforming above standards on their quality and test for resistant against high temperature and pressure.

The pipes of hot water supply system should provide resistant against high temperature (to 100 celsius degree), corrosion, chemical agents, simple possibility for repair, simple and fast welding, long working life and resistant against hot water.

Properties of PPR pipes that will use for heating water supply system are as follows:

- Density of material PPR 0,9 g/cm3
- Temperature of welding 146celsius degree
- Thermal conductivity in 20 degree 0,23 W/m.K
- Thermal linear expansion coefficient 1,5 x 0,0001 K
- Measure of elasticity in 20 degree 670 N/mm2
- Stress against leakage in 20 degree 22 N/mm2
- Stress against the broken in 20 degree 35 N/mm2

Diameters of pipes depend from calculation flow of drinking water and flow velocities. During the calculation, the flow velocity should be 0,8-1,2 m/sec.

For more information see point 9.2.1.

At the hot water pipes should be installed the compensatory, type **U** or type omega because the pipes has linear deformation from hot water. The material of compensatory will be cast iron or steel.

All works of installation and putting of hot water system in object should be perfect and in accordance with technical requirements of project and supervisor. Thermal and hydraulic test should be made before the using of pipes. Thermal test should be made in maximum temperature. They will be made to check the thermal losses and other technical data that are given in the project.

Hydraulic test should be made with pressure 1,25 time of working pressure. They will be made to check possibility leakage of pipes and stability of network.

A sample of hot water pipe, their fittings and thermal insulation materials with their quality certificate, origin certificate and warranty certificate must be previously submitted to the Supervisor for approval before installation on the object. Supervisor can make additional test on physical, Mechanical and thermal properties, pressure, leakage, etc.

9.3.1 Discharge Pipes

In the rainwater discharge system of buildings will be used PVC pipes. It will be in accordance with international quality standards ISO 4427 or prEN 12201 (Quality and test Requirements for pipes)

The Pipes should be excellent resistant against corrosion and chemical agents, low weight, easy of maintenance for repair and transport, simple welding and fast installation, long working life over 30 years.

The sizes of pipes will be depending from calculation flow of wastewater, flow velocities and full scale of pipes. The flow velocity should be 1,0-1,2 m/sec and the full scale of pipes should be 0,5- 0,8.

The lengths of pipes should be 6-10 m. Diameters and thickness should be in accordance with data of technical of drawings. All data on outside diamteres, pressure, name of manifacture, year of production, etc should be stamped on every pipe.

The discharge pipes should be installed on all parts of bilidngs (as columns) where are installed sanitation equipment. They will be installed near of wasterwater equipment. The discharge pipes should be be connected with sanitation equipment in every floor.Fitting type Tee with 45 degree or 60 degree should make the connection of discharge pipes with discharge columns. The connection of pipes with 90 degree is not recommended.The pipes should be installed on or under the slabs or inside of the walls in accordance with technical conditions of installation for internal sewerage networks. The pipes should be PVC pipes with above technical characteristics. Their length should be less than 10 ml. Their diameter should be depending from outlet of sanitation equipment that is installed.

The sanitation equipment should be in the groups to reduce the number of discharge columns. They will be installed in a vertical direction of all floors of building. Every vertical discharge columns will have checkpoints in every two floor. The diameter of columns should be in same in all floors of buildings. This diameter can not be less than diameter of biggest waste water pipe. The using of discharge pipes with diameter less than 0 mm is not recommended.

All works of installation and fixing in the object of them should be perfect and in accordance with technical requirements of project and Supervisor. The connection of the discharge pipes should be with special materials for PVC pipes in accordance with recommendation of pipe manifacture. If the land of basement is not strong, the discharge pipes should be installed in concrete channel or bricks channel.

A sample of PVC pipe with their quality certificate, origins cetificate and warranty cetificate must be previously submitted to the Supervisor for approval before installation on the object. Supervisor can make additional test on physical, Mechanical and thermal properties of pipes and special jointed materials of them. If the land of basement is not strong.

9.3.2 Fittings of water discharge pipes

The PVC fittings will be used for connection of discharge pipes with sanitation equipment and other part of sewerage system. . It will be in accordance with international quality standards ISO 4427 or prEN 12201 (Quality and Test Requirements for pipes).

The fittings (connection parts) should be excellent resistant against corrosion and chemical agents, low weight, ease of maintenance for repair and transport, simple welding and fast installation, long working life.

The sizes of fittings will be depending from calculation flow of wastewater, kind of santiation equipment, flow velocities and diameter of respectively pipes. The flow velocity should be 1,0-1,2 m/sec and the full scale of pipes should be 0,5-0,8.

Diameters and thickness should be in accordance with data of technical drawings. All data on outside diameters, lengths, pressure, name of manufacture, referred standard, year of production, etc should be stamped on every fitting.

The fittings of discharge pipes should be installed on all parts of building where are connected the sewerage pipes. Fitting type Tee or bend with 45 degree or 60 degree should make the connection of discharge columns with pipes.

The pipes should be installed on or under the slab or inside of the walls in accordance with technical conditions of installation for internal sewerage networks. The fittings should be made up to PVC material with above technical characteristics. Their length should be in accordance with requirement of project. Their diameter should be depending from outlet of sanitation equipment that is installed.

The diameter of fittings should be equal with diameter of discharge pipes. The smallest diameter is not recommended. If the pipes will change their diameter, the fittings should be adapted with them.

All works of installation and fixing of them in the object should be perfect and in accordance with technical requirements of project and Supervisor. The connection of the fittings with discharge pipes should be made by special materials for PVC pipes in accordance with recommendation of pipe manufacture. If the land of basement is not strong, the discharge pipes should be installed in concrete channel or bricks channel

A sample of PVC fittings with their quality certificate, origins certificate and warranty certificate must be previously submitted to the Supervisor for approval before installation on the object. Supervisor can make additional test on physical, Mechanical and thermal properties of pipes and special jointed materials of them.

9.3.3 Ventilation Pipes

The ventilation pipe are extension of upper part of discharge pipe. They will be installed until 70 - 100 cm over the upper part of roofing or terrace of building.

The ventilation pipe will provide the ventilation of internal and external sewerage network. This ventilation will provide the fast leaving of vapours from discharge columns and other vapours that are bot good for health of peoples.

Also, The ventilation pipe will connect the sewerage columns with atmosphere. So, They will improve the works of sanitation equipment siphons.

The diameter of ventilation pipes will be equal with diameter of discharge pipes. In the cold area, the diameter of ventilation pipe should be 50 mm biggest from discharge columns diameter.

The ventilation pipe can be made up to cast iron, steel sheet, galvanised steel sheet with thickness 0,6 mm. The material should be resistant against corrosion, atmospheric agents, metan, acetylene, ammoniac, benzoic and benzene vapours, etc.

On the ventilation pipe will be installed a cover that will be improved the ventilation of discharge columns.

The ellipsoidal equipment that are installed in ventilation pipes (depending requirement of project) can improve the ventilation of discharge columns. They will provide the fast leaving of vapour from discharge columns.

If the ventilation pipe is near of balcony or windows of neighbour building, The height of ventilation pipes should be biggest of neighbour building. In this case, the ventilation pipe should be 4 m from them.

An equipment group will have two ventilation tubes.

The ventilation pipe should be installed in upper part of discharge pipe. They will be protected by the strong wind. They will be installed in vertical position.

All works of installation and fixing of them in the object should be perfect and in accordance with technical requirements of project and Supervisor.

A sample of ventilation pipe must be previously submitted to the Supervisor for approval before installation on the object.

9.3.4 Floor Drain

The floor drain should be used for discharge of water from floor. They will be in accordance with international quality standards ISO 9001 and pr EN 12201, as described in the Technical Drawings. The floor drain set can make up in plastic, stainless steel or brass materials.

The floor drain set should provide the fast and large flow of the water. They should be resistant against mechanic shutting, corrosion and chemical agents. They should provide water insulation, simple possibility for the repair, transport and connection.

The parts of floor drain consist of:

- **Collector basin** in the Siphon form with D=80 - 120 mm. Their size is depending from the quantity of discharge water and the place of installation. Usually, the drains are circular but in some special case they are quadrangle with size 20-x 20 cm.
- **Water discharge tube with D=** 45 - 70 mm. The outlet pipe is in the body of collector basin. Their sizes are depending from the quantity of discharge water, kind of drain material and columns that are connected.

- **Cover with holes** is a part that will put on the collector basin. Their size is depending from the size of collector basin. The size and forms of holes are depending from quantity of discharge water, kind of floor and place of their installation. Usually, They are circular but the drains of the terrace of building are quadrangle.

The floor drain will be installed in the lowest part of the water collector basin. Usually, They will be installed near of centre of the floor. They can not be installed near of the connection of the walls with floor.

The floor drain set should be connected with discharge columns by PVC pipe or zinc steel pipes (The connection will be realised with a siphon type tube). The above connection will be made by fittings, type Tee, with 45 degree or 60 degree. The connection pipes should be PVC pipes (in same technical characteristic with other water sewerage pipes). The lengths of them should is 20-30 cm. Their Diameters should be in function of the outlet of the floor drain. If the diameter of floor drain is different from supply pipe, should be used the reductions fittings.

All works of installation and putting of floor drain in object should be perfect and in accordance with the project and Supervisor's technical requirements. The connection of floor drain with discharge pipes should be with special materials for PVC pipes in accordance with recommendation of manufacture.

A sample of floor drain with their quality certificate, origin certificates and warranty certificate must be previously submitted to the Supervisor for approval before installation on the object. Supervisor can make additional test on physical and mechanical properties of floor drain and welding materials.

9.3.5 Insulation of Pipes

The water insulation of pipes should be used to provide the protection of walls and floor from leakage of water. The water insulation of pipes consist of 3 goals as follows:

- **To eliminate the leakage in connection of pipes and their fittings**. The linen thread or Plastic materials that are given will make the water insulation from manufacture. The insulation materials should be putting in the filet of pipes and their fittings. Before the filet of two connection parts, this material should be painted with materials that are resistant against rust.

If will be used the PPR pipes, the water insulation should be made as described in item 94.

If will be used steel pipes, type cups, the water insulation in their connection will be made by rubber water stop between their flange.

In all above cases, The pressure test for leakage should be made in 1,5 time of working pressure.

- **To eliminate the moisture of walls or floor by water condensation** during the heating and cooling of pipes. In this case, the pipes should be protecting by a cloth materials or rubber material.

- **To protect the pipes from rust.**

The water insulation should protect the walls from moisture. The water insulation should provide the protection of connections from leakage, resistant of pipes against corrosion and rust.

If the designer will request the water insulation of pipes with bitumen, the water insulation will be made up to technical standards and requirements of supervisor for water insulation with bitumen. The description of this method should be given in the project. (painting with primer, insulation layers, kind of bitumen and insulation materials).

All works of installation and water insulation of pipes should be perfect and in accordance with the project and Supervisor's technical requirements.

9.3.6 Pits

According to the role they play pits are classified as:

- Waste water control pits.
- Rainwater & drainage collecting pits.
- Guiding (commanding) pits for drinking water pipes.

All the above-mentioned types of pits may be of pre-cast reinforced concrete slabs or concrete cast at the site.

The following procedure will be followed for the pits with pre-cast elements:

- Pre-determined section excavation in terrain of whatever nature and relocation of resulting material.
- Placing of pre-cast concrete and their connection with cement mortar, in good working order.
- The placing of the systems pipes and covering of spaces with mortar.

The pits in themselves have two important elements as described below:

- The pit construction element.
- The pit covering
- The descending stairs (for pits deeper than 1 m)

The construction of the pit is realized according to the following order and elements:

- Pre determined section excavation in terrain of whatever nature and relocation of resulting material.
- River stone bedding layer
- Impermeable concrete layer flooring type m-200 in dosage as indicated in 4.1.4 adding in the mixture impermeability feature elements.
- Impermeable concrete walls of type m-200 me in dosage as indicated in 4.1.4 adding in the mixture impermeability feature elements.
- Impermeable concrete upper layer of type m-200 in dosage as indicated in 4.1.4 adding in the mixture impermeability feature elements. The supporting frame for the pit cover is also cast in concrete.
- The installation of the pit cover.

The pit cover is made of two elements:

- The supporting frame.
- The cover.
- The measures of the pit cover will depend on its function allowing for a free enter/exit of a person.

The pit cover and it's frame will be of cast iron.

Pits shall meet the following technical requirements:

- External load support.
- Ground pressure.
- Water pressure.

The load support runs under the three following classes (A, B, C),:

- Class A- pits for pedestrian areas shall support up to 15 t weight.
- Class B- pits for car traffic areas, which, shall support up to 25 t weights.

Class C- pits for car traffic areas, which, shall support up to 40 t weights.
The water pressure coefficient shall be 2 t/m³.
The water pressure coefficient from outside up 0.5 m under the upper level of the cover, shall be 1 t/m³ and from inside with the fully filled.
Stairs shall be installed in pits deeper than 1 m, which are used to facilitate entrance/exit. The stair shall be of corrosion resistant material (zinc). The stair is installed in the process of concrete walling of the pit with part of it fixed with concrete.
Pit dimensions will depend on its function and be determined by the designer.
Some pit types, covers and cover frames with the related technical data, are presented in the following table.

Technical data of a frame



Technical data
Height
150 mm

Submerging depth
13 mm

Ø exterior
789 mm

Ø interior
625 mm

Technical data for cast iron pit cover



Technical data
Height
120 mm

Ø external
730 mm

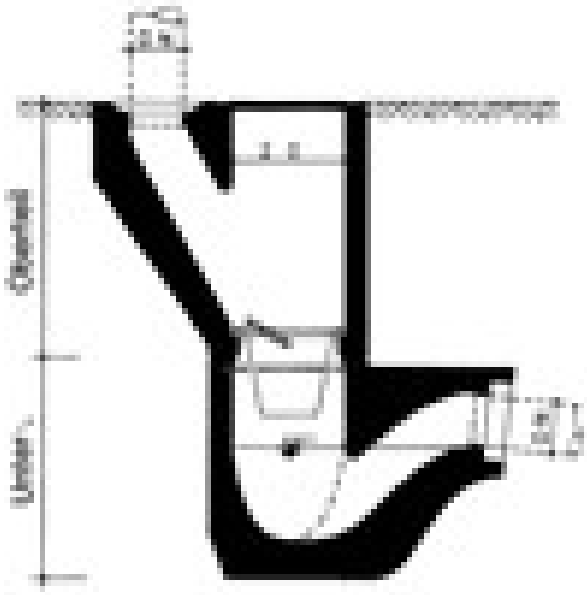
ventilation space
170cm^2, must be=40 cm^2

Ø of operational circle
46 cm

Space resting on the frame
60.000 mm^2=6,7 N/mm^2

Openings position
3 x 120°

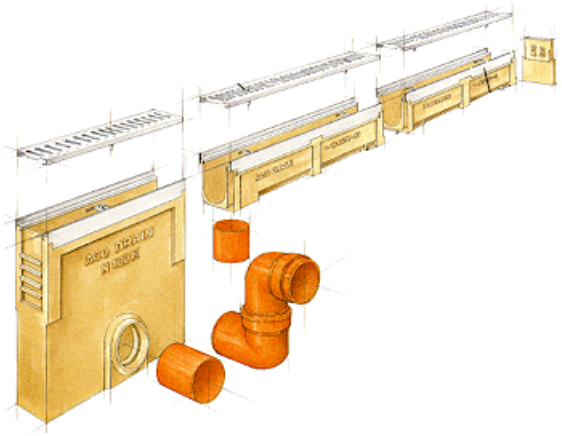
Closing force
Opening force
Approx.20kg



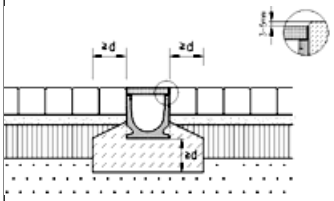
A detail of a rainwater leakage pit, with an irreversible cup, is presented in the above figure.

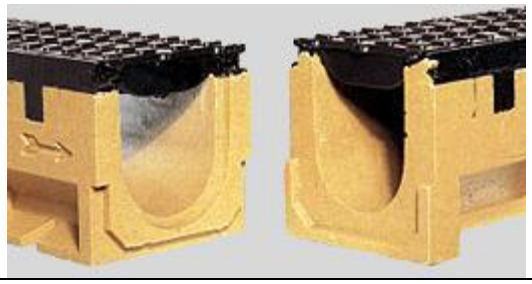
Some examples on the rainwater management, collection and conveyance are shown in the following figures.

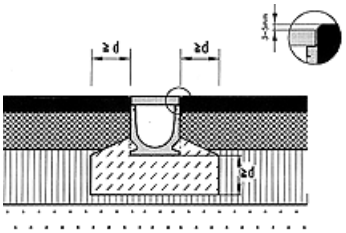
The rainwater leakage pits shall be of a rectangular form, not less than 50 cm deep. They will be of the dimensions 50x50x50, with iron or iron-cast grate cover with cover spacing of 25 to 35 mm.











9.4 Rain water drainage

Rainwater droning collected by the roofs and terraces is an important moment (point) during the design process of a building.
The rainwater shall be either channeled to the existing local channeling system or be collected and exploited for the irrigation of the terrain (landscape) or for some other purpose.
The roofs, balconies, terraces and other construction elements shall be drained through a gutters and pipes system. If the rainwater does not harm the landscape and terrain, the drainage system may not be linked with the existing channel network and be installed in such a way as to allow for the infiltration into the soil (ground).

9.4.1 Pipes and other element

A system of gutters and pipes is necessary for the drainage of the building elements. The drainage system components shall be water resistant and other extreme natural conditions resistant material. The pipes shall be hermetical and capable of enduring without any damage a pressure of at least 0.5 bars. The welding of pipes shall be perfectly executed under the supervision of the architect (designer)

The metal-sheet drainage pipes shall be allowed only for outside the building. If indoor installation is necessary then plastic tubes or some other material shall be used.

The gutters as system's elements may me be of various material but they shall be of the same material with the pipes they shall be linked with. The shall be of U form, rectangular form or some other form.

9.4.3 Insulation of pipes

In the case when pipes are placed inside of building, they should be insulated in a such manner not to cause noises. For their insulation form should be investigated the market and should decide the architect/engineer together with the client.

9.4.4 Pits

For the gathering of rainwaters it preferable to be placed a special pit, in which the water will gather and exploited according the necessities. In some cases the rainwater are gathered in same pit with wastewater.

The pits construction for the rainwater, it's the same as the waste water pits. This is described in the Chapter of Waste Water System 9.3.6.

The dimensions of these pits depends on their placing in object and chance by the minimal 50x50x50 cm till 100x100x100 cm.

The covers of these pits are by cast iron pit material and have splitting with width 2-3 cm in order to impede the trash and also to enable the water drainage.

9.5.1 Water Closet (WC) set and flash box

In the Toilet rooms and washing parts Water Closet (WC) sets should be foreseen. The WC sets are porcelain sanitary toilets made of in Porcelain materials in accordance with international quality standards ISO 9001, as described in the Technical Drawings from designer. The Type of WC set can be Oriental (Turkish) Type or Modern (French) type. Oriental Type will be installed directly on the floor with cement mortar. They will be putt in accordance with the Supervisor's requirements.

The WC sets, Modern (French) Type will be strongly fixed on the floor or to the wall by brass clamps and screw plugs and screws, without creating gaps in the wall tiling. WC set will be connected with water discharge pipes before the installation on the wall by brass clamps. The outlet of the WC set can be under the body of the set or on the backside of the WC set. The WC set with side outlet should be 19 cm high from floor level.

In the lowest part of the collector basin will be a hole with minimal diameter of D= 90 mm. The upper part of WC set can be oval or circular in accordance with the project requirements and WC set type. The height of WC set, Modern type, is 38-40 cm. They will be installed in accordance with the project and Supervisor's requirement. Horizontal Distance between WC Sets and other sanitation equipment (Wash basin, bidet, etc) should be minimum 30 cm.

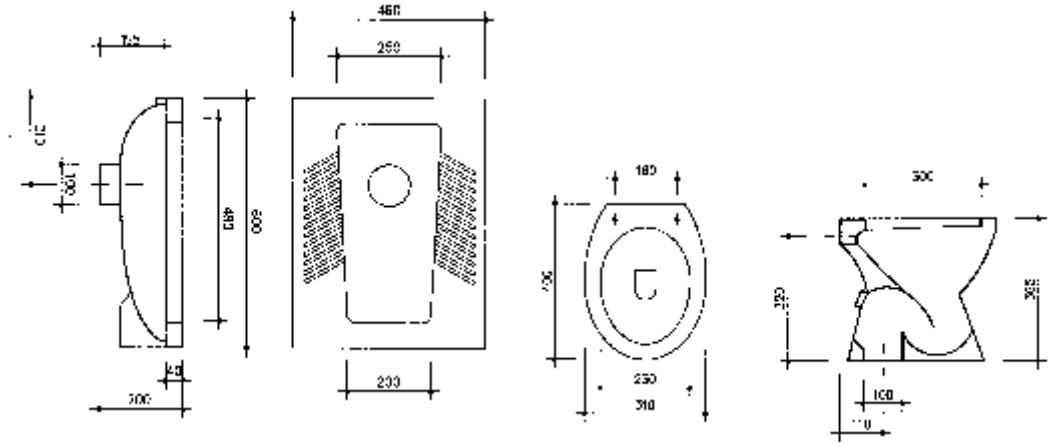
WC sets should provide a fast and big water flow. They should be resistant against mechanical shutting, corrosion and chemical agents. They should provide water insulation, good condition during the work and easy access for the repair.

The WC set should be connected with sewerage pipes (The connection will be realized with a siphon type tube). The connection pipes of WC sets should be PVC pipes (of the same technical characteristic with other sewerage pipes). Their Diameters should match the outlet of the WC set (Usually their diameter is 100-110 mm).

The WC set will be connected with drinking water system. The connection will be realized to a flash box that can be installed directly on the WC set or on the wall (separately from the WC set). This depends on the type of WC set. The flash box will be installed in the height of 1,5 m high from floor level. The flash box made of metal; plastic or porcelain materials will be in accordance the project and quality standards ISO with requirements. The sewerage pipe will be fixed on the wall every 50 cm.

All the supervisor technical requirements to complete the work in a first class should be included. The connection of the WC set with the sewerage pipes should be done by special materials for PVC pipes in accordance with the recommendation of the pipe manufacturer. Sample of the WC set together with quality certificate, certificate of origin, test certificate and warranty certificate will be submitted to the supervisor for the initial approval before WC installation at the site. The WC set technical data (including WC type, working pressure, name of the manufacturer, standards and year of production) should be given in the catalogue. The supervisor can conduct on additional test for the mechanical and physical data.





9.5.3 Urinal set

In the Toilet rooms and Washing parts the installation of Urinal sets should be foreseen. The Urinal sets are porcelain sanitary toilets made of Porcelain material in accordance with the international quality standards ISO 9001, as described in the Technical Drawings from designer. They will be installed directly on the floor with cement mortar. They will be put in accordance with the Supervisor's requirements.

The Urinal sets will be strongly fixed to the wall by brass clamps and screw plugs and screws, without any gaps in the wall tiling. Urinal set will be connected with water discharge pipes before the installation to the wall by brass clamps.

In the lowest part of the collector basin there will be a hole with minimum diameter of D= 50 mm. The upper part of the Urinal set can be oval or circular in accordance with the project requirements and the Urinal set type. The Urinal set height, Modern type, is 55-70 cm. They will be installed in accordance with the project and Supervisors requirement. Horizontal Distance

between Urinal Sets and other sanitation equipment (Wash basin, bidet, etc) should be minimum 30 cm.

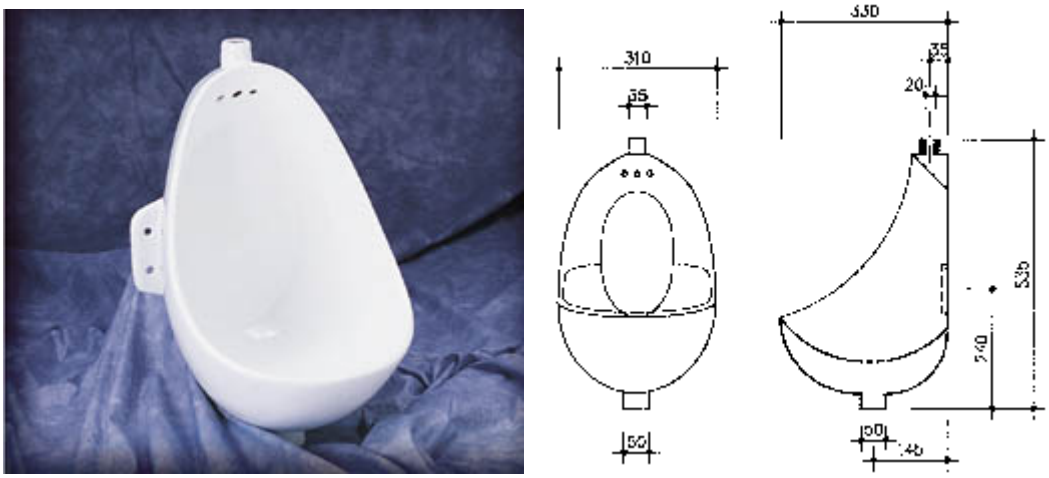
The Urinal sets should provide a fast and big water flow. They should be resistant against mechanical shutting, corrosion and chemical agents. They should provide water insulation, good condition during the work and easy access for the repair.

The Urinal set should be connected with sewerage pipes (The connection will be realised with a siphon type tube). The connection pipes of urinal set should be PVC pipes (in same technical characteristic with other sewerage pipes). Their Diameters should match of the outlet of the urinal set, but be of the minimum diameter of 50 mm.

The Urinal set will be connected with drinking water system. The connection will be realised with a flash box that can be installed directly on the wall (separately from the urinal set). The cassette will be installed in a height of 1,5 m high from floor level. The flash box made of metal; plastic or porcelain materials will be in accordance with the project and quality ISO standards requirements. The sewerage pipe will be fixed to the wall by brass clamps and screw plugs and screws every 50 cm.

All the supervisor technical requirements to complete the work in a first class should be included. Special materials for PVC pipes in accordance with the pipe manufacturer's recommendations should do the connection of the urinal set with the sewerage pipes.

Sample of the urinal set together with the quality certificate, certificate of origin, test certificate and warranty certificate will be submitted to the supervisor for the initial approval before the fixing at the site. The technical data of the Urinal set (including the Urinal type, working pressured, name of the manufacture, standards and year of production) should be given in the catalogue. The supervisor should make an additional test for the mechanical and physical data.



9.5.4 Wash Basin sets

In the Toilet rooms and washing parts Wash Basin sets should be foreseen. The Wash Basin sets are sanitary equipment for washing hands, face, etc. Wash Basin set can be made of metallic materials, Porcelain materials or in site. Material type for Wash Basin set will be in accordance with the international quality standards ISO 9001, as described in the Technical Drawings from designer.

The Washbasin sets should provide a fast and big water flow. They should be resistant against mechanical shutting, corrosion and chemical agents. They should provide water insulation, sound insulation, and good condition during the work and easy access for the repair.

The Wash Basin and their support will be strongly fixed to the wall by brass clamps and screw plugs and screws, without any gaps of the wall tiling. Washbasin set will be connected with water discharge pipes before the installation to the wall by brass clamps. The outlet of the WC set can placed be under the body of the set or in the backside of the WC set. The WC set with side outlet should be 19 cm high from floor level.

In the lowest part of the collector basin will be a metallic hole with minimal diameter of D= 40 mm. The size of collector basin is 40/60 cm x 36/ 45 cm (depending the type and model). The collector basin can be oval or circular in accordance with the project and type requirements. The height of the Washbasin set is 75 - 85 cm. They will be installed in accordance with the project and Supervisor's requirements. Horizontal distance between the Wash Basin Set and other sanitation equipment (Water Closet, bidet) should be minimum 30 cm.

Wash basin in site, according to the indications in the drawings and of the Supervisor of works formed from**:**

- N. 2 brick supporting walls in full brick and lime mortar with the following dosage per m3 according to the technical conditions of mortar preparation (n. 434 bricks, 0,17 kg of mortar, 27 kg of cement and necessary water).
- Base lightly reinforced slab, realized in concrete (type 200) with dosage per m3 as technical conditions including formwork, propping.
- Supply and installation of mixer set for basin with plug and chain, taps and spout, siphon tube, etc.
- Tiling of vertical and flat surfaces in the ceramic tile of first quality.

The Washbasin set should be connected with sewerage pipes (The connection will be realized with a siphon type tube). The above connection will be made by fittings, type Tee, with 45 degree or 60 degree. The connection pipes of Washbasin sets should be PVC pipes (in same technical characteristic with other sewerage pipes). Their length should be 20 - 40 cm and their Diameters should match the outlet of the Washbasin set.

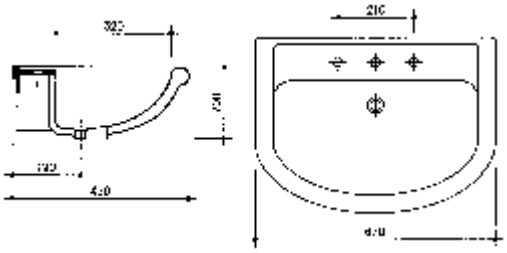
The Washbasin set will be connected with drinking water system. The connection will be realized with two flexible pipes with the length of 30 - 50 cm and diameter OD= 1/2 ". The pipes will realize connection of valves with pipes of hot and cold water system.

The Water Stop will be installed in the place of connection of valves with the washbasin set, because the water leakage should be stopped during the working time.

All the supervisor technical requirements to complete the work in a first class should be included. The connection of the Washbasin set with the sewerage pipes should be with special materials for PVC pipes in accordance with the pipe manufacturers recommendations.

Sample of the Wash basin set together with the quality certificate, certificate of origin, test certificate and warranty certificate will be submitted to the supervisor for the initial approval before the fixing at the site. The technical data of the Washbasin set (including the Wash basin type, working pressure, name of the manufacture, standards and year of production) should be given in the catalogue. The supervisor can conduct on additional test for their mechanical and physical data.





9.5.5 Sink sets

In the kitchens and cooking rooms Sink sets should be foreseen. The sink sets are sanitary equipment for plates, knifes, spoons washing of and discharge of dirty water. Sink set can be made up in metallic, plastic or porcelain materials. The material type for sink set will be in accordance with international quality standards ISO 9001, as described in the Technical Drawings from designer.

The Sink sets should provide the fast and big flow of the water. They should be resistant against mechanical shutting, corrosion and chemical agents. They should provide water insulation, sound insulation, and good condition during the work and easy access for the repair.

The sink sets and their support will be strongly fixed to the wall or suitable support that are constructed for them. Their fixing will be made to the wall by brass clamps and screw plugs and screws, without any gaps in the wall tiling. After their fixing to the wall, will be made the installation of the stopcocks and the connection of sink set with discharge pipes. The sink set will be connected with water discharge pipes before the installation to the wall by brass clamps. The outlet of the sink set will be under the body of the set. In the lowest part of the collector basin a metallic drain with the minimum diameter of D= 40 mm will be installed.
The sink set will have one or two collector basins with the dimension of 45x 36 cm per each. The dimension of sink set is 100/150 cm x 50 cm (depends on the type and model of the sink set). The width of the sink set is 50 cm.
There is a special part in the sink set that can be used for putting plates after washing. There can be used two water discharge plate types (**rhd** or **lhd)**.

The sink set should be connected with sewerage pipes by drain (The connection will be realised with a siphon type tube and metallic drain). Fittings, type Tee with 45 or 60 degree, will provide the above connection. The connection pipes of sink sets should be PVC pipes (in same technical characteristic with other sewerage pipes). Their length will be 20 - 40 cm and diameters should match the outlet of the sink set (the diameter of the metallic drain).

The sink set will be connected with drinking water system. The connection will be realized with two flexible pipes with a length of 30 - 50 cm and diameter of OD= 1/2 ". The pipes will realize connection of stopcock with pipes of hot and cold water system. The water Stop will be installed in the place of connection of stopcock with the sink set, because the water leakage should be stopped during the working time.

All the supervisor technical requirements to complete the work in a first class should be included. The connection of the Sink set with the sewerage pipes should be done with special materials for PVC pipes in accordance with the pipe manufacturers recommendations.

Sample of the sink set together with the quality certificate, certificate of origin, test certificate and warranty certificate will be submitted to the supervisor for the initial approval before the fixing at

the site. The technical data of the sink set should be given in the catalogue. The supervisor can make on additional test for their mechanical and physical data.

9.5.6 Stop Cocks

The stopcocks are special equipment that to be used for flow control in the water pipes. They are installed in the sanitation equipment (sink set, wash basin, bidet). They can be simple cock (only for drinking water) or complex cock (for hot and cold water system). A simple stopcock can be seeing in the point 9.2.3 (Valves). The stopcock can change the water quantity that will be discharged by sanitation equipment and can regulate the water temperature. The stopcock can be made up by brass, nickel or cost iron material. They can be ball type or door type.

The stopcock group includes the following parts:

- The body (brass or cast iron). Types and forms of bodies are different. The colour, type and form should be decided in the project and should be approved by Investor.
- Disc or Ball. It should allow opening and closing of the stopcock for hot and cold water. Also, It should regulate the quantity of water. Stainless steel or brass makes up disc or ball. They will be resistant against corrosion, mechanical shutting
- Lever that will connect the cock with the axis and will open and close the disc or ball.
- Water filter that will be fixed with filet. It will be fixed in the outside part of the cock and should provide the cleaning of water from dirty materials or minerals.
- Flexible pipes with length L = 30-50 cm that will connect cock with water supply pipes. The diameter of pipes is 1/2" or 3/8" depending on type of cock and pipes.

The water Stops will be installed in the place of connection of stopcocks with sanitation equipment and connection pipes, because the water leakage should be stopped during the working time.

The stopcocks should be resistant against corrosion, mechanic shutting and chemical agents. They will have best view. They should provide simple maintenance, working longivety and simple possibility for the repair.

Their working pressure should be 1,5 times of the working pressure of pipes. Minimum pressure for them should be 10 at.

All the supervisor technical requirements to complete the work in a first class should be included.

Sample of the stop cock together with the quality certificate, certificate of origin, test certificate and warranty certificate will be submitted to the supervisor for the initial approval before the at the site fixing. The technical data of the outside diameter, model, working pressure, name of the manufacture, standards and year of production should be given in the catalogue. The supervisor can conduct additional test for their quality and working pressure after installation (Test pressure should be 1,5 times of the working pressure).

9.6 Ant fire protection system (equipments)

9.6.1 Fire extinguishing (ant fire) cylinders

According to contemporary norms/standards are divided into classes. The European standard DIN EN 2 for e.g. distinguishes the following classes of the fire extinguishing cylinders.

Class A :
Used for fires originating from hard material i.e. timber, paper, textiles, plastics, etc.

Class B:
Used for fires originating from liquid materials benzenes, benzyl, alcohol, oil, etc.

Class C:
Used for fires originating from gas materials i.e. methane, propane etc.
Class D:
Used for fires originating from metallic material i.e. aluminum, magnesium, sodium, etc.

The types of fire extinguishing cylinders and their use in accordance to the material source of fire, are presented in the following table:

Ant fire cylinder:	**Class:**	A	B	C	D
Ant fire dust cylinder	PG	✓	✓	✓	
Ant fire dust cylinder (dust used against the fire caused by metal materials)	PM				✓
Ant fire dust cylinder (with special dust)	P		✓	✓	
Dioxide carbon Cylinder (CO2)	K		✓		
Water cylinder	W	✓			
Foam cylinder	S	✓	✓		







Some ant fire cylinder types produced by the German company « Gloria » are presented in the following table:

Type	Cylinder's weight in[kg]	Cylinder's material	Extinguishing material weight in[kg]	Reactive gas	Functioning in [sec]	Material through in [m]	Functioning under the temperatures [°C]	Dimensions Height [mm]	Length [mm]	Thickness [mm]
Pi6	10,5	Dust	6	CO_2	20	5	-20/+60	435	200	170
Pi9	15,5	Dust	9	CO_2	20	6	-20/+60	455	220	210
Pi12	19,2	Dust	12	CO_2	22	7	-20/+60	580	230	210

The number of fire extinguishing cylinders shall be determined by the designer of the building in accordance with the contemporary (existing) norms/standards (e.g. DIN EN 3). They shall be maintained and checked at least, every two years, from the licensed authorities.

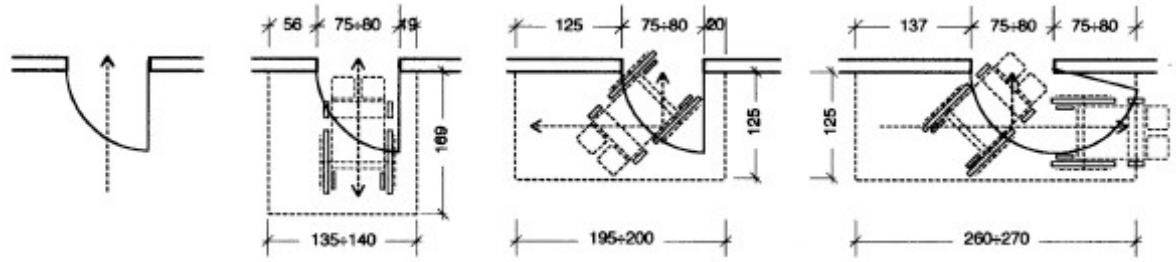
SPECIFICATIONS/ NORMS FOR PERSONS WITH DISABILITIES

- ***Environmental units and their components:***

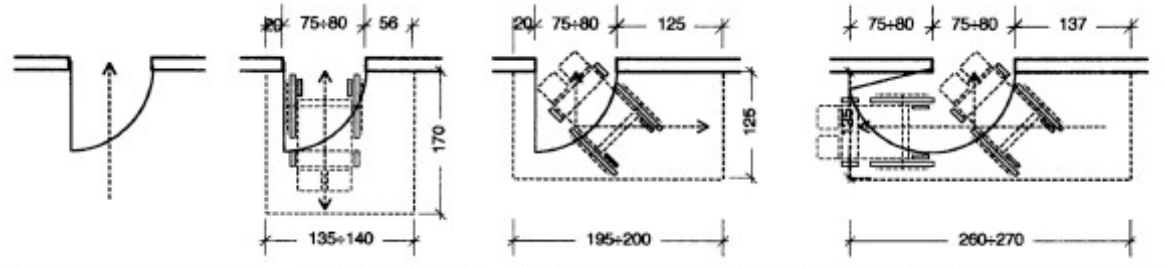
Doors, entrance doors spaces of each building and each estate unit must be at least 80 cm. Doors space must be at least 75 cm. Spaces before and after the door shall be in accordance with the minimum provided graphic data schemes as follows. The height of the glove should be between 85 and 95 cm (90 cm recommended) and for window up 90 ~ 120 cm. Solutions should be given priority with a single shutter doors have width greater than 120 cm and windows are placed at a height of 40 cm from the walking plan. Shoe cleaning elements must be placed at floor level.

Appropriate solutions for persons with disabilities: the spaces before and after the doors

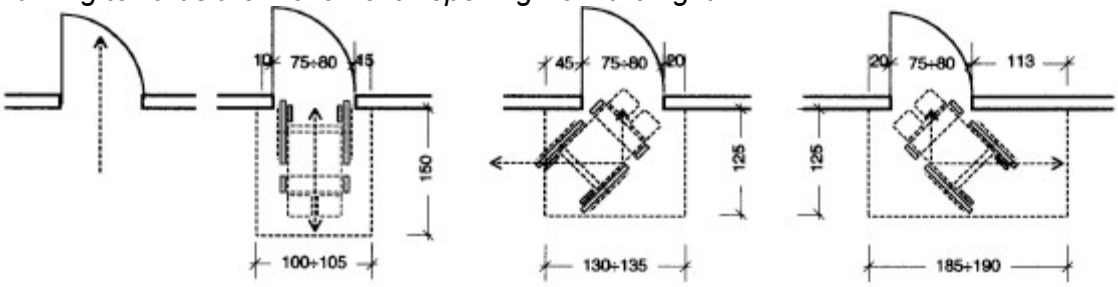
Turning in the opposite direction to the movement - turning from left



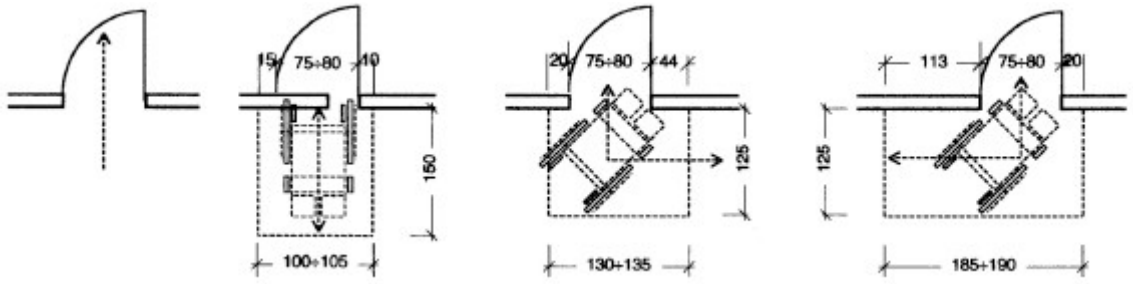
Turning in the opposite direction to the movement - opening from the right



Turning towards the movement - opening from the right

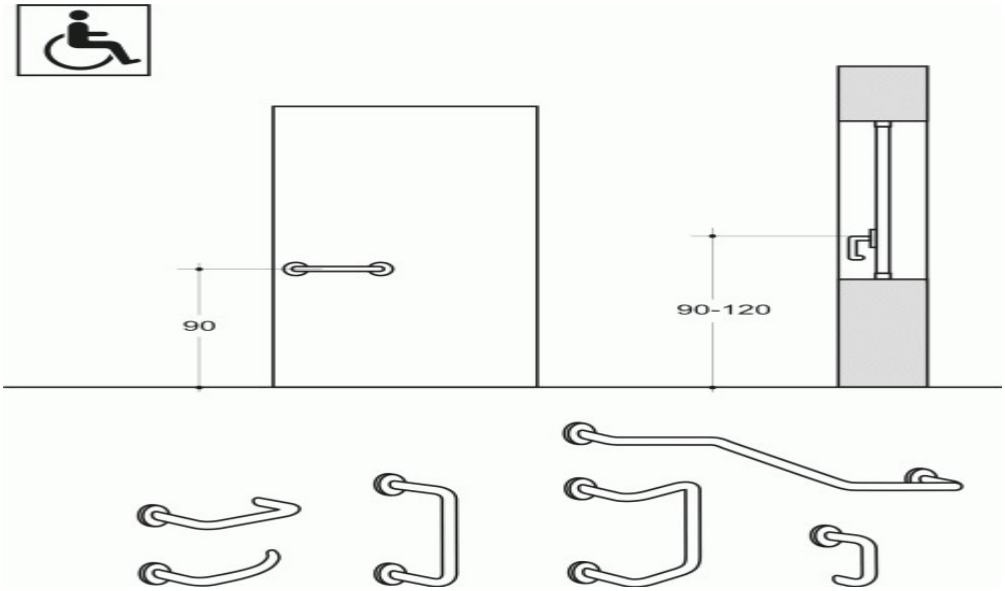


Turning towards the movement - turning from left



Handles on doors and windows.

Establishment of installations.

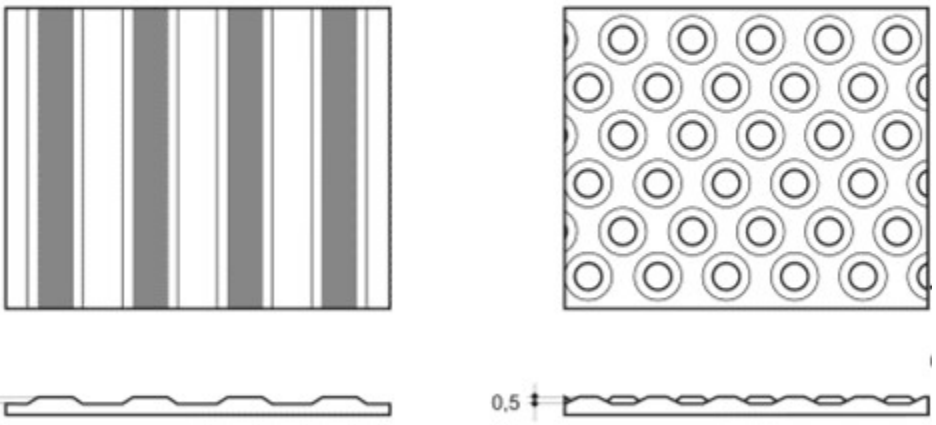


Floors, their possible disparities should not exceed 2.5 cm. Where they are predicting skid road paving.

Relief surface

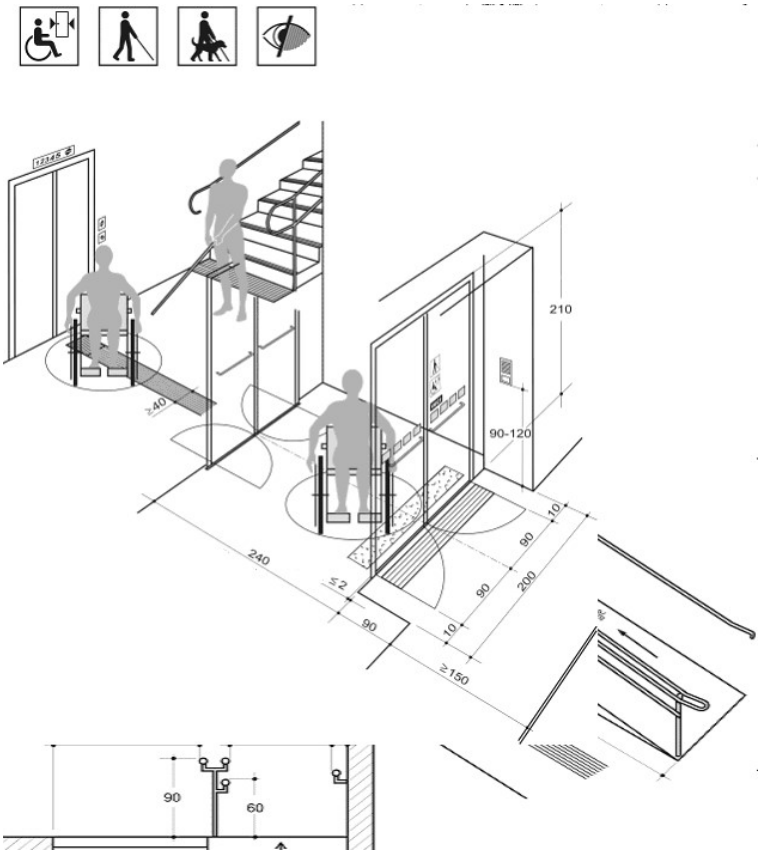
Depressions structures; Beaded edge structures





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Space entry.



- ***Electrical installations***

Electrical installations must have:
- Interphone set height to 120 cm from the floor with light indication;
- Light switches and alarm set in height from 90 to 120 cm from the floor;
- Outlets placed on the kitchen work surface;
- Other outlets located in height from 90 to 120 cm from the floor;
- Electrical framework set in the amount of 90 to 120 cm;
- All electrical equipment installations have color in contrast to the surface where installed.

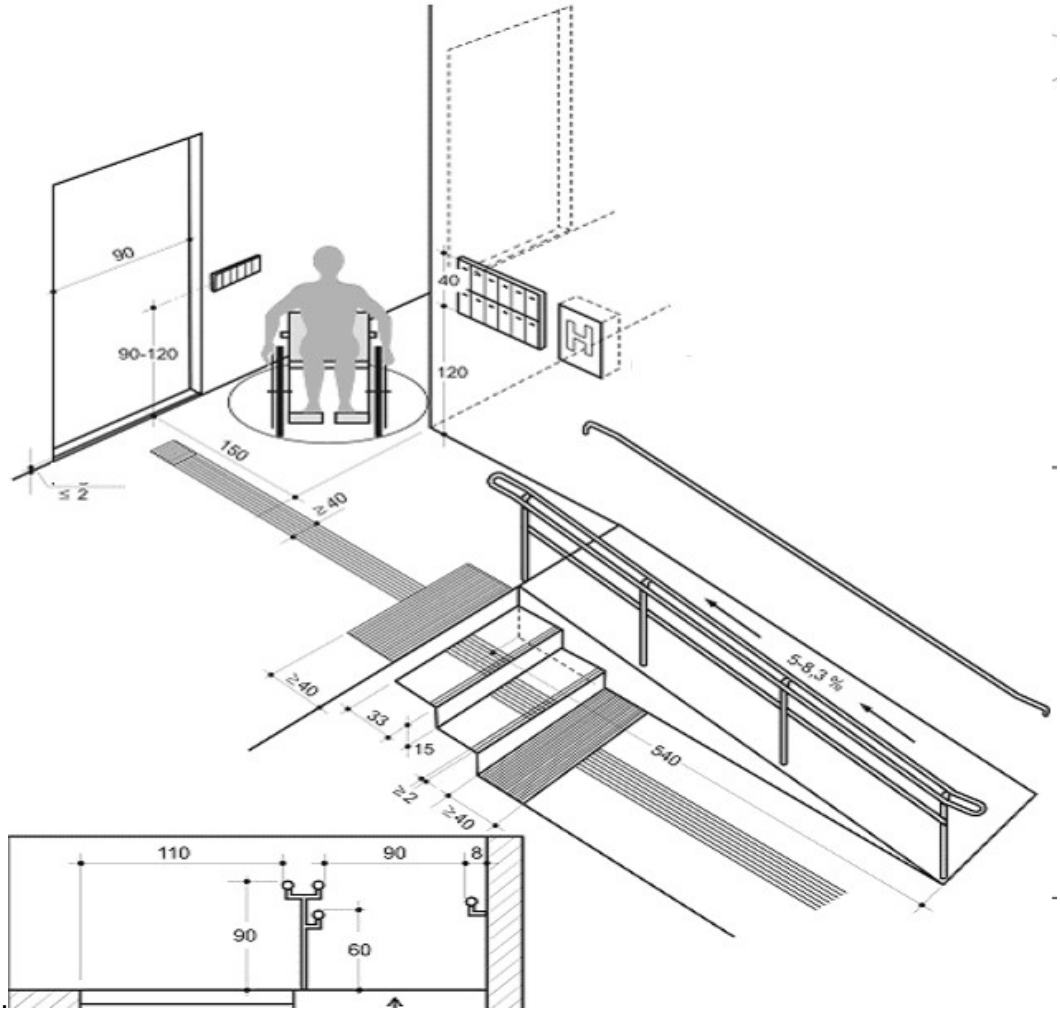
Terminals of plants which includes electrical equipment, general staff, valves and taps, jams various uses, regulators heating plant and air conditioning, alarm bells, citofoni, should be placed at a height between 40 and 140 cm. Indicative signs used are as follows.

- ***Communication (communication facilities).***

Installation



Fitting,



thresholds.

- ***Wheel chair lift***

• 340 kg capacity •Maximum travel of 3,000 mm •Travel speed: up to 0.13 m/s approx.
•900 x 1,400 mm standard platform dimensions
•115 VAC operation (115 VAC up direction and 12 VDC battery down)
•Emergency battery lowering •Remote location emergency manual lowering device •2:1 chain hydraulic drive system
•Gear type hydraulic pump •8 foot long modular guide rail assembly •Roller guide shoes •1.5 hp (1.119kW) output
•Electronic free relay logic controller •Automatic battery recharging system (115 VAC)
•Combination mechanical lock and electric contacts or electric strike •Low voltage controls
•Normal limit switch
•Control buttons on platform •Keyed call station •Continuous pressure directional buttons
•6,067 mm high side guard panels •Non-skid platform surface
•Beige electrostatic powder coat paint on all steel and aluminum surfaces •No machine room required



- ***Hygenic services***

Services should ensure hygienic handling and access for people with motor disabilities, should provide about the maneuvering space, the toilet-side approach here, bidet, bathtub, shower, washing machine and approach the front of the sink. So be respected following minimum dimensions:

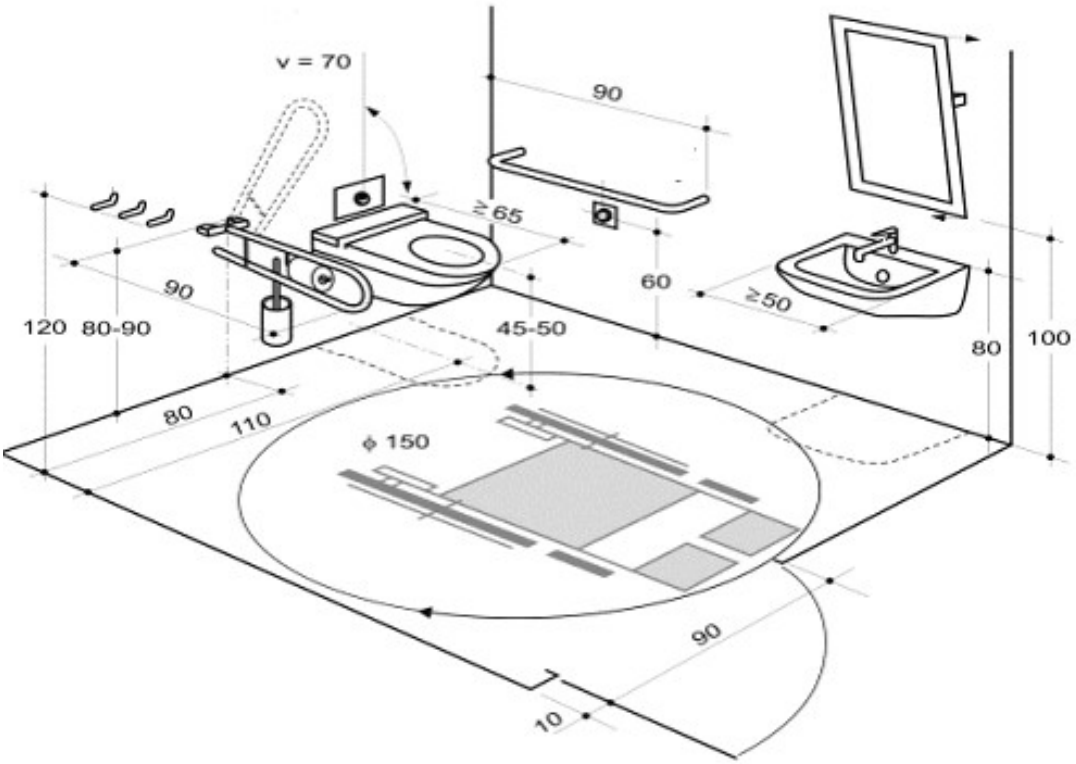
• Space required approach and lateral movement of the wheelchair to toilet and bidet shall, if provided, must be minimum 100 cm, measured from the axis of no sanitary isjes
• Space required approximation wheelchair side of bathtubs, must be minimum 140 cm along the tub with a minimum depth of 90 cm;
• Free space for movement in a wheelchair for people with disabilities should be circular area with a diameter of at least 150 cm
• Space required approximation wheelchair front of the sink, must be at least 80 cm measured from the front of the sink. Regarding the characteristics of sanitary equipment among others sinks must have upper located at 80 cm from the floor and without column with siphon possibly half closed or embedded in the wall;
• toilets and type bidetë be dependent, in particular toilet axis or bides should be placed at a minimum distance from the wall 40 cm side, the front should be greater than 65 cm the back wall and the top must be 45-50 cm from the floor. If the axis of the toilet or bides is more than 40 cm away from the wall, it has

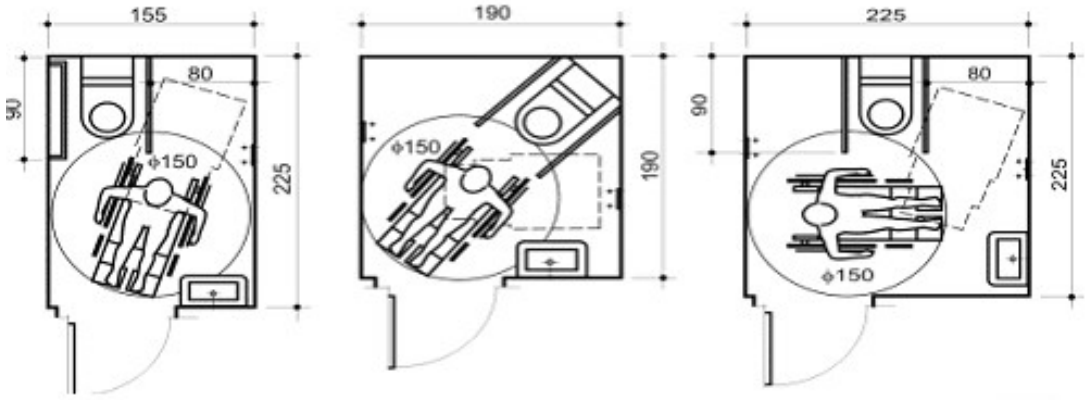
provided a link or guardrail to allow movement at a distance of 40 cm from the axis of the sanitary device. Equipping the release of water in the toilet be placed at a height of 70 cm above the floor surface;
• Spray should be placed below, equipped with a chair to sit and get up and shower the phone;
• clothes VARs should be placed at a height of 120 cm from the floor;
• All equipment should have pronounced contrast in color from the floor and walls;
• Installation of the door opening mechanism from the outside in case aid award;
• Installation of an alarm system within the bathroom for use by disabled persons in case of need.
In residential dwellings accessible, the data in Article 3 of the second part of this regulation, among others, should be set in steps and railing equipment horizontal and / or vertical near the equipment.
In public places sanitation is required installation of guardrail near toilets, set with a height of 80 cm from the floor and with a diameter equal to 3-4 cm; if it is fixed to the wall should be placed 5 cm away from himself.
In the case of eligibility allowed bideve removal and replacement of the bath with a shower set down, in order to obtain a space for approaching the toilet side States and to determine adequate maneuvering space.
In the apartments of the residential buildings, which is projected at the request of the possibility of exploitation, sanitary service will be called accessible if it would be possible to achieve at least a toilet and a sink you by a person in a wheelchair. With the achievement of sanitary equipment means the opportunity to reach her bedside without side approach to toilets and bringing the front to sink.
Signs for the possibility of using hygienic service facilities are provided as follows.

TOILET
The mechanism for releasing water.
v = 70 cm.
Installing alarm.

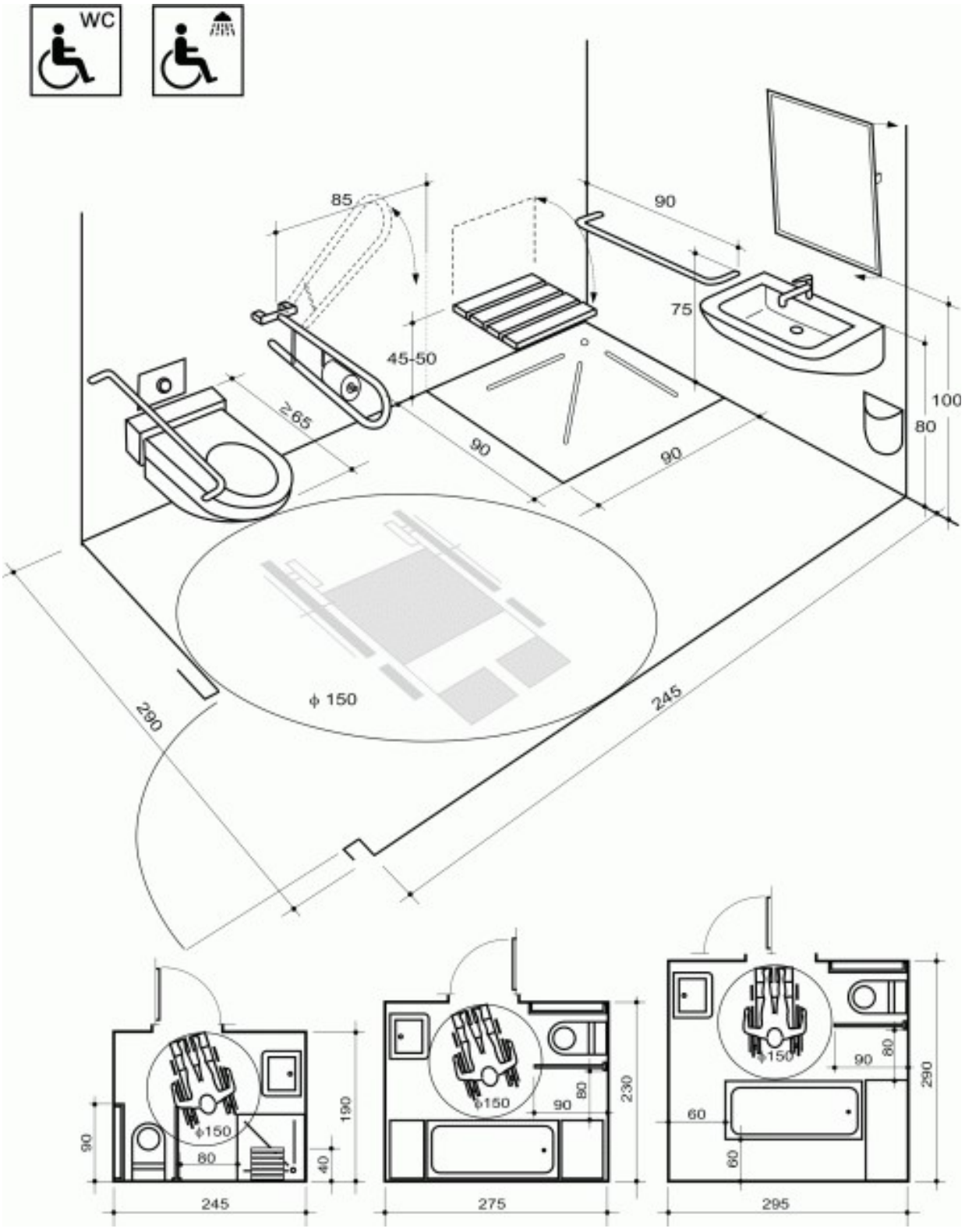








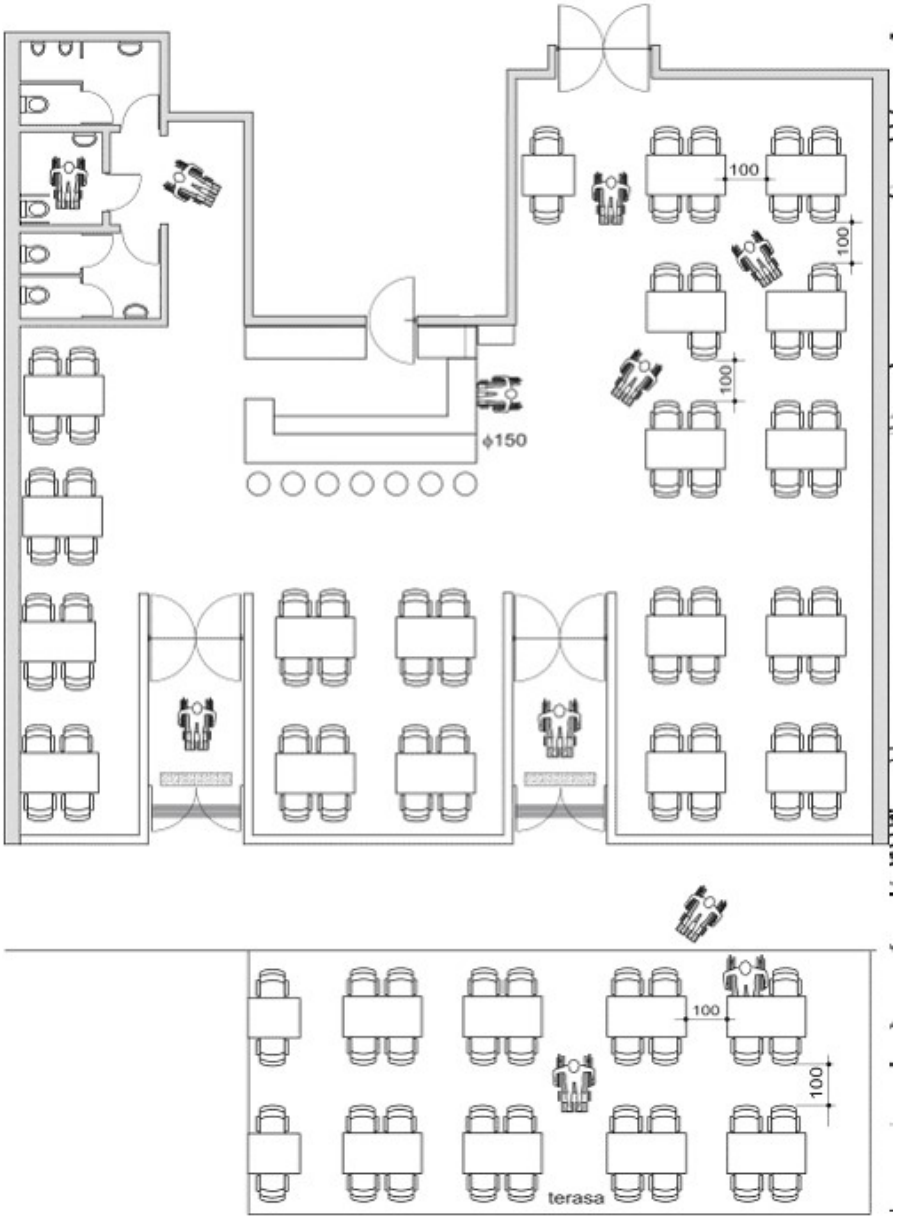
The toilet


WC
85
90
75
45-50
≥65
90
90
100
80
ϕ 150
290
245
90
190
ϕ150
80
40
245
ϕ150
90
80
230
275
ϕ150
90
80
60
60
290
295

Kitchens, in which ensured maneuvering and easily use the sink and cooking device, setting down their free space 50 cm in depth and at an altitude of at least 70 cm from the floor. Limited spaces are preferred sliding doors or those in book form. The extent of the use of space, the use of elements of the kitchen and return with wheelchair for disabled-in, at least be a sipërfaqie the circle with diameter 150 cm. Space to move around furniture with at least 120 cm width.

Cafeteria.
Bench accessible.
Kitchen.





Horizontal routes and corridors must have a minimum width of 100 cm, and appropriate extensions to allow the change of direction of movement by a person in a wheelchair. These extensions must be realized in the terminal parts of the corridors and also provided to realized every 10 m in linear development. For parts or landing corridor where doors open to be adapted technical solutions in accordance with the ways of opening doors and spaces needed for passage, as well as technical solutions:

• The equivalent net goal with 75 ~ 80 cm when:

a. Passing the gate area on the page wall is perpendicular to the direction of the wheelchair direction for:
a-1. needs back during the opening movement, the free base required surface is 190 cm and 100 cm width of the corridor.
A-2. simple maneuver, without moving back side spaces that should be respected is 45 cm and the free surface of the base must be 135 cm.
A-3. free width 100 cm, free surface of the base must be 120 cm.

b. Passing the gate area located on a site wall is parallel to the direction of management for wheelchair;
b-1. Corridor width 100 cm, space needed beyond the gate should be 20 cm, the maneuver space to start on the left should be 100 cm and the opening of the gate more than 90 °. The same goes for the opposite door.
b-2. Corridor width 100 cm space required beyond the goal should be 110 cm to allow opening and necessary space on the left should be as far as voice instead carts .. The same for the opposite side entrance.
b-3. Corridor width 100 cm opening of the gate is beyond 90 °, the space required in the corridor beyond the gate is 10 cm, space needed beyond the entrance gate space is 20 cm and the space required on the left, in the hallway at least 90 cm, to guarantee the return.

c. Thin crossings and through the gates located in straight line between them and the page wall perpendicular to the direction of movement of the wheelchair for:
c-1. Need movement back during the opening of the gate basic space needed is 190 cm, space needed basis before the hall is 120 cm and 100 cm width of the hall. c-2. Simple maneuver, without having to perform space moves back through the second gate is 45 cm, space needed basis is 180 cm and width required is 135 cm.
c-3. Need movement back during the opening of the gate width of the hall is 100 cm and the space needed is 190 cm base.
c-4. Simple maneuver without having to move back empty spaces through the second gate is 45 cm and the necessary space base is 210 cm ..
c-5. Simple maneuver without having to move back needed space base is 170 cm and space needed basis before the hall is 135 cm.

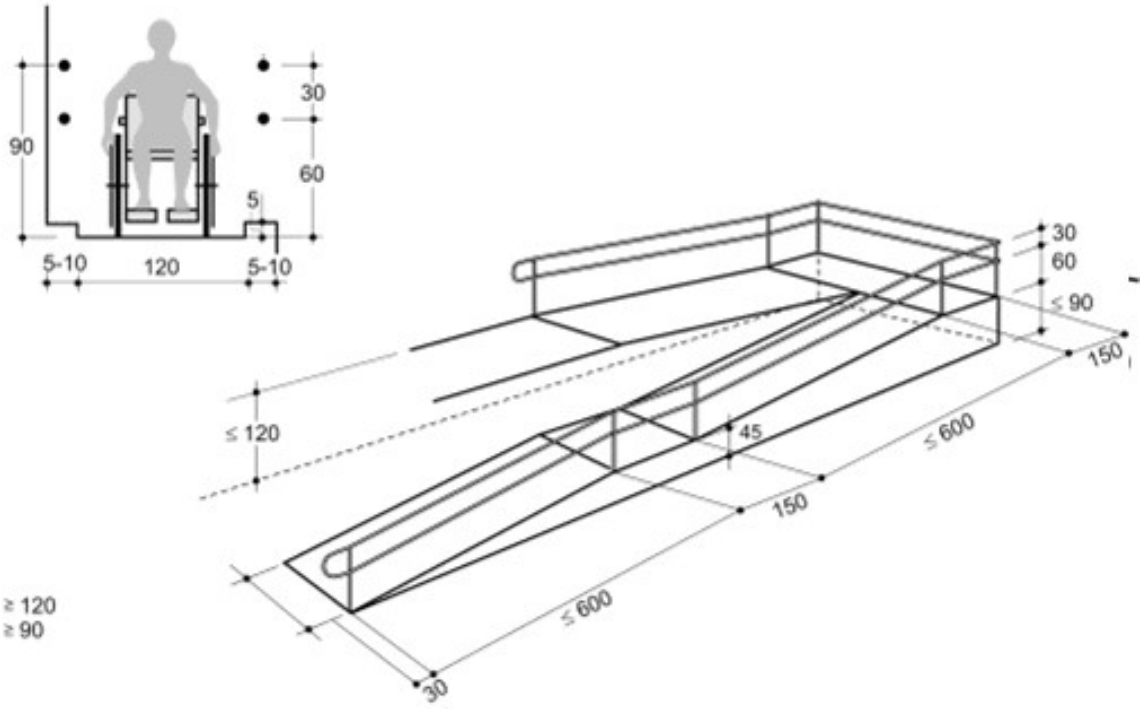
d. Walking trails exists located in thin and pass through gates perpendicular among them are:
d-1. width 100 cm thin and needed beyond the gate areas 20 cm, as well as the necessary space between the two doors 110 cm.
d-2. Hall width 100 cm, opening the gates to 90 ° and hall space base 140 cm.

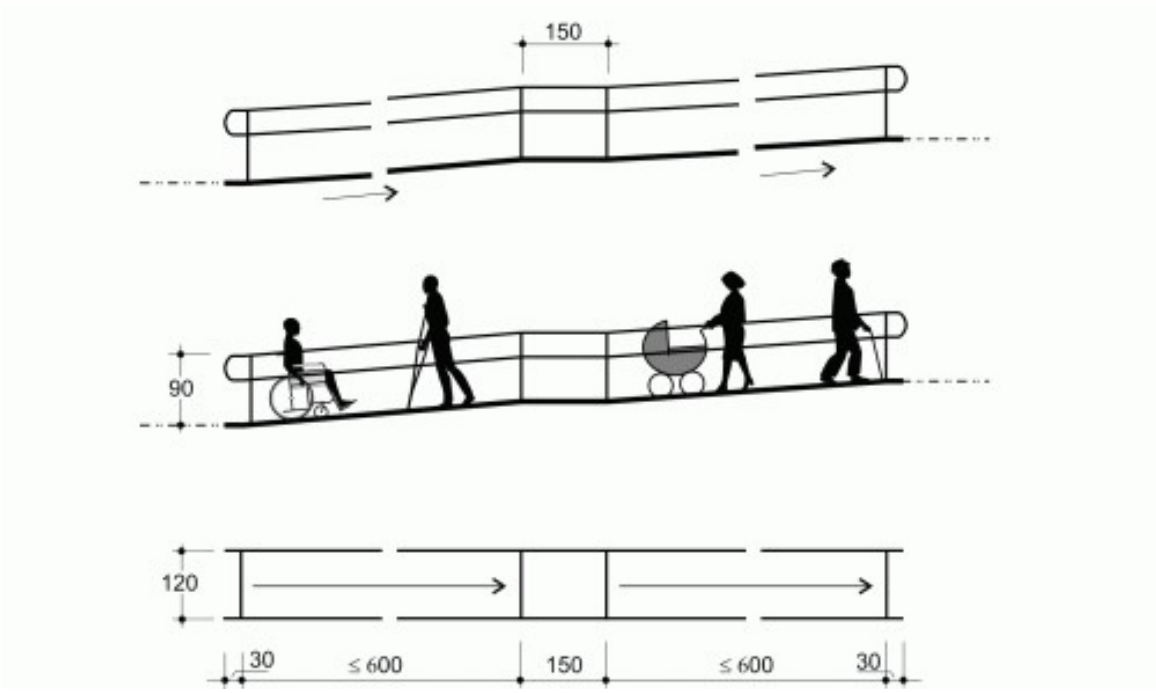
Solutions a-1, c-1, c-3 are acceptable only in case of adjustment.

Ramps (ramps)
Considered achievable passage of an elevation of up to 320 cm via ramps placed one after the other. Ramp must fulfill conditions:
- Slope to allow up to 1:20 (5%);
- Width of at least 120 cm in outdoor spaces, ie less than 90 cm in the interior spaces;
- Horizontal holiday square minimum dimensions of 150 x 150 cm or 140 x 170 cm in terms of indirect and 170 cm in the longitudinal direction from the opposite side of the movement, located in 10 m length of the ramp,
- Relievore against the sliding surface;
- Fencing with gloves built into the unprotected holder or, failing an edging at least 10 cm height;
- Glove holder with 4 cm diameter, formatted so that it can be captured with the span, located in two heights - 60 cm and 90 cm;
- Siege of the ramp which is located in outer space, holding his gloves realized in such a way as not to be susceptible to thermal changes;
- Siege of the glass surface to be visibly;
- Use of signs of adaptation.
The slope of the platforms must not exceed 8%. Are acceptable sloping higher, in the case of eligibility, related to the effective linear development platform.

Ramp
≥ 120 cm in outer space
≥ 90 cm in interior spaces

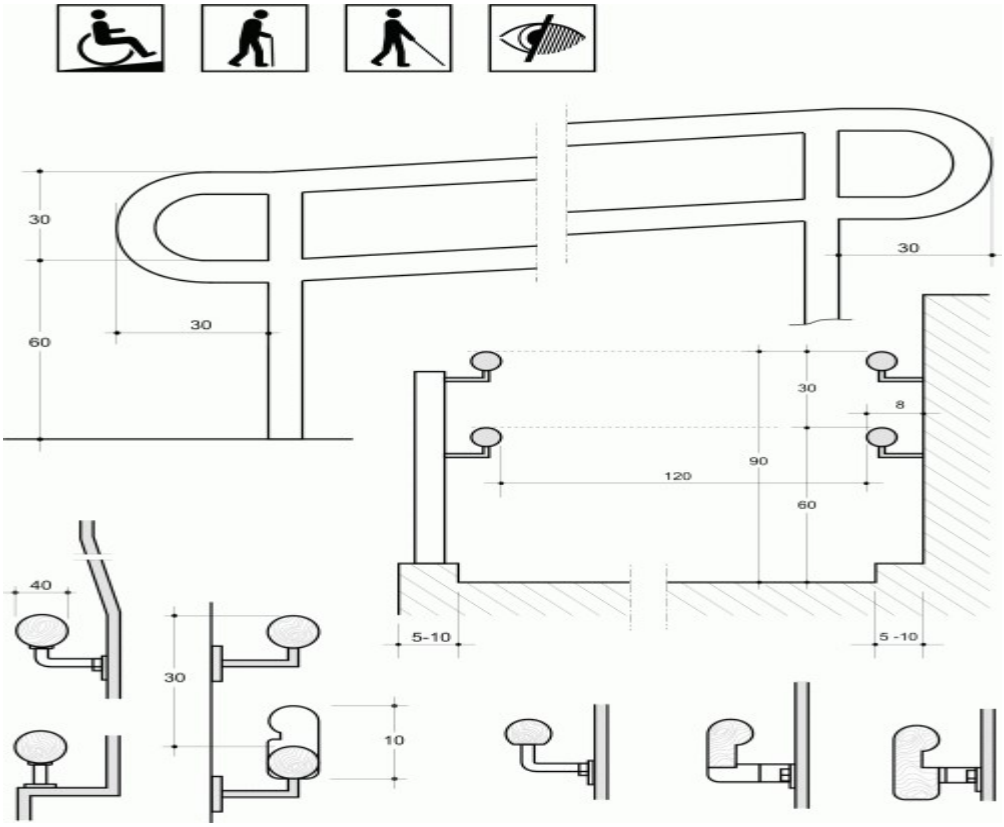





150
90
120
30
≤ 600
150
≤ 600
30

Supporter of hand (koromano)

circular handles

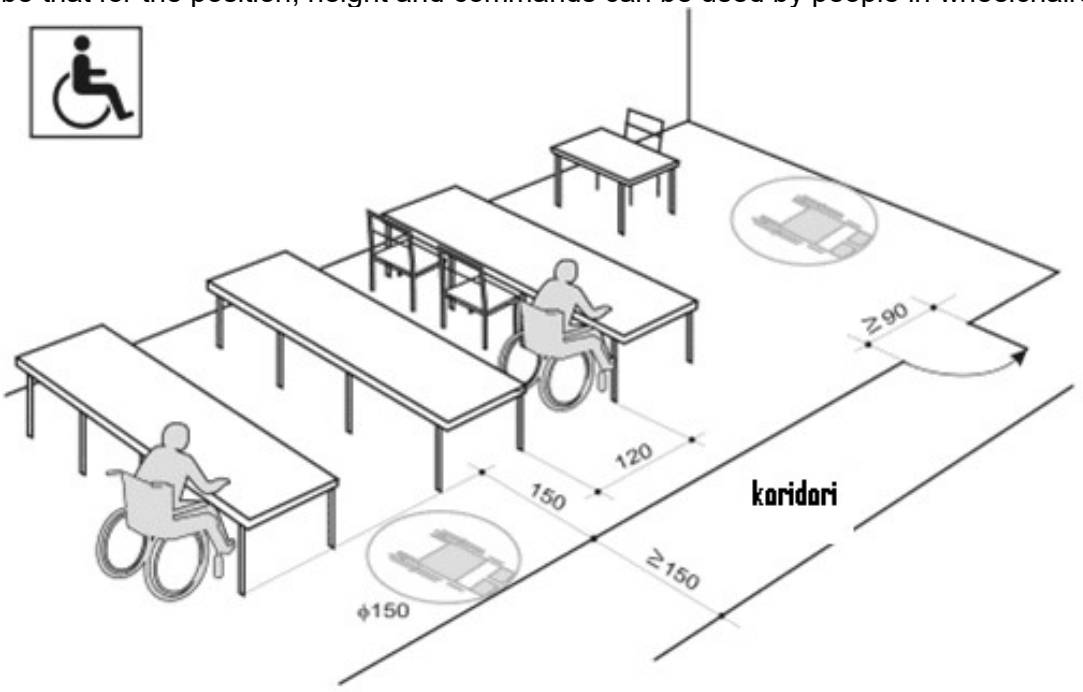


Rooms, classrooms and work spaces

Rooms, classrooms and work areas should be free communication space for a wheelchair for the disabled movement, minimum size 150 cm diameter circular, communication space for moving around furniture (furniture) to the width of at least 120 cm; work table made in console form wherein the upper sipërfaqies distance from the floor to be 85 cm, while the width of at least 70 cm by 50 cm depth approach.

Stationary equipment
In residential buildings, mail boxes should not be placed at a height more than 140 cm.
In places open to the public, where human contact is made through the tables, it has provided a free appropriate space, preferably in a shared environment, to become a normal expectation, which among other things can be placed a sufficient number of countries to sit (preferably separate seats).
Distance before each table should be at least 150 cm and 120 cm laterally at least over easily order through tables.
In places open to the public, in which human contact is made through the counter window or in walls extend, facilitate a suitable reception for the public, in order to avoid the appearance of pathological situations of nervousness and fatigue. However, in such countries should create free space, preferably in separate rooms, which can become a normal expectation, in which among other things can set a certain number of places to sit (preferably separate seats) .
Regarding specific flows of people, they should be provided guidance dividing barriers, which should be of a similar length to that of the order of the people and which is considered as the average large flows and with a minimum width of 70 cm . Barrier that separates the path of bringing him exit window should be stopped from a distance of 120 cm at the end of the counter obstacles prolonged or work plan of the window in the wall. In any case the barrier between guiding should not have a length greater than 400 cm. Barrier between guiding must be firmly fixed on the floor and have an elevation in the level of a borders of 90 cm.

At least one window must have the plan of use for persons in wheelchairs, located at a height equal to 90 cm from the ground in the space reserved for the public.
In places open to the public where human contact is made through extended counter, at least some of them should have a plan of use for people, situated at a height equivalent to had 85 cm from the ground.
Automatic equipment of any kind for public use located inside or outside the estate units open to the public, be that for the position, height and commands can be used by people in wheelchairs.

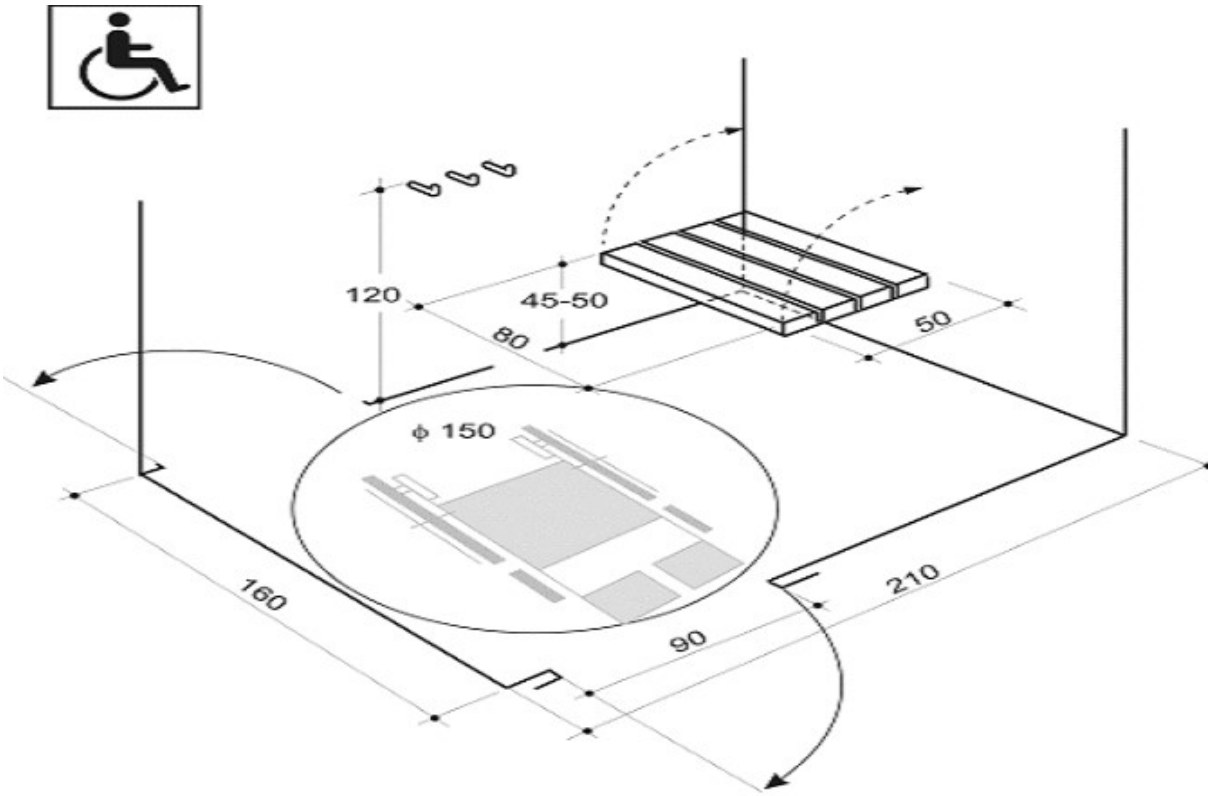


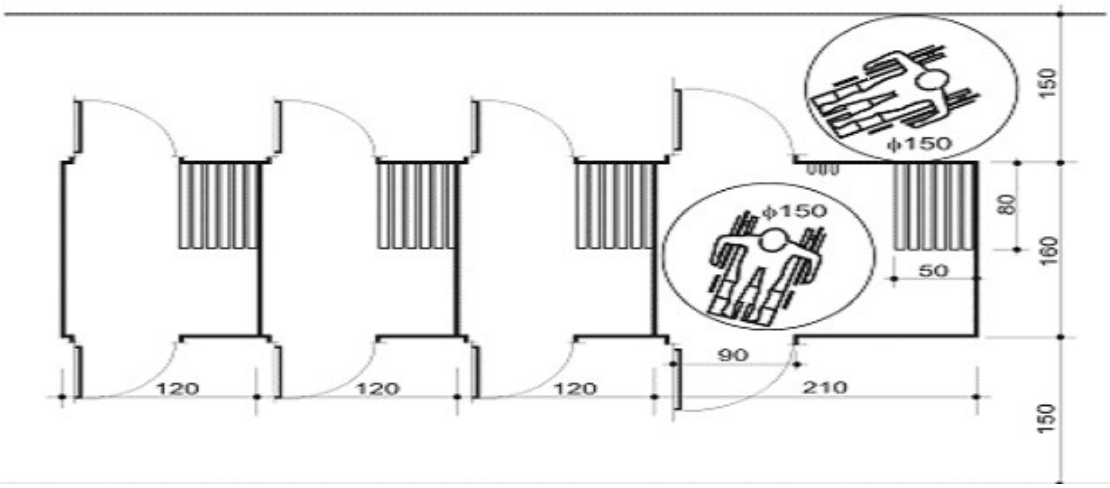
Wardrobe

Wardrobe must have:
- The dimensions of the base not less than 160 x 210 cm;
- Door with a handle according to the standards of 2.1 of Article 8 of Part II of this regulation, with at least 90 cm space opening out or sliding;
- Hangnail located at height of 120 cm from the floor;
- Folding seats located in height from 45 to 50 cm from the floor;

In the building which is necessary wardrobe 10% of their adjusted realized from the total number, but not less than one.

Wardrobe.





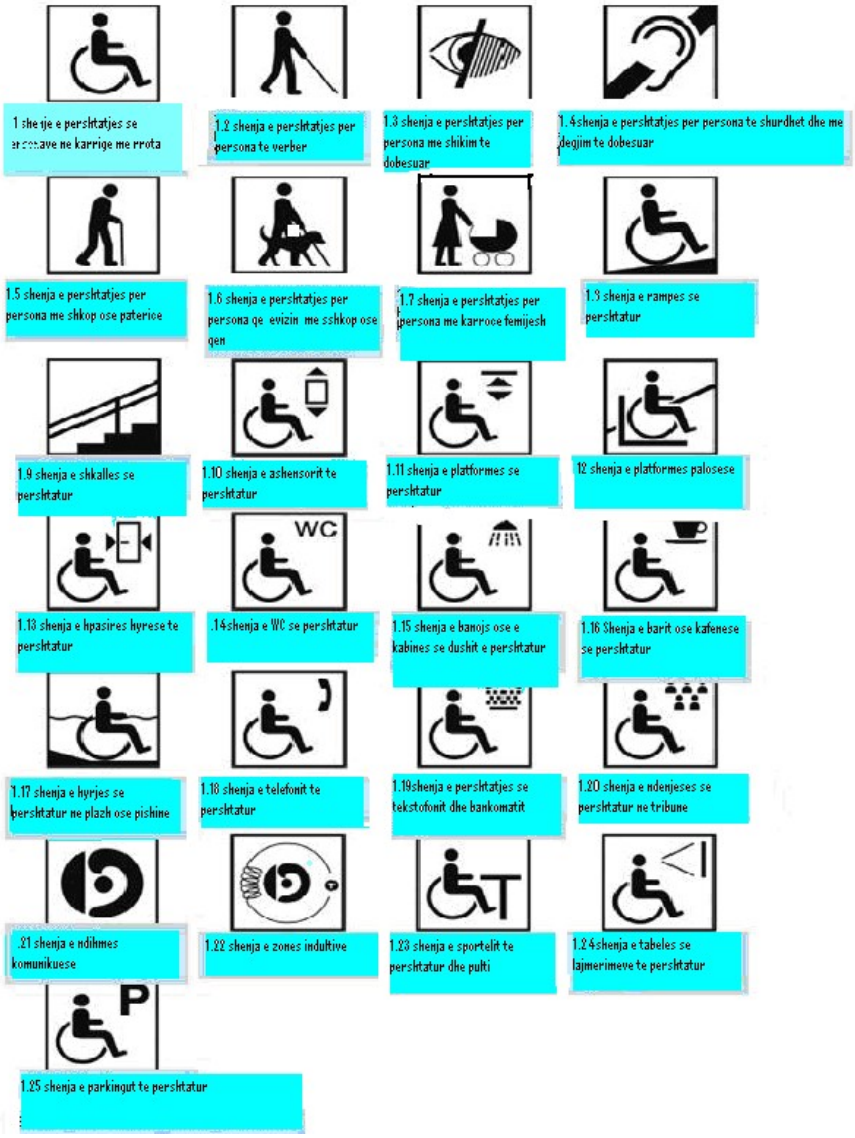
Rings.

Orientation plan for movement in buildings

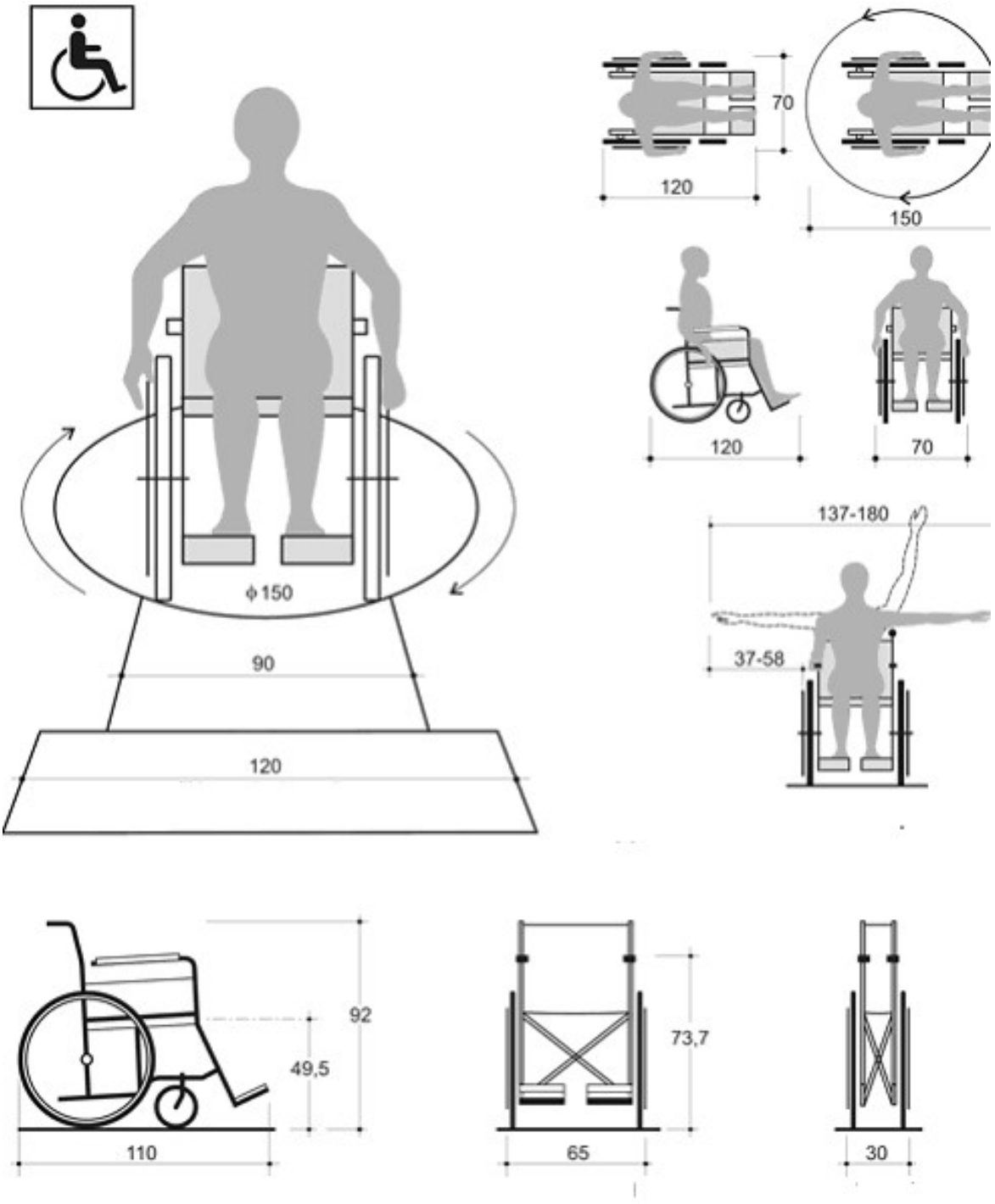
Orientation plan for movement in the building must be carried out in the form relievore and satisfy the following conditions:
- Be placed horizontally up to 90 cm height and vertically up to 180 cm height from the quota of the floor.
- To be located near the entrance of the building;
- Contain information in Braille;
- From the front door of the building to have come relievore plan leading to the direction of movement;
- To show the direction to accomplish

Signs of adjustment for people with disabilities-in
The following are signs of adaptation. Dimensions and color of all the signs of achievement, as well as the type of material from which it is determined in relation to work:

- Plan in which a sign;
- The shape of the outer space and / or the interior;
- The distance from which the PWD should notice the sign.



Graphic presentation on the conditions of use of auxiliary elements for accessibility
Terms of use of assistance in moving the wheelchair spaces for persons with disabilities - PWD



The width of the road movement in closed spaces.
The width of the road movement in outer space.
Side view, frontal view, frontal view of the folded wheelchair.

Dimensions in the wheelchair with the user width.