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TECHNICAL SPECIFICATION

HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

BUILDINGS

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REFERENCES DOCUMENTS

- REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, CPD

[Construction Products Directive]

- EU DIRECTIVE 2009/125//EC,

[Eco-design Directive]

- EU DIRECTIVE 92/42/EC Boiler Efficiency

[Efficiency Requirements for New Hot-Water Boilers Fired with Liquid or Gaseous Fuels Directive]

- EU DIRECTIVE 2010/31/EU, EPBD

[Energy Performance of Buildings Directive]

- EN ISO 306

[Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)]

- EN 345

[Water for Mixing and Curing of Concrete]

- EN 413 (harmonised under CPD)

[Masonry cement - Part 1: Composition, specifications and conformity criteria]

- EN 459 (harmonised to CPD)

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[Specification for mortar for masonry - Part 1: Rendering and plastering mortar]

- EN 1057 (harmonised under CPD)

[Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications]

- EN 1254

[Copper and copper alloys - Plumbing fittings - Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes]

- EN 1401-1

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- EN 1451-1

[Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polypropylene (PP) - Part 1: Specifications for pipes]

- EN 1453-1

[Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings - Unplasticized poly (vinyl chloride) (PVC-U) - Part 1: Specifications for pipes and the system]

- EN 1852-1

[Plastics piping systems for non-pressure underground drainage and sewerage - Polypropylene (PP) - Part 1: Specifications for pipes, fittings and the system]

- EN1856 (harmonised under CPD)

[Chimneys — Requirements for metal chimneys]

- EN 1857 (harmonised under CPD)

[Chimneys — Components — Concrete flue liners]

- EN 1858(harmonised under CPD)

[Chimneys — Components — Concrete flue blocks]

- EN12150 (harmonised under CPD)

[Glass in building - Thermally toughened soda lime silicate safety glass - Part 1: Definition and description]

- EN 12446 (harmonised under CPD)

[Chimneys — Components — Concrete outer wall elements]

- EN 12594

[Bitumen and bituminous binders - Preparation of test samples]

- EN 13024 (harmonised under CPD)

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- EN 13707 (harmonised under CPD)

[Flexible sheets for waterproofing — Reinforced bitumen sheets for roof waterproofing - Definitions and characteristics]

- EN 13950 (harmonised under CPD)

[Gypsum plasterboard thermal/acoustic insulation composite panels - Definitions, requirements and test methods]

- EN 13964 (harmonised under CPD)

[Suspended ceilings - Requirements and test methods]

- EN 13970 (harmonised under CPD)

[Flexible sheets for waterproofing - Bitumen water vapour control layers - Definitions and characteristics]

- EN 14179 (harmonised under CPD)

[Glass in building - Heat soaked thermally toughened soda lime silicate safety glass]

- EN 14321 (harmonised under CPD)

[Glass in building - Thermally toughened alkaline earth silicate safety glass]

- EN 14351-1 (harmonised under CPD)

[Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics]

- EN 14411 (harmonised under CPD)

[Ceramic tiles - Definitions, classification, characteristics and marking]

- EN 14496 (harmonised under CPD)

[Gypsum based adhesives for thermal/acoustic insulation composite panels and plasterboards - Definitions, requirements and test methods]

- EN 14967 (harmonised under CPD)

[Flexible sheets for waterproofing — Bitumen damp proof courses — Definitions and characteristics]

- EN14989 (harmonised under CPD)

[Chimneys — Requirements and test methods for metal chimneys and material independent air supply ducts for roomsealed heating applications]

- ΚΤΣ – 2016 Απόφαση : Αριθμ. Γ.Δ.Τ.Υ./οικ.3328 ΦΕΚ 1561Β 2-6-2016

«Ελληνικός Κανονισμός Τεχνολογίας Σκυροδέματος»

[Hellenic Concrete Technology Regulation]

- ATOE1976

[Material on the Spot]

- ATOE 051 (a)

[Reinforced or non reinforced Lime Mortar and Mortar Type]

- ATOE 052 (b)

[Mortar or Cement Mortar, preferable Quartz or at least of Ferric Limestone Origin]

- ATOE 1417

[Lime Cement Mortar Materials Ratio 1:2$^{1}/_{2}$ of 150 Kg of Cement]

- ATOE 1447

[Cement Mortar Material Ratio of 400 Kg of Cement]

- ATOE 4621

[Block Structure Construction 1/4 Block Thickness]

- ATOE 4622 / ATOE 4623
[Track Block Structures Construction of 15 cm Thickness]

If also required

- Νόμος 4412 (ΦΕΚ Α' 147/08-08-2016) “Δημόσιες Συμβάσεις Έργων, Προμηθειών και Υπηρεσιών (προσαρμογή στις Οδηγίες 2014/24/ΕΕ και 2014/25/ΕΕ)”

- Απόφαση : Αριθ. ΔΝΣγ/οικ.35577/ΦΝ 466 ΦΕΚ 1746/Β/19-05-2017 “ Κανονισμός Περιγραφικών Τιμολογίων Εργασιών για δημόσιες συμβάσεις έργων . ”

- Technical Recommendation of T.E.E. (Technical Chamber of Greece)
T.OT.E.E. 2411/86
[Plumping in building- cold and hot water supply]

- Technical Recommendation of T.E.E. (Technical Chamber of Greece)
T.OT.E.E. 2412/86
[Plumping in building - sewers]

If also required

Τ.Ο.Τ.Ε.Ε.	ΠΕΡΙΓΡΑΦΗ	ΕΓΚΡΙΤΙΚΕΣ ΑΠΟΦΑΣΕΙΣ	ΕΠΑΝΕΚΔΟΣΕΙΣ
ΤΟΤΕΕ 20701-1/2017	*Αναλυτικές εθνικές προδιαγραφές παραμέτρων για τον υπολογισμό της ενεργειακής απόδοσης κτηρίων και την έκδοση του πιστοποιητικού ενεργειακής απόδοσης*	ΦΕΚ Β' 4003/17-11-2017	Α΄ ΕΚΔΟΣΗ
ΤΟΤΕΕ 20701-2/2017	*Θερμοφυσικές ιδιότητες δομικών υλικών και έλεγχος της θερμομονωτικής επάρκειας των κτηρίων*	ΦΕΚ Β' 4003/17-11-2017	Α΄ ΕΚΔΟΣΗ
ΤΟΤΕΕ 20701-3/2010	*Κλιματικά δεδομένα ελληνικών περιοχών*	ΦΕΚ Β' 2945/23-10-2014	Γ΄ ΕΚΔΟΣΗ
ΤΟΤΕΕ 20701-4/2017	*Οδηγίες και έντυπα εκθέσεων ενεργειακών επιθεωρήσεων κτιρίων, συστημάτων θέρμανσης και συστημάτων κλιματισμού*	ΦΕΚ Β' 4003/17-11-2017	Α΄ ΕΚΔΟΣΗ
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1. TYPES OF MORTAR

1.1 OBJECTIVE

This specification concerns the treatment process of various types of mortar used in masonry, plaster coating, joint filling, plating, paving and generally wherever considered necessary.

1.2 WATER

For mortar treatment shall exclusively be used water that conforms to the requirements of EN 1008 & ΚΤΣ 2016.

1.3 LIME

It shall originate from pure limestone well baked with calcium oxide and magnesium oxide content higher than 95%. Lime shall comply to EN 459-1:2001, EN 459-2:2002 & EN 459-3:2001.

1.4 HYDRATED LIME

Use of lime powder is permitted. It shall be screened on 0.25mm hole sieve and be of uniform colour. Lime powder is carried in paper bags bearing manufacturer's seal, in conformity with article No. 1017 of chapter MATERIAL on the spot of **ATOE 1976**.

1.5 SAND

1.5.1 ORIGIN

Sand intended to be used in mortar treatment shall originate from company approved quarry, mortar type **ATOE 051 (a)** for reinforced or non reinforced lime mortar and mortar type **ATOE 052 (b)** for mortar or cement mortar, preferably quartz or at least of ferric limestone origin.

1.5.2 SUITABILITY

The sand shall be free from certain detrimental matter such as clay (colloidal matter consisting of max. diameter 0.005 mm grains) and organic matter, talc, mica etc. Respective maximum permissible content is: 2% for clay, 1% for organic matter and 1% for talc and mica. During storage at worksite, the sand shall be protected against various substances which may cause fouling.

1.5.3 GRADATION

Sand gradation depends on the kind of work the mortar is intended for. Where there is use of the terms: "coarse", "medium" and "fine" these are defined as in the table below:

	Screened By	Checked By
Sand Categories	**Diameter Sieve**	**Diameter Hole Sieve**
Coarse	6.0 mm	3.0 mm
Medium	3.0 mm	0.5 mm
Fine	0.5 mm	------

In all the above categories there shall be proper gradation of the sand grains.

As to the shape of the grains, category, gradation, usage of natural (marine, mineral) or crushed sand, this is described in the respective paragraphs regarding masonry, plaster coating, joint filling and plating.

1.6 MARBLE DUST

Marble dust shall be of excellent quality, white, free from extraneous materials and depending on its destination, fine (totally ground powder) or coarse (rice) No 1-3.

1.7 MIXING AND PROCESSING

1.7.1 MIXING

Mixing of binders with inert materials in dry or liquid state, shall necessarily be done by mechanical mixer for proper length of time to ensure uniformity of volume. Practical proof of uniformity is that of the mixture's colour.

1.7.2 PROPORTIONS

The proportions of the materials constituting mortar shall be strictly kept in conformity and to this end shall be used special iron plated containers of normal dimensions commensurate with their destination. In cases where proportions are not specified in the next chapters, shall be in effect those which are applicable in respective cases by approval of the Supervisor.

1.7.3 LIME MIXING

If lime pulp constitutes the mortar binder, this shall be transformed into emulsion by adding water and subsequently be mixed with inert material. When the binder is in powder form (cement, hydrated lime dust etc.) this shall be preceded by its mixing in dry state with the inert material and afterwards be mixed with gradual addition of water.

1.7.4 CEMENT MIXING

When mixing lime mortar reinforced with cement, the latter shall be mixed in dry state with the sand, while the mortar shall be processed, by adding lime in liquid state to the lime pulp. If lime dust is used, this shall be mixed with cement and sand in dry state first before water is added.

1.7.5 ADDITIONAL TYPES OF MORTAR

When use of aggregate materials is made, respective mortar processing must fulfill the Manufacturer's requirements.

Aggregate materials shall not detract from mortar strength and shall have no impact on material strength and /or structures they are (temporarily or permanently) adjacent to. Should any damage be caused, the Contractor bears total responsibility even if the aggregate materials have been approved by the Owner's Engineer.

Mortar used in clay tiling shall be mixed with special emulsion (type ELIFLEX) in proportions specified by the Manufacturer.

2. WALLS

2.1 Brick or block STRUCTURES

2.1.1 OBJECTIVE

This specification specifies the construction of brick or block structures for both interior and exterior walls and the requirements for materials, method and construction practices for the completion of works.

2.1.2 MORTAR MATERIALS

Lime, cement, sand and water to be used for wall structure mortar treatment shall be in conformity with the requirements specified in chapter 1. cement mortar material shall comply to **EN 413-1.**

2.1.3 TOLERANCE

Defects, carving, setting, inaccuracy in aligning, wall structure vertical surface divergence, in corners and angles, coarsely cut blocks, irregular or too thick horizontal joints, etc. shall be unacceptable and any such work dismissed by Owner's Engineer shall be totally demolished and rebuilt at the Contractor's expense. There shall be no reuse of demolition products.

Generally concerning wall structures no wall point is to diverge from the line as specified by either of the supports more than 5mm. Moreover, no wall point shall diverge from plumb line more than 5mm. Block dimensions shall be fixed with tolerance ± 3%. For wall structure right angles there is allowance of 4mm divergence for up to 3m wall length and 3mm for 2m wall length.

2.1.4 SAMPLES

2.1.4.1 INDIVIDUAL MATERIAL SAMPLES

Individual samples of each block, joint, supports type and various other types of equipment shall be delivered and approved before starting work.

All material deliveries generally shall be of the same quality as that of approved samples.

2.1.4.2 MATERIAL CONTROL

Certificate submission is necessary to assure quality of all types of blocks to be used.

2.1.5 SEALING MATERIALS

2.1.5.1 MANUFACTURER'S DATA

All sealing materials shall be accompanied by the specification as prescribed by the Manufacturer as well as by use-appliance instructions. This also applies to auxiliary or collaborate materials of each type. Besides the above there shall be submission of official certificates along with respective experimental trials reports indicating suitability for the works they are intended for.

2.1.6 SPECIAL SPECIFICATIONS

2.1.6.1 WORK CONDITIONS

Works must be protected, by approved methods, against detrimental weather conditions.

Both sides of the exposed wall structures shall be covered top to bottom during the first 24-hour period after construction.

In cases of frost hazard, all necessary measures shall be taken to protect newly constructed wall structures.

2.1.6.2 GENERAL RULES

All wall structures shall be leveled, vertical at right angles with full mortar layers and all vertical joints fully filled.

Work shall be performed in uniformity in order to sustain consistent wall line on each

floor.

Broken or worn out pieces shall not be used as they will make wall surface conspicuous when work has been completed.

If wall structure requires block size reducing which will be visible when work is completed, this shall be performed with the use of marble disk.

2.1.6.3 BUILDING AND JOINT FILLING

All surfaces shall be wet and clean free from dirt before wall construction begins. Surface shall be covered by adequate cement mortar on a ratio of 1:3 to ensure fitting of the first block layer.

Building shall be performed in horizontal layers with ample mortar as well as sliding and hard pressing of the blocks until mortar overflows from all joint points.

Finally, surfaces shall be trowel cleaned. All vertical joints shall be filled with mortar and block layering shall be performed on full mortar bedding. There shall mostly be used cement mortar 400 kg cement with lime.

Layering shall be done in such way as to ensure four layers reaching a height of 40mm higher than if laid without mortar. Joints shall be kept horizontal and uniform.

Vertical joints shall be kept uniform of average 10mm width. Wall building, apart from cases when joints are required without mortar or similar constructions, shall be done in accordance with track laying or the owner's Engineer's requirements. Where smaller size pieces or endings are required, there shall be used special pieces or compact cut pieces to form quadrangular sides.

Bricks shall be built absolutely vertical with parallel smooth faces. Horizontal or vertical recesses shall not be acceptable if exceeding tolerance limits.

Joining of bricks with beam or roof footings shall be done three days after initial building to allow complete mortar drying of the wall. Brick laying shall be done sideways.

Before brick building, columns, beams and other elements the wall structure is adjacent to, will be coated with one layer of cast cement mortar on a ratio of 1:3, while wall construction shall take place after cast cement dries.

Independent angles, runners etc. that are of short length shall be built with reinforced cement mortar of 400kg cement per cubic meter.

In case of wall structure in common bend or wall structure interception, building will be done simultaneously to achieve binding of all wall structures.

Wall structures will be wetted after building once a day for a period of seven days during summertime and the rest of the seasons accordingly.

2.1.7 NON BEARING WALLS

Nonbearing wall structures shall be constructed after a period of two weeks of wood shuttering or support removal.

2.1.8 INSULATION GASKETS. REMOVAL JOINT SEALING

When removal joints are provided, these shall be sharpened to allow for gaskets. Metal gaskets shall be wedged using hardwood wedges. Next, joints shall be sealed with approved asphalt paste supplied by specialized Manufacturer.

Door frame gaps, window and other framework or wall structure gaps as well as removal joints on external surfaces shall be grouted.

2.1.9 GROUTING

A horizontal grouting strip shall be placed at minimum height of 150mm over the final top floor surface. The strip shall be appropriate for this use and of proportional rough surface in order adhesion to the mortar to be achieved.

2.1.10 WINDOW. DOOR PLACING

Door frames and other similar constructions shall be fixed onto wall structure with strong galvanized iron joints (6 for each opening) and shall be built within wall structure.

Iron doorframes must be fitted parallel to firm building on all sides while their gap shall be filled with cement mortar or polyurethane. The Contractor shall bear responsibility for placing and accurate aligning of all similar constructions.

2.1.11 PROTECTION AND CLEANING

Finished walls must be kept clean and protected against various types of dirt.

Mortar spots and other stains shall be cleaned from surfaces by rubbing and washing with clean water.

In addition, walls shall be protected against excessively rapid drying by using appropriate and approved methods after the owner’s Engineer's approval.

All door frames, steel constructions, frames and any fitted structure shall be placed accurately. Where H/M piping installations run through the wall, respective sleeves shall be placed. On fire compartment walls after piping installation, gaps shall be filled with fire-proof materials.

All recesses, inserts and openings no longer needed, shall be filled with great care. The same also applies to pieces that are the product of cutting and fitting.

Non galvanized fitted metal objects shall be painted with two coats of anti-rust paint.

Contractor shall also take protective measures against damages caused by human error or weathering, particularly to protect external wall insulation before, as well as during external linings construction.

2.1.12 GENERAL REQUIREMENTS

Materials shall be provided by the Manufacturer or Vendor approved by the owner’s Engineer.

After approval all quantities for the work shall be provided by the same Manufacturer or Vendor.

2.1.13 Bricks or blocks

Bricks or blocks to be used shall be identical in texture and colour.

Bricks or blocks must be tough, strong, rectangular and clean.

Bricks or blocks to be used for all types of block structures shall be gapped with six (6) holes parallel to their length and measuring 19/9/6 cm.

If provided by the study information there shall be used gapped blocks with rectangular holes parallel to their length and measuring 22/15/25 cm or 28/15/25 cm or 18/15/35 cm or 10/15/35 cm, Cutting of these bricks or blocks shall be performed with mechanical cutter, any other way of cutting not being allowed.

Bricks or blocks must originate from leading manufacturers, processed by mechanical pressure, free from marl, lime grains and other matter that is later the cause of flaking off; solid, tough, sound, and not fragile, of regular shape with perfectly right angles, consistent straight lines and well-shaped edges.

Bricks or blocks lacking the above mentioned properties or left in the open for long periods of time thus being fragile, corroded or bearing lime fouling shall be rejected by the owner's Engineer.

Bricks must be according to the European standard **EN 771 :2003.**

Materials and bricks or blocks treatment- structure methods shall be in conformity with mortar specifications. More specifically sand shall be construction sand, clean and medium grained.

2.1.14 MORTAR PROPORTIONS

Block structure construction 1/4 block thickness **(ATOE 4621).**

Cement mortar material ratio of 400kg of cement **(ATOE 1447)** per cement bag:

- cement 50kg
- lime pulp 0.01m^3
- mortar sand 0.125m^3
- water 0.03m^3

Track, block structure construction of 15cm. Thickness **(ATOE 4622, 4623).**

Lime cement mortar materials ratio 1:2 $^1/_2$ of 150kg of cement **(ATOE 1417)** per cement bag:

- cement 50kg
- lime pulp 0.10m^3
- mortar sand 0.30m^3
- water 0.07m^3

3. PLASTERING

3.1 OBJECT

This chapter deals with plastering construction, covering surfaces of various structural elements. Plastering shall comply to EN 998-1:2003.

Apart from this chapter, contractual conditions 7001 to 7017 (Joint-fillings Plastering) of **ATOE 1976** also apply.

3.2 MATERIALS-MORTARS

All materials to be used in plastering and joint-fillings, i.e. water, cement, lime, sand, marble dust, etc. shall be in accordance with what is prescribed in the respective articles and paragraphs here in.

More specifically lime shall be absolutely clear, while sand must originate from quarry, be suitable for plastering and clean.

Treatment of various mortars shall be performed in accordance with article 1.7 here in.

3.3 CONSTRUCTION

3.3.1 GENERAL CONDITIONS

Surfaces to be plastered shall be cleaned free with ample water, from dust and other materials preventing adhesion of plastering to them.

The types of mortars to be used for each plastering coat are referred to in the relative invoice articles.

The width the various plastering coats shall bear is specified in **ATOE 1976** article 7004.

Free plastering surfaces shall be completely even.

Caved or curved edges forming two vertical plastered surfaces shall be linear and vertical. Caved and curved edges forming vertical and horizontal surfaces shall be linear and horizontal. All edges shall belong to clear angles and shall not form convex or curves unless otherwise prescribed by the owner's Engineer.

On occasional slight repairs of finished plastering, joint-fillings of old and new plastering shall not be discernible.

Plastering and joint-filling finish shall be followed by carefully cleaning adjacent structures such as walls, floors, piping etc stained by plastering materials and all mortar remains shall be removed from work place.

3.3.2 GROUND LIME MORTAR PLASTERING

First coat of internal and external plastering shall be applied by amply wetted mortar, trowel cast on the surface to be plastered.

After trowel casting there shall be a total of gaps not exceeding 10% of the whole surface. On concrete surface, cast mortar shall be performed with cement mortar 450kg cement and medium grained sand on a ratio of 1:3, regardless of the mortar type prescribed to be used on the second coat. Material difference on the first coat does not affect invoice articles prices which concern plastering and are applied invariably on both cement and any other kind of surfaces.

Second coat, brown coat, shall be applied by trowel and bar. To form completely flat surface, leads of the same material shall be constructed, spanning no more than one meter.

Internal coat proportion shall be 150kg cement, marine sand and lime pulp on a ratio of 1:3.

External coat proportion shall involve 450kg cement, sand and lime pulp on a ratio of 1:3.

Both coat thickness shall be 15mm.

Third coat shall be done with marble dust. Before mortar sets, processing will be done with hand float and ample wetting until regular, smooth, compact surface is achieved.

Plastering treatment with soft material fragments such as polystyrene, beforehand floating, is not allowed.

Internal coat proportion shall be 150kg white cement, carefully sieved marble dust on a ratio of 1:2.

External coat proportion shall be 450kg white cement and marble mortar on a ratio of 1:2. Coat thickness shall be 5mm. Plastering treatment shall be better achieved by use of steel trowel.

The whole work shall be performed by experienced craftsmen to ensure final plastering surface shall be smooth and free from hollows.

4. COATING AND LINING

4.1 OBJECT

Stairs (steps and risers) and landings lining will be done with hard white marble.

4.2 MATERIAL

Tough slit marble originating from Kavala or similar, white, 3 cm thick for steps and 2 cm for risers, with clear, linear edges (without borings), choice marble, without cracks, gluing or flakes. Marble wall-base.

Lime mortar 1:3 with the addition of 100kg cement per cubic meter of ready-made mortar (bedding).

Marble stucco of the same color as the plates.

Any required minor material.

4.3 METHODS OF APPLICATION

Cleaning of concrete surface and wetting.

Careful coat of lime cement mortar 2 cm thick.

Included cutting and processing of lining work (creating vertical recesses etc.) as well as surface polishing (water lacquer).

4.4 MARBLE WINDOWSILLS

4.4.1 OBJECT

Marble windowsill placing.

4.4.2 MATERIAL

Sills of soft white marble strips of Kavala origin or similar, suitably processed and smoothly honed 2 cm thick, up to 35cm wide and 1.20m long suitably glued so that the final product is on a par with a complete consistent sill.

Cement mortar 450kg cement.

Cement mortar 600kg white cement.

4.4.3 PLACING

Surface cleaning to place the sill.

Marble sill placing with cement mortar 450kg cement at 2% outward gradient and beading on occasional angles/walls.

Joint-filling with cement mortar 600kg white cement.

4.5 EXTERNAL DOOR THRESHOLDS

4.5.1 OBJECT

Marble external door thresholds.

4.5.2 MATERIALS

Hard marble of Kavala origin or similar, white, 2cm thick, up to 30cm wide, and length commensurate with frame opening.

Suitable formations for stabilizing closed window shutters in their final position and preventing wash or rain water accessibility towards the inside.

Cement mortar 450kg cement.

4.5.3 WORKMANSHIP

Marble sill placing with cement mortar 2cm thick.

4.6 FLOOR TILING

4.6.1 OBJECT

Floor tiling shall be in compliance with **elot en 14411**.

4.6.2 MATERIALS

In personnel offices and toilettes shall be placed anti-slipping ceramic tiles size 30 x 30.

Tile absorption (E) shall be higher than 6% and surface hardness higher than 5ms of MOHS scale, A quality and type, series and colour of company choice.

Other dimensions of tiles may be used provided they are in conformity with the construction, comply with EN applicable specification, space aesthetics and after the approval of owner's Engineer.

Wall coating with porcelain 20 x 20cm tiles in sanitary places and kitchens. These shall be placed with vertical joints in harmony with sanitary fixtures.

Around these fixtures shall be placed whole tiles; cut tiles shall be avoided. Cut tiles may be used at wall edges.

In wall tiles, joint thickness shall be 2mm approximately allowing a 0.3 difference between thicker and thinner joint.

To avoid differences plastic crosses shall be used.

Joints shall be filled with cement filling and shall be carefully cleaned to avoid real joint thickness increase. Where tiles are not white, color shall be added in the filling, to match coating colour. Tiles shall be fitted with glue.

In floor tiles, bedding shall consist of cement mortar with a proportion of 1:3 cement to washed marine sand.

Joint shall be 3mm and joint filling shall consist of white cement thick emulsion and addition of colour cement. Any minor material required for the work.

4.6.3 WORKMANSHIP

Careful floor cleaning and wetting.

Uniform spreading of cement mortar 2cm thick or more if necessary to form gradients.

5. FALSE CEILINGS

5.1 OBJECT

This specification concerns materials and workmanship requirements of false ceilings placing. These are placed where prescribed by technical specification and study.

Mostly false ceilings are prefabricated products combined with fitted strips to achieve sound absorption as well as fire-proof indicator according to respective work studies.

False ceilings shall comply to **EN 13964.**

5.2 WORKMANSHIP

The whole work shall be executed by experienced, competent craftsmen with long time, longer than ten years, experience in similar work.

5.3 INFORMATION AND SAMPLES SUBMISSION

5.3.1 SAMPLES

The Contractor shall submit samples 300mm in length of the prescribed materials to be used for suspension systems.

The Contractor shall submit three natural size samples for each type of panel and strip.

In addition to the samples there shall be: detailed list of all materials, tiny plugs, gaskets, screws etc. in combination with the areas where these shall be installed in, samples of all materials 300mm in length, one piece of each component to be used, quality, properties etc. assurance certificates, features by Notified Body as required and all necessary technical information available by the system Manufacturer. In addition to this submission, the Contractor shall also submit general information on the selected materials directly related with false ceilings, such as lighting vent nozzles, sensors, ionizers, etc., to provide full picture of the recommended solutions.

5.3.2 STRUCTURAL DRAWINGS

The Contractor shall submit three (3) copies of construction drawings and the electronic files (CAD) of them demonstrating the recommended suspension system of both false ceilings and strips.

In addition, the Contractor shall submit three (3) copies of the Contractor's forms indicating the recommended materials.

5.3.3 STRUCTURAL DESIGNS

System design and technical description shall include details on a 1:1 scale of all application special details, joints, and particularly of structural sections indicating outer edge linking (permanent or removable), acoustical insulation materials details and special details related with joints and outer edges.

5.3.4 SUSPENSION SYSTEM

The Contractor shall ensure a technically satisfactory recommended suspension system that will sufficiently bear without any undesired deformations the false ceiling. Any alternative proposals about suspension structures shall be submitted to owner's Engineer for approval. Suspensions shall be fitted from the roof with cables of changeable height (no wires) with ±1 mm adjustability tolerance.

5.4 ELECTRICAL-MECHANICAL INSTALLATIONS

The Contractor's attention should be drawn to the fact that a significant number of E/M installations shall cross over the false ceiling, which will cause difficulties regarding the suspensions position etc., and may require bigger openings to suspension beams. False ceiling frame must sufficiently bear without any undesired deformations all live loads due to dismountable strips, lighting equipment, inlet/outlet vent nozzles etc.

In case installations are placed inside false ceilings, all required access manholes shall be provided in points where repair and maintenance work may be required.

5.5 TOLERANCE

For pre-established surfaces ± 5mm tolerance at 4 meters' span (leveled). For alignment of visible frames, 2mm divergence at 4 meters (joint alignment). Total panel right angling with no divergence. False ceiling deflection 2mm at 4 meters.

Deflection with suspension 30kg, 3mm. Weight harness shall be done both on the frame and in the middle of two false ceiling suspensions. For nervometal false ceilings weight harness 100kg.

Overlap surface variation at frame cross sections joints 0.5mm.

5.6 SPECIFICATIONS

The system to be used shall fulfill the following requirements:

a. Materials shall withstand moisture, erosion and should be inflammable.
b. Area over false ceiling shall be accessible, allow for ventilation and panel changing shall be made easy.
c. There shall be sound absorption capability.
d. It shall be combined with soft fitted strips system.
e. It shall combine with vent/air-conditioning nozzles, space lighting etc elements to be incorporated into false ceiling such as fire extinguisher.

5.7 PREPARATION

Contractor shall coordinate his work with those of other works e.g. mechanical and electrical installations etc. A coordinator shall be appointed for this purpose.

Contractor shall examine the surfaces these installations shall be attached to and shall report any unsatisfactory conditions to owner's Engineer.

Contractor shall not launch work before unsatisfactory conditions are rectified. Routing shall be made towards both directions as well as lower surfaces levels specified to achieve desirable finish.

Contractor shall deliver flat surfaces of floors and horizontal or vertical partitions, depending on the case, and divergence shall not exceed tolerance specified in para.5.5 of this chapter.

Before work commencement, all drawings general (1:100 or 1:50) and detailed (1:20, 1:10) shall have been approved by the owner's engineer. When drafting them, there shall be consideration to concrete slab bearing capacity to which the false ceiling shall be suspended, false ceilings Manufacturer instructions, potential and tolerance of approved systems, electrical/mechanical installations placed between concrete slab and false ceiling and all suspension frame layout problems etc., must have been dealt to ensure desirable false ceiling function without the any defects (deformation etc).

Experienced and competent craftsmen (five-year experience) shall execute work with special care according to approved designs and use of all material systems prescribed in this chapter.

Due to work specialty, Contractor shall appoint work Coordinator responsible for false ceiling construction, electrical installations, air conditioning installations etc. and referring to Project Engineers about any problem related with these works.

Works shall be preceded by horizontal proportions routing along and across as well as vertical in relation with other elements (internal partitions, lighting nozzles etc) to achieve desirable finish.

All additional suspenders of other work elements shall be installed where necessary.

No false ceiling shall be sealed with finish material until all trials of electrical/mechanical installations have been completed.

5.8 INSTALLATION

5.8.1 FALSE CEILING ELEMENTS

Contractor shall provide elements supports to be included in the false ceilings, such as lighting units, ventilators, manholes, curtain rods and other as displayed on the design. where support is separate from grid system, there shall be adjustment possibility so as to align these elements with false ceiling finish.

The system to be used shall allow easy removal of these elements for maintenance reasons, without causing damage to finish or disturbance to false ceiling support system.

5.8.2 MOISTURE CONTENT ADJUSTMENT

Materials shall be placed under conditions nearest to those expected when the building is in normal use that is with windowpanes, closed doors and windows, dried plastering, all works that precondition moisture when finished and the building suitably heated. Materials shall be exposed to such conditions when balance is to be achieved to avoid excessive removal by expansions or contractions after installation.

5.8.3 SOUND INSULATION

In case a partition wall is sound insulated, Contractor shall continue the sound insulation in the false ceiling so that equal sound insulation is achieved.

5.8.4 PERIMETER STRIP

False ceiling outer edge shall be finished with a U shape special aluminum profile section, in appropriate length to form a wall to wall appearance. Fitting shall be done solidly onto the walls. Outer edge strips shall also be fitted round lighting units and nozzles.

5.8.5 MANHOLES

These shall be constructed with visible removable manholes special for this purpose, in places where access to various installations is required, completed with frames finish and panel support mechanisms easy to lift.

5.9 PROTECTION

The pre-established sections of ceiling shall be kept clean and have colour stability.

Contractor shall withdraw pieces worn or bearing spots, and shall replace them with new material not at his own expense.

Storing and forwarding of materials shall be done according to manufacturer's instructions to keep intact until incorporating into the work.

5.10 MATERIALS SPECIFICATIONS

5.10.1 DELIVERY. FORWARDING AND STORING

Delivery shall be done in protective boxes with respective labeling and storing in cool, well aired, dry place.

They shall be forwarded according to Manufacturer's instructions.

All people forwarding materials shall wear clean white fabric gloves at any time, as well as when work on or with materials constituting finished surfaces.

5.10.2 GENERAL REQUIREMENTS

False ceilings elements shall be easily removed without causing damage to neighboring elements.

Moreover, they shall be constructed in such a way that when dismantling is required the sound insulation material will not be affected, neither the fire-proof rates will be affected, even if after repeated dismantling and removals.

False ceilings shall be as rigid and shall bear the horizontal forces during construction without any deformations due to lateral forces of partition walls and shall bear percussion load caused when doors closing.

False ceilings when placed in situ shall be completely flat.

All elements of suspension grid (angles, tee squares etc.,) shall be placed in greatest possible spanning. Splicing shall be immaculate. In the inside of splicing points shall be placed the required supports. Perimeter elements of false ceilings shall be suitably fixed on each construction element and shall be perfectly in contact with the false ceiling, as well as the support points.

Before starting false ceiling installation, Contractor should mark on the drawings any insitu accurate dimensions of the layout of false ceilings as well as the dimensions of non-integral panels.

On these drawings there shall also be marked the exact position of lighting points, nozzles and ventilators and generally of all installations. No false ceiling work shall commence before approval of the above drawings and ensuring wall alignment at false ceilings levels.

5.10.3 MAINTENANCE - CLEANING

Contractor is obliged to maintain the in subject works until completion of the whole work. Maintenance is meant to include cost of necessary materials for the protection of surfaces. Special attention should be drawn to Contractor's obligation to deliver clean, free from defects the metal surfaces and protect the cement and lime from alkali.

5.11 YPES OF FALSE CEILINGS

5.11.1 PLASTERPANEL FALSE CEILINGS

These shall consist of suspended galvanized grid and plaster panels 12.5mm thick. After peripherals weighting of the false ceiling, false ceiling suspensions are fixed with metal plugs at spans no longer than 90cm and main false ceilings leads are placed at 1 meter span, connected with suspensions by special throttle and two pegs.

Transverse leads are clasped with double joints at each point at 50cm between them across main leads.

It is necessary that round the areas, false ceiling edges and at distances no longer than 10cm, there is a main or transverse lead for plasterpanel screwing. After false ceiling alignment plasterpanels are screwed by special screws at span 15-20cm.

Plasterpanels shall necessarily be placed in such way that frequent joints are avoided as possible. After completing plasterpanel fixing, special self-adhesive gauze is applied onto joints and both joints and screws are plastered with special material in two layers.

After plastered surfaces smoothing, all false ceiling plastered points are plastered with special finish material and after final smoothing, surface is ready for painting.

Around areas, contact points of false ceilings with walls are plastered with acrylic plaster by approval of owner’s Engineer.

Where frequent inside access is required, special 60 x 60 cm clasps are attached turning on/off with special removable key.

When sound insulation is required a suspension system study shall be provided by the Manufacturer for the false ceiling and plasterpanels shall be 15mm or 18mm thick.

5.11.2 FALSE CEILING TECHNICAL CHARACTERISTICS

Total weight : 12.6 kg/m^2 (plasterpanels 12.5mm)

Plasterpanel thickness : 12.5 mm

Frame weight : 2.350 kg/m^2 (plasterpanel 12.5mm)

5.11.3 MATERIALS TECHNICAL CHARACTERISTICS

Plasterpanels: Produced according to the requirements of **EN 13950** or **EN 14496** 12.5mm thick, dimensions 1.20 x 3.00m with chamfers, end-grained wood and special affixed paper, non-moisted in their mass, consisting of 70% natural and 30% artificial gypsum.

Suspension: Perforated galvanized shape "**u**" 20mm, 1mm thick 240gr/m weight.

Suspension joint: "T" shape, 15cm long galvanized 55gr/piece approximate weight.

Coupling pegs: galvanized 6 gr/piece weight.

Main leads: galvanized cool extrusion iron plate 0.6mm thick with grooves on all sides, 60mm wide and 620 gr/piece approximate weight.

Chordial lead joints: galvanized sheet 1mm thick.

Miscellaneous: screws, gauze, plaster, finish, by the same plasterpanel Manufacturer.

5.12 REMOVABLE FALSE CEILINGS

Removable false ceilings shall be of metal so that removal and refitting will not harm them and will provide greater endurance to conflagration and fire protection.

6. SANITARIES

In each toilette the following articles shall be placed according to building sectional drawings:

- White water closet with low pressure cistern and white wash-basin with plain taps.
- Sanitaries shall be "BAU" by "IDEAL STANDARD" type or equivalent and taps of "SLIM LINE" series by "IDEAL STANDARD" type or equivalent.

Toilette articles shall be:

- Plain mirror 60 x 50 with self, no frame.
- Hanging paper-napkin holders.

- Soap holders.
- Toilette paper holder.
- Double towel hanger.

7. DOORS. WINDOWS-WOODWORK

7.1 OBJECT

This chapter deals with external and internal framework for all types of buildings.

Doors shall be according to **EN 14351-1**.

Glassware shall be according to **EN 12150**, or **EN 13024**, or **EN 14179**, or **EN 14321.**

7.2 MATERIALS

7.2.1 IRON FRAMES

External frames or internal as required (boiler rooms, storerooms)

For door lid suspension any design there shall be placed frames consisting of cool extrusion hollowed iron plate 1.5mm thick. In the framework the following are included: cover strips to be placed round the frame on both sides, wall frame installation brackets, door keyholes and other minor structures necessary for frame functioning. Total gap filling between walls and frames with cement mortar of 350 kg cement on a ratio of 1:4.

7.2.2 STEEL FRAMES

External frames

door frames in the buildings shall be of steel (drawing or opening), double panes (heat insulating).

Steel profiles of glass doors made of steel as well as hollowed tubes of false frames shall be done in according to the detailed construction drawings.

Electrostatic paint shall have minimum thickness 60 and maximum thickness 120. All

bottom frames for external steel framework, of any form and function shall be provided with special steel drain channel of minimum width similar to frame bottom.

Entrance doors shall also be of steel or aluminum, one ply, opening. The frames shall be metal L100/50/10 type.

Doors shall consist of RHS 60/40/3.0 frame and there shall be two transversal traverses of the same type. In addition, there shall be secondary hemp with metal channel Z 40 to be covered with metal iron plate at least 3mm thick inside outside. Gaps shall be filled with mineral cotton sheets 30mm for fire protection. Door shall be locked by mechanism and have stoppers.

Doorframe shall consist of steel L type and anchor cables, and shall be placed before concrete priming to be supported by three (3) holders (metal blades) within concrete. There shall be three (3) door suspension hinges.

Internal framework

Interior space frames shall consist of white timber or metal and doors of MDF except auxiliary areas (boiler room, storerooms etc.). These doors shall be made of pressed door sheets framed by white pressed timber, dried, slightly moisted. Frame profiles of door sheet shall be 33 x 42mm while profile of lower frame part 33 x 85mm. There shall be frame reinforcement at the hinges and lock while a horizontal traverse shall be placed in the middle of the frame for additional reinforcement. Filling shall be made of inert gummed paper cell 10-15mm diameter. MDF sheets shall be 6mm thick at each door sheet side. Total door sheet thickness 45mm.

Doors shall bear plain type locks with knob and keyhole and be suspended by two hinges. Door sheets shall be covered by melamine sheets. Frame shall be made of Swedish pressed timber, dried, relative moisture 10-12%.

At storerooms metal doors with ventilation louvers shall be placed.

These doors shall be sandwich type doors and frames shall be metal, minimum iron plate thickness 1.5mm Fe360, and shall be fixed on wall with three (3) holders. Frame shall be metal, consist of curved beams framing 35/35 and same type transversal beams. Metal door sheets thickness 1.5mm.

a. Glass partition and steel door specifications.

Appearance of final surface shall be carefully attended to, no spot or scratch shall be accepted. No defect in appearance or color shall tolerate. All joints shall be done both on construction as well as during placing, with special care in conformity with best industrial methods. In addition, each ingot shall be aligned according to **EN ISO 306.**

b. Protection

Final appearance of steel surface shall be achieved by electrostatic paint.

Steel articles to be used as reinforcement or for caulking despite being totally inconspicuous, shall be protected by zinc plated 40micron layer after ungluing with sand and shall be covered by color layer based on zinc.

c. Tightness

Air and water tightness shall be complete between steel profiles.

- Between profiles and frames.
- Between profiles and concrete frame.
- Between profiles and opaque filling elements (upper).
- Between profiles and final faces.
- Between profiles and glass plates.

d. Accessories

Door latches, handles etc. indispensable for smooth operation of frames as well as steel items shall be approved by Owner's Engineer. Use of stainless steel 18/8 bolts indispensable.

e. Framework fixing

Unless otherwise provided by detailed drawings, frames shall be constructed so that when placing large size glass to be conducted allowing necessary backlash to avoid glass rupture in severe weather conditions.

f. Closing (locking)

Unless otherwise provided, all frames when closed shall not open from outdoors. For the ones that are foreseen to be outdoors accessible locking devises shall be provided.

g. Duration

Frame materials, including accessories as well as those used for fitting, shall have lasting properties (mechanical strength, natural and chemical stability) for provided useful life span without necessary, frequent, costly maintenance according to the requirements of **EU Regulation 305/11/EEC**, CPD - Construction products directive.

8. THERMAL INSULATION-WATER PROOFING

8.1 OBJECT

Thermal insulation-water proof at accessible area shall be conducted as follows and according to the detailed construction drawings.

On top of reinforced concrete slab surface the following layers will be applied:

1. Bituminous emulsion in accordance with **EN 12954** or other equivalent, applied in two (2) coats.

2. Foam extruded polystyrene plates ROOF MATE type, 100mm thick (thermal insulation).

3. Celled grouting cement.
   should cement layer withhold water-content approximately 1.5% therefore further to total grading, complete drying is necessary before water proofing work.

5. Bituminous PRIMER coating.

6. Bitumen flexible sheets as per **EN 534** or, **EN 544** or, **EN 13707** or, **EN 13970** or, **EN 14967**.

7. Lime cement mortar.

8. light weight cement slates.

Water proof works shall not be executed if the weather temperature is below 2°C.

Moreover water proofing work shall be done between eight (8) to three (3) weeks after cement coating, depending on the season and according to owner's Engineer instructions.

Around the buildings shall be constructed 1m wide pavements of cement slates on top of mass concrete base 10cm thick.

Thermal insulation for external walls shall be of extruded polystyrene WALL MATE DOW type at least 50mm thick.

Quantity survey method: square meters ($1m^2$) of apartment sectional view with open insulation structure for finish protection, parapet insulation.

9. HEATING-AIR CONDITIONING

9.1 HEATING

Buildings heating shall be effected with single pipe central heating installation via hot water circulation.

Water heating shall be effected with boiler oil and/or gas combustion equipment.

Oil and/or gas burner with automatic adjusters and thermostats.

Boiler will be labeled EU CE type testing according to **EU Directive 92/42/EC** and the harmonized national legislation Presidential decree 335/1993.

Boiler shall also be according to the requirements of **EU Directive 2009/125/EC** with respect eco design parameters, and the requirements of **EU Directive 2010/31/EC**, **EPBD** with respect installation of boiler.

Central heating installation, if oil is the fuel, includes metal oil tank, oil preheating devices and underground installation, necessary oil conveying piping. The nozzle shall be placed in an accessible pit outside of the building.

Boilers, piping diameters and radiator surfaces shall be according to the approved by the owner heating study. The target is, when external temperature drops to -10 °C, to achieve building internal temperature 20 °C and 22 °C for bathrooms. Radiators shall be PANEL type, by BIOSOL or other Greek Manufacturer approved by the owner. Each radiator shall be provided with brass valve along with switch, and their return with pipe connection. Radiators shall be placed in main as well as auxiliary apartment areas according to the approved study. If central heating piping runs externally the building, then the underground and above ground network shall be insulated and shall be protected against corrosion.

Chimneys shall be constructed according to the approved by the owner drawings.

Chimneys shall be according to **EN 1857**, or **EN 1858,** or **EN 12446,** or **EN 1856,** or **EN 14989**.

9.2 AIR CONDITIONING

Air conditioning shall be constructed in the buildings in accordance with relative approved by the owner study. Air conditioning design and construction shall also conform to the requirements of **EU Directive 2010/31/EC, EPBD**.

10. PLUMBING

Plumbing shall be constructed in conformity to current regulations i.e. **Technical recommendations of TEE (technical chamber of Greece), TOTEE 2411/86** and **TOTEE 2412/86,** Craftsmanship Rules and according to owner's Engineer's instructions.

The Study for plumbing includes:

a) Plumbing installation for hot/cold water supply in kitchens and toilettes.

b) building Sewers.

c) buildings and paved areas rainwater drains.

10.1 WATER SUPPLY

The water supply system for buildings shall be connected to the city main water supply system.

Should the buildings located in an area out of the city plan that cannot be connected to city water supply system, then a detailed study must be provided by the contractor which shall be approved by the owner's Engineer. Then the water supply shall be provided either from underground water storage tank or from a water tower. These alternatives will be investigated whether feasible by the contractor and will be proposed to the owner for approval.

10.2 WATER SUPPLY PIPING

Cold and hot water supply systems shall be detached, i.e. there shall be individual plumbing boards and individual pipelines for cold and for hot water supply and shown on the approved detailed plumbing engineering drawings.

For washbasin supply cold and hot water the min diameter of the pipes shall be Ø18. pipes for water supply toilettes shall be Ø40 up to cistern, while cistern shall be joined to water closet with Ø40 plastic pipe. for hot and cold water supply to sinks min pipes diameter shall be Ø22. Valves shall be of applicable diameter to be connected to the water supply pipes.

A valve provision in the network shall be foreseen in suitable places for its automatic ventilation.

Water supply network pipes placed at exterior of the building shall be insulated.

Main network shall be constructed with suitable copper pipes and non-toxic welding materials shall be used.

Distributors complexes shall be constructed with brass equipment and shall be fitted inside special boards.

All hot water piping shall be insulated with insulation ARMAFLEX type.

All piping materials and equipment shall be according to **EN 1057** and **EN 1254** respectively**.**

10.3 SEWERAGE

Sewerage includes, on the one hand, sinks, washbasins, water closets, traps, etc along with serving pipes.

On the other hand, it includes vertical ventilation network, drain wells and main sewage pipes.

All sewage pipes shall be according to **EN 1401-1, EN 1451-1,**

EN 1453-1 and **EN 1852-1** for in the building or for underground service

respectively.

10.3.1 All flow pipes, connection piping, multiple connection piping, as well as floor osmotrap piping connecting all plumbing drums in the building, shall be of polypropylene pipes and equipment. All drums shall be provided with traps of suitable size. It is pointed out that flow piping from drums to floor traps as well as connection piping shall exclusively be used pipes (U-PVC) with diameters as follows:

Showers: Ø50

Washbasins: Ø40

For connection piping from floor osmotraps to vertical drains shall be used pipes (U-PVC) Ø50.

Water closets shall be directly connected to vertical drains with individual polypropylene connection pipes (U-PVC) Ø100.

Kitchen sink piping shall be directly drained to vertical drains through a trap. Boiler room shall be drained with individual floor trap.

At all connecting points with vertical columns there shall be cleaning taps of appropriate diameter.

For detached buildings, situated within the city plan area connections shall be made at existing or new city water supplies, at the building site boundaries. Where necessary, pits shall be constructed in conformity with approved construction plumbing drawings.

10.3.2 SEWAGE DRAIN VERTICALS

Sewage drains running through floors and leading sewage from horizontal connection piping to collecting verticals. Piping shall be constructed with non-plastic PVC (U-PVC).

Vertical drains shall extend upwards, terminating 2m higher than floor level serving as ventilation verticals.

10.3.3 COLLECTING SEWAGE PIPING

Underground sewage pipes horizontal system shall be connected to wells or vertical drains terminating points, and shall be connected to the main collecting sewage pipe. they shall be constructed of U-PVC pipes with diameter larger than Ø125, with slope more than 2%, at depth at least 0.8m below the ground level. Sewage shall be led through special cleaning wells to machine trap and shall be connected with a pipe at least Ø200 to the building catch basin pit or to the main sewer network of the city.

10.4 RAIN WATER DRAINAGE

10.4.1 Rain water drainage for buildings shall be constructed with drain pipes UPVC Ø 125 6Atm as per **EN 1451-1** and **EN1453-1** as shown on sectional plan drawings of respective buildings.

Fittings materials shall be of the same material as pipes and shall fulfill the applicable EN standards.

10.4.2 Rain water draining for the building exterior surrounding area shall be underground with slope matching the surface configuration.

Drainage Rain pipes shall be constructed of U-PVC pipes as per **EN 1401- 1** and **EN 1852-1**.

At the drain pipe outlet point at the building facade shall be constructed a pit (approximate dimensions 20cm x 20cm with double cast iron cover) on the pavement. this will be connected to the city main drainage system with U-PVC pipe (slope 1%).

To support visible pipes (verticals and horizontal visibles) shall be used special collars of PVC spanning 2m at least, two of which shall fix the pipe (fixed points) and the others shall simply support it allowing free expansion along (minimum space placing collar no more than tenfold its diameter).

11. COLORING

11.1 OBJECT

This chapter specifies walls, wooden and iron structures, asphalt (building exterior area) surface coloring.

all requirements as per **ATOE 1976** also apply.

11.2 MATERIALS

All colors and their treatment materials shall be approved by owner’s Engineer.

Ready colors in general as well as those necessary for color treatment shall be delivered at site in sealed containers.

Oil colors shall be processed with excellent quality linseed oil and zinc for interior coloring or white lead for exterior, as well as with pigment needed to achieve specified coloring. Color treatment shall be done in such way as to ensure spreading of slight quantity of ready color on glass does not display undiluted parts.

Varnishes shall be of great endurance and flexibility. If marking dry varnish layer with pin does not display cracks, varnish is then considered to conform with specifications.

Embossed colors on plastering surfaces and concrete shall be of excellent quality and have two coats of anti-rust protection (protection walls).

11.3 GENERAL COLORING CONDITIONS

All coloring coats shall be done on totally clean surfaces, free from even dust traces.

All coloring coats shall display the same tints without lighter or darker nuances.

Contractor shall be obliged to make samples at his own expense to be submitted to owner's Engineer approval. Contractor is responsible for painting accomplishment.

Contractor shall take all necessary measures to avoid staining of adjacent areas such as walls, ceilings, floors, window panes, switches, piping, etc. during painting. Should these areas be stained, Contractor shall ensure they are cleaned at his own expense.

11.4 OIL COLORING ON IRON SURFACES

For plain coloring of iron surfaces, work procedure is as follows. Surface shall be scrubbed with wire brush or emery cloth, cleaned free from rust, dust etc., coated twice with red lead, according to invoice prescription, and painted with two or more coats, until smooth, uniform surface is achieved. Each coat is applied, after previous coat has completely dried and rubbed with fine-grained sandpaper No.2 to No.0.

For spatula coloring, after preparation and before oil color application, surface shall be painted with "antoui" and shall be knotted according to contractual condition of **ATOE 1976.**

For plain coloring with "ducco", when preparing the surface, there shall be one coat of red lead and two coats of color. Each new coat except for the last is rubbed with sandpaper No.2 to No.0 and knotted. For spatula spread coloring, this shall be done with "duccostucco".

For oil coloring of piping, pipe is cleaned with wire brush or emery cloth, coated with red lead and painted with two oil color coats.

11.5 PLASTIC COLORS ON PLASTERING SURFACES

Coloring of plastering work will be done as follows:

a. Plastered surface is spatula smoothened free from any roughness, rubbed slightly with sandglass, dusted and knotted with two coats according to ATOE.

b. Plastered with fine fluid primer and painted with plastic color in accordance with manufacturer's prescriptions. Number of plastic color coats is specified by invoice or technical specification.

11.6 COLORING with CEMENT COLOR ON CONCRETE SURFACE

For concrete water colors, surface to be painted is smoothened free from any defect and cleaned from dust, after random knotting with cement mortar and coating with linseed oil, excluding use of stucco or gypsum. Then it is painted with cement color in two or more coats.

11.7 EMBOSSED paints ON PLASTER SURFACES & CEMENT MORTAR

Cement mortar coloring surface to be painted is smoothened and cleaned free from defects and dust.

12. COMPLIANCE WITH EU DIRECTIVE CPD

All materials, equipment that fall under the "New Approach" directives i.e. **EU Regulation 305/11/EU CPD, EU Directive 2009/125/EC ecodesign**, **EU Directive 92/42/EC Boiler Efficiency** shall be provided with:

a. A physical CE marking and other information as required by the applicable directives.

b. A declaration of conformity which lists all the directives with which the product complies.

c. Any other information specified by the directives, e.g. user instructions.