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NATIONAL IRANIAN OIL REFINING & DISTRIBUTION COMPANY
NATIONAL IRANIAN OIL ENGINEERING
& CONSTRUCTION COMPANY

NIOEC SP

NIOEC SPECIFICATION

FOR

**WORK TO BE DONE AND MATERIALS TO BE
USED IN MASONRY BUILDINGS**

SECOND EDITION

JUNE, 2015

THIS SPECIFICATION IS THE PROPERTY OF NATIONAL IRANIAN OIL ENGINEERING & CONSTRUCTION COMPANY. IT IS CONFIDENTIAL AND ALL RIGHTS RESERVED TO THE OWNER. NEITHER WHOLE NOR ANY PART OF THIS DOCUMENT MAY BE DISCLOSED TO ANY THIRD PARTY, REPRODUCED, STORED IN ANY RETRIEVAL SYSTEM OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN CONSENT OF THE NATIONAL IRANIAN OIL ENGINEERING & CONSTRUCTION COMPANY.

IN THE NAME OF GOD**FOREWORD**

By their very nature, technical Specifications are continuously subject to modifications and revisions. To strengthen their merit and usefulness, continuous improvements, addendum, deletion of disparate information and consequently provision of updated revisions are to be made in order to ascertain that such Specifications meet the current requirements, inclusive of Iranian Petroleum Standards (IPS) and the recognized and acceptable national and international Standards, as well as the optimal codes and practices based on the accumulated in-house know-how and plant knowledge and experiences.

However, in reality, due to several reasons, not to mention the complexity of the matter, the ultimate goal of continuous direct embedment of the required changes on the relevant Specifications may be far reaching. Therefore, in the interim periods between the officially issued revisions, the required changes will appear in other documents related to the engineering and design work of the ongoing projects.

In response to the initiative of the Design and Engineering Directorate, and considering that the task of the execution of several important and mega projects for the realization of the new oil refineries, pipelines and oil terminals as well as improvements of the existing facilities, has been assigned to NIOEC, it was decided to update the NIOEC Specifications and to issue new official revisions.

The Design and Engineering Directorate was itself entrusted to carry out this important task, and as such by forming several special technical committees, working in close co-operation and cohesion and sharing their expertise and knowledge, the updated and revised NIOEC Specifications were successfully prepared and complied.

These Specifications are intended to be used for Oil Refineries, Distribution Depots, Oil Terminals, Pipelines and Pump Stations within NIOEC's projects, and have been proven to be of high value for such purposes. It must however be appreciated that these Specifications represent the minimum requirements and should in no way be interpreted as a restriction on the use of better procedures, engineering and design practices or materials.

We encourage and highly appreciate the users and other clear sighted and experts to send their comments on the Specifications to the Design and Engineering Director of NIOEC for evaluation and approval.

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NOTES:

- 1) THIS SHEET IS A RECORD OF ALL REVISIONS TO THIS SPECIFICATION.
- 2) WHEN APPROVED EACH REVISION SHALL BE CONSIDERED AS A PART OF THE ORIGINAL DOCUMENT.
- 3) NUMBER OF PAGES EXCLUDES THIS SHEET AND THE COVER SHEET.

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1. SCOPE

The intent of this specification is to include all labor, material, equipment, temporary utilities and transportation necessary for the proper execution and completion of the work for masonry buildings. The electrical work is not included herein.

This specification Contain references to some materials and best products but other may be substituted upon approval of the Employer's. The substituted materials shall be of equivalent quality and characteristics to the materials described in the following sections of the specification and shall be approved by the Employer's.

All materials used in the construction of the buildings shall be new and the best of their respective kind.

Guarantee, binds and certificates required by this specification shall be submitted to the Employer.

Deviations from this Specification will only be permitted on obtaining written approval from NIOEC.

Resolution on cases not explicitly stipulated in this Specification, or on cases where conflicts may arise among the requirements of the referenced/relevant IPS and the international standards, shall be made through written consent and approval of NIOEC.

2. REFERENCES

The following standards, codes, and specifications, to the extent specified hereinafter, shall constitute a part of this NIOEC Specification. Latest edition of the undated referenced documents and the cited edition of the dated references shall apply. The applicability of changes made to the dated references ,after the cited date shall be mutually agreed upon between NIOEC and the vendor/contractor.

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

ASTM A6/A6M	“Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling”
ASTM A36/A36M	“Standard Specification for Carbon Structural Steel”
ASTM A82/A82M	“Standard Specification for Steel Wire, Plain, for Concrete Reinforcement”
ASTM A121	“Standard Specification for Metallic-Coated Carbon Steel Barbed Wire”
ASTM A153/A153M	“Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
ASTM A184/A184M	“Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement”
ASTM A185/A185M	“Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete”
ASTM A416/A416M	“Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete”
ASTM A421/A421M	“Standard Specification for Uncoated Stress-Relieved Steel Wire for Prestressed Concrete”
ASTM A496	“Standard Specification for Deformed Steel Wire for Concrete Reinforcement”
ASTM A497	“Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete”
ASTM A615/A 615M	“Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement”

ASTM A633/A633M	“Standard Specification for Normalized High-Strength Low-Alloy Structural Steel Plates”
ASTM A653/A653M	“Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Gal annealed) by the Hot-Dip Process”
ASTM A700	“Standard Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment”
ASTM A706/A706M	“Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement”
ASTM A722/A722M	“Standard Specification for Uncoated High-Strength Steel Bars for Prestressing Concrete”
ASTM A767/A767M	“Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement”
ASTM A950/A950M	“Standard Specification for Fusion-Bonded Epoxy-Coated Structural Steel H-Piles and Sheet Piling”
ASTM B221M	“Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes”
ASTM B860	“Standard Specification for Zinc Master Alloys for Use in Hot Dip Galvanizing”
ASTM C 28/C 28M	“Standard Specification for Gypsum Plasters”
ASTM C33/C33M	“Standard Specification for Concrete Aggregates”
ASTM C62	“Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)”
ASTM C67	“Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile”
ASTM C88	“Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate”
ASTM C90	“Standard Specification for Load bearing Concrete Masonry Units”
ASTM C97/C97M	“Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone”
ASTM C119	“Standard Terminology Relating to Dimension Stone”
ASTM C129	“Standard Specification for Non load bearing Concrete Masonry Units”
ASTM C134	“Standard Test Methods for Size, Dimensional Measurements, and Bulk Density of Refractory Brick and Insulating Firebrick”
ASTM C144	“Standard Specification for Aggregate for Masonry Mortar”
ASTM C155	“Standard Classification of Insulating Firebrick”
ASTM C207	“Standard Specification for Hydrated Lime for Masonry Purposes”
ASTM C216	“Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)”
ASTM C220	“Standard Specification for Flat Asbestos-Cement Sheets”
ASTM C221	“Standard Specification for Corrugated Asbestos-Cement Sheets”
ASTM C270	“Standard Specification for Mortar for Unit Masonry”
ASTM C331/C331M	“Standard Specification for Lightweight Aggregates for Concrete Masonry Unit”
ASTM C404	“Standard Specification for Aggregates for Masonry Grout”
ASTM C423	“Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method”
ASTM C503/C503M	“Standard Specification for Marble Dimension Stone”
ASTM C568	“Standard Specification for Limestone Dimension Stone”
ASTM C615/C615M	“Standard Specification for Granite Dimension Stone”
ASTM C616	“Standard Specification for Quartz-Based Dimension Stone”
ASTM C629/C629M	“Standard Specification for Slate Dimension Stone”

ASTM C635/C635M	“Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings”
ASTM C636/C636M	“Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels”
ASTM C650	“Standard Test Method for Resistance of Ceramic Tile to Chemical Substances”
ASTM C652	“Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale)”
ASTM C755	“Standard Practice for Selection of Water Vapor Retarders for Thermal Insulation”
ASTM C979/C979M	“Standard Specification for Pigments for Integrally Colored Concrete”
ASTM C1036	“Standard Specification for Flat Glass”
ASTM C1127	“Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface”
ASTM C1240	“Standard Specification for Silica Fume Used in Cementitious Mixtures”
ASTM C1489	“Standard Specification for Lime Putty for Structural Purposes”
ASTM C1527/C1527M	“Standard Specification for Travertine Dimension Stone”
ASTM C1528	“Standard Guide for Selection of Dimension Stone”
ASTM D41/D41M	“Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing”
ASTM D312	“Standard Specification for Asphalt Used in Roofing”
ASTM D365	“Standard Guide For Soluble Nitrocellulose Base Solutions”
ASTM D4093	“Standard Test Method for Photo elastic Measurements of Birefringence and Residual Strains in Transparent or Translucent Plastic Materials”
ASTM E6	“Standard Terminology Relating to Methods of Mechanical Testing”
ASTM E580/E580M	“Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint”
ASTM E1264	“Standard Classification for Acoustical Ceiling Products”
ASTM F386	“Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces”
ASTM F510	“Standard Test Method for Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method”

BSI (BRITISH STANDARD INSTITUTION)

BS 952-1	“Glass for Glazing-Part1: Classification”
BS 952-2	“Glass for Glazing-Part2: Terminology for Work on Glass”
BS 3083	“Specification for Hot-Dip Zinc Coated and Hot-Dip Aluminum Zinc Coated” Corrugated Steel Sheets for General Purposes”
BS 5385-1	“Wall and Floor Tiling-Part1: Design and Installation of Ceramic, Natural Stone and Mosaic Wall Tiling in Normal Internal Conditions-Code of Practice”
BS 5385-2	“Wall and Floor Tiling-Part2: Design and Installation of External Ceramic and Mosaic Wall Tiling in Normal Conditions-Code of Practice”

BS 5385-3	“Wall and Floor Tiling, Part3: Design and Installation of Internal and External Ceramic and Mosaic Floor Tiling in Normal Conditions-Code of Practice”
BS 5385-4	“Wall and Floor Tiling, Part4: Design and Installation of Ceramic and Mosaic Tiling in Special Conditions –Code of Practice”
BS 5385-5	“Wall and Floor Tiling, Part5: Design and Installation of Terrazzo, Natural Stone and Agglomerated Stone Tile and Slab Flooring–Code of Practice”
BS EN 10055	“Hot Rolled Steel Equal Flange Tees with Radiused Root and Toes Dimensions and Tolerances on Shape and Dimensions”
BS EN 10143	“Continuously Hot-Dip Coated Steel and Strip–Tolerances on Dimensions and Shape”
BS EN 10244-1	“Steel Wire and Wire Products Non–Ferrous Metallic Coatings on Steel Wire, Part1: General Principles”
BS EN 10244-2	“Steel Wire and Wire Products Non-Ferrous Metallic Coatings on Steel Wire, Part2: Zinc or Zinc Alloy Coatings”
BS EN 10336	“Continuously Hot-Dip Coated and Electrolytic ally Coated Strip and Sheet Of multiphase Steels For Cold Forming-Technical Delivery Condition”
BS EN 10346	“Continuously Hot-Dip Coated Steel Flat Products –Technical Delivery Conditions”
BS EN 14600	“Door Sets and Open able Windows with Fire Resisting and/or Smoke Control Characteristics- Requirements and Classification”

DIN (DEUTSCHES INSTITUTE FOR NORMUNG)

DIN 1025-1	“Hot Rolled I-Sections-Part1: Narrow Flange I-Sections, I-Series - Dimensions, Masses, Sectional Properties”
DIN 1025-2	“Steel Sections; Hot Rolled I-Beams; Wide Flange I-Be”
DIN 1025-3	“Hot Rolled I and H Sections (IPBI Series); Dimensions, Mass and Static Parameters”
DIN 1025-4	“Steel Sections; Hot Rolled I-Beams; Wide Flange I-Be”
DIN 1025-5	“Steel Sections; Hot Rolled I-Beams, Medium Flange I”
DIN 1027	“Bars Made of Hot Rolled Steel Zee Sections with Rounded Roots and Toes Dimensions, Mass and Static Parameters”
DIN 59051	“Bars Made of Hot Rolled Square-Edged Steel T Sections-Dimensions and Mass”
DIN EN 572-6	“Glass in building Basic soda lime silicate glass products-Part6: Wired patterned glass”
DIN EN 10034	“Structural Steel I and H Sections-Tolerances on Shape and Dimensions”
DIN EN 10223-6	“Steel Wire and Wire Products for Fencing and Netting-Part6: Steel Wire Chain”

ISO (INTERNATIONAL STANDARD)

ISO 630-1	“Structural Steels-Part1: General Technical Delivery Conditions for Hot rolled Products”
ISO 630-2	“Structural Steels-Part2: Technical Delivery Conditions for Structural Steels for General Purpose”
ISO 630-3	“Structural Steels-Part3: Technical Delivery Conditions for Fine-Grain Structural Steels”

ISO 630-4	“Structural Steels-Part4: Technical Delivery Conditions for High-Yield Strength Quenched and Tempered Structural Steel Plates”
ISO 657-1	“Hot-Rolled Steel Sections-Part1: Equal-Leg Angles–Dimensions”
ISO 657-2	“Hot-Rolled Steel Sections-Part2: Unequal-Leg Angles–Dimensions”
ISO 657-5	“Hot-Rolled Steel Sections-Part5: Equal-leg angles and unequal-leg angles–Tolerances for metric and inch series”
ISO 657-11	“Hot-Rolled Steel Sections-Part11: Sloping Flange channel sections (metric series)-dimensions and sectional properties”
ISO 657-13	“Tolerances on sloping flange beam, column and channel sections”
ISO 12633-2	“Hot-Finished Structural Hollow Sections of Non-Alloy and Fine Grain Steels Part2: Dimensions and Sectional Properties”
ISO 657-15	“Hot-Rolled Steel Sections-Part15: Sloping Flange Beam Sections (Metric Series)-Dimensions and Sectional Properties”
ISO 657-16	“Hot-Rolled Steel Sections-Part16: Sloping Flange Column Sections (Metric Series)-Dimensions and Sectional Properties”
ISO 657-18	“Hot-Rolled Steel Sections-Part18: L Sections for Shipbuilding (Metric Series)-Dimensions, Sectional Properties and Tolerances
ISO 657-19	“Hot-Rolled Steel Sections-Part19: Bulb Flats (Metric Series)-Dimensions, Sectional Properties and Tolerances”
ISO 657-21	“Hot-Rolled Steel Sections-Part21: T-Sections with Equal Depth and Flange Width- Dimensions”
ISO 1035-1	“Hot-Rolled Steel Bars-Part1: Dimensions of round bars”
ISO 1035-2	“Hot-Rolled Steel Bars-Part2: Dimensions of Square bars”
ISO 1035-3	“Hot-Rolled Steel Bars-Part3: Dimensions of Flat bars”
ISO 1035-4	“Hot-Rolled Steel Bars-Part1: Tolerances”
ISO 10545-4	“Ceramic Tiles-Part4: Determination of Modulus of Rupture and Breaking Strength”
ISO 10545-5	“Ceramic Tiles-Part5: Determination of Impact Resistance by Measurement of Coefficient of Restitution”
ISO 10545-6	“Ceramic Tiles-Part6: Determination of Resistance to Deep Abrasion for Unglazed Tiles”
ISO 10545-9	“Ceramic Tiles-Part9: Determination of Resistance to Thermal Shock”
ISO 10545-15	“Ceramic Tiles-Part15: Determination of Lead and Cadmium Given off by Glazed Tiles”
ISO 10545-16	“Ceramic tiles-Part16: Determination of Small Color Differences”
ISO 10799-2	“Cold-Formed Welded Structural Hollow Sections of Non-Alloy and Fine Grain Steels-Part2: Dimensions and Sectional Properties”

NIOEC-SP (NIOEC SPECIFICATIONS)

NIOEC-SP-00-01	“NIOEC Specification for Civil Design Criteria”
NIOEC-SP-00-05	“NIOEC Specification for Excavation and Backfill for Civil Work”
NIOEC-SP-00-10	“NIOEC Specification for Units”
NIOEC-SP-10-01	“NIOEC Specification for Concrete”
NIOEC-SP-10-02	“NIOEC Specification for High Temperature Protection for Concrete”
NIOEC-SP-10-03	“NIOEC Specification for Low Temperature Protection for Concrete”
NIOEC-SP-20-01	“NIOEC Specification for Structural Steel Fabrication”
NIOEC-SP-20-02	“NIOEC Specification for Structural Steel Erection”
NIOEC-SP-30-03	“NIOEC Specification for Heating, Ventilation, Air Conditioning, Refrigerating and Pressurizing Systems”
NIOEC-SP-30-05	“NIOEC Specification for Plumbing piping for building”

NIOEC-SP-30-06	“NIOEC Specification for Installation of Heating, Ventilation, Air Conditioning, Refrigerating and Pressurizing”
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UL (UNDERWRITERS LABORATORIES INC. STANDARD FOR SAFETY)

UL 10A	“Tin-Clad Fire Door”
UL 10B	“Fire Tests of Door Assemblies”

3. UNITS

International system of units (SI) shall be used in accordance with NIOEC-SP-00-10, unless otherwise specified.

4. DEFINITION & TERMINOLOGY

A sliding door: is a type of door which opens horizontally by sliding, whereby the door is either mounted on or suspended from a track.

A swing doors: a door that can be opened in either direction and is closed by a spring device when released.

End-lap: Refers to the amount of overlap in a direction following the roof slope

Grilles: a grating or screen of metal bars or wires, placed in front of something as protection or to allow ventilation or discreet observation.

Grout: is a construction material used to embed rebars in masonry walls, connect sections of pre-cast concrete, fill voids, and seal joints (like those between tiles).

Mortar: a mortar or paste for filling crevices, especially the gaps between wall or floor tiles.

Prefabricate: manufacture sections of (a building or piece of furniture) to enable quick assembly on site.

Roofing Lap: the amount by which roofing tiles, slates, shingles, flashings, etc overlap each other to achieve waterproofing.

Side-lap: Refers to the overlap in a sideways or horizontal direction.

SECTION A**BRICK MASONRY, BRICK VENEER AND HOLLOW CONCRETE MASONRY****1. SCOPE**

The Contractor shall provide all the labor, material, transportation, and equipment required to completely furnish and install all brick work shown on the drawing as specified herein.

This specification includes:

- 1.1. Grout and mortar,
- 1.2. Install anchors, bolts, pipe sleeves, etc., for attaching other materials,
- 1.3. Instruct the concrete foreman as to the required positioning of dowels,
- 1.4. Submit samples of brick to the Employer for approval.

2. MATERIALS**2.1. Facing Brick**

2.1.1. Standard commercial Iranian manufactured brick. The maximum water absorption in according to ASTM C216. The maximum absorption shall be 20% by 5 hour boiling, and the maximum saturation coefficient (the ratio of absorption by 24-h submersion in cold water to that after 5-h submersion in boiling water) shall be 0.80. The minimum compressive strength shall be 17.2 MPa (2500 psi).

2.1.2. Sizes and tolerance of facing bricks shall be as given in the following table 1.

TABLE 1- SIZES AND TOLERANCE OF BRICKS

DIMENSION mm	Thickness = 55 mm			Thickness = 40 mm		Thickness = 30 mm	
	Machine made*	Pressed	Hand Made	Machine made*	Hand Made	Machine Made *	Hand Made
Length	220 ±2	220 ±3	210 ±3	220 ±2	210 ±3	220 ±2	210 ±3
Width	105 ±1	105 ±1.5	100 ±1.5	105 ±1	100 ±1.5	105 ±1	100 ±1.5
Thickness	55 ±1	55 ±1.5	55 ±1.5	40 ±1	40 ±1.5	30 ±1	30 ±1

* For facing brick

2.1.3. Brick sizes shall be such that the thickness of grout or mortar between masonry units and reinforcement will not be less than 6 mm (1/4 inch).

2.1.4. Surface texture and color shall be approved by the Employer.

2.1.5. Surface texture and color shall match the brick that has been used on any other newly constructed buildings on the site.

2.2. Common Brick

Common brick same as facing brick except that the minimum compressive strength shall be 13.7 MPa (2000 psi) and that the contractor is permitted to use different color than the facing brick.

2.2.1. The brick shall be sampled and tested in according to the ASTM C67.

2.3. Hollow Concrete Masonry

2.3.1. Hollow Load-Bearing Concrete Masonry shall be according to ASTM C90, using lightweight aggregate conforming to ASTM C331 and graded so that not more than 25% passes through #8 sieve and 80-90% passes through a 9.52 mm (3/8 in.) sieve, or using normal weight aggregate conforming to ASTM C33/C33M and graded as above.

2.3.2. Hollow Non-Load-Bearing Concrete Masonry Units, shall be in conforming to ASTM C129. Aggregate may be both normal weight aggregate or lightweight aggregate conforming to ASTM standards as per point 2.3.1.

2.4. Lime and Lime Putty

2.4.1. Lime for all mortar shall be superior quality, freshly burnt quick lime. Live lime shall be stored in a dry place and protected from dampness. No lime shall be used within twenty four (24) hours of slaking.

2.4.2. Lime Putty used for mortar shall be washed and shall be protected against drying in the lime pool.

2.4.3. Hydrated Lime shall be in conforming to ASTM C207, Type S.

2.5. Sand

Sand shall be in conforming to ASTM C144, except that not less than 5% shall pass the #100 sieve.

2.6. Pea Gravel

Pea gravel graded with not more than 5% passing the #8 sieve and with 95% to 100% passing the 9.52 mm (3/8 inch) sieve.

2.7. Water

Water shall be clean and free of amounts of oils, acids, alkalizes, salts, organic materials, or other substances that are deleterious to mortar or any metal in the wall, conforming to ASTM C270 clause 4.1.3.

Water taken from a supply distributed for domestic purposes, clean when used.

2.8. Color pigments

The use of admixtures for mortar and grout shall not be permitted, except that inert coloring pigments may be used, when shown on the drawings. Material weight shall not exceed 6% by weight of the cement.

Pigments for integrally colored concrete are conforming to ASTM C979/C979M.

2.9. Reinforcing Steel

Reinforcing Steel shall refer to NIOEC SP-10-01.

2.10. Mortar and Grout

Mortar and Grout shall conform to ASTM C270.

2.10.1. All bricks except facing shall be laid with a shove joint in a full mortar bed and shall be thoroughly slushed up with mortar at every course. Facing brick shall be laid on full mortar beds and shall have all vertical joints completely filled with mortar.

2.10.2. Mortar shall consist of a mixture of sand and cement with the following proportions:

1 Part by volume of cement	50 kilograms
3 Part by volume of sand	0.105 cu. M.

2.10.3. Ingredients for mortar shall be mixed in approved gauge boxes to give a consistent mix of correct proportions. The ingredients shall be turned over twice dry and twice while water is added through a hose. Only sufficient water shall be added to give a good workable mortar, as approved by the Employer's Representative. Alternatively, mixing may be by means of an approved mechanical batch mixer.

2.10.4. All mortar shall be used within one hour of mixing. No mortar which has commenced to set shall be "knocked up" and used again.

2.10.5. Grout shall consist of mortar into which sufficient additional water has been incorporated to cause the mixture to flow readily.

2.10.6. Hydrated lime or lime putty may be added to the mortar or grout (before thinning) shall be not less than 11.27 N/mm² at 7 days and 17.5 N/mm² at 28 days.

2.11. Fire Brick

This material is suitable for lining certain kinds of industrial furnaces.

2.11.1. The classification of insulating firebrick in accordance with ASTM C155 is based on bulk density (weight per cubic foot) and the behavior in the reheat change test conducted at the specified temperature.

2.11.2. Test methods for size, dimensional measurements, and bulk density of insulating firebrick shall be in accordance with ASTM C134.

3. GENERAL

The Contractor shall provide all the labor, material, transportation, and equipment required to completely furnish and install all brick work shown on the drawing as specified herein.

4. MASONRY CONSTRUCTION**4.1. Workmanship**

4.1.1. All work shall be executed in the best workmanlike manner and in full compliance with the uniform Building Code.

4.1.2. All masonry walls shall be laid true, level and plumb in accordance with the drawings. All units shall be free of chipped corners and edges.

- 4.1.3.** Brickwork shall not use more than 300 mm of standard brick for four courses and no portion of the walling shall rise more than 900 mm above other portion during construction.
- 4.1.4.** Brick shall be cut accurately to fit all plumbing sleeves, openings, electrical work, etc., and all voids shall be slushed fully.
- 4.1.5.** Required pipe sleeves shall be set and securely anchored by the mason, with sleeve ends flush with the wall.
- 4.1.6.** No bricklaying (or mortar mixing) shall take place when temperature is 3°C on a falling temperature unless special precautions are taken.

4.2. Wetting

The amount of wetting will depend on the rate of absorption of the brick at time of laying. When being laid, brick shall have suction sufficient to hold the mortar and to delete the excess water from the grout, and shall be sufficiently damp so that the mortar will remain plastic enough to permit the brick to be leveled and plumbed after being laid, without breaking the mortar bond.

4.3. Bonding

- 4.3.1.** Where no bond pattern is shown, the wall shall be laid up in straight uniform course with common bond.
- 4.3.2.** Intersecting walls and partitions shall be fully bonded with steel ties in every fourth course. Around window and door framers, masonry shall be kept back a sufficient distance to permit a caulked joint.
- 4.3.3.** Where stacked bond is indicated on the drawings, the centerline of vertical joints shall be plumb, with 3.2 mm (1/8 inch) maximum variation in the width of vertical joints. Approved metal ties shall be used, with each tie supporting not more than two square feet of wall area and spaced not more than 608 mm (24 inches) on center horizontally.
- 4.3.4.** For bonding of brick to the foundation the top surface of the concrete foundation shall be thoroughly cleaned with laitance removed and aggregate exposed before masonry construction is started.

4.4. Joints

- 4.4.1.** Mortar joints shall be straight, clean and with 9.52 mm (3/8 inch) uniform thicknesses.
- 4.4.2.** Exposed unpainted walls shall have joints tooled with a round bar to produce a dense, slightly concave surface well bonded to brick at the edges.
- 4.4.3.** Tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. All tooling shall be done with a tool which compact the mortar, pressing the excess mortar out of the joint rather than dragging it out.
- 4.4.4.** Where walls are to receive plaster, the joints shall be struck flush, and left rough to provide bond.

4.4.5. Where certain joints are to be concealed under paint, these joints shall be filled flush and given a sacked joint effect by using a hard rubber ball or a rubber heel which produces a slightly concave joints, leaving a sanded surface without smearing the brick. Sack rubbing or wiping finished masonry with rags will not be permitted.

4.4.6. The mortar of brick veneer joints shall be raked and left rough for cement pointing. Pointing mortar shall be struck flush, and be tooled to a hard smooth finish.

4.4.7. Units shall be full-bedded in flat un arrowed bed or mortar and shoved into place, with head joints completely filled. If resetting of a unit becomes necessary, for alignment, the joint shall be cleaned thoroughly and new mortar used.

4.5. Reinforcing

4.5.1. Reinforcing steel shall be lapped according to NIOEC-SP-10-01.

4.5.2. Vertical bars shall be held in position at top and bottom and at intermediate intervals as per NIOEC-SP-10-01.

4.5.3. Brick veneer ties shall be installed as shown on the drawings.

4.6. Grouting

4.6.1. Reinforcing steel shall be in place and inspected before grouting is begun.

4.6.2. All debris and projecting mortar shall be cleaned out before pouring grout.

4.6.3. Grouting of beams over openings shall be done in a continuous operation.

4.6.4. All bolts, anchors, etc., inserted in the wall shall be solidly grouted in place.

4.6.5. All grout spaces shall be filled with grout and immediately pulled or swished sufficiently to cause the grout to flow into all voids, and to fully encase the reinforcing steel.

4.7. Wall Care

4.7.1. Where masonry walls are to be left bare or painted, extreme care shall be taken to prevent mortar splashes.

4.7.2. All forms shall be made tight (special attention is necessary for bottom forms of beams) and grout spilled on walls shall be washed off before it can set up.

4.7.3. After the wall is constructed it shall not be saturated with water for curing or any other purposes.

4.7.4. In hot weather and when the atmosphere is dry, the wall shall have its surface dampened with a light fog spray during a mortar curing period of three days.

4.7.5. The masonry work shall be protected against rain, frost, or freezing during construction.

4.7.6. All exposed brick surfaces shall be left completely clean of all foreign substances or stain upon completion of the work.

4.8. Flashing

The contractor shall set and built all window and door frames, lintels, anchors, tie rods etc., chases, openings and reveals in masonry to receive frames, pipes, sleeves, conduit, wiring etc., as shown on the drawing.

4.9. Embedding Frames

Metal door frames shall be bedded solidly in cement mortar, with the lugs properly built in to brick work or partitions as the work proceeds. Metal window frames shall be bedded in cement mortar and pointed internally with approved non-hardening mastic compound.

4.10. Block out

The contractor shall provide all block outs, required ties etc., in all wall lintels, sills, steps etc., for door and window frames, hand rails etc., Block out shall be packed with a rich mortar mix.

4.11. Waterproofing

Waterproofing when called for on the drawings, shall be applied on well cleaned and brushed surface. Upon the cleaned and brushed surface a two millimeter thick coat of hot 85/25 bitumen shall be brushed on. On this mopping while still hot, one layer of superior quality new gunny fabric or burlap, with 100 millimeter lapse on each direction shall placed. A second coat of hot bitumen shall then be mopped on the gunny fabric as specified for the first coat. A second layer of the same quality of gunny fabric shall then be applied while the bitumen is still hot with main laps running in opposite directions. A third mopping of hot bitumen shall then be mopped on the second layer of gunny. Any pipes, drains, or other interruptions Passing through waterproofing shall be properly sealed, and all water proofing shall be turned up or down on walls or other surfaces.

Where specified or shown on the drawings the contractor shall install waterproofing with three layers of gunny fabric.

Passing through waterproofing shall be properly sealed, and all water proofing shall be turned up or down on walls or other surfaces. Where specified or shown on the drawings the contractor shall install waterproofing with three layers of gunny fabric.

4.12. Cleaning

At the conclusion of the masonry work, all masonry shall be cleaned, all stains removed with acid, and the acid washed off with water.

SECTION B ROOFING

1. SCOPE

The contractor shall provide all the labor, material, transportation and equipment required to completely furnish and install all the work in connection with roofing as shown on the drawings or as specified herein, to the complete satisfaction of the Employer's Representative.

1.1. Roof and Floor Structures

Roof and Floor structures shall be cast-in place or pre-cast concrete joists with concrete slabs.

1.2. Lightweight Concrete

Lightweight concrete for roof covering when called for on the drawing, shall be of "Choecolite" light weight concrete (Foam Concrete) with density of 650 Kg per cubic meter as approved by the Employer's Representative, or approved equal. Lightweight concrete shall be built according to roof slopes as shown on the drawings and shall have a minimum thickness of 20 millimeters.

1.3. Concrete with Light Weight Aggregates

When called for on drawings, shall be prepared as specified herein and shall be evenly spread to levels shown on the drawings. The weight of the aggregate shall not exceed 900 Kg per cubic meter, and shall consist of an assortment of hard clean sea shells (scallop, etc.) containing some clean hard natural sand as approved by the Employer's Representative, or a similar approved material.

The aggregate as described above shall be mixed with 100 Kg of cement per cubic meter of aggregate with sufficient amount of water to form a workable mix, as directed by the Employer's Representative.

The concrete as prepared above shall be placed to line and grades shown on the drawings and shall be allowed to cure in a manner acceptable to the Employer's Representative.

Material and mix proportioning of comparable quality may be used subject to prior approval of the Employer.

1.4. Roof Waterproofing

Waterproofing shall consist of two polyester reinforced bituminous elastomeric membranes, 4 mm minimum thickness, each. The membranes shall be laid over the primer recommended by the Manufacturer.

Overlapping shall be minimum 80 mm. and shall be hot welded.

Water proofing membranes shall be extended to vertical edge and top of parapet. All sharp angles shall be rounded.

The exposed membrane shall be topped with a built-in slate flakes layer allowing for pedestrian access for inspection and acting as protection from U.V. rays. The membrane shall have the following minimum requirements:

Weight	: 4.5 Kg/sq. m.
Cold flexibility	: - 25°C
Hot stability	: over 100°C
Punching strength (Static)	: Ps4
Fatigue strength	: over 500 cycles (at -10°C)

Sample shall be submitted to the Employer for approval.

A galvanized and painted steel flashing shall be provided on top of perimeter parapet (and at expansion joints also) min. thickness 0.8 mm.

1.5. Cleaning

On completion, all roofs shall be swept clean of dirt and debris and any caves, gutters, and drain leaders shall be cleaned out to the entire satisfaction of the Employer's Representative, the roofs shall be waterproof and watertight.

1.6. Roof Drainage and Downspout Pipes

1.6.1. Main roof drain shall be "High Velocity" roof drain coated cast iron body or heavy PVC complete of aluminum or galvanized steel strainer.

1.6.2. Downspout pipes: shall be made of galvanized and painted steel sheet, 0.8 mm thickness. Number and size of downspout pipes shall be in accordance with hydraulic calculations. However, diameter shall not be less than 100 mm.

SECTION C**ROOF INSULATION AND VAPOR BARRIER OVER CONCRETE DECK OR METAL DECK****1. SCOPE**

All roof insulation and vapor barrier in accordance with drawings and this specification, including items listed below:

1.1. Asphalt for bedding vapor barrier and insulation.

1.2. Cant strips.

2. MATERIALS

Materials must be approved by the Employer.

2.1. Insulation

Roof insulation shall be Fiberglass and having a top surface faced with a glass fiber reinforced, asphalt and craft mopping surface. For size and thickness see drawing.

2.2. Primer

Asphaltic primer is conforming to ASTM D41/D41M.

2.3. Vapor Barrier

Fiberglass Perma Ply No. 11.

2.4. Asphalt

Roofing asphalt shall conform to ASTM D312 with a softening point in accordance with roofing manufacturer's recommendation, considering the climatic conditions and roof slope.

2.5. Cant Strips

Cant strips shall be of rigid fiberboard material with 100 mm. vertical and horizontal dimensions and a face incline of not more than 45 degrees with the roof surface.

2.6. Roof Tape

Roof tape shall be Fiberglass Roof Tape having 150 mm width.

2.7. Mechanical Fastener

Lexsuo clips with tin dieses for attaching insulation to metal deck.

3. APPLICATION

3.1. Treated wood insulation stops of the same thickness as the insulation shall be secured to the roof deck adjoining. All eaves and around all projections through the deck, and are shown on the drawings. Stops must be 150 mm wide or minimum 25 mm wider than the flanges being nailed to them.

3.2. Surface of deck shall be smooth, clean and dry.

- 3.3.** Primer shall be applied to the surface of the entire deck at the rate of 0.41 liters per square meter. Primer shall be allowed to dry thoroughly before application of roofing. Keep primer several centimeters back from joints of precast panels.
- 3.4.** In the metal deck surface is such that a satisfactory bond cannot be obtained between the deck and the adhesive, coat the deck with concrete primer and allow drying.
- 3.5.** One layer of Fiberglass Perma Ply vapor barrier lapped 50 mm on sides and 150 mm on ends shall be applied to a solid mopping of hot steep asphalt applied at a nominal rate of 1.5 kilograms per square meter. Edges of vapor barrier shall be turned up on, but not cemented to, all vertical surfaces to a height of 150 mm. and shall overhang all roof edges 150 mm.
- 3.6.** In the metal deck vapor barrier shall be strip mopped to the deck in such a manner that the principal direction of the vapor barrier is parallel with the flutes of steel deck. Lap all side joints 100 mm and all end joints 150 mm and seal-with hot asphalt. Sealed side laps shall be located so as to be supported by the steel deck corrugations. Second ply of vapor barrier shall be embedded in a solid mopping of hot asphalt applied at the rate of 1.5 kilograms per square meter. Edges of vapor barrier shall be turned up on, but not cemented to, all vertical surfaces to a height of 150 mm and shall overhang all roof edges 150 mm.
- 3.7.** Over vapor barrier roof insulation shall be embedded in a solid mopping of hot asphalt applied at a nominal rate of 1.5 kilograms per square meter.
- 3.7.1.** In the metal deck over vapor barrier embed insulation in 0.6-0.7 kilograms of hot asphalt per square meter of deck in ribbons 150 mm on center with contact surface of deck. Insulation shall be laid in courses parallel to edges and at right angles with flutes of steel deck, with joints continuous in both directions to facilitate the insulation of roof tape.
- 3.7.2.** End and side joints shall be butted with joints continuous in both directions.
- 3.7.3.** Edges of insulation boards running parallel to the flutes of steel decks shall bear on the deck and not terminate unsupported over a channel.
- 3.7.4.** Edges of insulation boards shall be metered at ridges and elsewhere to prevent open joints or irregular surfaces.
- 3.8.** Roof tape shall be centered over all insulation joints and edges, embedded in hot steep asphalt applied at the rate of 0.75-1.0 kilograms per square meter of tape. End laps shall be 100 mm. Care is to be taken to ensure smooth application of tape and that the tape is in full contact with the asphalt.
- 3.9.** Where more than one layer of insulation is indicated on the drawings, the top surface of the first layer shall be coated with 1.5 kilograms of hot asphalt per square meter and successive layers of insulation shall be applied so that joints are continuous in both directions, with no joints failing on top of joint below.
- 3.10.** Nail cant strips to wood insulation stops at intersections of vertical walls and roof projections.
- 3.11.** Before application of the roofing, the projecting 150 mm of felt at vertical surfaces and at all edges shall be turned over the insulation and mopped solidly with the asphalt. The insulation shall be applied than can be completely covered or applied over with Perma Ply.

- 3.12.** At the end of each day's work all exposed edges of insulation must be sealed off with hot asphalt and a 305 mm wide strip Perma Ply No. 11 installed as water cut off.
- 3.13.** On roof slopes of $\frac{1}{6}$ to $\frac{1}{3}$ treated wood insulation stops 50 mm wide and the same thickness as the insulation shall be installed on the top of the vapor barrier and at right angles to the direction of the roof slope. These insulation stops shall be spaced 1225 mm apart (face to face) and secured mechanically using drive screws or nails to the concrete deck.
The insulation shall be placed between the stops with the long dimension at right angles to the roof stops. Roof insulation shall then be taped to wood insulation stops.

SECTION D**COMPOSITION ROOFING OVER CONCRETE DECK OR OVER INSULATION****1. SCOPE**

- 1.1. All composition roof work is in accordance with the drawings and this specification, including items listed below. This specification provides for application of composition roofing to various deck surfaces with slopes not exceeding 1 in 4.
- 1.2. Cap Flashing (plastic materials) at junction of roofing with walls and other projections, when metal flashing or counter – flashing is not shown on the drawings.
- 1.3. Gravel strips for flat roofs and roof projections.
- 1.4. Metal scuppers and vent flashing.
- 1.5. Cant Strips when deck is not insulated.

2. MATERIALS**2.1. Concrete Primer**

Bitumen 60/70

2.2. Roofing

Hessian Cloth

2.3. Bitumen

60/70 and 85/25 The softening joints and applied heat temperatures shall be in accordance with the manufacturer's recommendations, considering the climatic conditions and roof slope.

2.4. Cant Strips

Cant Strips shall be of a rigid fibrous material. The vertical leg of the cant shall be 101.6 mm (4 inches).

2.5. Cap Flashing

Plastic materials

2.6. Gravel Strips

Unless otherwise shown the gravel strip shall be 24 gage carbon steel of uniform quality, hot dip coated with 458 gram of zinc per square meter (1.5 ounces of zinc per square foot), ASTM A 153/153M.

2.7. Nails

Roofing nails shall be of the size and type recommended by the roofing manufacturer for the job conditions.

2.8. Surface Protection

Asphalt or other means of protection is approved by the Employer's Representative.

3. PREPARATORY WORK

- 3.1.** Treated wood nailing strips 25.4 mm (1 inch) thick shall be embedded in not insulated poured or pre-cast roof decks at rakes, eaves and around larger openings, so that flanges of gravel strips, edging strips, large vents, etc., may be properly secured to deck during the application of the roofing.
- 3.2.** All metal gravel strips, scuppers and roof drains shall be in place and metal flashing, flanges, etc. shall be provided in time to be installed along with the roofing assembly. Cant strips shall be installed at the angle formed by the roof deck and the vertical surfaces. When roof insulation is required, the cant strip is included in the roof insulation specification.
- 3.3.** All surfaces to be roofed shall be broom clean and dry.

4. APPLICATION OVER CONCRETE DECK

- 4.1.** Prime entire deck surface and parapet walls with concrete primer and allow dry thoroughly.
- 4.2.** Mop primed deck with hot bitumen at the rate of 1.5 Kg per square meter embed in the cant strips and the first of two layers of Hessian cloth, lapping each sheet 150 mm. The Hessian cloth shall be well pressed into the hot bitumen. Hessian shall be carried up parapet walls, pressed into the bitumen and securely nailed into place.
- 4.3.** The first layer of Hessian shall be covered with a coating of a mixture of 2 parts bitumen 60/70 to 1 part bitumen 85/25 and a further layer of Hessian cloth pressed on similarly to but across the first layer.
- 4.4.** This second layer of Hessian cloth shall be further sealed with a layer of a mixture of 1 part bitumen 60/70 to 2 parts 85/25.

5. APPLICATION OVER INSULATION

Application over insulation same as over concrete deck except concrete primer is omitted.

6. MISCELLANEOUS

6.1. Gravel Stop

Install at edges of all flat roofs and parapet as detailed. Embed in hot bitumen over bottom layer of hessian cloth. End lap 76.2 mm (3 inch) and seal with flashing cement.

6.2. Connections with Projecting Items Furnished by Others

Metal base flashings of vents, etc., shall be thoroughly cemented in place over first layer of hessian cloth and covered with flashing fabric cemented to roofing and flanges. Balance of roofing shall be applied over the flashing fabric, and joints at edges shall be completely filled with flashing cement.

6.3. Outlet and Drains

Roof drain base shall be filled with flashing compound and flashing fabric before application of roofing. Set clamp ring and tighten bolts while felt, top flashing fabric and bitumen are still warm.

6.4. Pipe Openings

All pipes passing through roofing shall be flashed watertight as indicated on the drawing and approved by the Employer's Representative.

7. GUARANTEE**7.1. Manufacturer's Certificate of Inspection**

The installer of the composition roofing shall submit a certificate of inspection, executed by the manufacturer of the roofing materials installed, certifying that the manufacturer's representative and Employer has inspected the job and that the materials have been installed in accordance with requirements of the specifications and good roofing practice.

SECTION E
FINISH CARPENTRY AND MILLWORK**1. SCOPE**

The Contractor shall provide all labor, material, equipment, and transportation required for the complete furnishing and installing of all the work in connection with carpentry and hardware in accordance with the specifications and as shown on the drawings, including items listed below.

- 1.1. Wood doors, wood frames and trim.
- 1.2. Counters and cabinets.
- 1.3. Wardrobe shelves and poles.
- 1.4. Toilet accessories.
- 1.5. Overhead doors, frames and hardware.

2. MATERIALS

- 2.1. All softwood and hardwood lumber for finish carpentry and millwork shall be thoroughly and properly kiln dried, sized, surfaced, and machine, hand sanded.

- 2.1.1. The grade of all wood shall be approved imported superior quality lumber (Russian wood, forest pine, Oak, sycamores etc.), or equal grade Iranian wood when specifically approved by the Employer's Representative.

- 2.1.2. Plywood shall be of superior first quality foreign manufacture, consisting of a minimum of three ply and a minimum thickness as shown on the drawings. Plywood shall be well pressed and Glued, approved samples.

- 2.1.3. (Pallisandre, walnut, or Acagou) Face veneer (veneer sheet) for surfaces shall be of superior quality in accordance with approved samples.

- 2.1.4. Hanging poles for wardrobes shall be 35mm ($1\frac{3}{8}$ inch) chromium plated hard copper tubing with chromium plated wall flanges.

- 2.1.5. Glue used in joining pieces shall be superior grade glue as approved by the Employer's Representative.

- 2.1.6. Laminated Plastic

- Where laminated plastic is shown on the drawings the material shall be "Formical" as manufactured for the best quality in Iran. See drawings for color. The Formica shall be adhered to plywood backing as recommended by the manufacturer. Glue used in jointing pieces shall be superior grade glue as approved by the employer's representative.

- 2.1.7. Protect finished woodwork from weather while in transit. When delivered to site, immediately place under cover and adequately protect from weather. Do not store or erect material in wet or damp portion of building.

- 2.2. Wood doors shall be Gabon Mahogany or Sapeh Plywood facing on a wood frame and spacer blocks.

2.2.1. Fire doors shall be welded wood with hardwood veneer faces. Doors shall bear the Underwriters' Labels designating the rating, as manufactured and guaranteed by Iranian Plywood, Standards.

Safety for fire tests of door assemblies shall be according to UL 10B.

2.2.2. All wood doors that are to be painted as shown on the drawings shall have a "Duraply" coating applied at the factory.

2.2.3. Double leaf doors shall have overlapping astragals.

2.2.4. Kind of hardwood veneer facing shall be considered according to the drawing.

2.2.5. Doors shall be prepared for hardware as scheduled on the drawings.

3. CONSTRUCTION

3.1. Built-In Woodwork and Cabinets

3.1.1. Wood finish shall be installed in single full lengths, where possible. When splicing is unavoidable the joining ends shall be beveled together. All exterior angles shall be mitered; interior angles for flat members shall be but joints and coped for detailed members. All nails shall be set for puttying. Hanging stiles for case and cabinets doors shall be solid lumber. All screwing in joinery shall be countersunk.

3.1.2. Where jambs, heads and sills of door and window frames meet masonry or concrete, they shall be neatly and tightly caulked by pressure gun. Joints and cracks shall be completely filled with an even, continuous fillet having a slightly concave surface. Excess Sealant material shall be removed from frame members and masonry.

3.1.3. Where plywood is required are edges may be exposed in finished work, such as for doors, shelves, and like cases, finish edges with hardwood strips to form a frame mitered corners and glued-up. Round edges become slightly with sandpaper.

3.1.4. Shelves face casings, doors, and similar exposed work, not specifically noted to be constructed of hardwood plywood or hardwood stock are to be constructed of "C" and "Southern Pine or fir" and better select. Shelves over 305 mm wide are to be constructed of plywood.

3.1.5. Fillers and scribe mouldings shall be provided as required to make a workmanlike installation.

3.1.6. Provide recessed chrome plated standard clips for making shelves adjustable where indicated.

3.1.7. Drawers

Dovetail fronts and backs to sides. House bottoms into grooves on sides, front and back. Provide plywood dust stops between drawers, and between drawers and cupboards.

Hardware (locks, pulls and slides) shall be approved by employer. Grant sliding hardware slides shall be attached to drawer on cabinet sides as per detail drawings supplied by manufacturer.

3.1.8. When carpentry and millwork are released for finishing, the work shall be in such shape and condition that only puttying and light sanding are required. All surfaces shall be examined accordingly and refinished as necessary.

3.2. Shop Fabricated Cabinets and Millwork

3.2.1. It is the intention that the workmanship in fabrication and installation of millwork, cabinetwork and finish carpentry work shall be of the highest quality, executed by skilled craftsmen. Workmanship not meeting the standards will not be acceptable.

3.2.2. In general, finish and assemble cabinets at mill, as far as practicable. Deliver at building ready to set in place. Work materials in best manner known to trade. Mortise, tenon, dowel, block and glue together to avoid use of nails as much as possible with mouldings cleanly cut, sharply defined and miters accurately made, plain butt joints without an approved device for preventing separation at joints will not be accepted. Conceal nails and screws when necessary to use, Smooth machine finish for all surfaces before leaving mill.

3.2.3. Install all frames and finish plumb or level, straight and true. Install trim with proper grounds in every case, and firmly secure thereto.

3.2.4. Fit and scribe all work to finished work in careful manner, so as not to injure surface in any way. Blind nail wherever possible, but, where not possible, locate and drive nailing as not to be visible in finish.

4. WOODWORK PRIMING REQUIREMENT

4.1. Prime and back-paint frames, trim, and other millwork finished, except that to have stained or natural finish.

4.2. Where work is designed for stained or varnished finish, paint all concealed surfaces with on heavy coat of damp-proof paint of a NIOEC authorized type.

4.3. Apply priming and back painting of millwork at job as soon as delivered and inspected.

4.4. After doors are fitted, they shall be removed and top, bottom and edges painted. When paint has thoroughly dried, doors shall be re-hung.

5. FINISH HARDWARE

Finish hardware shall be installed in accordance with the drawings, templates and instructions of manufacturers. Butt hinges lock strikes and keepers shall be full-dapped.

SECTION F**METAL FURRING, LATHING, WALLBOARD AND SILICATE CEMENT BOARD****1. SCOPE**

All furring, wallboard and flat silicate board in accordance with the drawings and this specification, including items listed below.

1.1. Clips, wires, anchors and miscellaneous accessories.

1.2. Instruct concrete foremen that hanger inserts shall be installed in forms at perimeter and on center each way, over all areas having suspended ceiling.

2. MATERIALS

The following materials listed are standard building products of reputable manufacture. Locally manufactured or locally available similar products of equal quality and usability may be substituted, if approved by the Employer's Representative.

2.1. Metal Furring

2.1.1. Carrying channels shall be installed in accordance with the drawing and constituent technical specification

2.1.2. Nailing channels shall be regular zinc coated, complete with channel splices and hanger clips.

2.2. Wallboard

2.2.1. Gypsum wallboard shall be according to the ASTM 1597M, with square edges for backing of acoustical tile finish.

2.2.2. Flat silica Fume shall be according to ASTM C1240.

2.2.3. Aluminum panels and related fasteners shall be according to technical specification and drawing.

2.2.4. The choice of panel depends on the characteristics of the space.

2.3. Metal Trim and Accessories

2.3.1. Substructure shall be prepared according to the manufacturer's specifications and approved by the Employer. All fasteners shall be provided on the ceiling before finishing joinery.

2.3.2. Casing bead, corner bead and base screeds shall be galvanized steel of size and shape shown on the drawings.

2.3.3. Wire ties for metal lath shall be soft annealed and galvanized with suitable gage.

2.3.4. Hanger wire for suspended ceilings shall be annealed wire with suitable gage.

2.3.5. Staples and nails shall be of sizes, number and finish recommended by the manufacturer of the product being attached.

3. APPLICATION

All this work shall be done in a neat workmanlike manner in accordance with the standards of this trade.

3.1. Metal Furring

3.1.1. Metal furring refers to a non- structural metal attachment is used to hold a finish material. Ridged furring channels can be installed over masonry or concrete surfaces either horizontally or vertically. Metal furring specification shall be according to type of wallboard. All work, details, fasteners, kind and dimensions shall be according to Manufacturer's Instructions.

3.1.2. Furring shall be placed to suit the arrangement of lighting fixtures and diffusers.

3.2. Lathing and Finish Board

3.2.1. Apply gypsum wallboard horizontally, and nail according to drawing on center using bulbous nails and metal joint fasteners. Drive nail heads so as to lightly dimple the wall board without breaking its surface.

3.2.2. Apply flat asbestos cement sheets to supports and nail at suitable distances on center accordance with the drawing. Cover all joints with suitable diameter battens, and nail, unless noted otherwise on the drawings.

3.2.3. In Aluminum panels, the kind of fasteners shall be galvanized steel.

3.3. Metal Trim and Accessories

3.3.1. Apply corner beads on all exterior corners and where indicated. Use single lengths only, and fasten securely with staples or nails at specified distances on center and staggered.

3.3.2. Apply wood grounds or metal casing bead at the base and as indicated on the drawings. All corners shall be true, square, and mitered accurately.

3.3.3. Apply base screeds where indicated on the drawings. Screeds shall be level and true to line and as long as practicable, with joints in straight runs aligned with suitable formed splices. Secure screeds applied to metal lath with tie wire.