

# VOLUME 3

## TECHNICAL SPECIFICATIONS

EUROPEAid/135220/DD/WKS/RS  
EuropeAid/XXXXXXXXXX

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## 1 PREFACE

For the needs of RS Ministry of Interior, it is necessary to carry out adaptation and reconstruction of premises in compliance with current needs of the Ministry, including setting up new office space with laboratories on the first floor of the existing facility, block C, at the address Kneza Miloša Street, no. 103 in Belgrade.

The building will be equipped with all installations including electrical, mechanical, water, sewage, fire protection, ventilation and air conditioning which are necessary for operation of this type of facility.

During designing process, the designer was respecting the Beneficiary's needs, local regulations, EU standards and norms and environmental issues.

Based on the Main design, local and EU standards, the following Technical Specifications are prepared by considering them to be integral part with the Main design and are given in detail to provide the Contractor the necessary information in executing the project.

## 2 GENERAL INSTRUCTION

These Technical Specifications for execution of works shall be an integral part of the Tender Documentation, which being an Annex to the Works Contract, shall be considered as an integral part of this contract. dk  
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The Contractor will fully familiarise himself with all details of the Main Design, as well as with all local regulations and standards (SRPS), common practice of trade and circumstances for their execution. Nevertheless, it is understood that, whenever local regulations / standards (SRPS), or any common practice of trade are subject to any interpretation, clarification, ambiguity, or dispute, then the Supervisor's decision shall prevail provided that such ruling shall be fully in compliance with and shall be based on the subject local regulations / standards (SRPS) including, but not limited to:

ICS Number	Standard Number	Year	TITLE
91.200	SRPS ISO 3443-1	2003	Tolerances for building - Part 1: Recommendations for basic principles for evaluation and specification
	SRPS ISO 3443-8	2005	Tolerances for building - Part 8: Dimensional inspection and control of construction work
	SRPS ISO 7077	1994	Measuring methods for building - General principles and procedures for the verification of dimensional compliance
	SRPS ISO 12491	2002	Statistical methods for quality control of building materials and components

All works must be carried out precisely and professionally. Prior to implementation, the Supervisor must examine all the materials and his comments referring to material and quality of work shall be obligatory for the Contractor. The agreed prices include all completed works, the final product ready for use and all other activities such as cleaning that have to be done prior to provisional acceptance.

ICS Number	Standard Number	Year	TITLE
03.120.10	SRPS ISO 9001	2008	Quality management systems-Requirements
	SRPS ISO 10001	2008	Quality agreement-Customer satisfaction-Guidelines for codes of conduct for organization

The Contractor shall be responsible for any damages caused by him to third parties during the works in the main building and any repair works and compensation of any kind shall be at the Contractor's expenses.

The Beneficiary and Contracting Authority shall provide to the Contractor the area necessary for organization of the building site. All other matters in this regard shall be the competence of the Contractor.

The Contractor shall be responsible to keep records of the progress of works in the measurement log and measurement book and have them checked and verified by the Supervisor.

It is also considered that the Contractor shall be responsible for safeguarding the building site and maintenance of existing structure and/or building at all times during the progress of the works until the final completion and acceptance of the building by the Contracting Authority.

Upon the completion of the works, the Contractor shall remove from the building site and other used areas all his tools, machinery, surplus material, etc. in order to arrange the site in the manner defined in the investment-technical documentation, and all other areas restored in same condition as before the construction.

Coding of each specific technical specification for any type of works given in this Technical Specification, and subsequently in the BoQ, is based on the International Classification for Standards – ICS, providing comprehensive correlation between the international and local standards. The Catalogue of Institute for Standardization of the Republic Serbia (Institute za Standardizaciju Srbije, Stevana Brakusa 2, 11030 Beograd, <http://www.iss.rs/kataloge.htm>) provides numerous updated tables enabling connection between international and local standards, as well as, updated review of old JUS standards which have been either withdrawn, replaced, or simply renamed.

### 3 GENERAL TECHNICAL SPECIFICATIONS

#### 3.1 GENERAL TECHNICAL CONDITIONS FOR THE EXECUTION OF CONSTRUCTION WORKS

All the works envisaged within this documentation and estimated bill of quantities include procurement of all the main and auxiliary materials, providing tools, mechanism and all the other equipment necessary for completion of all the items within the estimated bill of quantities in full accordance with the enclosed drawings, details, technical descriptions, applied technical regulations for such works, standards and additional instructions provided by the site Supervisor.

Complete work must be professional and precise. Prior to using all materials, they need to be inspected by the Supervisor and his notes regarding materials and work quality are mandatory for the Contractor.

Agreed prices include all the executed works and the final product of which is ready to be used. Contractor's prices include all the expenses regarding final completion of each working item, including the values of:

- main and auxiliary materials used (with wastage),
- labour and mechanical works,
- external and internal transportation,

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- marking,
- use of tools, scaffolds, formwork, moulds etc.
- as well as, all other expenses related to such works (overheads, earnings, social insurances, taxes and the rest affected by the applied regulations).

Prior to submitting a bid, contract and commencement of works, the Contractor is obliged to visit the location and the building and, based on the existing condition, determine all potential special terms and circumstances under which the works are to be executed according to this design. Offered and contracted prices include these potential special terms and circumstances.

The Contractor is responsible for all damages caused during the execution of works regarding the building or adjacent structures and he is to make any repairs and compensations at his own expense.

The Beneficiary is to provide the Contractor with the necessary space for the site organization. The remaining related items are the Contractor's responsibility.

The provision of the site with water, electricity and all other necessary utilities during the entire period of implementation of works is solely the Contractor's responsibility, including all expenses and necessary administrative procedures.

Prior to commencement as well as during the execution of each work item, the Contractor is obliged to require all the necessary explanations from the site or design Supervisor. This way, the Contractor bears the responsibility for all work that might not be executed in accordance with the concept and details of the main design.

For additional work not included in the initial TS, similarly to lump sum contracts, the use of contingencies is subject to prior approval by the CA to be formalised through a formal addendum as this amends the scope of the work. It needs to be formalised and endorsed by the CA and the works Contractor before the performance of the works. If done otherwise and any other work which is executed that would later be considered as the 'additional', such work is to be calculated within the agreed prices and will not be separately remunerated and paid for.

Prior to commencement of works, the Contractor is to provide the Contracting Authority with last name, first name and address of his authorized party who is to manage and be directly responsible for the job (site manager). In the course of executing works, the above mentioned party cannot be substituted without the Contracting Authority's approval.

Considering the fact that the Contractor is thoroughly familiar with the main design and all local conditions and circumstances under which it is to be developed, the agreed deadline could not be postponed for any reason but the force majeure. Poor weather conditions, lack of certain materials on site, lack of labour etc. will not be taken into account for possible delay. By signing the contract for the execution of works the Contractor declines any rights of changing the quoted prices due to rise in the prices of materials (he is considered to have procured (agreed) all the necessary materials immediately after signing the contract).

Work description provided for certain item within the bill of quantities is also appropriate for the execution of similar works – items, unless otherwise specified in the bill of quantities.

If certain work is not executed in accordance with the entire investment-technical documentation it will not be accepted nor paid for. The possibility of price reduction based on the lower quality of works or used materials is excluded. Such work is to be repaired or demolished and executed again at the Contractor's expense.

The Contractor is obliged to regularly keep the measurement book and construction log and submit those for the inspection and verification by the site Supervisor.

After completion of works, the Contractor is obliged to remove all of his tools from the site and rest of the used area, as well as equipment, surplus material etc. thus leaving the site clear according to the entire investment-technical documentation and the remaining areas in the same condition as before building works.

It is also the Contractor's duty to keep the site safe and maintain the existing building in the course of the entire works until the final completion and acceptance by the Contracting Authority.

The general conditions stated herein as well as technical conditions, estimated bill of quantities, technical report, hydraulic and structural analyses and all drawings present parts of the contract and are valid in all their sections, unless something is specifically altered by the contract.

## 3.2 PRELIMINARY WORKS

### 3.2.1 SITE PREPARATORY WORKS

Prior to commencing the earth works, or any other works, the Contractor shall be under the obligation to undertake all necessary preparations to provide the placement, maintenance and removal of required installations and devices, electric power distribution (for operation of machines and lighting) and other installations. The Contractor shall provide the safety of structures and property; prevent any trespassing, taking care that all works are performed in full compliance with the design documentation and time schedule of the Contracting Authority.

All ancillary works shall be considered as preliminary works that must be performed by the Contractor in full compliance with the instruction of the Supervisor. Such work shall include the engagement of the work force and equipment, for excavation, transport and disposal of excavated material, fully observing provisions prescribed for transportation of surplus materials as defined in this document.

### 3.2.2 SUPERVISOR'S OFFICE

The Supervisor will be accommodated on the site by the Contractor. The Contractor is obliged to provide:

- One office space with area of not less than 2.4x6 m for exclusive use by the Supervisor's staff
- One space for meeting purposes with area not less than 2.4x6 m
- Two office desks with chairs
- Two cabinets,
- One telephone and one internet line for exclusive use of the Supervisor, and
- Appropriate sanitary facilities.

The cost of accommodation, equipment, heating, fuel, electricity, water, sewerage, disposal of waste and cleaning shall be borne by the Contractor.

### 3.2.3 HEALTH AND SAFETY

The Contractor shall make his best endeavours to ensure, so far as is reasonably practicable and, to the satisfaction of the Supervisor, the health, safety and welfare at work of his employees including those of his subcontractors and of all other persons on the site.

The Contractor shall comply with the requirements of European Directives 92/57/EEC dated 24.06.1992 and 89/391/EEC dated 12.06.1989 and Serbian law concerning the Health and Safety Protection and all relevant national health and safety regulations.

The Contractor shall execute the works in a manner complying with the best European and/or Serbian Safety Regulations and Standards.

Should the Supervisor consider that the Contractor's method of working is unsafe or that there are insufficient or inadequate safety barriers or other devices or that there is insufficient safety or rescue equipment, the Contractor shall change his method of working or install or strengthen safety and

rescue equipment if so instructed. Such instructions shall not relieve the Contractor of any of his responsibilities under the Contract.

The Contractor shall notify the Supervisor immediately of any accident that occurs, whether on site or off site, in which the Contractor is directly involved, and which results in any injury to any person whether directly concerned with the site or a third party. Such initial notification may be verbal and shall be followed by a written comprehensive report within 24 hours of the accident.

Transportation of any material by the Contractor shall be in suitable vehicles, which do not cause spillage when loaded, and all loads shall be suitably secured. Any vehicle, which does not comply with this requirement or any of the local traffic regulations and laws, shall be removed from the site.

Construction activities may give rise to noise nuisance. The normal health and safety controls will be required to safeguard the Contractor's staff and labourers and the residential and passing population.

The Contractor has to enable access to sites at any time to any external institutes or experts carrying out safety inspections.

The Contractor's attention is drawn to the number of hazards that are likely to be encountered when carrying out the works that could affect the health and safety of his operators, the Beneficiary's employees, and members of general public.

Prior to the commencement of any hazardous operation, the Contractor shall submit a safety method statement to the Supervisor for his approval.

All operators have to be trained prior to commencing work and adequately supervised whilst carrying it out.

All plant and equipment is to be suitable for the task to be undertaken and properly inspected and tested before putting into operation.

The Contractor shall appoint licensed H&S officer at the site, responsible for safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents.

The Contractor shall send to the Supervisor details of any accident as soon as possible after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Supervisor may reasonably require.

The Supervisor will require the Contractor to remove (or cause to be removed) any person employed on the works who persist in any conduct that is prejudicial to safety, health or the protection of the environment.

Any part of the site that is designated as a "restricted area" may not be entered without a "permit to work". All places occupied by live, operational, mechanical, electrical or chemical equipment, and "live" sewers, manholes and chambers will usually be so designated. The Contractor shall not allow any of his operatives or sub-contractors to enter such an area until a permit has been issued. When the Contractor requires such a permit he shall give 7 clear days' notice to the Supervisor, who will arrange with the appropriate authority to issue one. When the Contractor receives such a permit he shall comply with any precautionary requirements that may be specified in it and shall hold the permit until the end of the period covered and then return it to the Supervisor. Compliance with the requirements of the permit shall not absolve the Contractor from any responsibilities under the Contract.

The Contractor shall prepare an "Emergency Response Plan" and submit for approval to the Supervisor.

The Contractor shall provide the necessary monitoring equipment required for entry to hazardous or potentially hazardous atmospheres. Monitoring of all hazardous or potentially hazardous atmospheres shall be carried out by the Contractor and a suitable register maintained.

The Contractor shall provide all necessary rescue equipment that shall be regularly checked and maintained. A register of equipment checks shall be kept on site. The Contractor shall ensure that an adequate number of his operators are fully trained in the use of breathing apparatus and rescue techniques.

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### 3.2.4 ENVIRONMENTAL MANAGEMENT

The Contractor shall comply with the provisions of the EU standards and Serbian regulations with regard to environmental protection.

Legal and material consequences of possible non-observance of environmental requirements affecting construction, set forth in various legislation texts, shall be supported by the Contractor.

The Contractor shall be responsible for all matters whatsoever arising out of or in connection with the processing, removal, transport and disposal of arising, spoil, groundwater and other waste material in accordance with all applicable Environmental Laws.

In dealing with water and wastewater arising from the Works, including water from cleansing, testing or disinfections, the Contractor shall comply with the requirements of Serbian standard in regards to discharge of wastewater into sewers and into watercourses.

The Contractor shall take all reasonable measures to ensure that his activities do not cause pollution of groundwater sources or surface watercourses.

The Contractor shall comply with the provisions and recommendations of any national or local regulations or codes of practice for noise and dust control on construction sites.

The Contractor shall take care about environment in particular in relation to the environmental impacts as a result of construction and do all reasonable effort to reduce impacts as much as possible.

### 3.2.5 SITE CLEAN UP

The site clean-up shall involve removal of all obstacles from the areas that shall be occupied by permanent and/or temporary structures. An area of the site to be cleaned up should be one as minimum required, and approved by the Supervisor. The method of execution of works for clearing the areas shall be decided by the Contractor himself who shall be responsible to observe all work safety regulations, prevent any damage of buildings or areas owned by others and avoid any disturbance of the works.

The site clearing up should also include grubbing up of shrubs and trees, demolition of fences and other similar barriers that may hinder the progress of works.

All material that may appear as the result of the works defined above, the Contractor shall remove from site free from any additional charges, and fully observing provisions prescribed for transportation of surplus materials as defined in this document.

### 3.2.6 VISIBILITY

The visibility measures must comply with the rules laid down in the EC Communication and Visibility Manual for EU External Actions published by the European Commission which may be obtained from [http://ec.europa.eu/europeaid/work/visibility/index\\_en.htm](http://ec.europa.eu/europeaid/work/visibility/index_en.htm)

The Contractor shall, at his own expense, provide, install and maintain signboards at the site after the Contractor has been given access to the site.

One project signboard shall be prepared according to Construction and Planning Law.

Second signboard and commemorative plaque have to be provided and erected by the Contractor at the entrance to the site. They will be made according to EC Communication and Visibility Manual for EU External Actions.

The Contractor shall obtain instructions from the Supervisor regarding the information to be displayed on the all three types of the signboard.

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### 3.3 DEMOLITION WORKS

#### 3.3.1 DEMOLITION OF EXISTING STRUCTURES

Demolition of the existing buildings on the location will be done according to the Main design. Objects to be demolished are marked on the drawings.

Demolished material, that can be further used, is owned by the Beneficiary. The waste is transported to the landfill free from any additional charges.

Prior to execution of works as foreseen by the design, the Contractor assigned with the works shall carry out demolishing of all damaged parts, including walls which are to be removed due to change in the facility concept during reconstruction and adaptation.

During demolition of complete or part of the facility, the Contractor shall observe all applicable regulations regarding measures for protection at work. All demolition and dismantling works must be executed carefully in order to minimize the damage of material.

The technical documentation shall contain all necessary demolitions: walls, floors, ceilings, various partitions, stripping off, etc. In case when it is necessary to demolish or dismantle some parts of the facility, which is not foreseen by the design, the Contractor is obligated to demolish and/or dismantle those parts, subject to previously received written order by a competent body, and these works shall be treated as additional works in case that they are not included in the bill of quantities or priced bill of quantities.

It is necessary to comply with technically correct sequence of demolishing, i.e. before the works start, it is necessary to dismantle installed parts: doors, cabinets, aluminium partitions, buffer boards, etc.

During demolishing or dismantling, the material shall be classified per type and dimensions, cleaned and assorted at dump which shall be determined by the Supervisor. Usable and non-usable material shall be selected, and reusable material shall be separated, while the remaining part shall be transported to the dump. Following the demolition and transport to the dump, the construction site shall be clean and safe for execution of new works.

Parts of the facility which are to be demolished or dismantled have to be precisely marked in order to avoid unnecessary demolition or dismantling. In case when some parts of the facility are demolished or dismantled due to the Contractor's error, he shall, at his own expense, restore them to their original condition.

When pulling out joinery, it is necessary to numerate and then take off windows of the frame, i.e. doors from the door frame of footer, and then take out the frames from the walls, taking care not to damage them. Following dismantling, the windows and the doors shall be paired with their frames and delivered to the user.

All applicable standards shall be observed during demolition, and all the works shall be carried out with competence and good care for the elements that are to be kept.

Prices shall be formed per piece,  $m^2$ ,  $m^3$ , all in compliance with average standards in civil engineering (GN-301-700-706). The price shall include: demolition, sorting and classification, removing of debris (cleaning), including transport to the dump allocated for that purpose outside the construction site and dismantling of auxiliary scaffold.

### 3.4 CONCRETE AND REINFORCED CONCRETE WORKS

#### 3.4.1 GENERAL

All concrete work shall be carried out in full accordance with the Final Design, Static Analysis and applicable regulations and standards.

The Main Design shall define concrete quality, separately for each Static Analysis item, including crushing strength after 28 days (C) and class of concrete, as well as number of test samples for each Static Analysis item. The Contractor shall be obliged to observe all the above.

Natural aggregate mixture shall be used for concrete C12/15 at the maximum; all other concrete quality shall be made from separated aggregate, which shall be comprised under the unit price.

The concrete shall be mixed mechanically from aggregate, cement and water, subject to the Supervisor approval, following the prevailing regulations:

MATERIAL	ICS Number	Standard Number	Year	TITLE
Cement	91.100.10	SRPS B.C1.011	2001	Cement - Portland cement, Portland composite cement, plastfurnace cement, pozzolanic cement, composite cement - Definition, classification and technical conditions
		SRPS B.C1.012	1996	Cement - Delivery, packing and storage density
		SRPS ENV 196-4	1995	Methods of testing cement - Quantitative determination of constituents
		SRPS ENV 197-1	1997	Cement - Composition, specifications and conformity criteria - Part 1: Common cements
Natural and crushed aggregate	91.100.15	SRPS B.B2.009	1986	Raw materials for production of aggregates for concrete - Technical requirements
		SRPS B.B2.010	1986	Aggregate for concrete - Technical requirements
		SRPS B.B3.100	1983	Crushed aggregates for concrete and asphalt
		SRPS B.B8.040	1982	Crushed aggregate for concrete and mortar - Examination of aggregate with organic impurities
		SRPS B.B8.042	1984	Natural and crushed aggregate - Chemical analysis of aggregates for concretes and mortars
	91.100.30	SRPS U.M1.057	1984	Concrete - Grading of aggregate for concrete
Water	91.100.30	SRPS U.M1.058	1985	Concrete - Water for making concrete - Technical requirements and testing methods
Admixtures for concrete	91.100.30	SRPS U.M1.034	1996	Concrete - Admixtures for concrete - Definitions and classification
		SRPS U.M1.035	1996	Concrete - Admixtures for concrete - Quality requirements and testing
		SRPS U.M1.037	1981	Concrete - Admixtures for concrete - Previous testing

The aggregate has to be clean, without organic impurities or soil (acceptable up to 2% by weigh), otherwise the aggregate has to be washed.

The Contractor shall be under obligation to present evidence on quality of material used for concrete manufacturing (cement, aggregate, water).

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The concrete quality and executed works have to be in accordance with prevailing regulations:

ICS Number	Standard Number	Year	TITLE
91.100.30	SRPS ISO 2736-1	1997	Concrete tests - Test specimens - Part 1: Sampling of fresh concrete
	SRPS ISO 2736-2	1997	Concrete tests - Test specimens - Part 2: Making and curing of test specimens for strength tests
	SRPS ISO 4012	2000	Concrete - Determination of compressive strength of test specimens
	SRPS ISO 4013	2000	Concrete - Determination of flexural strength of test specimens
	SRPS ISO 4109	1997	Fresh concrete - Determination of the consistency - Slump test
	SRPS ISO 4848	1999	Concrete - Determination of air content of freshly mixed concrete - Pressure method
	SRPS U.M1.051	1987	Concrete - Production control in the concrete plants
	SRPS U.M1.021	1997	Concrete - Classification by compressive strength
	SRPS U.M1.055	1984	Concrete - Method of test for resistance of concrete against freezing
	SRPS U.M1.015	1998	Concrete - Concrete, hardened - Determination of the depth of penetration of water under pressure
	SRPS U.M1.016	1992	Concrete - Method of test for resistance of concrete against freezing and thawing
	SRPS U.M1.045	1987	Transport and delivery of ready-mixed concrete

The concrete works shall be executed by qualified work force only, respecting technical specifications and prevailing regulations, national and international standards for such type of works.

Prescribed number of samples shall be tested by a licensed Laboratory for Construction Material Testing at the Contractor's expense. The Supervisor shall be entitled to request additional sample testing, up to the maximum number of samples foreseen under the regulation, fee of any additional expense on his side. Should the Supervisor request additional sample tests exceeding the maximum number of samples foreseen under the regulation due to unsatisfactory test results, then the expenses shall be on the Contractor.

Concreting shall not commence prior to the inspection and acceptance of the reinforcement by the Supervisor.

Only plain concrete casting shall be done manually in 5-15 cm layers, the reinforced concrete casting shall be done mechanically with vibration, provided that vibration equipment shall be in accordance with the type of structure, subject to the Supervisor approval.

The price includes: concrete form, moving of mobile scaffolds, mounting and dismounting of the stationary scaffolds, form positioning and removal, concrete protection and wetting, water pumping (at inflow of 30 litter per minute), procurement of required cranes and installations, tools, hauling means, material labour force, costs of hauling, maintenance, use of tools and all mechanical devices during operation, as well as costs for their removal upon completion of the works. Recess cutting of holes and

grips for lighting installations, waterworks, sewerage, vapour heating and similar is included within the price. Casing, which is, scrambling of grips for installations, is Contractor's responsibility and it is not paid separately. Namely, prices per item in the pricelist from this chapter cover fully completed work per unit measure.

The Contractor procures the form material and it remains in his possession upon use. During reuse, material should be cleaned from concrete, dirt, etc. Prior to concreting, plate should be wetted well. Form, supports and scaffolds are not paid separately, but are included in concreting unit price.

#### CONCRETE CLASSIFICATION FOLLOWING NEW SRPS U.M1.021

ICS Number	Standard Number	Year	TITLE
91.100.30	SRPS U.M1.021	1997	Concrete - Classification by compressive strength (ISO 3893:1977)

The common regulation for concrete in the Republic of Serbia is "the Regulation for Concrete and Reinforced Concrete" (always referred to as: "BAB87"). Meanwhile, when applying newly introduced 1997 standard SRPS U.M1.021 (Concrete - Classification by compressive strength - ISO 3893:1977) and "BAB87", certain discrepancies appear. The newly introduced standard SRPS U.M1.021 refers to EUROCODE 2 and EN 206 and subsequently defines 28 days compressive strength [ N/mm<sup>2</sup> ] using, either a cylinder Ø 15 cm/30 cm test sample, or a 15 cm cube test sample, compared to the 20 cm cube test sample usual and prescribed for "BAB87".

A table below is presenting and emphasising such discrepancies:

MB following "BAB87"	Concrete Classes following EUROCODE 2 & EN 206	28 days Compressive Strength [ N/mm <sup>2</sup> ]	
		Cylinder Ø15 cm/30 cm	Cube 15 cm
MB 10	C 8/10	8	10
MB 15	C 12/15	12	15
MB 20	C 16/20	16	20
MB 25	C 20/25	20	25
MB 30	C 25/30	25	30
MB 35	C 30/37	30	37
MB 40	C 30/37	30	37
MB 45	C 35/45	35	45

All plain and reinforced concreting shall be carried out fully in compliance with regulations. The Contractor shall be liable to make concrete design, which has to be certified by the Designer. For each item and type of works, the bill of quantities specifies framed size of section for calculation and brand of concrete which has to be achieved. The Contractor shall prove that the concrete produced

shall be tested by inspection bodies in authorized laboratory, in compliance with regulations set forth by appropriate instructions. The Contractor shall make test cubes in presence of the Supervisor. Findings of authorized laboratory shall be applicable for the Contractor/ Contracting Authority. Costs of this testing shall be borne by the Contractor and included in the unit price.

All works shall be carried out as per designs, details and structural analysis by competent and appropriately qualified Contractor's staff, supervised by experts.

Manual placement is allowed only with consent of Supervisor, and only in case of small quantities and slightly stressed structures and elements. Manual placement of concrete shall be carried out by proper ramming and knocking on shattering, while machine placement shall be carried out by pervibrator or shattering vibrator in layers not thicker than 70cm. Next layer shall be placed during the time which provides for good bonding with previous layer. In cases where depth of concrete pouring is more than 1 m, placement of concrete shall be carried out in a way which will prevent segregation.

Manual placement of concrete shall be carried out by proper ramming in layers and knocking on concrete form, while machine placement shall be carried out by pervibrator or shattering vibrator. In cases where depth concrete pouring is more than 1 m, placement of concrete shall be carried out by "tremie".

Temperature of fresh concrete during phase of placement has to be between +5°C and +30°C. If the average air temperature is lower than +5°C or higher than +30°C, it is necessary to take all measures necessary for normal hardening of concrete, as set forth by the "Rules on Technical Standards for Concrete and Reinforced Concrete".

### 3.4.2 STONE AGREGATE

Stone aggregate is to be of greater strength than cement. It must not contain stone disintegrating under the influence of water. Muddy elements reduce the concrete strength as well as organic and other harmful mixtures.

The Contractor is thus obliged to conduct regular aggregate tests on site.

The aggregate must be fully in compliance with SRPS B.BZ.100:1983, SRPS B.B2.010:1986. The aggregate may not contain earthy or organic ingredients, or any other ingredients which can cause damage to concrete and reinforcement. If sludgy ingredients exceed the prescribed limit of 2% in weight, the aggregate must be washed. Natural mixture of aggregate can be used only for structures without reinforcement MB10 and MB15. Aggregate containing maximum 1% of particles smaller than 0,02mm shall be used for making of fair-faced concrete. The Contractor shall submit quality certificates for the aggregate, not older than six months, and it shall also check moisture of aggregate surface.

### 3.4.3 CEMENT

The cement for making the concrete must not be older than 3 months and must have powdered structure (with no clots).

Moisture, wind and heat protection is mandatory on the site. It is stored in raised floor premises or silos.

In case of long-term storage on site it is necessary to be dislocated each 10 ÷ 15 days (winter, autumn, spring), and each 30 days (summer).

Applying cement when making concrete is to be in accordance with the applied standards, rules and instructions provided by the manufacturer.

Cost of procurement, transportation, storage and incorporation is included in the unit price for finished concrete.

The cement must be fully in compliance with SRPS EN 197-1:2010, SROS B.C.1.014:1982. The Supervisor shall be entitled to carry out inspection of cement storage conditions. On premises where

the cement is stored, it is necessary to clearly mark all types of cement and dates of production. It shall be kept at construction site on wooden base, at least 20-30 cm above the ground. If cement has been stored for more than three months, it is necessary to test it before use.

#### 3.4.4 WATER

The water coming from the supply network is used by default for making and treating the concrete. For all other waters (except for waste and swamp waters that must not be used) the required quality is bound to be proved (in accordance with the rules for concrete and reinforced concrete).

Also, where necessary pursuant to the design, everything shall be carried out in compliance with SRPS U.M1.058:1985.

#### 3.4.5 GENERAL METHOD STATEMENT

The class of concrete is specified with descriptions of individual items, and the Contractor must achieve it by using the appropriate materials.

Before concreting begins, it is necessary to inspect the scaffold, shattering and supports with respect to shape and stability thereof, and during concreting it is necessary to check them on regular basis. Concreting may not begin before the Supervisor inspects the reinforcement and gives written approval for beginning of concrete-work.

In case of reinforcement, it is necessary to take care that it remains in placed position and to be covered with concrete from all sides.

During concrete-work, the Contractor's staff may not step on reinforcement or shattering, and the Contractor must place mobile bridges erected over the reinforcement which will protect concrete from spilling over the reinforcement and shattering, and it will also prevent the reinforcement from movement.

When concreting is to be stopped or continued, it shall be done in compliance with regulations. Prior to concreting, it is necessary to mark places concrete movement joints.

Surface, over which the concreting is to be continued, shall be properly cleaned and made rough.

In case that concrete "nests" occurs, they may not be sealed or rendered without previous approval by the Supervisor. Sealing, as a consequence of poor work, shall not be paid separately and costs thereof shall be borne by the Contractor.

The concrete mixture needs to be placed quickly during concreting. In case of segregation during transport, concrete mixture may not be placed and has to be removed.

All casted parts of construction have to be made precisely pursuant to designed dimensions.

On completion of concreting, it is necessary to cure concrete in compliance with the regulations, which shall not be paid separately.

During casting of concrete structures, two different types of cement may not be used for the same item. Before commencement of the works, it is necessary to carry out trial tests of appropriate types of cement which will be applied during works.

In case that some load needs to be transported over casted structures, bridges for crossing shall be erected everywhere and the wheelbarrow must have rubber wheels.

Bricklaying over concrete structures may be continued only when approved by the Supervisor. During concreting, concrete construction must be protected.

Shattering, if wooden, (ordinary or surfaced) smooth or metal, has to be made by qualified and competent labour, from material which is in compliance with applicable technical regulations. Wooden shattering may not be made of boards thinner than 24mm.

Shattering material must be stable, well braced, supported, with dimensions as per structural analysis (done by the Contractor) in order to give proper support to concrete and labour, all of which shall be in compliance with plans and/or instructions by the Supervisor, with precise junctions and necessary pre

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camber, so that it can be dismantled easily without damage to concrete construction. Internal surfaces of shattering must have precise form of designed concrete construction, and concrete surfaces inside of them shall be completely plain following dismantling of shattering, with sharp and straight edges, without any bumps. Extensions, if any, must be levelled with the plain and for one concrete surface only boards of same thickness may be used.

Placement of dead shores may not be carried out directly onto terrain or construction, and wooden fixings must be placed under them. Stiffening of dead shores shall be carried out in both directions in order to prevent movements in any direction whatsoever.

If already used material is reused for shattering, then it has to be cleaned and prepared for reuse (free of any filth and hardened concrete, nails, etc).

Prior to concreting, shattering needs to be well wetted or coated with appropriate oil.

Acceptance of installed shattering and scaffold, including removal thereof, shall be approved only within term which is in compliance with the regulations and approved by the Supervisor, and it shall be recorded into the building log book, pursuant to the work procedure.

It is clearly specified in the bill of quantities which structures the smooth shattering shall be applied on.

Should it be necessary to prepare structural analysis and plans for construction of scaffold and shattering – it shall be Contractor's liability.

In case of any changes to the design, due to just reasons, the Contractor is liable to notify everyone on changed documentation, without any right to change unit prices. The actual amount of performed works shall be paid according to appropriate agreed unit prices for respective items.

Unit price includes: all works, material with wastage, tools, transport (horizontal and vertical), shattering, supports, scaffolds and any other expense per price structure, including concrete curing. Also, the price includes passages for all types of installations and other technical needs.

Following installation of steel structures or equipment, shattering for anchor holes and casting thereof, including grouting with concrete or mortar, shall not be paid separately, and the holes shall not be deducted from the concrete volume. Bill of quantities specifies separately structures with anchor holes. Calculation and payment shall be done per unit price of executed quantities and as per measures from the plans, with deduction of all clear openings.

#### 3.4.1 REINFORCING STEEL

Must be fully in compliance with SRPS EN 10025:2003, SRPS C.B3.021:1985, SRPS EN 1008:2008, SRPS C.K6.021:1987.

Reinforcement shall be cleaned from rust and dirt, straightened, cut, placed and installed in compliance with plans and instruction by the Supervisor. All dividing steel parts and blinders shall be tied to reinforcement with black bailing wire  $\varnothing$  1,4mm.

Type and quality of reinforcement steel must be in compliance with the design and the "Rules on Technical Standards for Concrete and Reinforced Concrete". Unit price includes placement of steel or concrete bedding in order to make accurate the reinforcement position.

Acceptance of installed reinforcement by the Supervisor shall be recorded in the building log book prior to concreting.

Installed reinforcement must be stiffened enough in order to sustain, without any movement or deformations, process of concreting. Calculation is made per theoretical weight, structural analysis and details, regardless of how complex the reinforcement is.

Regardless of how complex the reinforcement is, the Unit price includes the concrete steel with wastage, wire for fixing and beddings, external and internal transport, tools, scaffold for reinforcement labour, on costs, earnings and all the Contractor's expenses in compliance with the General Requirements for Execution of Construction works.

### 3.5 MASONRY

Material used for building must be of good quality, and the work shall be carried out in compliance with technical regulations in SRPS.

ICS Number	Standard Number	Year	TITLE
91.080.30	SRPS ISO 9652-2	2005	Masonry - Part 2: Unreinforced masonry design by simple rules
	SRPS ISO 9652-5	2003	Masonry - Part 5: Vocabulary

All materials used for masonry works shall have specified quality and valid test certificates

MATERIAL	ICS Number	Standard Number	Year	TITLE
Clay Bricks And other Brick products	91.100.25	SRPS B.D1.011	1987	Massive clay bricks – Technical requirements
		SRPS B.D1.012	1988	Radial clay bricks – Technical requirements
		SRPS B.D1.014	1987	Facing massive clay bricks - Technical requirements
		SRPS B.D1.014/1	1995	Hollow clay facing bricks and blocks - Technical requirements - Amendments
		SRPS B.D1.015	1987	Hollow clay bricks and blocks - Technical requirements
		SRPS B.D1.015/1	2003	Hollow clay bricks and blocks - Technical requirements - Amendment 1
		SRPS B.D1.016	1987	Solid light-clay bricks – Technical requirements
		SRPS B.D1.017	1987	Perforated light-clay bricks and clay blocks - Technical requirements
Lime	91.100.10	SRPS B.C1.020	1981	Building lime
Cement	91.100.10	SRPS B.C1.010	1997	Hydraulic masonry binder - Technical requirements
		SRPS B.C1.011	2001	Cement - Portland cement, Portland composite cement, plastfurnace cement, pozzolanic cement, composite cement - Definition, classification and technical conditions
		SRPS B.C1.012	1996	Cement - Delivery, packing and storage density
		SRPS ENV 197-1	1997	Cement - Composition, specifications and conformity criteria - Part 1: Common cements
Natural and crushed aggregate	91.100.15	SRPS B.B8.040	1982	Crushed aggregate for concrete and mortar - Examination of aggregate with organic impurities
		SRPS B.B8.042	1984	Natural and crushed aggregate - Chemical analysis of aggregates for concretes and mortars

		SRPS EN 13139	2007	Aggregates for mortar
Gypsum	91.100.10	SRPS B.C1.030	1966	Building gypsum
Water	91.100.30	SRPS U.M1.058	1985	Concrete - Water for making concrete - Technical requirements and testing methods

All used binding materials and protecting agents must be of specified quality and possess test certificates.

ICS Number	Standard Number	Year	TITLE
91.100.10	SRPS U.M8.002	1997	Mortars for masonry and plastering - Test methods

### 3.5.1 BRICKLAYING WORKS

Bricklaying works shall be carried out exactly as scheduled, with correct junctions in completely horizontal rows without pieces smaller than  $\frac{1}{4}$  of the brick, on condition that broken bricks and pieces may not be placed next to each other in the wall.

Vertical and horizontal joints must be completely filled in with mortar, i.e. free of cavities. Mortar in joints may not be thicker than 10 mm. External parts of joints shall be left empty 15-20mm in order to achieve better bonding of mortar during rendering, and the leaked out mortar from joints must be removed while fresh.

Any dropout such as window frames, arches, extensions, columns between windows or other, shall not be calculated separately, because they are calculated in the volume of bricklaying works.

Also, unit price for bricklaying shall include making of all openings, wall chases for all types of installations, technical openings, etc., which shall later on be closed with bricks or mortar, by patching the wall chases following executed installation works, and there will be no additional payments for these works.

For partition walls, it is necessary to drop half of brick, for connection, in each row, and for partition rowlock walls it is necessary to leave chases, depth of which shall be  $\frac{1}{4}$  of brick's depth, along the wall height in every other row.

Bracing of wall canvas and bridging of openings (for windows, doors, etc.) shall be carried out in compliance with PTP, reinforced-concrete horizontal and vertical ring beams min. MB 20, reinforced structurally with 4  $\varnothing$  8mm, blinders  $\varnothing$  6mm/20cm. Connection of partition wall with reinforced-concrete walls and columns shall be carried out with 3mm diameter wire on every other brick course, i.e. on 0,25m per wall height, and fully in compliance with article 4.2.5. PTP - GuSP.

To determine door lining, it is necessary to plan bricking-in of necessary connections, which shall also be included in the price of bricklaying works.

Mortar shall be made only in such amounts that can be used the same day. Hardened mortar may not be used. Making of mortar has to be done fully in compliance with the regulations, and measures shall be as per respective item from the bill of quantities.

Price given for 1 m<sup>3</sup>, or 1 m<sup>2</sup> of the constructed wall (wall <15cm in m<sup>2</sup> and wall >15cm in m<sup>3</sup>), covers all works, materials, usual wastage of material, tools, transport (horizontal and vertical), mobile scaffolds and face scaffolds, earnings, all governmental contributions and duties. Ring beams in partition walls shall not be paid, because they are included in the unit price.

Payment calculation method shall be fully in compliance with General Requirements for Execution of Civil Works, applicable average standards in civil engineering and appropriate point of bill of quantities, per m<sup>2</sup> of built wall, unless otherwise specified in description of some items, that is, door openings shall be deducted from bricklaying works, but window dentils shall be included in volume of

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bricklaying works per full thickness as per designed measures. Reduced wall thickness in window niches, if any, shall not be deducted from the volume of bricklaying works.

### 3.6 PLASTERING

For indoor plastering of clay product wall surfaces, and /or concrete surfaces (columns, girders, lintels, etc) mortars shall be produced from materials as defined under the related standards.

ICS Number	Standard Number	Year	TITLE
91.100.10	SRPS CEN/TR 15124 (en)	2008	Design, preparation and application of internal gypsum plastering systems
	SRPS CEN/TR 15125 (en)	2008	Design, preparation and application of internal cement and/or lime plastering systems
	SRPS EN 998-1	2008	Specification for mortar for masonry - Part 1: Rendering and plastering mortar
	SRPS EN 1015-12	2008	Methods of test for mortar for masonry - Part 12: Determination of adhesive strength of hardened rendering and plastering mortars on substrates

Plastering shall be carried out when the outside temperature is convenient, only when all necessary subsidence is achieved and when the walls are completely dry.

To make the second, finishing layer, the mortar must be sifted through dense sand sifter.

Prior to rendering, the walls must be clean and wetted properly, especially in case of cement rendering.

Joints shall be cleaned from extra mortar, up to 15mm of depth, for better setting of mortar.

All concrete surfaces, regardless of whether it is pointed out in the respective item, have to be previously sprayed with lean cement mortar, which is included in the measure unit and shall not be paid separately.

Plastering shall be carried out in two layers, total thickness of which shall be from 15 – 20mm, as follows: the first layer shall be made of mortar with rough, sharp, sifted sand, and the other with fine sand, once the rough part dries completely. Following rendering, the surfaces shall be flat and smooth, not wavy, concaved or convex. Edges shall be slightly rounded, laid low and straight, with sharp and straight angles at junctions of walls, junctions between walls and ceiling.

To any other detail, calculation for executed works and payment, General Conditions for Execution of Civil Works and General Description for Bricklaying Works shall apply. Payments shall be made for actually rendered surface per m<sup>2</sup> after deduction of openings pursuant to applicable standards in civil engineering. Rendering price shall include erection and dismantling of scaffold, including amortization thereof, patching of slits following placement of installations, cleaning of windows, doors, and window frames, etc., because these works will not be paid separately.

### 3.7 INSULATION WORKS

#### 3.7.1 POLYMER - CEMENT INSULATIONS

Polymer-cement waterproofing consists of cement and polymer and mineral additives which prevent ingress of water, while preserving relatively high steam permeability. It may consist of one or two components.

ICS Number	Standard Number	Year	TITLE
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91.120.30	SRPS U.M3.220	1987	Non-strew, bitumen impregnated roofing felt - Quality requirements
	SRPS U.M3.231	1988	Bituminous strip with porous glass mat - Quality requirements
	SRPS U.M3.232	1987	Bituminous roofing felt - Quality Requirements
	SRPS U.M3.234	1988	Bituminous strip with glass fibre fabrics - Quality requirements
	SRPS U.M3.244	1990	Materials for damp-proof courses, for hot process
	SRPS U.M3.300	1989	Bitumen strip for welding - Quality requirements
	SRPS U.M8.080	1990	Bitumen strip for waterproofing - Method of testing

Two-component coatings are more elastic.

Bedding (cement screed on floors and cement mortar on walls, or plasterboard walls) shall be clean, free of grease, crumbly materials, dust, etc.

If necessary, two coatings of polymer-cement mortar shall be levelled and then wetted well, but without water accumulation.

Prior to coating, it is necessary to fill in the gaps round pipe lines and sewage lines.

Polymer-cement mortar is applied by brush or spraying in two or three layers, depending on type of product and room requirements.

Each layer shall be dried before the next one is applied.

Thickness of each layer is usually from 1 to 2 mm, as per manufacturer's instruction.

At junction of floors and walls and at junction with lower drain, it is necessary to use flexible cement coating with local reinforcement by tape made of glass-fibre fleece or polyester cloth, fast bonding filling or other product recommended by manufacturer.

Along the floor junctions, wide spread of 12-15cm shall be applied, and 10cm wide reinforcement material shall be pressed into it, while fresh.

Next coating shall be applied when the previous one is completely dry.

### 3.7.2 THERMAL INSULATION

Thermal insulation works shall be done with insulating material in accordance with thermal calculation, details and description specified in bill of quantities and priced bill of quantities.

ICS Number	Standard Number	Year	TITLE
91.120.10	SRPS EN ISO 10077-1 (en)	2008	Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 1: General
	SRPS ISO 8144-1	1998	Thermal insulation – Mineral wool mats for ventilated roof spaces – Part 1: Specification for applications with restricted ventilation
	SRPS ISO 8144-2	1998	Thermal insulation – Mineral wool mats for ventilated roof spaces – Part 2: Specification for horizontal applications with unrestricted ventilation
	SRPS U.J5.600	1998	Heat in civil engineering – Requirements for design and manufacturing of buildings
	SRPS U.M9.015	1998	Fibrous building materials – Materials for thermal insulation – Technical requirements

Material shall meet characteristics according to standards for heat technology in civil engineering SRPS U.J5.600:1998.

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Thickness of insulating plates shall be in compliance with thermal calculation, details and description specified in bill of quantities and priced bill of quantities.

Material, which is used for constructing of elements and structures of buildings, must have compliance certificate of competent company, registered for the activity falling within testing of thermal and sound insulation of material. Compliance certificates must be issued by institution authorized for this type of works and may not be older than one year from the certificate issuance date to the day when the Contractor started the works.

Certificate of occupancy may be issued only if it has been previously confirmed with certificate of compliance, issued by competent company registered for the activity falling within testing of thermal and sound insulation of elements and structures – buildings that the elements and structures are in compliance with provisions of this Rulebook.

Guarantee period for all agreed items of insulation works shall be determined in accordance with applicable legal regulations. Pursuant to the given alternative, there are particular obligations of contractor specialized for execution of all insulation works on flat roofs:

- Insulation works have to be carried out fully in compliance with correct details, applicable regulations, instructions and appropriate work method, and in time convenient for execution of those works
- All constructing or craft works, preceding insulation works, can damage the insulation and have to be executed before the insulation works and in compliance with appropriate technical sequence
- Prior to execution of insulation works, it is necessary to check and confirm accuracy of already executed construction and craft works that could affect the quality and durability of insulation works
- Supplied material must be without damages or reduced quality, otherwise it may not be installed

Insulation works have to be executed in such manner that some parts and layers of insulation are fully in accord with their purpose, quality and durability.

Insulation may not be placed over concrete bedding if setting process is not completed. Preparation of bedding has to be executed completely, cleaned thoroughly, dust particles removed completely, grease stains, oil acids removed chemically and washed with water. At the beginning of insulating works, the bedding must be dry.

### 3.8 FLOORING

#### 3.8.1 GENERAL DESCRIPTION

All floor coverings shall meet quality requirements; surfaces have to be horizontal or rounded, depending on the type of floor covering or floor description.

#### 3.8.2 FLOOR PVC COVERING

These types of floor coverings shall be placed over cement screed which has to be made in compliance with quality requirements and horizontally. Levelling with appropriate compound shall be carried out above cement screed. Floor PVC covering, 2.00m wide, shall be placed in glue previously applied on the surface. Junction between the two parts must be also filled with glue or welded.

#### 3.8.3 ANTISTATIC FLOOR

Antistatic floor is a floor covering, made of homogenous floor tapes based on PVC, specially intended for: laboratories, operating theatres, intensive care, i.e. premises equipped with electronic devices which create static electricity, and discharge thereof is undesirable and dangerous.

Floor shall not release toxic gases during combustion, type Bfl, S1/Cfl.S1.

Bedding shall be cleaned from dust. After that, levelling compound shall be applied and grinded.

Cooper tapes shall be placed over prepared bedding. The tapes width, thickness and grid shall be in compliance with manufacturer's instruction and connected to grounded output.

Prior to installation, anti-static tapes shall be developed, laid and left at the room temperature above 15°C for 24 hours.

Tapes shall be glued to the surface with current-conducting (antistatic) glue.

Placement shall be carried out by double cutting procedure, taking care not to damage copper tapes.

Joints shall be welded with hot air, with soft PVC electrodes.

Immediately after installation, the anti-static floor lining shall be cleaned and coated with agent based on emulsions for protection and care of PVC floors.

All works shall be carried out in compliance with applicable regulations and standards for this type of works.

Calculation is done per m<sup>2</sup> of finished floor, including all necessary transport (horizontal and vertical), preparation and ancillary works, fully in compliance with applicable standards in civil engineering.

### 3.9 TILING

#### 3.9.1 GENERAL DESCRIPTION

General description refers to tiling of all types of walls and floors, inside and/or outside of the facility. Works are carried out in compliance with technical requirements for execution of tile works – SRPS U.F2.011:1999. Ceramic tiles have to meet SRPS EN 14411:2005 regarding quality and dimensions:

- Parallel, straight, sharp and undamaged edges
- May not contain soluble salts and/or other ingredient that can cause damage
- Visible surface free of bubbles and notches
- Even colour
- Water absorption shall be within limits of standards applicable to respective type of tiles

Glues shall meet SRPS standards. They shall be applied in a layer of prescribed thickness, in accordance with manufacturer's instruction.

Only glues declared by manufacturer as appropriate for that type of works and certified by authorized Institute may be used for ceramic tiles. Manufacturer shall provide detailed instructions for installation and necessary pre-washing and gluing to certain type of walls.

When carried out inside the facility, tiling shall be executed only after the premises have been rendered, doors and windows frames installed and tested, and installations conducted. All edges, angles and wall plains have to be completely vertical.

Floor tiling shall be carried out horizontally, without waves, bumps, with flat surfaces or under required gradient, with equal and appropriately wide joints. Permitted departures for floors with ceramic tiles are ± 3mm measured by 4,0m long rod. In order to protect the executed works, any form of traffic or walking is strictly forbidden within three days following completion of tiling.

Sealing material for joints shall meet its purpose and must be strictly used as per manufacturer's instruction. Filling of joints may be started with only after the surface has completely hardened. After filling, tiles shall be cleaned from material residue. In order to provide for necessary width of joints, PVC crosses placed before filling must be removed. When the joints are completely dry, tiles shall be cleaned with dry cloth.

Before the works begin, it is necessary to check whether the surfaces, which are to be tiled, are cleaned from dust and debris, flat, dry and prepared for works.

Calculation is done per m<sup>2</sup> of tiled surfaces or m<sup>3</sup> per developed width of respective item.

### 3.10 DRYWALL WORKS

Dropped ceilings, partition walls, wall coverings on substructure and gluing of gypsum plasterboards to massive walls.

#### 3.10.1 RELEVANT STANDARDS

SRPS EN 520 (2008), Gypsum plasterboards – Definitions, requirements and test methods

SRPS EN 14195 (2008), Metal framing components for gypsum plasterboard systems – Definitions, requirements and test methods

SRPS B.C1.035 (1981), Gypsum plasterboards – types, technical requirements and tests

SRPS EN 14353 (2009), Metal sections for fixing of gypsum plasterboards – Definitions, requirements and test methods

#### 3.10.2 DESCRIPTION OF THE MATERIAL

Gypsum plasterboards GKV 12,5mm thick (tolerance +/- 0,5mm) shall be used. Longitudinal edges shall be conical (marking KK pursuant to SRPS EN 520), semi-rounded or conical semi-rounded. Dimensions and type of board, including finishing of the edge, shall be specified at the back of each board, label or packaging.

On the premises where the fire prevention ceilings and walls are to be installed, appropriately thick fireproof panels GKF, with appropriate fireproofing capacity, shall be used. On premises with higher level of humidity (laboratories, bathrooms, kitchens, etc.), gypsum plasterboards resistant to humidity (impregnated) – marking GKV-I shall be used.

Dimensions of the sections most usually used for substructures are:

CW sections – 50 or 75 or 100 x 50 mm;

UW sections - 50 or 75 or 100 x 40 mm;

CD sections – 60 x 27 mm;

UD sections – 28 x 27 mm;

C sections – 18 x 45 mm;

U sections – 20 x 30 mm;

Sections are made of cold rolled low-carbon steel straps, coated with zinc, aluminium-zinc or zinc-aluminium (markings Z, AZ or ZA), minimum thickness of which shall be 0.6mm. Sections have to be straight and may not bended.

#### 3.10.3 METHOD OF WORKS

Items that this technical specification refers to are:

- Dropped ceilings;
- Wall coverings on substructure;
- Partition walls;
- Lying of gypsum plasterboards to massive walls.

It is necessary to fill in joints of all items tape and skim them with compound for filling of joints, and then grind them with grinding paper. External angles shall be reinforced with aluminium protective tape.

#### Dropped ceiling:

Substructure consists of two rows of cross CD sections; lower row of CD sections shall be fixed to the upper row with cruciform couplings. Distance between the sections in the upper section shall be 1,0m and in the lower section 50 cm. CD sections shall be continued with extensions.

Edge UD sections shall be covered with sound insulation tape.

Screws for tightening of gypsum plasterboards to substructure shall be appropriately long and placed at 17 cm distance (six spacing per 1m length). Screw heads have to be submerged to the board at approximately 1mm depth. Edge sections shall be fixed at distance not greater than 50 cm.

Hangers which support the ceiling substructure shall be fixed to concrete structure with bolts and metal plugs.

Fire prevention ceilings shall have fire prevention (PP) boxes for lights and ventilation insulated with mineral wool, appropriately thick for required fire prevention capacity.

Junction of wall and floor shall be filled with white acrylic.

#### Partition walls:

Standard spacing between vertical CW sections in walls is 60cm.

Permitted height for walls with vertical sections CW50 at 600mm spacing is 2,6m, at 400mm spacing it is 3,0m, and at 300mm - 3,3m. Permitted height for walls with vertical sections CW75 at 600mm spacing is 3,0m, at 400mm spacing it is 3,5m, and at 300mm - 4,0m. In case those walls with CW75 sections are double covered, the height may be up to 4,25m. CW sections shall be a few millimetres shorter due to flexion of concrete ceiling.

If the wall is covered with ceramic tiles, then vertical sections shall be placed at 40cm spacing.

UW sections on floors and ceilings shall be covered with self-adhesive tape for sound insulation and then screwed to floor with bolts and plastic plugs.

Screws for tightening of gypsum plasterboards to substructure shall be placed at 25cm spacing. Screw bolts heads shall be submerged to the board at 1mm depth. Support sections shall be fixed at east at three spots at distances not greater than 1m.

Doors substructure shall be additionally reinforced with UA sections in case that wall is higher than 2,8m, if door is higher than 90cm and heavier than 25kg.

Installation walls in bathrooms are fixed to double substructure (due to pipes with bigger diameter). In order to increase rigidity and stability, it is necessary to connect separated substructures with smaller pieces of gypsum plasterboards 30cm wide, which are to be tightened with screws to CW sections. In case of walls with typical flooring height, this reinforcement shall be done at two places per height.

For penetration of installation from the walls, it is necessary to cut an opening in gypsum plasterboard which shall be 10mm wider than pipe diameter and then the gap shall be filled permanently with elastic fungicide putty (the surface shall be previously coated with primer coat, if requested so by putty manufacturer).

#### Wall covering on substructure:

In case of wall coverings with C or CD sections, distance between spacers shall be 60cm horizontally and 130cm vertically.

U or UD sections on floors and ceilings shall be bandaged with self-adhesive tape for sound insulation; the tape should be also placed under spacer, for the purpose of sound insulation.

Screws for tightening of gypsum plasterboards to substructure shall be placed at 25cm spacing. Screw bolts heads shall be submerged to the board at 1mm depth.

#### Gluing of gypsum plaster-boards to massive walls:

When gypsum plasterboards are glued to massive walls, the boards shall have such dimensions which cover full height of walls (board height = wall height reduced for 15mm). Boards shall be lifted

10mm of the floor (with washers made of gypsum plaster pieces), with 5mm clearance remaining on the top.

Glue shall be applied in three vertical rows across the board width, for 9.5mm thick boards, and four vertical rows for 12.5mm thick boards. Boards shall be levelled with plumb-rule covering three boards. When covering window niches or convexity on premises, complete surface of board shall be covered with bonding agent. When uneven or damaged wall surface is to be covered, narrow vertical straps of gypsum plasterboards shall be glued at 60cm spacing, and in case that the bedding is not supportive enough, straps shall be additionally tightened with plugs and bolts to the wall (vertical spacing of plugs and screws shall be round 60cm). Then, to those levelled narrow straps, complete 12,5mm thick plasterboards shall be glued.

### 3.10.4 CONTROL AND MEASURING METHOD

Dropped ceilings, partition walls and wall coverings shall be calculated per m<sup>2</sup> of actually covered surface that is visible on the premises. Unless otherwise specified in the bill of quantities, denivelations in ceilings and small dimensions coverings (cutting of installing pipes, pilasters, etc.) shall also be calculated per m<sup>2</sup>. Parts of wall which shall remain within the space of dropped ceilings, covered with gypsum plasterboards which are not to be bandaged, or only substructure which is to be connected to ceiling shall not be calculated, if not otherwise specified in the bill of quantities.

Making of blind stock for door frame or other openings, up to 2.5 m<sup>2</sup> surface of light opening, shall be calculated separately, but that is why the opening surface shall not be deducted. In case of light openings or passages bigger than 2,5m<sup>2</sup>, opening surfaces shall be deducted, but making of blind stock shall be calculated separately.

### 3.11 JOINERY

#### **Wall parapet coverings**

Coverings made of enriched MDF finished with melamine film shall be placed at appropriate steel substructure. Covering has to be flat with uniform colour (no stains). Closing of the covering at junction with walls shall be carried out with appropriate strips.

The Contractor shall check all measures from plans on site. Joinery price includes joinery material, auxiliary and bonding material, work, tools, complete fitting, machines, transport, horizontal and vertical, installation on construction (together with all necessary protective measures in order to prevent damages before delivery), covering strips, scaffolds, detailed drawings, masonry assistance and repairs following potential damages, which have to be done prior to painting. Everything else shall be fully in compliance with designer's instructions, i.e. Supervisor.

### 3.12 ALUMINIUM WORKS

All aluminium elements in the workshop shall be made in compliance with the design patterns, workshop drawings and details on appropriate sections, by competent labour and with thorough factory control.

These requirements unconditionally refer to production, delivery and installation of face elements, windows, doors, fixed and combined glazed partitions, including all necessary basic and auxiliary material, glazing, sealing, protective material.

The Contractor shall make workshop drawings and deliver them, together with samples, through technical supervision on site to the designer in order to obtain consent for supply of material and fabrication in the workshop.

The Contractor shall be liable to check all building openings on the facility.

Basic material for fabrication of elements shall be aluminium solid or hollow rolled sections anodised or plasticised in colour as per designer's choice.

Substructure shall be made of aluminium, anchors, pallet pieces and stainless or galvanized steel joints.

Anchor bolts, bolts, screws, rivets and other tightening materials shall be made of high quality steel, protected from corrosion and coated with cadmium. Where visible, they shall be processed the same way as aluminium sections.

Joints in frames and angles shall be mechanically connected or electrically welded; joints shall be hard; electrical joints shall be waterproof and without any damage to surface protection. During fabrication, it is necessary to ensure tolerance of elements exposed to atmosphere influences. Each omission in tolerance and consequences thereof shall be borne by the Contractor, at his own expense.

When in contact with other elements, joint shall be protected from corrosion and chemical reactions.

Joints of aluminium sections and reinforced-concrete structure shall be sealed with two-pack durable elastic putty.

Quality of plasticising shall be adjusted to climate conditions of the territory where the works are being executed.

Sealing tapes and sealants shall be installed at all exposed places. Gaskets shall be adjusted to atmospheric conditions, sealing capacity against air and water shall be in class "D".

Gaskets shall be made of EPDM sections.

The Contractor shall be liable to protect aluminium surfaces in compliance with transport and storing conditions. Protection shall be maintained during installation and removed prior to works handover to the Beneficiary).

At the moment of delivery, installed elements shall be, clean, in perfect condition and functional as per design.

Any damage which occurs during transport, storing or installation shall be repaired by the contractor, at its own expense, before handover to the Beneficiary.

Glass has to be in compliance with applicable SRPS standards.

When glazing with special glass, the contractor shall observe manufacturer's instructions.

Installation of glasses shall be carried out with gaskets of EPDM sections resistant to changes in temperature. All glass surfaces (panes) shall be unbroken and finally cleaned at the moment of works handover to the Beneficiary.

In case some damages to the glass (breaking) occur during works due to third persons' negligence, the Contractor responsible for aluminium works shall be liable to replace damaged glasses, with compensation.

At the Contracting Authority's ( CA) request, the Contractor shall be obligated to prove quality of materials and permanently installed equipment with prescribed compliance certificates.

Obtaining the quality certificates, material and prototype samples shall not be paid separately to the contractor.

The Contractor shall be liable to provide a guarantee, from manufacturer of aluminium, auxiliary materials and glass, for durability of delivered product and for the period of ten years from the date of works handover to the Contracting Authority.

In case that during works or guarantee period defects in material occur, the Contractor shall be liable to repair them, at his own expense, immediately after users' complaint.

The Contractor shall be obligated to, during works, clean every day his workspace, and following completion of works it shall carry out final cleaning of installed elements and its workspace.

Calculation of executed works shall be done according to actually executed quantities by application of unit prices in priced bill of quantities.

Following completion of works, contractor shall be liable to remove from site all tools, mounting and other accessories, packaging and garbage.

These activities shall not be paid separately to the Contractor.

### 3.13 METALWORK

Before beginning with metalwork, the awarded Contractor shall agree with designer and Supervisor on each item separately, in order to precisely determine dimensions, constructing method, fabrication, processing, including type of used material and mounting/installation method. If designer has provided the details, they shall be deemed to be "framed". Therefore, preparation of workshop details falls within Contractor's obligations and the Contractor shall submit them for approval to designer and/or Supervisor. However, the Contractor shall be fully liable for functionality during exploitation.

All answers shall be in writing – possible changes for some items, which include change in quantity, shall be entered into records and it will be applied as billing quantity. Apart from this, the awarded Contractor shall not make any change without consent of the Supervisor, which shall also be entered in the records.

Complete metalwork shall be carried out accurately and competently, with section iron, sheet metal and other semi-finished goods, exactly as per design, details and instructions by the Supervisor and technical requirements for finishing off works.

Connections of some elements shall be carried out in compliance with details and instructions given by supervising body. All welded parts shall be free of bumps, flat welds shall be grinded. Rivets and bolts used for connecting of some iron parts made of anodized aluminium, tin-iron and nickel parts shall have nickel heads. Pieces and parts shall not be bent or concave, i.e. warping.

All visible surfaces must be smooth and suitable for further work, painting, possible varnishing, etc.

Finished parts shall be brought to construction site previously coated with real red lead, or some other contemporary basic coating. Before bringing finished parts to construction site, they shall be brought in the workshop, after measuring. Each finished part shall be supplied with necessary number of related elements for installation.

Aluminium joinery: doors and partitions shall be made of aluminium sections extruded from alloy AlMgSi 0, 5, with minimum interrupted strength of F22 (SRPS EN 755-1:2008). Surface of sections shall be treated and painted by anode oxidation procedure, in compliance with standard SRPS S.T7.220:1984 in class AA 20, that is, ISO/DIN 7499 (minimum thickness of anode layer 20 micrometres).

The construction in the system of aluminium sections shall be carried out by interrupted thermal bridge between external and internal metal parts. Constructive sections for wing and door frame shall be done by pouring polyurethane resin, within controlled industrial procedure. All soft parts in the construction shall be sealed with EPDM, resistant to temperatures from -40°C to +90°C, with good sealing performances regarding air, water and thermal insulation. Coefficient of heat passing-through is requirement for class 2.1 per DIN 4106 and it shall be 2, 8 W/m<sup>2</sup>K.

Construction of doors, tilt and turn positions shall be carried out in the system "EVROZLJEB", so that it can support hardware of all reputed manufacturers of aluminium joinery.

Mounting of some parts shall be carried out with competence and responsibility; finished mounted pieces shall be placed exactly in position as foreseen by the design, i.e. vertical or horizontal position.

Payments for metalwork shall be made per piece or kg assembled on the building. Repairs of possible damages shall not be paid separately. Price includes all necessary chase cutting, measures inspection, bricking in and fitting, transport (horizontal and vertical), scaffold, etc.

Apart from these general descriptions, it is necessary to comply with descriptions from metalwork specification, details and particular descriptions in the bill of quantities.

### 3.14 PAINTING AND DECORATING

Only certified material may be used for painting and decorating, and the works may be carried out only by competent labour, i.e. qualified workers. Painted surfaces shall be free of stains and brush traces. Shade of all painted surfaces shall be completely even.

Pattern and roller imprints shall be clean and sharp, and joints may not be visible. Painted surfaces may not wipe off or peel. The Designer is entitled to select paint, shades and structure, and the Contractor shall be liable to submit colour charts for selection of colour, or to make samples for that purpose on site, in fields not smaller than 0,25m<sup>2</sup>. Following selection of shades, the Contractor shall be obligated to paint agreed surfaces with identical shade of colour.

All works shall be technically correct, including preliminary and finishing works, fully in compliance with technical requirements for painting and decorating – SRPS U.F2.013:1978 and SRPS U.F2.012:1978.

During execution of painting and decorating, the Contractor shall be liable to protect cabinets, doors and windows, including all parts of the building which might be damaged due to negligence of painters and decorators. It is forbidden to spill painting and other materials on the floors.

Unit prices include horizontal and vertical transport, cleaning of floors, glasses and possibly other objects following completion of the works, including potential erection, moving and dismantling of scaffold and making of samples.

#### 4 WATER SUPPLY AND SEWERAGE

##### 4.1 GENERAL CONDITIONS FOR THE DESIGN OF WATER SUPPLY AND SEWERAGE INTERNAL INSTALLATIONS

The entire water supply and sewerage systems are to be executed according to the applied technical regulations and selected design.

It is the Beneficiary's responsibility to obtain permission and all necessary solutions for building from the authorized institutions in due time.

It is the Contractor's responsibility to inform the authorized institutions on commencement of works in written form and prior to commencement of works as well as to invite the authorized institutions in due time for the inspection and acceptance of installations.

Changes in design may be performed upon the Contracting Authority's approval or the approval of the Supervisor – the Contracting Authority's representative (if such changes and amendments affect the design solution) and he himself is to guarantee their usage.

In case of unexpected additional works, the Contractor is obliged to conduct cost analysis and submit those to the Contracting Authority's Supervisor prior to the execution of such works. Only after the approval by the Contracting Authority is the Contractor allowed performing the execution of additional works.

Otherwise, completed additional works are to be treated as the agreed works and will be paid for according to the prices specified within the items of the bill of quantities or as determined by the Supervisor.

The account is to be made per actually executed quantities, measured on site, regardless of those specified in the bill of quantities.

All water supply and sewage pipes are to be measured per m' of the axes.

All sewage fittings (arches, branches, reducers, offsets, inspection elements etc.) as well as water supply fittings (knees, arches, reducers, T-sections etc.) are not to be taken into account nor remunerated separately but are to be measured as actual pipes. Higher diameter of reducers is to be taken into account.

All the necessary wall penetrations, floor structures, grooving for laying pipes, scrimming, walling up, patching and plastering after the completion of pipe installation are not to be remunerated separately but are all to be included in the item price. Value of each item includes all dues.

#### 4.1.1 WATER SUPPLY

All works are to be completed professionally according to the design, technical regulations and norms with the competent labour.

The material is to be of high quality and to meet technical regulations and standards for some types of materials and works.

Water supply sealants and auxiliary materials are to be of high quality with no defects in accordance with the applied norms and to completely serve their purposes.

Procured, transported water supply material is to be installed with necessary fittings, the entire connecting and assembly materials (hangers, saddles).

Inspection and testing of pipes (sound and pressure), joints and reinforcements (sound), necessary pipe cutting, threading, by using hemp dipped in minium, pipe or joint screwing, levelling and grading, bituminous pipe coating and fixing the pipes with hooks or saddlers are all to be performed in high quality and according to the applied technical regulations and norms.

Free standing pipes outside walls are to be away from the wall by 2-3 cm and fixed with saddles at each 2 m.

Pipes laid in the ground are to be coated with Bitulit, then bitumen and shielded with underlining felt.

The works include water supply scaling and marking.

Prior to putting the water supply in the regular operation it is necessary to inspect the entire installations.

#### 4.1.2 SEWERAGE

All works are to be completed professionally according to the design, technical regulations and norms with the competent labour.

The material is to be of high quality and to meet the applied technical regulations and standards for some types of materials and works.

Sewage sealants, as well as assembly and auxiliary materials are to be of high quality with no defects in accordance with the applied regulations norms and to completely serve their purposes.

Pipeline joints are to be well sealed in accordance with the technical conditions stated herein and recommendations made by the pipe manufacturer. All sanitary fixtures are to be procured, transported and installed professionally and in high quality.

After laying the sewage system network, it is necessary to conduct installation tests and only then perform backfilling and scrimming.

Sewage network ventilating is to be executed through ventilating pipes DN 100 mm and 70 mm ending with ventilation heads DN 150 mm and DN 120 mm above the roofs.

#### 4.2 GENERAL TECHNICAL CONDITIONS FOR PE PIPES

Procured and installed PE (polyethylene) pipes are to be in accordance with the following standards:

- SRPS G.C6.620 and DIN 8074
- SRPS G.C6.600

All installed pipes are to be provided with appropriate test certificates.

Pipes are to be delivered in rolls (for diameters  $\varnothing 16 \div \varnothing 110$  mm) or as straight pipes of 5 m in length.

It is allowed to store pipes on flat surface (free of sharp stones) at a location with no danger of dirt, grease, oil or other aggressive substances. The rolls are stored on palettes in horizontal position.

Pipe storing height is up to 1 m.

Storage areas must be restrained with columns or other limiters in order to avoid pipe rolling.

Pipes are to be joined by welding with flanges or by tightening.

## Welding

Inseparable joint is obtained by pipe welding.

It is significant for welding that all parts and pipes are made of the same material for the proper stiffness of welded joint.

Welding is performed as butt welding procedure with heating element.

Welding must not be performed on the outdoor site at temperatures below 0°C.

At higher temperatures the pipes are to be covered in order to avoid great difference in pipe sections in the course of welding.

## Flange jointing

Such joint falls into category of separable joints.

Flange jointing performed with HDPE and steel flanges is used for connecting PE pipes with other materials as well as for reinforcement building in.

The jointing procedure is performed in the accordance with the instructions by the pipe manufacturer.

## Tightening

Tightening is performed with electrical, accu or hand tools.

When jointing, it is necessary to follow instructions by the manufacturer of pipes and jointing tools.

The Contractor is obliged to procure only the pipes determined by the design which is to be inspected by the Supervisor.

If PE pipelines cross with other pipelines transporting hot fluids, PE pipes are to be thermally insulated and placed at sufficient distance in order to avoid heating above 20 °C.

## 4.2.1 HYDRAULIC TEST

All lines are to be tested (while still exposed) for test pressure which is 1.5 times higher than operating pressure.

In the course of testing it is necessary to provide constant temperature of fluid in order to avoid change in test pressure. Testing is not to be conducted at temperatures lower than 0°C and higher than 20 °C.

Testing is to be conducted in three stages:

- Pretesting,
- Major testing,
- Final testing.

For test pressure measurement, use tested manometers with the scale enabling reading the pressure changes of 0.1 bars. If possible, the manometer is to be placed at the lowest pipeline point.

### Pretesting

Test pressure in the course of pretesting is 1.5 times higher than the operating pressure.

Such pressure is to be repeated twice in 30 minutes with a 10 minute break. In the next 30 minutes the pressure in network must not fall by more than 0.6 bars.

There must not be any unsealed areas.

### Major testing

Necessary condition for commencement of major testing is successfully completed pretesting.

Test pressure is 1.5 times higher than the operating pressure.

Major testing takes 2 hours and after it is completed pressure drop must not exceed 0.2 with regard to the pressure measured after completion of pretesting.

3

### Final testing

Necessary condition for commencement of major testing is successfully completed major testing. The network is pressurized under 1 bar in at least 5 minute intervals. The cycle is to be repeated four times and the network is in pressure-free condition between the intervals. Testing is considered to be satisfactory if all connecting areas are well sealed.

### Permeability

If there are signs of permeability on joints (drops, streams etc.) it is necessary to abort the testing, discharge the pipeline, perform necessary repairs and then repeat the testing.

### Report

Record of completed tests is bound to be kept for the purchaser and pipe manufacturer. The report is to be signed by the CA or Contracting Authority's representative (Supervisor) and Contractor.

## 4.2.2 WASHING OUT AND DISINFECTION

Washing out and disinfection of the network are to be executed the same way as for all water supply installations, in accordance with the description enclosed in the section 'Water supply disinfection and washing out'.

## 4.3 GENERAL TECHNICAL CONDITIONS FOR POLYPROPYLENE (PP) PIPES

Procured and installed PP (polypropylene) pipes are to be in accordance with the following standards:

- DIN 8078 - quality standard,
- DIN 8077 - dimension standard and
- DIN 16962 – joint assembly (fittings) standard.

All installed pipes are to be provided with appropriate test certificates.

Pipes may be stored at any external temperatures. When storing the pipes it is necessary to pay attention that the entire length of a pipe rests over the surface in order to avoid potential deformations.

Pipes may be damaged by hitting at temperatures below 0 °C which is why careful manipulation is necessary.

PP pipes containing UV stabilizers may be stored outdoors (up to 6 months).

All procured material (pipes and fittings) must be provided with the appropriate factory certificates.

Sewage three-layer polypropylene (PP) pipes are used for gravitational drain of the waste water from the building. Pipes and fittings are made in diameters of Ø 32 mm – Ø 160 mm.

Maximum temperature of fluid to be drained by three-layer PP pipes is 95°C.

Pipe and fitting connections are made by elastic (rubber) sealing rings and collars.

It is necessary to follow instructions by the pipe manufacturer when connecting elements and during installation.

In terms of fire resistance, the pipes are self-extinguishing.

Prior to putting into operation it is necessary to conduct hydraulic testing of the installation.

The account and payment are to be made per m' of completely procured, installed and tested pipeline, along with all additions and dues.

## 4.4 GENERAL TECHNICAL CONDITIONS FOR PVC PIPES

All procured material (pipes and fittings) must be provided with the appropriate factory certificates.

PVC pipes are used for gravitational drain of the waste water. Under certain conditions they may be used for pressurized water drain but the pressure of 1.5 bars must not be exceeded. If the network is under pressure it is mandatory to consult the pipe manufacturer regarding endurance of some fittings.

Properties of pipes are as follows:

- Quality according to SRPS. G. C6 502,
- Consistency according to SRPS.G.C6.503,
- Dimensions according to SRPS G.C6.501 and DIN 19531.

Maximum temperature of fluid draining with PVC pipes must not exceed 70 °C.

Pipe and fitting connections are made by fixed collar and elastic sealing ring.

It is necessary to follow instructions by the pipe manufacturer when connecting elements and during installation.

Prior to putting into operation it is necessary to conduct hydraulic testing of the installation.

The account and payment are to be made per m' of completely procured, installed and tested pipeline, along with all additions and dues.

#### 4.4.1 PIPE JOINTS AND INSTALLATION

Pipes and fittings are to be connected by semi-fusion welding or by electric socket welding.

Pipes and fittings must be clean and smooth. Pipe ends must be cut at right angle. Prior to welding, it is necessary to check the welding device functionality and reaching the welding temperature.

Welding is performed with welding device with simultaneous heating of sections to be connected. Once the welding temperature is reached, the elements are impressed one into another. Absolutely sealed joint is thus obtained.

Pipes and fittings imprint with no restrains and axially (without turning) into appropriate heating accessories (bushing and pin) up to the limiter. After heating time is elapsed the heated elements are to be pulled down from the devices and immediately imprinted one into another (without turning).

It is important to follow determined imprint depth in order not to exceed the fitting limiter.

##### Electric socket (collar) welding

Such procedure is primarily used for the repair and welding over the existing installations.

Sections to be connected must be axially directed. After drawing in the sections into E-collar the socket is to be connected to the welding device.

Completed joint must not take load until it is cooled down. Usage of cooling agents is not allowed.

##### Pipeline installation

The Contractor is obliged to procure only the pipes determined by the design which is to be inspected by the Supervisor.

It is not necessary to provide grounding for connecting the reinforcement to pipelines.

Saddles must be made according to diameter of PP pipes.

Pay attention that the fixing material does not damage external surfaces of pipes.

Most appropriate fixing elements are saddles with rubber insert. Rubber insert also serves as sound insulator.

There may be two types of supports – fixed (steady) and sliding (leading).

##### Fixed (steady) support

Proper arrangement of fixed points is to avoid uncontrolled movements of pipeline and provide safe pipe leading.

Fixed supports are to be dimensioned and made such way to receive and compensate elongation forces and potential additional loads.

Threaded rods are to be used as saddle supports (free saddles are not recommended). It is necessary to pay attention to short distances to wall and ceiling that are to be anchored in.

Saddle and support must be stable and well fixed.

Vertical distributions may be firmly mounted. If the fixed support is mounted immediately in front of or behind the branching, risers do not need compensation arches or expansion bends for elongation compensation.

#### Pipeline elongation

When installing the pipeline in wall and floor by inserting it into concrete or mortar, temperature elongations are prevented.

When installing the pipeline in installation canals it is necessary to pay attention that pipe sections are provided with sufficient space for monitoring the riser movements due to their elongations. Positioning of risers in canal, dimensions of openings for branches and making junction points for torsion compensation are bound to be executed in accordance with recommendations by the pipe manufacturer and according to instructions provided by the Supervisor.

When placing pipes in free areas, it is mandatory to pay attention to outward appearance and stability of the pipeline. Elongation compensation is obtained by changing the pipeline direction or with elastic arch (expansion bend).

In order to provide elongation compensation by changing the direction, the Contractor is obliged to obey determined distances in the course of installation between fixed supports and knees designed on the network.

Elastic arches (expansion bends) are to be set when the elongation compensation cannot be obtained by direction change.

The Contractor is obliged to make expansion bends and supports according to instructions by the Supervisor and recommendations by the pipe manufacturer.

#### 4.4.2 WASHING OUT AND DISINFECTION

Washing out and disinfection of the network are to be executed the same way as for all water supply installations, in accordance with the description enclosed in the section 'Water supply disinfection and washing out'.

### 5 ELECTRICAL HIGH CURRENT SUPPLY SYSTEM

In respect of the all foreseen works, the Contractor shall be fully familiar with all Final Design details, as well as with all local regulations, local standards (SRPS), common practice of trade and circumstances for their execution.

ICS	Standard number	Year	Title in English
29.020	SRPS IEC 529	1995	Degrees of protection provided by enclosures (IP code)
	SRPS N.A9.002	1982	Identification of apparatus terminals – General rules for terminal marking using an alphanumeric notation
	SRPS N.A9.005	1985	Code of designations of colours
	SRPS N.A0.826/1	1995	Electrical installations of buildings – Terms and definitions – Amendments

ICS	Standard number	Year	Title in English
91.140.50	SRPS N.B2.762	1990	Low voltage electrical installations - Verification of conditions for protection by automatic disconnection of supply - Measurement of earth electrode resistance

Whenever local regulations, local standards (SRPS), or any common practice of trade, are subject to any interpretation, clarification, ambiguity, or dispute, a ruling by the Supervisor shall prevail, always provided that such ruling shall be fully in compliance with, and shall be based on the subject local regulations, local standards (SRPS), as well as in accordance with common practice of trade.

Nevertheless the new, IEC 60364, is the only international and local standard that covers the wide field of electrical installations of buildings. It applies to all installations, from those of lower complexity, such as individual dwellings, to extended and complex installations in industrial and commercial premises, such as factories or large office buildings. It covers all aspects of safety, including protection against electric shock and thermal effects. Essential functional requirements, such as electromagnetic compatibility, are also covered, including, but not limited to:

ICS	Standard number	Year	Title in English
91-140-50	SRPS IEC 60364-1	2007	Electrical installations of buildings - Part 1: Fundamental principles, assessment of general characteristics, Definitions
	SRPS IEC 60364-4-41	2008	Electrical installations of buildings - Part 4-41: Protection for safety - Protection against electric shock
	SRPS IEC 60364-4-43		Electrical installations of buildings - Part 4-43: Protection for safety - Protection against over current
	SRPS IEC 60364-5-51		Electrical installations of buildings - Part 5-51: Selection and erection of electrical equipment - Common rules
	SRPS IEC 60364-5-52		Electrical installations of buildings - Part 5-52: Selection and erection of electrical equipment - Wiring systems
	SRPS IEC 60364-5-53		Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control
	SRPS IEC 60364-5-54		Electrical installations of buildings - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors
	SRPS IEC 60364-7-701		Low-voltage electrical installations - Part 7-701: Requirements for special installations or locations - Locations containing a bath or shower

All works must be carried out precisely and professionally. Prior to application, the Supervisor must examine all material and all his comments referring to material and quality of work shall be obligatory for the Contractor. The agreed prices include all fully completed works, the final product, and ready for use.

The Contractor shall be responsible for any and all damages caused by him during the works to any third party, structure, main building or adjacent buildings, and any repair works and compensations of any kind shall be at the Contractor's expense.

Upon completion of the works, the Contractor shall be liable to carry out all specified tests and measurements and submit written certificates in the form of attest to the Supervisor.

## 5.1 CABLES

### 5.1.1 CABLES

Procurement and assembling the internal high current (low voltage) cables shall be laid on the wall under the mortar or in the rails. Complete with installation material, connection boxes, connected, tested live under voltage and commissioned, all according to the Design.

## 5.2 DISTRIBUTION CABINET

Distribution cabinets shall be made according to the main design. The Contractor is under obligation to grasp available space at subject location and possibilities to bring the equipment. Upon testing and commissioning, the Contractor shall be under the obligation to deliver as build drawings on plasticized sheets for placing on back side of cabinet's doors, as well as, a CD electronic copy.

## 6 ELECTRICAL LIGHTING INSTALLATIONS

ICS Number	Standard number	Year	Title in English
91.160	SRPS U.C9.100	1962	Illumination of building rooms by daylight and electrical light
91.160	SRPS IEC 60364-7-714	2000	Electrical installations of buildings - Part 7: Requirements for special installations or locations - Section 714: External lighting Installations

## 6.1 CONNECTION POINTS

### 6.1.1 CONNECTION POINT

Procurement and assembly of light bulb connection points, having IP20 protection degree and connected by cables according to Main design, which shall be laid on the wall under the mortar, completely with switches, installation material and connected.

## 6.2 FLUO LIGHTS

Procurement and assembly of fluo-lights at ceilings: Completely in compensated connection, with pre-connection equipment, light bulbs, light installation material and connecting. The types of lights are defined in the Main design.

## 7 ELECTRICAL LOW CURRENT - IT SYSTEMS

In respect of the all foreseen works, the Contractor shall be fully familiar with all Final Design details, as well as with all local regulations, local standards (SRPS), common practice of trade and circumstances for their execution.

ICS number	Standard number	Year	Title in English
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ICS number	Standard number	Year	Title in English
91.140.50	SRPS EN 50174-2 (en)	2008	Information technology – Cabling installation - Part 2: Installation planning and practices inside buildings
	SRPS IEC 529	1995	Degrees of protection provided by enclosures (IP code)
	SRPS EN 50310 (en)	2008	Application of equipotent bonding and earthing in buildings with information technology equipment

Whenever local regulations, local standards (SRPS), or any common practice of trade, are subject to any interpretation, clarification, ambiguity, or dispute, a ruling by the Supervisor shall prevail, always provided that such ruling shall be fully in compliance with, and shall be based on the subject local regulations, local standards (SRPS), as well as in accordance with common practice of trade.

All works must be carried out precisely and professionally. Prior to application, the Supervisor must examine all material and all his comments referring to material and quality of work shall be obligatory for the Contractor. The agreed prices include all fully completed works, the final product, and ready for use.

The Contractor shall be responsible for all damages caused by the Contractor during any works, to any third party, structure, main building or adjacent buildings, and all repair works and compensations of any kind shall be at the Contractor's expense.

Upon completion of the works, the Contractor shall be liable to carry out all specified tests and measurements and submit written certificates in the form of attest to the Supervisor.

## 7.1 PHONE INSTALLATION NETWORK

Procurement and mounting of phone cables located and lay all according to the main design. Complete installations include cables, sockets, bends and other installation material.

## 8 ELECTRICAL FINAL WORKS & HANDOVER

Upon completion of all installation, the Contractor shall be under the obligation to perform:

- patching walls and slabs damaged due to installation assembly works,
- remedy of eventual technical and/or aesthetics defects of the subject building installation, cleaning and taking debris out of the building,

Upon completed inspection of the completed works, perform all tests as prescribed under prevailing regulations, such as:

- measuring insulation resistance of cables, electrical equipment and each piece of equipment separately and complete installation made,
- measuring transient grounding resistance,
- testing of complete installation made functioning, as well as functioning of each piece of equipment and/or installation separately, etc.,
- testing protection from voltage contact in the installation