البوتاس العربية
Arab Potash

اسم العطاء.

Rehabilitation and Replacement of Steel Cladding at Spare Parts Storage Hangar (J-6)

رقم العطاء

IFB No. # 202101652:

Tender Documents

Volume 2: Specifications

مجلد رقم (2)
المواصفات

المواصفات الفنية العامة

يجب على المقاول تنفيذ جميع أعمال العقد حسب:-

أ- المواصفات الفنية العامة للمباني الصادرة عن وزارة الأشغال العامة والإسكان لسنة 1996 وأية تعديلات أو إضافات أو ملحقات تمت بعد ذلك وتشمل ما يلي:-

- المجلد الأول:الأعمال المدنية والمعمارية للمباني

ب- المواصفات القياسية الأردنية الصادرة عن مديرية المواصفات والمقاييس بوزارة الصناعة والتجارة حتى تاريخ تقديم العطاء.

ج- الكود العربي لتصميم وتنفيذ المنشآت الخرسانية الصادرة عن اتحاد المهندسين العربسنة 1977 وأية تعديلات أو إضافات أو ملحقات تمت بعد ذلك ويستعمل هذا الكود في تحديد الأحمال والإجهادات ومرجعاً لتصميم طرق الإنشاء وتحديد خواص المواد وتقييم نتائج الخرسانة المنفذة.

د-كود دستور البناء الوطني الأردني الصادر عن وزارة الأشغال العامة والإسكان.

المواصفـــات الفنيـــة الخاصـــة

تعتبر المواصفات الفنية التالية والمذكورة في بنود جداول الكميات جزءاً من المواصفات المطلوب تنفيذ الأعمال بموجبها وتعتبر متممة ومتقدمة على المواصفات العامة للأخذ بها وفي حالة وجود تعارض أو عدم وضوح أو التباس بين أي من هذه المواصفات فإن تحديد المواصفة المطلوبة في هذه الحالة من صلاحية المهندس ويكون قراره نهائياً.

المواصفات الفنية الخاصة للأعمال الإنشائية والمعمارية

المواصفات الفنية العامة

تعتبر المواصفات التالية هي المواصفات الفنية العامة لتنفيذ اعمال المشروع ويتم اعتمادها الا اذا ورد خلاف ذلك في جداول الكميات أو المواصفات الفنية الخاصة أو الملاحظات على المخططات، وهذه المواصفات هي كالتالي:-

1. المواصفات الفنية العامة للابنية والصادرة عن وزارة الاشغال العامة والاسكان لعام 1996 وبمجلداتها الثلاث:-
   - المجلد الاول : الاعمال المدنية والمعمارية
   - المجلد الثاني : الاعمال الميكانيكية
   - المجلد الثالث : الاعمال الكهربائية
2. المواصفات العامة للطرق والصادرة عن وزارة الاشغال العامة والاسكان لعام 1991، وذلك فيما يتعلق باعمال الطمم ومواصفات المواد الصالحة للطمم اضافة الى اعمال الساحات الخارجية والاعمال المكملة لها
3. هذا وعلى المقاول تأمين نسخة واحدة على الاقل من المواصفات الفنية العامة المذكورة اعلاه وذلك لجهاز المشرف في موقع المشروع

المواصفات الفنية الخاصة

اولا :عام

1. على المقاول دراسة مخططات العطاء ومقارنتها مع الشروط والمواصفات الخاصة والعامة وبنود جداول الكميات الخاصة بهذه الاعمال و مقارنتها بالواقع وفي حال وجود أي تعارض بينهما فعلى المقاول ابلاغ المهندس وذلك قبل تسعير العطاء وتزويده في المخططات بعد التعديل.

2. **يجب تنفيذ جميع اعمال العقد طبقا لما يلي:-**

أ. المواصفات الفنية الصادرة عن وزارة الاشغال العامة سنة 1996.

ب. المواصفات القياسية الاردنية الصادرة عن مديرية المواصفات والمقاييس بوزارة الصناعة والتجارة حتى تاريخ تقديم العطاء.

ج. كودات البناء الوطني الاردني الصادرة عن مجلس البناء الوطني الاردني.

د. كود دستور البناء الوطني الصادرة عن اتحاد المهندسين العرب يستعمل هذا الكود في تحديد الاحمال والاجهادات ومرجعا للتصميم ولطرق الانشاء وتحديد خواص المواد وتقييم نتائج الخرسانة المنفذة.

3. المواصفات القياسية:

اذا حدد لمادة مواصفات قياسية عالمية مثل (ASTM) أو (BS) فانه يجب على المقاول تقديم شهادة المنشأ التي تبين مطابقة ما يقدمه لما فيه قناعة المهندس.

4. المواصفات المقيدة:

اذا ما حدد مصدر واحد لاحد المواد أو المنتجات فانه يجب على المقاول التقيد بالبند، ولا يغير ذلك المصدر الواحد بدون موافقة خطية من المهندس مقرونة بموافقة صاحب العمل.

6. في حالة وجود موقع العمل بالقرب من المواقع التي تتطلب حماية امنية فانه يتوجب ما يلي:-

ا. على المتعهد بيان اسماء الجهاز الذي سيقوم بحراسة الموقع.

ب. على المتعهد ان يزود افراد الجهاز العامل والمشرف بهويات توضح اسمائهم ومدى مسؤوليتهم الوظيفية في الموقع لابرازها للجهات الامنية المختصة.

ج. على المتعهد ان يشعر مديرية شرطة المحافظة بتاريخ مباشرته للعمل والتاريخ المتوقع لانهاء العمل وذلك بتزويدها بكشف متضمنا اسماء الجهاز المنفذ والمشرف من اجل تعميمها على الدوريات وسيارات النجدة والامن الوقائي لتتمكن هذه الجهات من تدقيقها عند اللزوم.

7. على المقاول ان يقوم باخراج المواد الناتجة عن مخلفات الهدم والازالة أو الكميات الزائدة ونقلها خارج الموقع وفي الاماكن المخصصة لذلك بالتنسيق مع السلطات المختصة وعلى نفقته ومسؤوليته الخاصة ولن تدفع له أي مبالغ نتيجة تنفيذ هذه الاعمال.

8. ان المقاول ملزم بتنفيذ اي بند من البنود المدرجة تحت اي قسم من الاقسام لاي عمل في اي قسم اخر لم يرد ذكر هذا البند فيه وبنفس الاسعار المقدمة من المقاول للبنود المشابهة.

9. الرافعات البرجية والمعدات الثقيلة:

على المقاول اتخاذ الاحتياطات الكافية لسلامة العاملين في الموقع والمارة من المخاطر عند استعمال الرافعات البرجية (Tower Cranes) وعند استعمال المعدات الثقيلة، مع اتخاذ الاحتياطات المعتادة لعموم المعدات الاخرى.

10. معدات المقاول:

في حال اقتضت الضرورة ان يقوم المقاول بخلط الخرسانة في الموقع فيجب ان يتم ذلك بواسطة الخلاطة المركزية أو خلاطات تعمل بالوزن وتكون مواصفاتها حسب ما تقتضيه حاجة اعمال المشروع وتوضع في المكان الذي يوافق عليه المهندس، وكذلك على المتعهد تأمين العدد الكافي من الونشات والدنابر والرجاجات واية آليات لازمة لنقل وصب الخرسانة.

11. المخططات في الموقع (Work shop drawings):

على المقاول وقبل المباشرة بالعمل بوقت مناسب تقديم مخططات (Work shop drawings) للاعمال المعمارية والعزل الصوتي و الانشائية والمعمارية والميكانيكية والكهربائية والصحية والاعمال الخارجية واية اعمال اخرى والتي تحتاج الى تفصيل لاخذ الموافقة المسبقة عليها من المهندس المشرف، وحسب طلب وتعليمات المهندس المشرف، وان عدم تقديم هذه المخططات في الوقت المناسب لاعتمادها حسب الاصول لا يعفي المقاول من مسؤولية التأخير الذي قد يحصل على تنفيذ الاعمال بسبب عدم اكتمال واعتماد هذه المخططات حسب الاصول. ويجب ان يقدم المقاول (3) ثلاث نسخ من المخططات Work Shop Drawings الى المهندس بحيث تعاد نسخة منها للمقاول بعد تدقيقها موقعة ومؤرخة من المهندس ومبين عليها ملاحظته.

12. علامات مرافق الخدمات المخفية:

أ. على المقاول وضع اشارات واضحة في الاماكن التي يوجد بداخلها مواقع لتمديدات مرافق الخدمات المخفية ، وذلك لتسهيل الاهتداء اليها عند اجراء الفحص عليها أو صيانتها أو تصليحها أو تشغيلها.

ب. على المقاول المحافظة على مرافق الخدمة القائمة التي تخدم المباني المجاورة القائمة مثل خطوط المجاري وخلافه وحماية هذه المرافق طوال مدة تنفيذ العمل واذا تضررت مثل هذه المرافق اثناء تنفيذ العمل يقوم المقاول باصلاح هذه الاضرار باتقان على

نفقته الخاصة وباسرع وقت ممكن وفي حالة تخلفه عن اصلاح الضرر يحق للمهندس تكليف أي جهة لاصلاح الاضرار (بعد اخذ موافقة المالك) وحسم ما يترتب على ذلك من تكاليف من مطالبات المقاول مهما بلغت هذه التكاليف.

13. مخططات الإنجاز(As built drawings):

على المقاول ان يقدم للمهندس المشرف عند الانتهاء من العمل مخططات كاملة لكافة الاعمال المدنية والمعمارية والميكانيكية والكهربائية والصحية واية اعمال اخرى حسب التنفيذ(As built drawings) تكون هذه المخططات مطابقة لما تم تنفيذه في الموقع وبجميع التفاصيل وذلك لاغراض الصيانة ويجب على المهندس المشرف متابعة عملية انجاز واستلام واعتماد هذه المخططات المنجزة من قبل المقاول حسب تقدم مراحل العمل اولا باول ودون انتظار مرحلة الاستلام النهائية. ويطلب من المقاول تسليم نسخة اصلية بالاضافة الى نسخة اقراص مدمجة (CD)و (2) نسختين (Blue Print) من هذه المخططات لصاحب العمل قبل عملية الاستلام الاولي ولا يعتبر المشروع قابلا للتسليم تسليما اوليا قبل تقديم هذه المخططات.

14. المواد والاجهزة:

على المقاول تقديم عينات او نماذج أو كتالوجات لمختلف الفعاليات للمهندس المشرف تبين نوعية مصدر ومواصفات المواد والاجهزة المنوي استعمالها في العرض المرفق لاعتمادها قبل التنفيذ ويجب ان لا يقل عدد العينات المقدمة بأي حال من الاحوال عن (3) ثلاثة من ثلاث مصادر مختلفة وان تكون مطابقة للمواصفات وجداول الكميات ولصاحب العمل وللمهندس الحرية باختيار اي واحدة من العينات المقدمة دون ان يكون للمقاول حق الاعتراض على اختيارهم.

15. شمولية السعر والكيل لكافة بنود الكميات:

أ. ان الوصف الموجز للعمل في بنود جداول الكميات لا يعتبر وصفا دقيقا متكاملا لجميع ما هو مطلوب اذ ان جداول الكميات تعتبر فقط جزءا من وثائق العقد يكملها جميع ما ورد من شروط ومواصفات عامة وخاصة واي من المواصفات العالمية التي تمت الاشارة اليها وكذلك أي من الكتالوجات لمنتجات محددة اشير اليها، لذلك يطلب من المقاول التأكد من جميع ما هو مطلوب قبل تعبئة الاسعار.

ب. يعتبر السعر المطلوب لاي بند من البنود الواردة في جداول الكميات، شاملا تقديم جميع المواد المطلوبة واجور النقل الى الموقع واجور المصانعات والمواد المختلفة اللازمة للتركيب وجميع الملحقات التابعة للعمل لانجازه وفقا للمخططات.

ج. المواصفات العامة هي المواصفات الفنية العامة للمباني والاعمال الكهربائية والميكانيكية الصادرة عن وزارة الاشغال العامة والاسكان سنة 1996 وما تضمنته من طريقة الكيل وشمولية السعر التي على المقاول اخذها في الاعتبار عند تحديد سعره لكل بند من بنود الكميات ما لم يرد خلاف ذلك في جداول الكميات.

د. المواصفات الخاصة تتقدم على المواصفات العامة ويؤخذ بها بالقدر الذي تعدل أو تضيف على المواصفة العامة وتبقى شمولية السعر ومواصفات الاعمال المكملة غير المعدلة حسب المواصفات العامة من مكملات العمل المطلوب.

16. اذا كان هناك اي التباس او تناقض في وثائق العطاء او كانت هناك اية حاجة للاستفسار عن اي توضيح في وثائق العطاء فعلى المناقص ان يتقدم بطلب خطي الى صاحب العمل او المهندس وذلك من اجل توضيح وازالة الالتباس او التناقض في موعد يسبق التاريخ المحدد لفتح العطاء بما لا يقل عن اسبوع ويقوم صاحب العمل بتوزيع جواب الاستفسار على كافة المناقصين للعطاء ولا يجوز ان يتخذ مثل هذا التوضيح مبرراً لتمديد الموعد المحدد لتقديم العروض في حال ظهر التباس او تناقض .

ثانياً: المواصفات

Sandwich Panels:

METAL ROOF PANELS

1. GENERAL

1.1. RELATED DOCUMENTS

1.1.1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

1.2.1. Section includes insulated metal roof panels.

1.3. PERFORMANCE REQUIREMENTS

1.3.1. General: Provide manufactured roof panel assemblies complying with performance requirements as per structural requirements and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

1.3.2. Air Infiltration: Provide manufactured roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.45 L/s/sq. m of fixed roof area when tested according to ASTM E 1680 at a static-air-pressure difference of 192 Pa.

1.3.3. Water Penetration: Provide manufactured roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 300 Pa and not more than 575 Pa.

1.3.4. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance. Wind speed to be in conformity to IBC 2003 – Section 6 of ASCE7, with basic wind of 37 m/s and exposure D

1.3.5. Structural Performance: Provide manufactured roof panel assemblies capable of safely supporting design loads indicated under in-service conditions with vertical deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 1592 by a qualified independent testing and inspecting agency.

1.3.5.1. Maximum Deflection: 1/180 of the span.
1.3.5.2. Design loads as per structural requirements.

1.4. SUBMITTALS

1.4.1. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

1.4.2. Shop Drawings: Show layouts of panels on roofs, details of edge conditions, joints, panel profiles, supports, anchorages, trim, flashings, underlayment, closures, snow guards, and special details. Distinguish between factory- and field-assembled work.

1.4.2.1. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4.3. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for roof panels with factory-applied finishes.

1.4.4. Samples for Verification: Provide sample panels 300 mm long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

1.4.5. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and employers, and other information specified.

1.4.6. Product Test Reports: Indicate compliance of manufactured roof panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

1.5. QUALITY ASSURANCE

1.5.1. Installer Qualifications: Engage an experienced installer who has completed metal roof panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.5.2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated.

1.5.3. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.

1.6. DELIVERY, STORAGE, AND HANDLING

1.6.1. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

1.6.2. Handling: Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting, and surface damage.

1.6.3. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7. PROJECT CONDITIONS

1.7.1. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8. WARRANTY

1.8.1. General Warranty: Special warranties specified in this Article shall not deprive the Employer of other rights the Employer may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

1.8.2. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal roof panels within the specified warranty period and agreeing to repair finish or replace roof panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

1.8.3. Finish Warranty Period: 20 years from date of expiry of the Defects Liability Period.

1.8.4. Special Weathertight Warranty: Submit a written warranty executed by manufacturer agreeing to repair or replace metal roof panel assembly that fails to remain weathertight within the specified warranty period.

1.8.5. Weathertight Warranty Period: 10 years from date of expiry of the Defects Liability Period.

2. PRODUCTS

2.1. METALS AND FINISHES

2.1.1. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755M and the following requirements:

2.1.1.1. Galvanized Steel Sheet: ASTM A 653M, Z275; structural quality.
2.1.1.2. Thickness: External sheet is 0.7 mm, and internal sheet is 0.5 mm unless otherwise required for loading criteria.
2.1.1.3. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.

2.1.1.3.1. Zincalume 40 Microne

2.1.1.3.1.1. Color: off white, or as selected by Engineer from manufacturer's full range of colors.

2.2. FOAMED-INSULATION-CORE METAL ROOF PANELS

2.2.1. General: Provide factory-formed and -assembled metal roof panels fabricated from two sheets of metal with insulation core foamed in place during fabrication with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.
2.2.2. Foam density is not less than 40kg/m3, U-Value = 0.0198 w/m2

2.2.1.1. Panel Performance:

2.2.1.1.1. Flatwise Tensile Strength: 200 kPa when tested according to ASTM C 297/C 297M.

2.2.1.1.2. Humid Aging: Volume increase not greater than 6.0 percent and no delamination or metal corrosion when tested for seven days at 60 deg C and 100 percent relative humidity according to ASTM D 2126.

2.2.1.1.3. Heat Aging: Volume increase not greater than 2.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at 93 deg C according to ASTM D 2126.

2.2.1.1.4. Cold Aging: Volume decrease not more than 1.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at minus 29 deg C according to ASTM D 2126.

2.2.1.1.5. Fatigue: No evidence of delamination, core cracking, or permanent bowing when tested to a 958-kPa positive and negative wind load and with deflection of L/180 for 2 million cycles.

2.2.1.1.6. Autoclave: No delamination when exposed to 13.8-kPa pressure at a temperature of 100 deg C for 2-1/2 hours.

2.2.1.1.7. Fire-Test-Response Characteristics: Class A according to ASTM E 108.

2.2.1.2. Insulation Core: Rock-Wool-Fiber Blanket Insulation, to ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.3. ROOF PANEL ASSEMBLIES

2.3.1. Lap-Seam Roof Panels: Manufacturer's standard factory-formed, lap-seam roof panel assembly designed for mechanical attachment of panels to roof purlins or deck using exposed fasteners and sealants.

2.4. MISCELLANEOUS MATERIALS

2.4.1. General: Provide materials and accessories required for a complete roof panel assembly and as recommended by panel manufacturer, unless otherwise indicated.

2.4.2. Translucent Panels: Glass-fiber-reinforced, polyester, translucent, plastic glazing panels complying with ASTM D 3841, Type CC1, limited flammability, Grade 2, weather and UV resistant, crinkle finish both sides, weighing not less than 2.5 kg/sq. m. Match configuration of adjacent metal panels.

2.4.2.1. Color: OFF White, or as selected by Engineer from manufacturer's full range of colors.

2.4.3. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

2.4.3.1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
2.4.3.2. Provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
2.4.3.3. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels.
2.4.3.4. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

2.4.4. Accessories: Unless otherwise specified, provide components required for a complete roof panel assembly including trim, copings, fasciae, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.

2.4.4.1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or crosslinked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.

2.4.4.2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

2.4.4.3. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing and remain weathertight. Provide sealant recommended by panel manufacturer.
2.4.4.4. Drainage gutter shall be 30 cm wide and 20 cm deep and made from galvanized steel sheet.

2.4.5. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 0.4-mm dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4.6. Expansion-Joint Sealant: For hooked-type expansion joints that must be free to move, provide non-setting, non-hardening, non-migrating, heavy-bodied polyisobutylene sealant.

2.5. FABRICATION

2.5.1. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

2.5.2. Fabricate panel joints with captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

3. EXECUTION

3.1. EXAMINATION

3.1.1. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel roofing.

3.1.1.1. Panel Supports and Anchorage: Examine roof framing to verify that purlins, angles, channels, and other secondary structural panel support members and anchorage have been installed according to written instructions of panel manufacturer.
3.1.1.2. Do not proceed with roof panel installation until unsatisfactory conditions have been corrected.

3.2. PREPARATION

3.2.1. Coordinate metal panel roofing with rain drainage work; flashing; trim; and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

3.2.2. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.3. PANEL INSTALLATION

3.3.1. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

3.3.1.1. Field cutting exterior panels by torch is not permitted.
3.3.1.2. Install panels with concealed fasteners, unless otherwise indicated.

3.3.2. Accessories: Install components required for a complete roof panel assembly including trim, copings, fasciae, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items.

3.3.3. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

3.3.4. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.

3.3.4.1. Install weatherseal under ridge cap. Flash and seal panels at eave and rake with rubber, neoprene, or other closures to exclude weather.

3.3.4.2. Seal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
3.3.4.3. Prepare joints and apply sealants to comply with requirements of Section "Joint Sealants."

3.3.5. Lap-Seam Roof Panels: Provide sealant tape at lapped joints of ribbed or fluted panels and between panels and protruding equipment, vents, and accessories.

3.3.5.1. Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on end laps; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.

3.3.6. Installation Tolerances: Shim and align panel units within installed tolerance of 6 mm in 6 m on slope and location lines as indicated and within 3-mm offset of adjoining faces and of alignment of matching profiles.

3.4. CLEANING AND PROTECTING

3.4.1. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.4.2. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION

METAL WALL SANDWICH PANELS

1. GENERAL

1.1. RELATED DOCUMENTS

1.1.1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

1.2.1. This Section includes the following:
1.2.1.1. Laminated-insulation-core metal wall panels.

1.3. DEFINITION

1.3.1. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight system.

1.4. PERFORMANCE REQUIREMENTS

1.4.1. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

1.4.2. Metal Thicknesses: thicknesses of metal components are indicative. Thicknesses shall be as required by roof panel manufacturer and loading conditions and approved by Engineer.

1.4.3. Air Infiltration: Air leakage through assembly of not more than 0.45 L/s per sq. m of wall area when tested according to ASTM E 283 at a static-air-pressure difference of 300 Pa

1.4.4. Water Penetration: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 300 Pa and not more than 575 Pa.

1.4.5. Water Penetration: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than 300 Pa and not more than 575 Pa.

1.4.5.1. Water Leakage: As defined according to AAMA 501.1.

1.4.5.2. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

1.4.6. Water Absorption: Maximum 1.0 percent absorption rate by volume when tested according to ASTM C 209.

1.4.7. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

1.4.7.1. Wind Loads: Determine loads based on the following minimum design wind pressures:

1.4.7.1.1. Wind Loads: International Building Code (IBC), 2003 Edition, Exposure D, Basic Wind Speed 37 m/s.

1.4.7.2. Deflection Limits: Engineer metal wall panel assemblies to withstand test pressures with deflection no greater than 1/180 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.

1.4.7.2.1. Test Pressures: 150 percent of inward and outward wind-load design pressures.

1.4.8. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to

1.4.8.1. Seismic Loads: International Building Code (IBC), 2003 Edition, Zone 3

1.5. SUBMITTALS

1.5.1. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.

1.5.2. Installer Certificates: Signed by product manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install his products.

1.5.3. Installer Experience: List of five projects (minimum) of a similar nature carried out successfully by the installer with the same product endorsed by the manufacturer's representative.

1.5.4. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factoryand field-assembled work.

1.5.4.1. Accessories: Include details of the following items, at a scale of not less than 1:10:

1.5.4.1.1. Flashing and trim.
1.5.4.1.2. Downspouts.

1.5.4.2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5.5. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

1.5.5.1. Wall panels and attachments.
1.5.5.2. Stud framing.
1.5.5.3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.

1.5.6. Samples for Initial Selection: For each type of metal wall panel indicated with factory-applied color finishes.

1.5.6.1. Include similar Samples of trim and accessories involving color selection.
1.5.6.2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.

1.5.7. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1.5.7.1. Metal Wall Soffit Wall and Soffit Panels: 300 mm long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.

1.5.7.1.1. Include four-way joint for composite panels.

1.5.7.2. Trim and Closures: 300 mm long. Include fasteners and other exposed accessories.
1.5.7.3. Accessories: 300-mm- long Samples for each type of accessory.
1.5.7.4. Exposed Gaskets: 300 mm long.
1.5.7.5. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 13-mm- wide joints formed between two 150-mm- long strips of material matching the appearance of metal wall panels adjacent to joint sealants.

1.5.8. Qualification Data: For Installer professional engineer testing agency.

1.5.9. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

1.5.9.1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
1.5.9.2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.5.10. Field quality-control test reports.

1.5.11. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:

1.5.11.1. Metal Wall Soffit Wall and Soffit Panels: Include reports for air infiltration, water penetration, and structural performance.

1.5.12. Maintenance Data: For metal wall panels to include in maintenance manuals.

1.5.13. Warranties: Special warranties specified in this Section.

1.6. QUALITY ASSURANCE

1.6.1. Installer Qualifications: A qualified firm specializing in performing the work of this Section with minimum three years documented experience and that is approved, authorized, or licensed by the product manufacturer to install his product and that is eligible to receive manufacturer's warranty. Include project names and addresses, names and addresses of Engineers and Employers, and other information specified

1.6.1.1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.
1.6.1.2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
1.6.1.3. Engineering Responsibility: Preparation of data for metal wall panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

1.6.2. Fabricator Qualifications: Certified by metal-faced composite wall panel manufacturer to fabricate and install manufacturer's wall panel system.

1.6.3. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1.6.4. Source Limitations: Obtain each type of metal wall panel through one source from a single manufacturer.

1.6.5. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal wall panels and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1.6.5.1. Do not modify intended aesthetic effects, as judged solely by Engineer, except with Engineer's approval. If modifications are proposed, submit comprehensive explanatory data to Engineer for review.

1.6.6. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1.6.6.1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

1.6.6.1.1. Perform tests under environmental conditions replicating those that will exist during installation.

1.6.6.2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

1.6.6.3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

1.6.6.4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

1.6.7. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1.6.7.1. Build mockup of typical corner wall panel, including soffit, as shown on Drawings; approximately 1200 mm square by full thickness, including insulation, supports, attachments, and accessories.

1.6.7.1.1. Include four-way joint for metal-plate wall panels.

1.6.7.2. Approval of mockups is for other material and construction qualities specifically approved by Engineer in writing.

1.6.7.3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Engineer in writing.

1.6.7.4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6.8. Preliminary Siding Conference: Before starting wall framing sheathing girt construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Project Management and Coordination." Review methods and procedures related to wall framing sheathing girt construction and metal wall panels including, but not limited to, the following:

1.6.8.1. Meet with Employer, Engineer, Employer's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.

1.6.8.2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6.8.3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
1.6.8.4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
1.6.8.5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
1.6.8.6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
1.6.8.7. Review temporary protection requirements for metal wall panel assembly during and after installation.
1.6.8.8. Review wall panel observation and repair procedures after metal wall panel installation.

1.6.9. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

1.6.9.1. Meet with Employer, Engineer, Employer's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.
1.6.9.2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6.9.3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
1.6.9.4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
1.6.9.5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
1.6.9.6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
1.6.9.7. Review temporary protection requirements for metal wall panel assembly during and after installation.
1.6.9.8. Review wall panel observation and repair procedures after metal wall panel installation.
1.6.9.9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7. DELIVERY, STORAGE, AND HANDLING

1.7.1. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

1.7.2. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

1.7.3. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7.4. Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 49 deg C.

1.7.5. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

1.7.6. Protect foam-plastic insulation as per manufacturer's requirements and as as follows:

1.7.6.1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
1.7.6.2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
1.7.6.3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.8. PROJECT CONDITIONS

1.8.1. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

1.8.2. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9. COORDINATION

1.9.1. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10. WARRANTY

1.10.1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1.10.1.1. Failures include, but are not limited to, the following:

1.10.1.1.1. Structural failures, including rupturing, cracking, or puncturing.
1.10.1.1.2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

1.10.1.2. Warranty Period: 10 years from date of Substantial Completion.

1.10.2. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1.10.2.1. Finish: Deterioration includes, but is not limited to, the following:

1.10.2.1.1. Color fading more than 15 Hunter units when tested according to ASTM D 2244.

1.10.2.1.2. Chalking in excess of a No. 2 rating when tested according to ASTM D 4214.
1.10.2.1.3. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

1.10.2.2. Finish Warranty Period: 20 years from date of Substantial Completion.

1.10.3. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal wall panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1.10.3.1. Weathertight Warranty Period: 10 years from date of Substantial Completion.

2. PRODUCTS

2.1. MATERIALS

2.1.1. Panel Sealants:

2.1.1.1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 13 mm wide and 3 mm thick.
2.1.1.2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
2.1.1.3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2. MISCELLANEOUS METAL FRAMING

2.2.1. Thicknesses of metal components are indicative. Thicknesses shall be as required by roof panel manufacturer and loading conditions and approved by Engineer.

2.2.2. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, Z180, hot-dip galvanized zinc coating.

2.2.3. Subgirts: C- or Z-shaped sections fabricated from 1.5-mm bare steel thickness, shop-painted, cold-formed, metallic-coated steel sheet.

2.2.4. Zee Clips: 2.0-mm bare steel thickness, cold-formed, galvanized steel sheet.

2.2.5. Base or Sill Angles Channels: 2.0-mm bare steel thickness, cold-formed, galvanized steel sheet.

2.2.6. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

2.2.6.1. Minimum Base Metal Thickness: As recommended by manufacturer and approved by Engineer.
2.2.6.2. Depth: As recommended by manufacturer and approved by Engineer.

2.2.7. Cold-Rolled Furring Channels: 1.37-mm bare steel thickness, with minimum 13-mm- wide flange.

2.2.7.1. Depth: As recommended by manufacturer and approved by Engineer.
2.2.7.2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.79 mm.
2.2.7.3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 1.59-mmdiameter wire, or double strand of 1.21-mm- diameter wire.

2.2.8. Z-Shaped Furring: With slotted or nonslotted web, face flange of 32 mm, wall attachment flange of 22 mm, minimum bare metal thickness of 0.45 mm, and depth required to fit insulation thickness indicated.

2.2.9. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3. MISCELLANEOUS MATERIALS

2.3.1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.

2.3.1.1. Fasteners for Wall Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
2.3.1.2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
2.3.1.3. Blind Fasteners: stainless-steel rivets.

2.3.2. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 0.4-mm dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4. LAMINATED-INSULATION-CORE METAL WALL PANELS

2.4.1. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and core material laminated or otherwise securely bonded to facing sheets during fabrication without use of contact adhesives, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

2.4.1.1. Panel Performance:

2.4.1.2. Flatwise Tensile Strength: 186 kPa when tested according to ASTM C 297/C 297M.

2.4.1.3. Humid Aging: Volume increase not greater than 6.0 percent and no delamination or metal corrosion when tested for seven days at 60 deg C and 100 percent relative humidity according to ASTM D 2126.

2.4.1.4. Heat Aging: Volume increase not greater than 2.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at 93 deg C according to ASTM D 2126.

2.4.1.5. Cold Aging: Volume decrease not more than 1.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at minus 29 deg C according to ASTM D 2126.

2.4.1.6. Fatigue: No evidence of delamination, core cracking, or permanent bowing when tested to a 958-kPa positive and negative wind load and with deflection of L/180 for 2

million cycles.

2.4.1.7. Autoclave: No delamination when exposed to 13.8-kPa pressure at a temperature of 100 deg C for 2-1/2 hours.

2.4.2. Wrapped-Edge, Laminated-Insulation-Core Metal Wall Panels: Formed with flush exterior panel facing wrapped over panel edges; designed for independent installation by mechanically attaching panels to supports using staggered, concealed side clips engaging panel edges; with sealant joints.

2.4.2.1. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, Z275 coating designation, or aluminum-zinc alloycoated steel sheet complying with ASTM A 792/A 792M, Class AZM150 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

2.4.2.1.1. Nominal Thickness: 1-mm.

2.4.2.1.2. Interior Finish: acrylic coating.

2.4.2.1.3. Color: As selected by Engineer from manufacturer's full range.

2.4.2.2. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755M and the following requirements:

2.1.1.1. Galvanized Steel Sheet: ASTM A 653M, Z275; structural quality.
2.1.1.2. Thickness: External sheet is 0.7 mm, and internal sheet is 0.5 mm unless otherwise required for loading criteria.
2.1.1.3. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.

2.1.1.3.1. Zincalume 40 Microne

2.1.1.3.1.1. Color: off white, or as selected by Engineer from manufacturer's full range of colors.

2.5. ACCESSORIES

2.5.1. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

2.5.1.1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.

2.5.1.2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

2.5.1.3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefinfoam or closed-cell laminated polyethylene; minimum 25-mm- thick, flexible closure

strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

2.5.2. Flashing and Trim: Formed from 0.45-mm- thick, zinc-coated (galvanized) steel sheet. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.5.3. Downspouts: Formed from 0.45-mm- thick, zinc-coated (galvanized) steel sheet; in 3-m-long sections, complete with formed elbows and offsets. Finish downspouts to match metal wall panels.

2.6. FABRICATION

2.6.1. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

2.6.1.1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.

2.6.1.2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.

2.6.2. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

2.6.3. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

2.6.4. Where indicated, fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

2.6.5. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations that apply to the design, dimensions, metal, and other characteristics of item indicated.

2.6.5.1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2.6.5.2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2.6.5.3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant .
2.6.5.4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
2.6.5.5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

2.7. FINISHES, GENERAL

2.7.1. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7.2. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

3. EXECUTION

3.1. EXAMINATION

3.1.1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

3.1.1.1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
3.1.1.2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
3.1.1.3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

3.1.2. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

3.1.3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

3.2.1. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

3.2.2. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

3.2.3. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.2.3.1. Soffit Framing: Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3. METAL WALL PANEL INSTALLATION, GENERAL

3.3.1. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

3.3.1.1. Field cutting of metal wall panels by torch is not permitted.
3.3.1.2. Shim or otherwise plumb substrates receiving metal wall panels.
3.3.1.3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
3.3.1.4. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
3.3.1.5. Install screw fasteners in predrilled holes.
3.3.1.6. Locate and space fastenings in uniform vertical and horizontal alignment.
3.3.1.7. Install flashing and trim as metal wall panel work proceeds.
3.3.1.8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
3.3.1.9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
3.3.1.10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or selftapping screws. Fasten flashings and trim around openings and similar elements with self tapping screws.
3.3.1.11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

3.3.2. Fasteners:

3.3.2.1. Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

3.3.3. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

3.3.3.1. Coat back side of wall panels with bituminous coating where wall panels will contact wood, ferrous metal, or cementitious construction.

3.3.4. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

3.3.4.1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel.
Seal side joints where recommended by metal wall panel manufacturer.
3.3.4.2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.4. FIELD-ASSEMBLED METAL WALL PANEL INSTALLATION

3.4.1. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

3.4.1.1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to l ine.
3.4.1.2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal wall panels.
3.4.1.3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
3.4.1.4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
3.4.1.5. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
3.4.1.6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nestingtype, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
3.4.1.7. At panel splices, nest panels with minimum 150-mm end lap, sealed with butylrubber sealant and fastened together by interlocking clamping plates.

3.4.2. Zee Clips: Provide Zee clips of size indicated or, if not indicated, as required to act as standoff from subgirts for thickness of insulation indicated. Attach to subgirts with fasteners.

3.4.3. Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or selftapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.5. ACCESSORY INSTALLATION

3.5.1. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

3.5.1.1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

3.5.2. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.5.2.1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in

waterproof and weather-resistant performance.
3.5.2.2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 3 m with no joints allowed within 600 mm of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with mastic sealant (concealed within joints).

3.5.3. Downspouts: Join sections with 38-mm telescoping joints. Provide fasteners designed to hold downspouts securely 25 mm away from walls; locate fasteners at top and bottom and at approximately 1500 mm o.c. in between.

3.5.3.1. Provide elbows at base of downspouts to direct water away from building.
3.5.3.2. Tie downspouts to underground drainage system indicated.

3.5.4. Translucent Wall Panels: Provide end laps of not less than 150 mm and side laps of not less than 38-mm corrugations. Align horizontal laps with adjacent translucent wall panels. Seal intermediate end laps and side laps of translucent panels with translucent mastic.

3.6. ERECTION TOLERANCES

3.6.1. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 6 mm in 6 m, nonaccumulative, on level, plumb, and location lines as indicated and within 3-mm offset of adjoining faces and of alignment of matching profiles.

3.7. FIELD QUALITY CONTROL

3.7.1. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

3.7.2. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 300 Pa.

3.7.3. Water-Spray Test: After completing the installation area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Engineer.

3.7.4. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.

3.7.5. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.

3.7.6. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8. CLEANING AND PROTECTION

3.8.1. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

3.8.2. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

3.8.3. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

2.3.2 Fabricate panel joints with captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

EXECUTION

2.4 EXAMINATION

2.4.1 Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel roofing.
Panel Supports and Anchorage: Examine roof framing to verify that purlins, angles, channels, and other secondary structural panel support members and anchorage have been installed according to written instructions of panel manufacturer.

2.4.1.2 Do not proceed with roof panel installation until unsatisfactory conditions have been corrected.

2.5 PREPARATION

2.5.1 Coordinate metal panel roofing with rain drainage work; flashing; trim; and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

2.5.2 Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoiddamage to finish.

2.6 PANEL INSTALLATION

2.6.1 General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

2.6.1.1 Field cutting exterior panels by torch is not permitted.
2.6.1.2 Install panels with concealed fasteners, unless otherwise indicated.

2.6.2 Accessories: Install components required for a complete roof panel assembly including trim, copings, fasciae, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items.

2.6.3 Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

2.6.4 Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.

2.6.4.1 Install weather seal under ridge cap. Flash and seal panels at eave and rake with rubber, neoprene, or other closures to exclude weather.

2.6.4.2 Seal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.

2.6.4.3 Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

2.6.5 Lap-Seam Roof Panels: Provide sealant tape at lapped joints of ribbed or fluted panels and between panels and protruding equipment, vents, and accessories.

2.6.5.1 Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on end laps; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.

2.6.6 Installation Tolerances: Shim and align panel units within installed tolerance of 6 mm in 6 m on slope and location lines as indicated and within 3-mm offset of adjoining faces and of alignment of matching profiles.

2.7 CLEANING AND PROTECTING

2.7.1 Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

2.7.2 Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION

المواصفات الفنية الخاصه لمبنى ال Prefab:-

1- الأعمال المعدنية والألمنيوم

أ- تكون الغالات سلندر نوع Yale أو Union أو Dorma أو ما يعادلها.

ب- يجب على المقاول تقديم مخطط للمبنى Planيوضح توزيع المكاتب وكل عناصر المبنى حسب ما هو مطلوب

ت- تصميم الهيكل المعدني و طريقة التثبيت با لاستعانة بالمخططات و المواصفات المرفقة و اخذ الموافقه المسبقه من قبل المهندس المشرف قبل البدء بالتنفيذ .

ث- السقف الخارجي :

يكون السقف الخارجي سماكة 7سم sandwich panelالصاج الخارجي سماكة 0.7مم والداخلي 0.5مم المجلفن المسبق الدهان و المضلع تضليعا بشكل بروفيل بواسطة السحب على البارد , يتم التثبيت أسفل صفائح الصاج وتثبت على المدادات مع احتساب OVER LAP بشكل هندسي , ومثبت على مدادات معدنية بواسطة براغي ذاتية الشد وهذه المدادات مثبتة على جمالونات معدنية مصنعة من مقاطع تيوبات مثبتة في ما بينها بواسطة اللحام محملة على الجدران بنظام انشائي متكامل وإضافة مزراب مطري معزول.

ج- السقف الداخلي :

يتكون السقف الداخلي من سقف معلق من بلاط (mineral fiber) المقاوم للحرارة والرطوبة قياس (60×60) سم متناسقه و مركبة على جسور معدنية مسبقة الدهان ومعلقة بنظام تعليق خفيف .

ح- الجدران:

تتكون الجدران الخارجية من وحدات متكررة من الواح مسبق الدهان سماكة 7سم (sandwich panel) المضلع تضليعا خفيفا سماكة الصاج0.5, مضلع و معبأة بالفوم كثافة 40كغم/سم3 و الوجه الداخلي من الصاج المضلع تضليعا خفيفا سماكة0.5ملم, ,والقواطع الداخلية من sandwich panel صاج من الجهتين مضلع تضليعا خفيفا سماكة الصاج 0.5ملم ومعبأة بالفوم كثافة 40 كغم/سم3 سماكة القاطع 5سم .

2- تكون الأرضيات من البورسلان الأسباني قص ليزر 60x60x10mm نخب أول, وبوجه مطفى للحمامات

3- تكون الأبواب من ال PVC مقطع خاص مع تقديم المواصفات الفنيه من قبل المورد للموافقه عليها

4- الشبابيك :

PVCdouble glass مقطع معماري أو ما يعادله درفتين سحاب مع درفة منخل وزجاج سماكة(6) ملم محلي او ما يعادله مع كافة ما يلزم من الاكسسوارات من الفراشي وعوازل والمعجون والسيلكون والزرافيل ذاتية الغلق وجميع مايلزم لانجاز العمل كاملا مع تركيب حديد حماية لجميع الشبابيك مدهون بدهان زياتي ثلاث وجوه بالاضافة الى وجهي الاساس.

5- خزائن المطبخ من ال PVC الفصالات منشأ أوروبي مع تركيب غرانيت ايطالي غالاكسي اسود ومجلى حوضين مع خلاط الماني المنشأ

6- أبعاد الأبواب والشبابيك يتم تحديدها على المخطط

7- يتم تزويد شركة البوتاس العربية بمخططات تفصيلية للمبنى والمواصفات الفنية من قبل الشركة الموردة للموافقة عليها من قبل المهندس المشرف..

8- يتم تركيب ستائر زيبرا تركي نخب أول واللون حسب رأي المهندس المشرف

9- المرحاض العربي نخب اول مع السيفون وتمديدات التصريف بواسطة مواسير بلاستيكيه قطر 4 انش سماكة 7.3 ملم (ضغط عالي) مع وصلها باقرب نقطة تصريف وتغذيته بالمياه مع جميع المحابس والبرابيش والأكسسوارات التابعه لها مع شطاف صناعه اوروبيه نخب اول .

10- المرحاض الأجنبي صناعه اوروبيه مع الشبك لأقرب نقطه تفتيش خارج المبنى مع شطاف يدوي صناعه اوروبيه

11- الشورات من نفس بلاط الأرضيات 80x80cm بفارق 3سم عن منسوب البلاط مع ما يلزم ليعمل بشكل صحيح

12- السخان الكهربائي مصدر أوروبي مع جميع المحابس وما يلزم لتشغيله

13- مروحة شفط الهواء :-

تركب مروحة لشفط الهواء على حائط الحمامات والمطبخ أو زجاج الشباك من نوع إنجليزي أو ياباني ذات قطر6انش

14- مواسير الصرف الصحي :-

تكون المواسير من نوع P.V.C. ضغط عالي سماكة 8ملم وبقطر 4 انش وتوصل مع بعضها حسب توصيات الشركة الصانعة مع عمل الميلان اللازم ويجب أن تكون خالية من الكسر والخدش وأي عيوب أخرى

15- الزجاج:-

زجاج الشبابيك يكون سماكة 6ملم وخالي من الفقاعات والتموجات والجرح والخدش وغيره

16- الحنفيات :-

تكون الحنفيات والدش والبرابيش جميعها من نوع GROHE ألماني أو ما يعادله من الكروم وتثبت وتركب بشكل جيد ويجب أن لا يكون هناك تسرب للماء .ويجب تقديم عينة للموافقة عليها.

17- زجاج المرايا :-المرايا المطلوبة سماكة 6ملم مع تثبيتها بزوايا مقاومة للصدأ وبأبعاد 60سم×40سم تثبت فوق المغاسل وعلى الارتفاع المطلوب.

18- المغاسل :- تكون المغاسل معلقه منشأ اجنبي ومن مصدر يوافق عليه المهندس وكذلك اختيار اللون المطلوب، ويجب أن تكون خالية من العيوب والكسر والخد.

19- تقديم وتركيب مواسير بلاستيكيه للمياه البارده والساخنه من مواسير البولي اثلين بطبقه مانعه للأكسجين من اجود الأنواع الى جميع المرافق الصحيه حيثما وجدت

أعمال البانيل:-يتم تركيب بانيل بنفس لون البلاط على كامل المبنى

نطاق عمل المقاول Scope of Work للاعمال الكهربائية

تتضمن مسؤولية المقاول تصميم وتوريد وتركيب وفحص وتشغيل الاعمال الكهربائية الواردة ادناه وحسب ما يلي وموافقة المهندس المشرف:

- الكودات المحلية الموصفات المعيارية.
- المواصفات الفنية المرفقة.
- تقديم الحسابات الهندسية للاعمال.
- تقديم مخططات هندسية للاعمال.
- مراعاة ظروف الموقع من حرارة ورطوبة واملاح بحيث تكون جميع الاعمال في اماكن تواجد الرطوبه والاغبرة بدرجة حماية مناسبة ومقاومة للتاكل.

اولا نظام القدرة:

1- الكيبل الرئيسي المغذي للمبنى نوع CU/PVC/SWA/PVC.
2- لوحة التوزيع عدد 1 لتغذية جميع الاحمال.
3- الاباريز للاحمال الاعتيادية بواقع ابريز مزدوج لكل 8 متر مربع من المساحة.
4- مفاتيح مزدوجة 20 امبير بواقع مفتاح لكل 16متر مربع للتكييف بالاضافة الى مفاتيح للغيازر ومجففات الايدي والافران الكهربائية والخ.
5- الغيازر ومجففات الايدي.
6- مراوح شفط في المطابخ والحمامات.
7- نقاط تغذية لكبينة الكمبيوتر وانذار الحريق.
8- نقاط التغذية الكهربائية لاية احمال اخرى.
9- الاسلاك بما لايقل عن 4 ملم مربع والكوابل والمواسير وصواني الكوابل وخنادق الكوابل وجميع ما يلزم من مواد لاتمام العمل على اكمل وجه.

ثانيا نظام الانارة: (جميع وحدات الانارة نوع LED)

1- وحدات انارة 60*60 سم بمعدل وحدة لكل 4 متر مربع.
2- ربع الكمية الواردة اعلاه تكون مع وحدة تشغيل طواريئ لمدة ساعة.
3- وحدات انارة طواريئ فوق ابواب المخارج وفي الممرات وفوق اي معدات سلامة.
4- وحدات انارة خارجية فوق المداخل للمبنى وعلى الزوايا وكل 5 متر طولي.
5- ادوات التحكم بالانارة من مفاتيح وخلايا ضونية ودمرز والخ.
6- الاسلاك بما لايقل عن 2.5 ملم مربع والكوابل والمواسير وصواني الكوابل وخنادق الكوابل وجميع ما يلزم من مواد لاتمام العمل على اكمل وجه.

ثالثا نظام التأريض:

1- قضيب التاريض الرئيسي للمبنى.
2- حفر التاريض حول المبنى للحصول على مقاومة كلية اقل من 1 اوم. يتم توصيلها بشكل حلقي مع قضيب التأريض الرئيسي.
3- التوصيل مع حديد التسليح للاساسات من اربع زوايا. يتم توصيلها بشكل حلقي مع قضيب التأريض الرئيسي.
4- توصيل جميع الاعمال المعدنية بشكل حلقي مع قضيب التاريض الرئيسي.
5- توصيل اللوحة من نقطتين مع قضيب التاريض الرئيسي.

6- توصيل مصدر التغذية مع لوحة المبنى بكيبل تأريض.
7- توصيل جميع عناصر الادوات والمعدات الكهربائية نزولا من اللوحة ولغاية الاحمال.

رابعاً نظام شبكة الحاسوب:

1- الكيبل الرئيسي نوع الالياف الضوئية وحسب مواصفات شركة البوتاس المغذي لكبينة الحاسوب للمبنى.
2- كبينة الحاسوب وتشمل الكبينة مع مروحة ومصدر تغذية وبداخالها patch panel, fiber batch panel, switch UTP cables, etc. الكبينة ومكوناتها نوع سيسكو امريكية.
3- اباريز الحاسوب بواقع واحد كل 8 متر مربع من المساحة.
4- الاسلاك والكوابل والمواسير وصواني الكوابل وخنادق الكوابل وجميع ما يلزم من مواد لاتمام العمل على اكمل وجه.

خامسا نظام انذار الحريق:

1- الكيبل الرئيسي المغذي للوحة انذار الحريق للمبنى وحسب مواصفات شركة البوتاس.
2- لوحة انذار الحريق نوع معنون صناعة شركة سيمنز امريكية ومطابقة للانواع المستخدة في شركة البوتاس العربية.
3- ادوات تحسس الحريق من كواشف دخانية وحرارية.
4- وحدات الاطلاق اليدوية عند جميع المخارج.
5- ادوات الانذار من اجراس وصفارات واضواء فلاش.
6- سماعات الاخلاء كل 10 متر.
7- جميع ما يلزم من قطع مثل عوازل دائرة القصر والخ.
5- الاسلاك والكوابل والمواسير وصواني الكوابل وخنادق الكوابل وجميع ما يلزم من مواد لاتمام العمل على اكمل وجه.

سادسا المكيفات:

- استخدام مكيفات نوع Pearl 2 طن لكل مكتب مع المطبخ

المواصفات الفنية العامة

لغاية تنفيذ أعمال هذا المشروع حسب الأصول الفنية تعتمد المواصفات الفنية العامة التالية للأعمال التي لا يوجد لها مواصفات خاصة.

أ. المواصفات الفنية العامة للمباني المجلد الثالث : الأعمال الكهربائية لعام 1996/ وزارة الأشغال.

على أن يؤمن المقاول وعلى حسابه الخاص نسخة كاملة من هذه المواصفات إلى المهندس المشرف منذ اليوم الأول للمباشرة بالعمل وطيلة مدة تنفيذ المشروع لتعود بعد ذلك ملكيتها لصاحب العمل .

المواصفات الخاصة للأعمال الكهربائية

1- تعتمد مواصفات وزارة الاشغال العامة - أخر طبعة للمجلد الثالث وما لحق بها من تعديلات وكذلك مواصفات شركة الكهرباء الوطنية الاردنية بالاضافة الى اية مواصفات وتعليمات مذكورة في أي من وثائق العطاء كمرجع لغايات تنفيذ الاعمال الكهربائية ,وفي حال وجود تعارض بينها يحسم الخلاف برأي المهندس المشرف .

2- تخضع كافة الاعمال والمواد والتمديدات لموافقة المهندس المشرف قبل الشراء والتنفيذ وعلى المقاول تقديم كتالوجات ورسوم توضيحية وعينات للمواد المراد تركيبها في الموقع لأخذ الموافقة المسبقة عليها .

3- على المقاول قبل المباشرة بأعمال الموقع بثلاث اسابيع على الأقل تقديم مخططات تنفيذية work shop محتوية على معلومات توزيع الاجهزة الكهربائية ومواقعها وطريقة التمديد واقيسة المواسير والكوابل والأسلاك ومسارها ومستويات تمديدها و كل ما يلزم من معلومات تنفيذية وذلك لدراستها والموافقة عليها من قبل المهندس .

4- على المقاول تسمية مهندس الكهرباء المنفذ الذى سيتولى متابعة تنفيذ الأعمال الكهربائية بحيث يكون متفرغا لهذا العطاء وموافق عليه من قبل المهندس .

5- على المقاول وبناء على تعليمات المهندس المشرف وإعتماداً على المواصفات المعتمدة في العطاء اجراء كافة الإختبارات والفحوصات اللازمة خلال العمل وبعد الإنتهاء منه للتأكد من سلامة التمديدات والأجهزة الكهربائية المختلفة ومطابقة ذلك للمواصفات . وعلى المقاول توفير اجهزة الفحص اللازمة بطريقتة الخاصة وتقديم اعتمادها للمهندس المشرف للموافقة عليها قبل استعمالها.

6 - على المقاول الإلتزام بنوعية المواد المطلوبة والمنصوص عليها في وثائق العطاء , ولا يتم النظر في اعتماد أي مواد أخرى معادلة الا في حالة عدم توفر المواد المنصوص عليها في العطاء , وذلك عن طريق تقديم إثباتات خطية بذلك من الوكلاء والموزعين ولهذه المواد في المملكة .

7- يجب على المقاول عند الإنتهاء من العمل تقديم مخططات حسب التنفيذ As Built مدعمة بكافة ما يلزم من معلومات فنية ولن يتم تشكيل لجنة استلام أولية قبل تجهيز هذه المخططات .

8- يجب على المقاول عند الإنتهاء من العمل تقديم كشف يبين كافة انواع المواد التي إستعمالها في المشروع محتويا على عناوين الوكلاء والشركات الصانعة والرقم المصنعي لهذه المواد وذلك لتقديمه الى صاحب العمل للإستعانه به مستقبلا عند الحاجة الى اجراء الصيانة أو أستبدال أى من هذه المواد .

9- كافة التمديدات التي تكون مخفية في الأسقف والجدران والأرضيات تتم بإستعمال مواسير من البلاستيك المقوى فنة (ب) PVC Conduits, heavy gaauge- class B بالأقطار المناسبة وحسب المواصفة البريطانية BS4607,Part1 وكذلك العلب والحلقات والأكمام والمرابط المناسبة لهذه المواسير تكون من نفس المادة .

10- كافة التمديدات الظاهرة والخارجية تكون عبر مواسير فولاذية مجلفنة حسب المواصفات البريطانيةBS31, Class B وبالأقطار المناسبة .

11- في حال تقاطع التمديدات الكهربائية مع أية تمديدات أخرى فإن مستوى التمديدات الكهربائية يجب أن يكون دائماً هو الأعلى مع الحفاظ على الحد الأدنى للمسافات المطلوبة بينها حسب المواصفات المعتمدة للعطاء .

12- يجب الإلتزام بنظام الألوان في كافة التمديدات (أحمر، اصفر، أزرق للفازات، أسود للحيادي، أخضر للأرضي) مع مراعاة أن تكون كافة التمديدات الخاصة باللوحة الفرعية الواحدة وتوابعها ذات لون واحد فقط لخط الفاز .

13- يجب أن تكون دوائر الإنارة، الأباريز، الهاتف، التلفزيون ونظام إنذار الحريق منفصلة عن بعضها في كافة مساراتها.

14- يستعمل النظام الدائري LOOP SYSTEM في كافة التمديدات الكهربائية .

15- يمنع استعمال الشريط اللاصق نهائياً في أي من التوصيلات.

16- يمنع قطع خط الفاز في أي من التمديدات إلا في مفتاح الإنارة أو الأبريز.

17- يتم تجميع وترتيب الأسلاك والكوابل في اللوحات الكهربائية بواسطة مرابط بلاستيكية.

18- على المقاول ترقيم كافة التمديدات بتسلسل واضح وموحد لكافة اللوحات والدوائر وتثبيت هذا الترقيم على المفاتيح والأباريز واللوحات الفرعية والشبه الرئيسية والرئيسية وعلى العدادات الكهربائية، بإستعمال مواد خاصة للترقيم لا تمحى، إضافة إلى تثبيت هذا الترقيم في مخططات AS BUILT.

19- يمنع منعاً باتاً وجود أكثر من كوعين 90 ° متتالين على نفس مسار التمديدات الكهربائية وعند الإضطرار لذلك يجب تركيب علبة وصل بقياس مناسب بعد الكوع الثاني.

20- يشمل سعر النقطة، إنارة أباريز، تلفزيون، هاتف كافة المواسير والأسلاك والمفاتيح والأباريز والعلب واليد العاملة والفحص.....الخ وكل ما يلزم لإنهاء العمل من اللوحة المغذية للنقطة حتى النقطة ذاتها فيما عدا وحدة الإنارة فقط.

21- الكوابل التي تمدد في الأرض الطبيعية تكون مسلحة، وتدفن على عمق لا يقل عن 80سم عن وجه السطح النهائي، بحيث يراعى تمديد الكوابل على أرضية من الرمل الناعم لا تقل سماكتها عن 10سم ومن ثم إعادة الطمم فوق الكوابل من الرمل الناعم بسماكة لا تقل عن 25سم مع وضع بلاطات خرسانية وشريطة تحذيري على طول مسار الكوابل، ومن ثم إجراء الطمم بالمواد الطبيعية.

22- توضع علامات خرسانية بارزة لتوضيح أماكن الكوابل في الأرض كل 50متر ، وعند تغيير اتجاه الكيبل.

23- عند مرور الكوابل المدفونة في الأرض من خلال شوارع وأرصفة يجب تمريرها من خلال مواسير بلاستيكية UPVC ذات قطر مناسب مدفونة بالاسمنت في هذه التقاطعات وعلى عمق لا يقل عن 80سم من وجه السطح النهائي.

24- المواد يجب أن تكون المواد المراد استعمالها في أعمال العطاء مطابقة للمواصفات المبينة أدناه :

أ- **لوحات التوزيع الرئيسية :**

تكون هذه اللوحات من حيث الصنع والمواد مطابقة للمواصفات البريطانية Bs5486 Part 1 60439 / نوع ABB- GERMANY ,MEM-UK, GE-USA.

وعلي ان تكون اللوحات من الوكيل الاصلي المعتمد للنوعيات المذكورة اعلاه.
والقواطع نوع MK-UK, LEGRAND-UK, MEM-UK
وتكون اللوحات من النوع: **form 4 type 5 free standing**
Draw able for incoming and outgoing.
ويكون هيكل اللوحة مصنوعاً من مقاطع من الفولاذ بسماكة لا تقل عن 2ملم ومعالجاً ضد الصدأ والتآكل ومدهونة دهان حراري ، وتكون أغلفة اللوحات مزودة بأقفال ومفاتيح وغير نافذة الماء والغبار ذات درجة حماية IP55 ، أما إذا كانت خارجية فبالإضافة للسابق يكون الدهان EPOXY وتدعم اللوحة بزوايا حديد طولية وعرضية وتكون ذات درجة حماية IP65.
تكون القضبان النحاسية فيها مطابقة للمواصفات البريطانية BS159 مع تمييزها بالألوان الأحمر والأصفر والأزرق للفازات والأسود للحيادي والأخضر للأرضي، كذلك يجب أن تكون هذه القضبان معزولة بمادة PVC يكون قياس هذه القضبان مناسباً للحمل المطلوب وقادراً على تحمل الإجهادات الميكانيكة والكهربائية الناتجة عن الأعطال وقصر الدائرة، وتكون اللوحات الرئيسية مزودة بأجهزة فولتيمتر وأميتر

لقياس الجهدبين كل فاز والحيادي وبين الفاز والفازات الاخري بواسطة (DIGITAL METERS) والتيار المسحوب للفازات الثلاثة مع كافة ما يلزم من محولات تيار وجهد إذا لزم.
وفيوزات ويجب أن تكون اللوحة الرئيسية مجهزة بمكان خاص لتركيب العداد حسب متطلبات شركة الكهرباء.

تحتوي اللوحات الرئيسية على قواطع حرارية مغناطيسية من النوع المصبوب حسب المواصفات البريطانية BS4752 وذات سعة مناسبة حسب ما هو مبين في المخططات محتوية على حماية ضد التيار الزائد ودائرة القصر.
تكون سعة القطع للقاطع الرئيسي 25 ك.أ ، وسعة الباسبار لا تقل سعته عن 1.5 مرة من سعة القاطع الرئيسي.

ب- لوحات التوزيع الفرعية :

تكون هذه اللوحات من حيث الصنع والمواد مطابقة للمواصفات البريطانية BS5486 و BSEN 60439 نوع ABB-GERMANY ,MEM-UK, GE-USA.
وعلي ان تكون اللوحات من الوكيل الاصلي المعتمد للنوعيات المذكورة اعلاه
والقواطع نوع MK-UK, LEGRAND-UK, MEM-UK
وتكون معدنية غاطسة سطحيه في الجدار ما لم يرد نصاً بخلاف ذلك يكون هيكل اللوحة مصنوعاً من مقاطع الفولاذ بسماكة لا تقل عن 1 ملم ومعالجاً ضد الصدأ والتآكل ومدهونة دهان
حراري ويكون باب اللوحة مزوداً بقفل ومفتاح وغير نافذ للماء والغبار ذات درجة حماية IP41 تكون القضبان النحاسية العمومية فيها مطابقة للمواصفة البريطانية BS159 مع تميزها بالألوان ومعزولة بمادة PVC ويكون قياسها مناسباً للأحمال المطلوبة والإجهادات الميكانيكية والكهربائية الناتجة عن دائرة القصر.

تحتوي هذه اللوحات على قاطع حماية رئيسي حراري مغناطيسي محمي من التيار المتبقي RCB0-RESIDUAL CURRENT PROTECTEDوقواطع حرارية مغناطيسية فرعية MCB حسب المواصفة البريطانية Bs3871 وتكون سعة هذه القواطع حسب ما هو مبين في المخططات تكون سعة القطع للقواطع 10 ك.أ.

يكون تركيب القواطع فيها بطريقة Plug-in بحيث يمكن نزع أي قاطع من اللوحة دون التأثير على توصيلات باقي القواطع فيها، تكون اللوحة من النوع الذي يركب سطحيه في الجدار مع إمكانية توصيل الكوابل والأسلاك لها من الأعلى والأسفل.

ت- المفاتيح :
حسب المواصفة البريطانية BS 3676.
نوع MK - MEM - LEGRAND

ث- الأباريز :
حسب المواصفة البريطانية BS 1363.

نوع LEGRAND - MEM - MK

ج- **المواسير والعلب وتوابعها :**

1) مواسير بلاستيكية حسب المواصفة البريطانية BS4607 من البلاستيك المقوي فئة (ب).
PVC conduits heavy gauge-class B.

2) مواسير فولاذية مجلفنة حسب المواصفة البريطانية BS31 class B.
نوع محلي .MITSOSHITA-JAPAN, ALAHLIAH CO
LEGRAND-UK

ح- **الأسلاك :**
ذات جهد 600/1000 Volt نحاسية مجدولة حسب المواصفة البريطانية BS6004.

خ- **الكوابل :**

نحاسية مجدولة وبالأقيسة المبينة في المخططات وجداول الكميات ذات جهد 600/1000 Volt
1 كوابل غير مسلحة PVC/PVC حسب المواصفة البريطانية BS6004.
2 كوابل مسلحة PVC/SWA/PVC حسب المواصفة البريطانية BS6121 , BS6004 , BS5467.
3 كوابل مسلحة XLPE/SWA/PVC حسب المواصفة البريطانية BS6360 .
الاسلاك و الكوابل تكون من JORDAN CABLE COMPANY,
JORDAN NEW CABLE COMPANY , SAUDI CABLES

د- **نهايات الكوابل Cable Shoe :**
حسب المواصفة البريطانية BS6121.
نوع BICC,HAWKE,CMP-UK

ذ- **قضبان التأريض من Copper -Clade Steel :**
بقطر 20 ملم وطول 300 سم وإلى الحد الذي يؤمن النظام الأرضي المطلوب بحيث تكون مقاومة الأرضي الكلية لا تزيد عن 1 أوم.وان يكون النظام نوع FURSE/ THOMAS&BETTS WALLIS-UK , CADWELD-UK

ر- **تكون العلب المستعملة في مجمعات الهاتف والتلفزيون :**
مطابقة للمواصفات البريطانية BS4662 أو الالمانية VDE0606 وتكون مصنوعة من مواد لا تساعد على الاشتعال مثل الحديد المجلفن او الـ PVC المقوى.
نوع KRONE-GERMANY , LEGRAND-UK

ز- **كوابل الهاتف :**
مطابقة للمواصفة البريطانية BS3573 وتكون مكونة من موصلات نحاسية مزدوجة بحيث يكون كل زوج مكون من موصلين ملويين حول بعضهما البعض.الكوابل تكون JORDAN CABLE COMPANY,
JORDAN NEW CABLE COMPANY, SAUDI CABLES

س- **كوابل واسلاك شبكة انذار الحريق :**
مطابقة للمواصفة البريطانية BS6207 Part 1 تكون الكوابل والأسلاك حسب توصية الشركة الصانعة Siemens/PYROTRONICS-USA وموافقة الدفاع المدني .

25- على المقاول تقديم شهادات خاصة صادرة عن مختبر معتمد تثبت صلاحية ومطابقة جميع الاجهزة المستعملة في شبكة انذار الحريق للمواصفات المعتمدة، اضافة الى تقديم كتيب يحتوي على المعلومات والتعليمات الفنية الكاملة المتعلقة بتركيب وصيانة نظام الانذار من الحريق بالاضافة الى قائمة بقطع الغيار الموصى بحيازتها، وكذلك موافقة الدفاع المدني على المخططات التنفيذية والأجهزة وتسليم النظام للدفاع المدني .

26- على المقاول ان يرفق مع عرضه نوعية ومواصفات المواد المنوي استخدامها في هذا العطاء والذي بنى على اساسها اسعار بنود جداول الكميات مع مراعاة ما ورد في البند رقم (6) اعلاه.

27- LED Lighting Specifications:

- LED lighting fixtures shall be used for all tasks of light in the project.
- LED lamps used to be one of the finest known brands AS, THORN – MAZDA – PHILIPS – GE.
- LED lamps shall fulfill the following requirements:
  - CRI greater than 75%
  - Lumens/W to be 100 lm/w or higher.
  - Lamp's life hour time to be (50,000 h@L80)
  - Pure UGR less than 19.
  - Color consistency: less than 3macadam steps.
  - Photo Biological Test Report: exempted is approved.
- Emergency kit shall be built in with several selected lamps as needed & at specified locations shown in the lighting plans, And consist of: Nickel Cadmium Battery ,Charger works for 3hours upon the failure of the main power supply.
- IP (ingress protection) shall be defined for each area According to international standards.
- External lighting to be equipped with photocells type: ABB, GROUP SCHNEIDER, SIEMENS.

A.

B. 28- Computer Network System:

*SYSTEM COMPONENTS TO BE FROM CISCO-USA:

Data Outlets: a.
P.V.C. rigid conduit of 1" diam. Complete with boxes and all needed accessories, to be installed separately for computer from the data box in every floor of the building to the data outlets. Data outlet should be provided with suitable cover. The work shall be supplied, installed and connected as shown in drawings.Type of outlets RJ 45.

Data Boxes: b.
Conduits of Data outlets for every floor shall be connected to metallic Box recessed in wall, and shall be supplied with a suitable door. Box and door shall be powder painted from inside and outside.

Data Boxes in different floors shall be connected to main data box in computer room in first floor by using PVC conduits of 50 mm diameter or by suitable metallic trunking. **c.**

Wiring and commission of computer network sytem shall be done and tested. **d.**

All conduits shall be provided with, UTP, Cat 6 Data cables for each computer outlet from the main data box. **e.**

f. All data outlets shall be numbered and labeled from both ends.

29- <u>Addressable Fire Alarm System</u>:

<u>*ALL THE SYSTEM COMPENENTS SHALL BE OF THE SAME EXISTING SYSTEM SIEMENS/PYROTRONICS –USA</u>.

***The Contractor shall supply, install, connect, commission and test a complete analogue addressable fire alarm system as specified below and as shown in drawings including the following:**

- Manual alarm stations (PULLDOWN contacts)
- Alarm advices (Sounders)
- Lamp indicators.
- Door hold and door release units.
- Complete wiring system, end of line devices, sounder drives.
- Zone or line isolator modules, and any related accessories.

***STANDARDS:**

Fire alarm system is to be in accordance with the local fire protection regulations , and in compliance with BS 5839 part –1, BS 5445 – part 5 , 7 , 8- , BS –3116 equivalent standards and civil defence requirements ALSO SHALL BE AS PER EXISTING SYSTEM.

***SUBMITTALS:**

Complete technical data, codes and standards, manufacturers

Catalogues and specification , construction and cuircuit description in detail for each type of component and technology used , equipment tests for quality and operation at the factory , test certificates , certified by an official testing authority , are to be submitted to the engineer for approval before dispatch to site .

***SHOP DRAWIMNGS:**

Include but not limited to the following:

Exact composition of main and terminal cabinets , detailed system schematic diagram , terminal numbers and wiring diagrams , exact routing and layout of all wire ways , conduit and cables , giving type and size with calculations to verify satisfactory wire sizes for all circuits , typical installation detailes of cabinets , detectors , stations , alarm devices etc. , shall be submitted for approval before carrying on the installations of the systems and before starting the works.

Equipment supplier shall be authorized distributor of manufacturer, and able to maintain a local staff of specialists for engineering assistance, maintenance and repair.

***System Description and Function:**

- Fault mute, Alarm mute, Evacuate, reset and lamp test push button co ntrols.

***General Description:**

1. **Automatic Detectors : Analogue Addressable Same As Exist :**

All detectors shall be of Analogue Addressable **type** suitable for mounting to as common back plate and connected to a two wire circuit.

Smoke detectors shall be ionization or optical type as required. They shall have green LED's to indicate the unit is operational.

Heat detectors shall generally be designed to operate on (rate of rise) and a fixed temperature (57oC) where heat detectors are instilled in kitchens boiler rooms etc. where rapid temerature changes may occur they shall be fixed temperature type set for (85oC).

Smoke and heat detectors shall incorporate LED'S indicators which flash periodically in the quiescent mode, when a fire, alert or fault condition is detected, The LED'S should flash continuously.

All detectors should be interchangeable with the base unit. Where automatic detectors are located in inaccessible positions above cold rooms and in lift shafts etc. a remote indicator light shall be provided to illuminate when the unit is in alarm condition. This shall be engraved (fire detector in .....) .

The above detectors shall meet the requirement (BS 5445 pt.7) and (BS 5445 pt. 5.) .

2. **Manual alarm stations (PULLDOWN) Analogue Addressable Same As Exist :**

PULLDOWN contact shall be Analogue Addressable **type**, flush mounted at (145 cm.) Above finish floor level, and incorporate a key operated test facility. They shall meet the requirement of (BS 5839 pt.2)

3. **Alarm devices (Sounders) Same As Exist :**

Sounders shall be electronic type with an output of approximate 103 dBA with distinctive tone.

Alarm sounders shall be connected through an addressable modular (Sounder drive) and mounted directly over a flush condubox at (50 cm) below ceiling level and clearly labeled (Fire Alarm).

4. **Wiring System and related accessories :**

1. Wiring: Fire Alarm wiring shall be completely segregated from any other system.

All internal wiring between bells, push buttons, master alarm panel and local junction boxes, shall be insulated conductors (2x1.5mm2 for detectors and 2x2.5mm2 for bells).

Cable used for theb transmission of system data and alarm signals shall be in accordance with types and sizes recommended by the manufacturer of the fire alarm system.

For recessed installations , the internal wiring shall generally by concealed in rigid heavy gauge P.V.C. conduits , while for surface installations the interior wiring generally by exposed in galvanized

Steel, heavy gauge conduits in accordance with the specification for electrical installations.

2. End of line device: Exact value and characteristics of end-of-line device shall be determined, supplied and installed accordingly.
   Equipment is to operate without manual adjustment and without faulls or false alarms.

***Special requirments :**

- ❖ Compatible devices with our addressable fire alarm system SIEMENS (Cerberus PRO) , includes (smoke detectors, heat detector for kitchen, strobe sirens, loudspeakers, manual stations ,junction box and fire rated cables as below:

- Initiating devices / in-circuit (1.5 mm/2 core, 105 grade for stainless sleeves or grade 950 for plastic sleeves)
- Appliances notifications out-circuit (2.5mm/2 core, 105 grade for stainless sleeves or grade 950 for plastic sleeves)
- Outdoor cable 6 core with connection Point
- Submit wiring diagram

- ❖ Portable fire extinguishers
- ❖ No need control panel

***System of Operation:**

Operation of detector or break glass contact shall signal to the main control panel and operator panels and indicate the Zone of detector in which the signal organized.

Provision shall be made at the main control panel to silence the alarm sounders, but the visual indication shall remain on until the system is reset.

A further call shall not be inhabited whilst sounders have been silenced.

An output signals shall be provided in the event of an alarm call to release the automatic doors closers, unlock fire escape exit doors … etc.

Operation of an automatic detector in a lift motor room shall provide a signal to the particular lift or lifts associated with the motor room and dispatch the car to the ground floor, car door will be opened, and lift will not receive any orders till fire alarm problem is solved.

The repeater panels shall incorporate an IED display and shall indicate the Zone where an alarm call has originated.

***Contractual maintenance period:**

The Contractor shall maintain the system and all associated equipment of all descriptions for a period of two years including all parts needed, from the date of handing over to the Engineer or such other person appointed for this purpose.

***Testing and Commissioning:**

All tests required by international standards, the local regulations and manufacturers recommendations shall be carried out by the contractor on the completed installations, as well as all running tests for insulation. All the expenses for the tests shall be include in the tender.

The contractor alone will be responsible to be the authorities as to the installation's compliance with rules and regulations, while all tests must be carried out in the presence of the Engineer.

The Contractor shall provide precise instrument and all labor for testing.

All tests' results shall be submitted to the Engineer within (14) days of the test, and the contractor shall issue the certificate upon completion of work.

Any effects, faults or commissions of the installations appear during such tests certificate including factory test procedure for all equipment shall also be submitted to the Engineer.

Partial and spot tests on site shall be done during the execution of the works according to Engineer's recommendations. In addition, the contractor shall perform his own partial and final tests.

Final tests shall be carried out in the presence of the Engineer at the completion of the work, and the contract must submit a detailed test procedure and time schedule for the test to the Engineer.

***Operating and Maintenance Manuals:**

The Contractor shall furnish four copies of a maintenance manuals relating to equipment and plant forming of the works to the Engineer upon completion of the works. The manual shall be loose-leaf type international A4 size with stiff covers in several volumes and divided into sections, each section covering and a detailed index. The manual shall contain full operating and maintenance instructions for all equipment, plant and apparatus set out in a form dealing systematically with each system. It shall include the following: -

- Record drawings, true to scale and reduced to A4 size.
- Schematic and wiring diagrams of apparatus.
- System description
- Emergency procedures.
- Switch operation.
- Procedure for fault finding.
- Maintenance and servicing periods and procedures.
- List of primary and secondary spares.
- The Contractor shall submit general instructions, operation, manuals, technical catalogues, drawings, sketches and wiring diagrams etc. To the Engineer for approval.
- A soft copy of the operating and maintenance manuals shall also be provided.

***Hand Dryers:**

A hand dryer, automatic type, including all accessories needed.

Auto pilot hand dryers feature convenient hands-free operation, an electronic sensor automatically turns dryer on when hands are placed under the nozzle.

Dryer shall be surface type. Cover features concealed air intake grille corrosion, resistant A.B.S. Cover , Color to match location , Vandal resistant cover , 2000 Watt.

30- Uninterruptible Power Supply (UPS):

**** Uninterruptible Power Supply (UPS):**

***Part 1- General:**

1.1 Summary:

Section includes on-line uninterruptible power supply.

1.2 References:

IEC-285, BS6260, BS5932, BS6115 - type of batteries.

IEC-335-2-29, BS EN 60335-2-29, Battery charger specifications.

IEC-158, IEC-1095, IEC-947-4-1: Part 4, BS-764, Contactor's specifications.

1.3 Submittals:

Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate battery rack dimensions; battery type, size, dimensions, and weight; detailed equipment outlines, weight, and dimensions; location of conduit entry and exit; single-line diagram indicating metering, control, and external wiring requirements; heat rejection and air flow requirements.

Product Data: Submit catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements.

Manufacturer's Field Reports: Indicate inspections, findings, and recommendations.

1.4 Closeout Submittals:

Operation and Maintenance Data: Submit description of operating procedures; servicing procedures; list of major components; recommended remedial and preventive maintenance procedures; and spare parts list.

1.5 Qualifications:

Manufacturer: Company specializing in manufacturing products specified in this section with minimum 20 years documented experience.

Ups brands To Be: SIEMENS-USA, ABB-SWITZERLAND, GUTOR/ SWITZERLAND OR EQUIVALENT.

1.6
1.7 Delivery, Storage, And Handling :

Protect equipment from extreme temperature and humidity by storing in conditioned space.

Protect equipment from dust and debris by wrapping unit in dust tight cover and storing away from construction activity.

1.8 Environmental Requirements:

Do not store or install unless temperature is maintained between 22 degrees C and 30 degrees C, at relative humidity less than 95 percent (non-condensing).

1.9 Warranty:

Furnish 2 year manufacturer warranty.

1.10 Maintenance Service:

Furnish service and maintenance of uninterruptible power supply for one year from Date of Substantial Completion.

PART 2 – Products:

Uninterruptible Power Supply:

A. Product Description: Online Uninterruptible Power Supply with reverse transfer.

B. System Ratings and Operating Characteristics:

1. System Continuous Rating: As indicated in BOQ and drawings, such rating shall be considered as a full load for 15 minutes over entire battery voltage range at specified power factor. Maintain output voltage within specified limits at load from full load to no-load.
2. The UPS input power shall be as follow:
   A-Voltage: 230/400V, A.C., 3 phase, 4 wire ± 10% -
   b- Output power: 3 KVA.
   c- Frequency: 50 Hz. ± 4%
   d. Maximum short circuit current: 10KA.
3. The UPS output power characteristics shall be as follows:
   a. Voltage: 400V, A.C. 3 phase, 4 wire (± 1% for balanced loads)
   b. Frequency: 50 Hz. ± 0.5% synchronized to by-pass line.
   c. Voltage adjustment: 0.05% maximum.
   d. Harmonic voltage: 5% RMS maximum
   e. RMS current into fault: 150% of rated full load minimum.
   f. Sustained short circuit time: 1 second minimum.
   g. Rating: as indicated on drawings and B.O.Q for 10 minutes full load.
4. The UPS unit shall be suitable for continuous operation at 10-40°C ambient temperature.
5. The UPS system shall be guaranteed against faulty and improper materials and workmanship for a period of two years from date of final acceptance except that the batteries shall be guaranteed for ten years to deliver minimum 80% of its rated capacity.
6. The UPS system shall be inspected and tested to demonstrate achievement of system objectives.

2.2 Main UPS Cubicle:

The UPS system cubicle shall consist of but not be limited to the following major components:

1. Rectifier/battery charger: The rectifier/charger shall be totally solid state, complete with isolation transformer; Rectifier Bridge and D.C. filter to deliver regulated and filtered D.C. power to a static frequency inverter, and to the batteries.
2. Static inverter: The silicon solid state static inverter shall be capable of accepting the output of the rectifier/charger or emergency battery and providing an A.C. output.

3. Maintenance by-pass system, to permit direct connection of the critical load to the incoming power line, by passing and isolating the entire UPS and its static by-pass transfer system. The maintenance by-pass and isolation breakers shall be both electrically and mechanically interlocked to prevent interruption of service to the critical load due to improper operation.

4. Instruments: The following switchboard type instruments shall be provided, including current transformers as required:

    a. D.C. voltmeter and ammeter for measuring D.C. bus volts and battery charge/discharge current.
    b. A.C. voltmeter and ammeter with switch for measuring input and output phase voltages, line to line, line to neutral and current in each of the input and output phases.
    c. Frequency meter to measure UPS input and output frequency.
5. Alarm indicators: A visual and audible alarm shall be provided for any fault which occurs in UPS.
6. Controls: The following controls shall be provided in the UPS system:
    a. Primary Input circuit breaker.
    b. Reserve circuit breaker.
    c. Battery input circuit breaker.
    d. Inverters operate switch.
    e. Static switch transfer test pushbutton.
    f. Indicator test/reset switch.

C. Design:

1. Designed for capacity expansion by addition of parallel modules in field with minimum downtime.
2. Rectifier/Charger Capacity: Sufficient to supply full load to inverter while recharging fully discharged battery to 95 percent of full capacity in four hours or less; and within input current limits specified.
3. Furnish means for on-line testing of UPS, including test points to allow adjusting and servicing. Furnish means for testing static switch while load is bypassed to utility.
4. Mean Time Between Failures: 60,000hours, minimum.
5. Cooling: forced air cooled unit and ambient temperature of 25 degrees C or lower.
6. Operate battery floating, isolated from UPS AC input and AC output. Furnish battery resistance grounded through 5,000 - 10,000 ohms for purpose of ground fault sensing.

7. Do not use continuous moving parts or electron tubes. Accomplish power switching using semiconductor devices.
8. Construct equipment so each power component capable of replacement without soldering iron or special tools.
9. Use front-panel removable plug-in control modules.

D. Controls:

1. AC input circuit breaker.
2. "Inverters operate" switch to initiate inverter operation.
3. "Inverter standby" switch to cause inverter to cease operation.
4. "Static switch transfer" switch to permit manual actuation of static transfer switch.
5. "Static switch lock-out" switch to inhibit automatic retransfer of load to inverter.
6. Battery charge timer.
7. "Indicator test" switch.
8. Static switch preferred input circuit breaker
9. Static switch output circuit breaker
10. Static switch bypass circuit breaker.
11. Controls for maintenance bypass switch.

E. Indicators:

1. "Inverter synchronized to utility."
2. "Load connected to utility."
3. "Static transfer switch inhibited."
4. "High/low DC voltage."
5. "Over temperature."
6. "Inverter output overload."

F. Meters: Use 1percent accuracy meters to indicate the following:

1. Rectifier/charger DC voltage and current.
2. Utility, inverter output, and load AC voltage.
3. Load AC current.
4. Inverter output and utility frequency.
5. UPS output watts.

G. Wall-mounted Alarm Panel: Flush mounted annunciator panel with the following monitoring and alarm functions:

1. "Utility power available."
2. "Utility bypass power available."
3. "Inverter output available."
4. "Inverter synchronized to utility."
5. "Load connected to inverter output."
6. "Load connected to utility bypass power (alarm)."
7. "Static transfer switch inhibited (alarm)."
8. "High/low DC voltage (alarm)."
9. "Over temperature (alarm)."
10. "Inverter output overload (alarm)."

11. Audible alarm (sounds when any of above alarm conditions occur).
12. Alarm/indicator "silence/test" switch.

H. Fabrication:

1. Electroplate brackets and securing hardware with corrosion resistant material. Secure bolts, studs and nuts with lock washers.
2. Identify internal wiring at each end of conductor. Furnish cabinet grounding lug.
3. Conversion Equipment Enclosure: NEMA 250, Type 1 enclosure allowing access from front for servicing adjustments and connections. Access through hinged door equipped with tumbler lock and latch handle. Equip cabinet for fork truck lifting.
4. Equip air inlet with permanent type filters and pressurize cabinet, or use gaskets around door and panel openings to prevent entry of dirt.
5. Cabinet finish: Primed and painted inside and outside with suitable semi-gloss enamel.

2.3 Battery:

A. Storage Battery: Lead acid heavy duty industrial battery, designed for auxiliary power service. Furnish battery with impact resistant plastic case. Furnish cells with explosion proof vents, clear containers, and ample space for plate growth without stressing container and cover.

B. Ampere-Hour Rating: Sized in accordance with IEC-285 or BS6260.

C. Battery Racks: Maximum of three tier, entirely steel construction, with plastic insulating rails at points of contact with battery case. Paint racks with acid resistant paint.

31- Earthing:

***General Requirements:**

a. Unless otherwise specified material used for earthing are to be copper or approved copper alloys, specially manufactured for the purpose.

b. Earthing System is to be mechanically and electrically continuous to provide and independent fault current return path to the earthing source in accordance with the requirements of IEE regulations.

c. Where indicated on the drawings or where non-metallic or flexible conduits are used for all or part of a run, a green conductor is to accompany the circuit wiring. Conductor is to connect earth bus or earth terminal in panel boards to outlet or device earthing lugs.

d. Earthing pits are to be constructed and equipped as shown on the drawings.

e. Each pits is to contain one directly driven 16mm. Diameter and 3M. Long copper clad steel earth rod with bolted cable connectors.

f. Panel boards are to be earthly by connecting and earth continuity conductor from main earthing bar to special earthing lug welded to panel boards cabinets as shown on the drawings and / or required by the regulations.

g. Receptacles are to be earthed by connecting a green/yellow insulated conductor from receptacle earthing terminal to earthing bushing on incoming and / or outgoing conduits, or to a special earthing lug provided within metallic outlet boxes. Earthing wire from supplying board earth bar up to receptacle shall also be provided.

h. Great care is to be taken in bonding and earthing the installation and test are to be carried out as the work progress, to check the earth continuity of all metal work, conduits .... Etc, and earth continuity conductors.

i. All exposed metal work, structural or otherwise, and the metal work of any gas or water service, shall be bonded to the earthing termination of the intake position in accordance with IEE regulations.

j. No earth continuity conductors shall be less than (2.5) mm2 tinned copper insulated and colored green.

k. The frames of all electric motors and starting panels, etc. are to be efficiently "earthed ".

l. Building earthing shall consist of PVC insulated copper cable connected between earthing copper rods and main, sub main distribution boards. As many additional pits shall be provided to obtain an earth resistance of 1 ohm. Maximum Without changing the nature of the soil.