RBSANCHEZ PME CONSULTANTS & ASSOCIATES, INC.

PROVEN, RELIABLE AND COST-EFFECTIVE SOLUTIONS

Unit 3603, 36F Makati Executive Tower II, Buendia Ave. cor. Dela Rosa St.
Brgy. Pio Del Pilar, Makati City Philippines 1230

(02) 8776–5879 / 8638-2604

(+63) 927-300-6000 Globe / 947-507-000 Smart

info@rbs-engineers.com
rosensanchez@yahoo.com

www.rbs-engineers.com

PRINCIPAL ENGINEER

ENGR. ROSENDO B. SANCHEZ

PME, ASEAN, ACPE, ASHRAE

- **HVAC ENGINEER of the "WORLD'S TALLEST BUILDING" THE BURJ KHALIFA TOWER** Dubai, UAE. Served as **"HVAC DESIGN MANAGER" and "HVAC ENGINEER ON RECORD"**. Year 2006-2007.

- **MECHANICAL ENGINEERING BOARD TOPNOTCHER (1st PLACE)** with the Highest Score Achievement in the government Licensure Examinations for Mechanical Engineers in 1981, with **CUMLAUDE honors** graduate in the **University of the Philippines, Diliman.**

- **PSME "TOME AWARDS" as "THE MOST OUTSTANDING MECHANICAL ENGINEER" in Research and Innovations Consultancy** by National P.S.M.E. (**Philippine Society of Mechanical Engineers**) and by the **Professional Regulation Commission** at SMX PSME Convention Center of Year 2018.

SOCRATES NOMINATION COMMITTEE

2 Woodin`s Way, Oxford, OX1 1HF · United Kingdom

www.awards.ebaoxford.co.uk

+441865794362

The nomination and award to

Europe Business Assembly

ENGR. ROSENDO B. SANCHEZ

PME, ASEAN, ACPE

- **Awarded for 'Manager of the Year" 2020 for contributing to International Engineering Design Projects for the Burj Khalifah Dubai "WORLD'S TALLEST BUILDING"**

As the **"HVAC DESIGN MANAGER" and** "**HVAC ENGINEER ON RECORD**". Engr. Rosen Sanchez is the official signatory of all building's HVAC construction drawings of Years 2006-2007.

PHILIPPINE NEWS

ENGR. ROSENDO B. SANCHEZ

PME, ASEAN, ACPE

- Featured by the **PHILIPPINE DAILY INQUIRER**, issue September 21, 2008 Metro Global Section A18 – half page as the **Filipino HVAC Design Manager** and **engineer to watch.**


INQUIRER.net

PHILIPPINE DAILY INQUIRER

Aplus METRO

LOOKING BACK

A travelling photo

- FEATURED IN A **DUBAI NEWSPAPER** AS HVAC DESIGN MANAGER for the LANDMARK DUBAI Project.
  NEWS EMARATALYOUM: Issued last September 29, 2006 page 38 as the selected "HVAC Design Manager" to watch in the Dubai Burj Khalifah Project.


«أنت وأنا ودوبري» كوميديا مطلوبة في رمضان

AWARDS AND RECOGNITION

ENGR. ROSENDO B. SANCHEZ

PME, ASEAN, ACPE

- **TOME AWARDEE "THE MOST OUTSTANDING MECHANICAL ENGINEER" in Consultancy** by National P.S.M.E. (**Philippine Society of Mechanical Engineers**) and by the **Professional Regulation Commission** at SMX PSME Convention Center of Year 2011.

- **"THE BEST MECHANICAL ENGINEERING DESIGN AND CONSULTANCY SERVICES"** by the **ASIA PACIFIC EXCELLENCE AWARDS COUNCIL (APAC),** Awarded December 15, 2018.


GOLDEN GLOBE ANNUAL AWARDS
FOR OUTSTANDING FILIPINO ACHIEVERS 2019

GIVES RECOGNITION & TRIBUTE TO
ENGR. ROSEN B. SANCHEZ
FOR OUTSTANDING & SIGNIFICANT ACHIEVEMENT IN
MECHANICAL ENGINEERING

Dear Maam/Sir,

Congratulations!

THE MANILA HOTEL

OUR SERVICES "COMPREHENSIVE EXPERTISE" FOR YOUR DESIGN

NEEDS! Engineering Sciences and Services from Design of Industrial Plants, High-end Hotels and Residences, Testing and Commissioning, Trouble-shooting to Plant Maintenance and retrofit Services with specialization in:

- **HVAC Design & Consultancy Services** for I.T. Server Farms, Semiconductor Fab Cleanrooms, Logistics Warehouses and systems, Bio-Chem facilities, Food and Medical Services, Oil & Gas, Chemical and Process Plants, Chiller Systems, Water and Waste Water Distribution networks, Mining, Power Plants, Malls, Medical, Commercial & BPOs, Real Estate Development, etc.

- **Plant Operation & Maintenance (O&M) and Instrumentation and Controls Upgrade.** running your plant efficiently and reliably **ONSHORE/OFFSHORE on a 24/7/365** basis and design of Controls and Instrumentation and upgrades

- **Improving Reliability and Energy Efficiency**, Reliabilty-Centered-Maintenance RCM-II and Asset Operations and Asset Integrity Improvements.

- **Testing and Measurements and Analysis**, Troubleshooting and Test and Commissioning works in the commercial, industrial, and both onshore and offshore industrial Oil & Gas, Mining and Semi-Conductor, Server and Solar Farms, etc, testing on HVAC, air & gases, weather & environment, water and viscous and Bingham fluids.

- **Computational Fluid Dynamics (CFD), Simulations,** Numerical Modelling, and complex Mathematical techniques to predict conditions using supercomputers for the ff fluids: Weather and Climate Change, Wind and Water, Viscous fluids, Sludge and Non-Newtonian and Mining fluids, Environmental Gases and Pollutants and Soot and Waste Sludge pumping and Wastewater treatment. Newtonian, Bingham and Heterogenious and slurry fluid flows.

RBS PHILOSOPHY on WORK/LIFE

Trust in the Sciences/Truth and on Filipino Engineers and Countrymen

- REALISTIC AND WORKABLE PROJECT CONTEXT/LOCALIZED SOLUTIONS
- ECONOMICAL & OPTIMIZED ENERGY / ENVIRONMENTAL APPROACH
- LONG-TERM AND MUTUALLY-BENEFICIAL SOLUTIONS/RELATIONSHIPS
- HONEST AUTHENTIC COMMUNICATION: NON-JUDGMENTAL AND CONFIDENTIAL
- HAS A CODE OF ETHICS AND WITH MUTUAL RESPECT
- TEAMWORK & DEDICATION: A VISION FOR PHILIPPINE INDUSTRIALIZATION
- ETERNAL MISSION & STRUGGLE: HOW TO “SEEK THE TRUTH FROM FACTS”

LIST OF PROJECTS AND CLIENTS

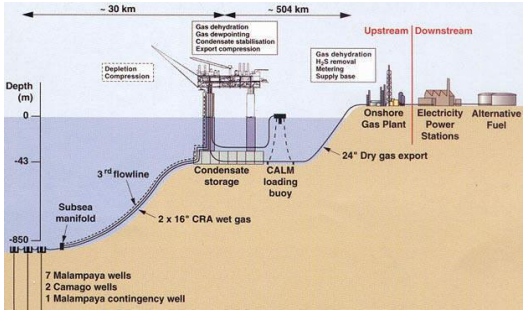
DESIGN AND CONSULTANCY

ENGINEERING/SCIENCES CONSULTANCY for SHELL MALAMPAYA OFFSHORE PUMPING PROJECT

MALAMPAYA
DEEP WATER GAS-TO-POWER

Offshore, Northwest of Palawan, Phillippines, August 2024 and ongoing

- RBS supplies the Scientific Structural and Mathematical Modelling and Mechanical Vibration problem-solving expertise for the 1.2MW vertical pump.
- The Pump system is an advanced offshore pump-up siphoning., pump body only weighs approx 40 tons , 1.200 MW and pump body height of 60-meters.



YCO CLOUD CENTER
Data Center (Philippines)

Light Industry and Science Park IV, Batangas
July 2023 ongoing 2024.

YCO CLOUD Gensler JSLA ARCHITECTS

US$500M DATA CENTER to rise in Batangas (2023 News Bulletin today)

12-MW YCO CLOUD DATA CENTER is certified to TIA 942 Rated III and ISO 22237

The design team is headed by U.S. based Gensler Architects and Manila-based JSLA Architects.

RBS is the Mechanical CFD consultant.

.

- **RBS is responsible for the HVAC CFD Design Consultancy and Airflow/Ventilation Consultancy for DATA CENTER HALLS, SERVER RACKS and CABINETS, HVAC units,i.e. Precision CRAH/PAHU equipment Cooling Airflows and the external cooling of the high-power density 2.5MW multiple DIESEL GENERATORS as well as cooling of the mission-critical battery/UPS power supplies.**

Western Digital Storage Technologies (Philippines) Corp.

HGST Plant. 109 Technology Ave SEPZ, Laguna Technopark Sta Rosa, Laguna, from February Years 2022-2024.

- **DESIGN and CONSULTANCY SERVICES for**

  70,000 sqm WD PLANT EXPANSION to capacity of 150mu with CLEANROOMS designed to ISO CLASS 1OO.

HGST
a Western Digital company

RBS will design the ARCHITECTURAL, STRUCTURAL, CIVIL, ELECTRICAL, MECHANICAL, ELECTRONIC, I.T. & DATA INFRASTRUCTURE of the WD PLANT.

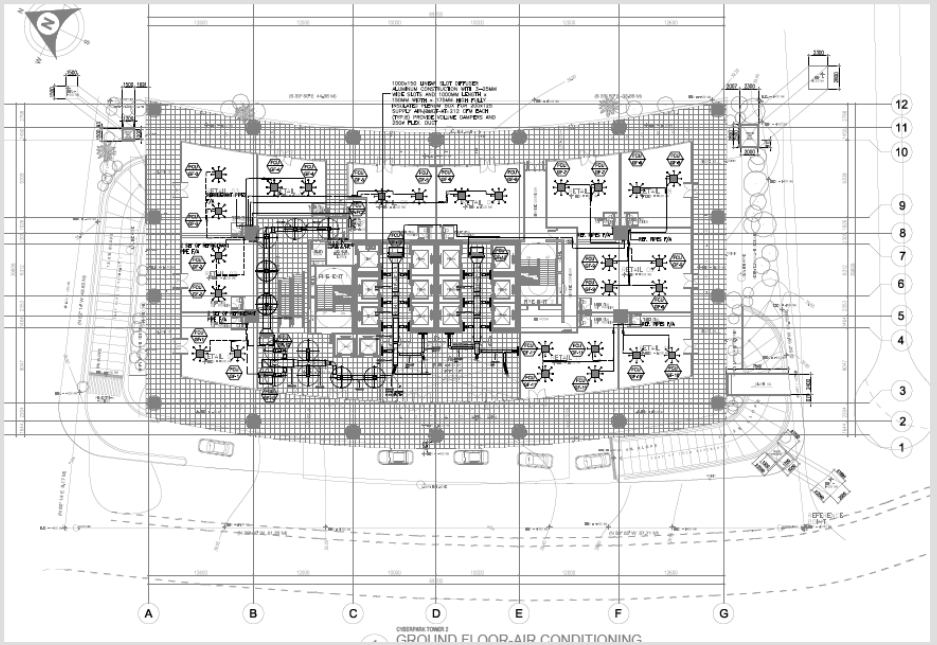
- **WD** has contracted **RBS as a "single-point responsibility"** for the engineering design of the plant's new 3000sqm CLEANROOM to ISO CLASS 1OO levels.

BPO LEED 4.0 COMPLIANT HIGH RISE DESIGN AND CONSULTANCY OF ARANETA CYBERPARK TOWER 3

Araneta Center, Cubao, Manila | Years 2023 to ongoing 2024

- HVAC System Design and Consultancy for Mechanical Systems of Araneta Cyberpark Tower 3 of 33 floors (90,000 sqm) high rise building. Araneta Cyberpark Tower 3 is a LEED 4.0 Compliant Design.

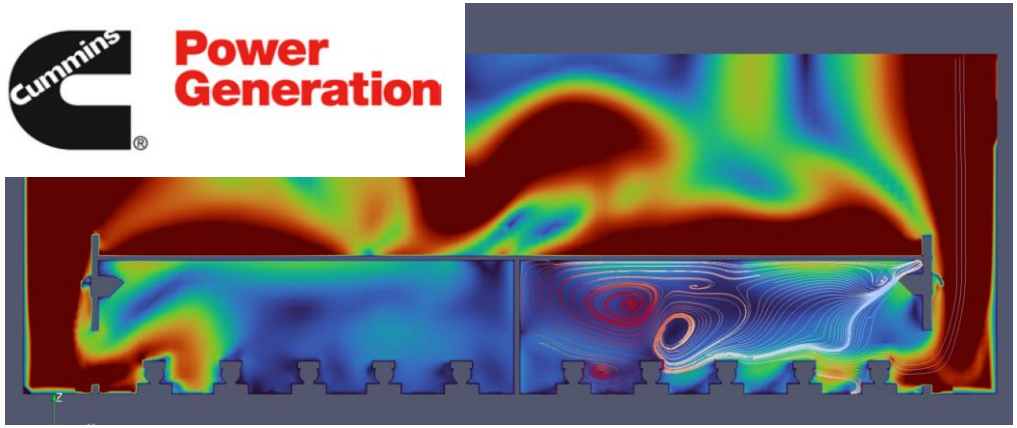
- RBSanchez PME is the Mechanical Systems Design Consultant



CONSULTANCY SERVICES FOR PLDT DATA CENTER 20MW POWER PLANT

PLDT DATA CENTER, Nicanor Garcia, Makati, Metro Manila

- **RBS SUPERCOMPUTERS POWERS THE CFD STUDIES AND CONSULTANCY SERVICES FOR THE 20MW DIESEL POWER FOR SERVER FARMS PLDT IN MAKATI CITY. October 2022 to 2023**



2.4 Thermophysical and Energy Models

Thermophysical models are used to describe cases where the thermal energy, compressibility, and/or mass transfer is important. OpenFOAM allows thermophysical properties to be constant, or functions of temperature, pressure and composition. Thermal energy can be described either in form of enthalpy or internal energy [3, 6]. Detailed explanations of this models are presented in the guide available online.

Transport equations for specific kinetic energy $k = v_i^2/2$ can be obtained by multiplying the momentum equation to the v_i:

$$v_i\rho\frac{Dv_i}{Dt} = v_i\rho\frac{\partial v_i}{\partial t} + v_i\rho\frac{\partial(v_j v_i)}{\partial x_j} = -v_i\frac{\partial p}{\partial x_i} + v_i\frac{\tau_{ij}}{\partial x_j} + v_i\rho f_i \tag{11}$$

Note that the left hand side of Equation 11 can be equated to

$$v_i\rho\frac{Dv_i}{Dt} = \frac{\rho}{2}\frac{D(v_i v_j}{Dt} = \rho\frac{Dk}{Dt} \tag{12}$$

and, thus allowing to rewrite the transport equation for the specific kinetic energy and internal energy into:

$$\rho\frac{Du}{Dt} = -v_i\frac{\partial p}{\partial x_i} + v_i\frac{\partial\tau_{ij}}{\partial x_j} + v_i\rho f_i \tag{13}$$

$$\rho\frac{Du}{Dt} = -p\frac{\partial v_i}{\partial x_i} + \tau_{ij}\frac{\partial v_i}{\partial x_j} - \frac{\partial q_i''}{\partial x_i} + q''', \tag{14}$$

where q'' is conductive heat flux and q''' is the volumetric heat source. Adding Equations 13 and 14, the total energy transport equation dictated by $e = k + u$ is formed as:

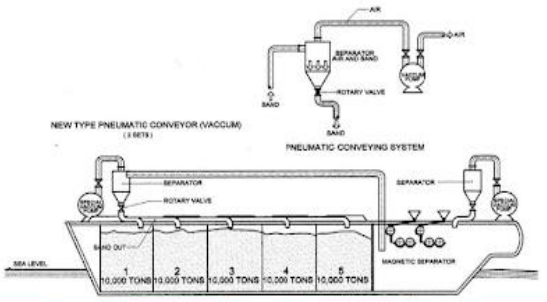
$$\rho\frac{De}{Dt} = \rho\frac{D(k+u)}{Dt} = \frac{\partial(v_i\sigma_{ij})}{\partial x_j} - \frac{\partial q_i''}{\partial x_i} + q''' + v_i\rho f_i \tag{15}$$

SCIENTIFIC CONSULTANCY and MINING OPERATIONS SERVICES FOR THE PHILS. LARGEST OFFSHORE MINING PROJECT

Offshore in Cagayan, Phillippines, July 2021 and ongoing 2023.

- RBS supplies the Scientific. Geological Mining, Structural and Mathematical Modelling and Mechanical Engineering expertise and the Operations and Maintenance Services for Offshore Platform Sand Extraction and On board Mineral Processing Plant of JDVC Corp.

- The operation requires a capesize siphon vessel with a width of 32 meters on average and a length of about 300 meters. Complete with three (3) full sets of magnetic separators, ejector system for deep-sea pump-up siphoning from down to 200 meters after the sea bed, washer apparatus, drying apparatus, and loading facilities for mineral transfer to export vessels.



HIGH RISE BUILDING HVAC DESIGN AND CONSULTANCY WYNDHAM RESORT HOTEL TOWER

Quezon City | 2018 to 2019

- HVAC System Design and Consultancy for Mechanical Systems of a 22-storey, 100-meter high tower with 800TR of chilled water systems.

- Using the latest technology of SMARDT Chillers with multiple Turbocore compressors for energy savings.

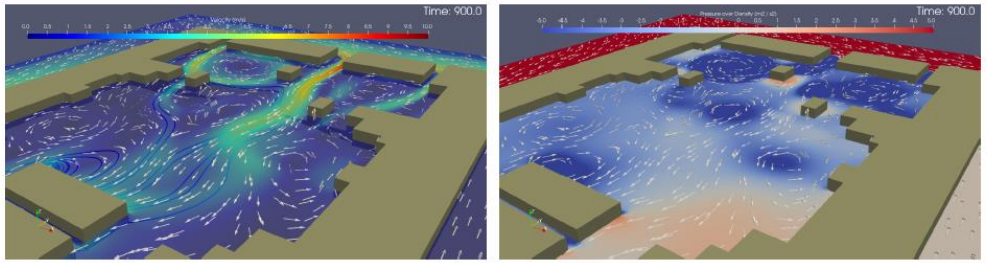
The First Wyndham Garden Hotel in the Philippines

CONSULTANCY SERVICES FOR CFD OF CARPARK OF MOA PARKSUITES TOWER

Aseana Business Park, MOA, Mall of Asia, Metro Manila | Sept 2020

- RBS is the CFD (Computerized Fluid Dynamics) and PME Consultant for Carpark Ventilation for **Monarch Parksuites.** It is an 17-storey composed of four towers that stands on a lot **area** of 18,000+ **square meters**. It is Multi use luxury building (Sepr 2020)

Figure 10 describes the filtered streamlines seeded in the genset patch boundary. The streamlines shows the air patterns from different sources. It can also be seen that indistinguishable amount air were drawn out from the basement level. In this result, it is empirical to have a fresh air injection system on the basement to compensate the drawn air.



(a) *velocity field* (b) *pressure field*

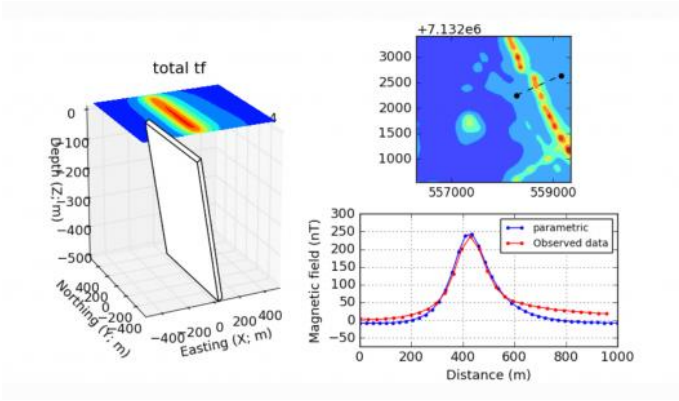
Figure 10. Streamlined flow with arrow lines seeded from the generator patch at *t = 900 seconds*

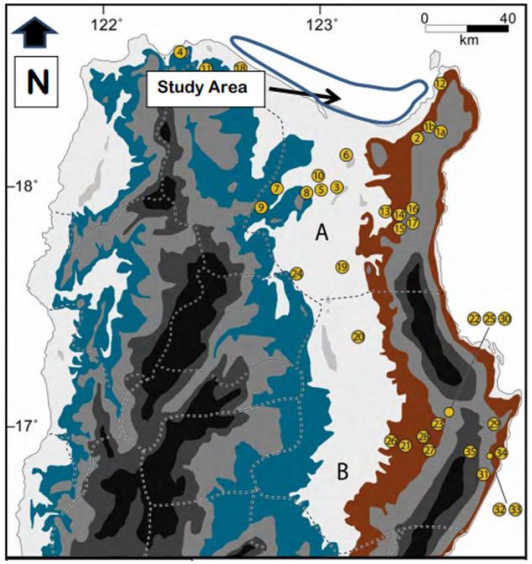
RBS CONSULTANCY FOR THE OFFSHORE MINING MAGNETIC SURVEY PROJECT.

Offshore in Cagayan, Phillippines, Sept 12 2022

- RBS supplies the holistic scientific and mathematical analysis and consultancy for the Sand Extractions using the Magnetic survey specialist Dr. Bernie B. Barcelona. He is Phd Doctor of Science at Tokyo University of Science.

- GEOPHYSICAL EQUIPMENT USED. Magnetic Transponders. PASI Resistivity Meter, RM-1 Model (3x) SEISMIC REFRACTION/MASW - GEOMETRIX-24 CHANNELSSCHMIDT HAMMER FOR ROCKS AND CONCRETE THERMAL RESISTIVITY INSTRUMENT (THERMTEST) TERRAMETER TERRALOC PRO GPRs – GSSI



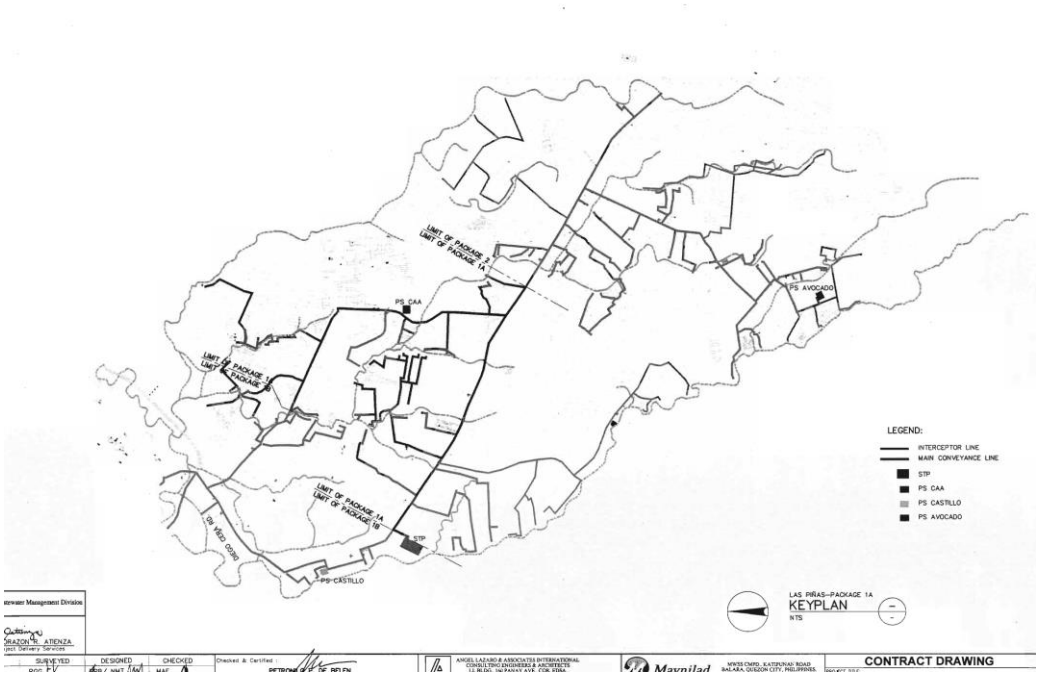


DESIGN OF LAS PINAS PUMPING STATION MAYNILAD 2023.

Las Pinas Maynilad, Paranaque City, Metro Manila 2023

- **DESIGN and CONSULTANCY SERVICES for to-be-constructed 25 Million liters a day WATER PUMPING STATION AND PIPING @ LAS PINAS, METRO MANILA.**

Scope is the Mechanical Pumping, Environmental, Structural, Civil, Safety, Sanitary and Fire Protection and Architectural services. 2022 to 2023



MANILA WATER INC.
DESIGN AND CFD CONSULTANCY PROJECT
EAST BAY R.O. WATER TREATMENT PLANT

Laguna Lake Reverse Osmosis Plant, Phillippines
Laguna Lake, August 2022

- **RBS supplies consultancy for the CFD Engineering and environmental marine expertise** for the diffusion and dispersal of inflows and outflows from the Plant.

- **MANILA EAST BAY WATER TREATMENT Reverse-Osmosis PLANT** Tedagua with Philippine construction company First Balfour secured a contract in December 2020 for the design and construction of the East Bay Drinking Water Treatment Plant.

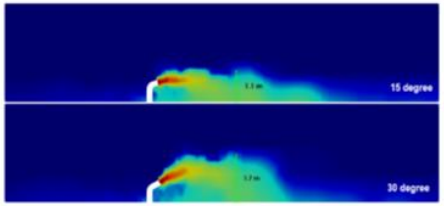


Figure 16. Comparison of brine dispersion at terminal heights reached by jet angles 15° and 30°

From the equation above, the extrapolated values coefficient for the Z/dF_0 of angles 15° and 30° yields to 0.1924215 and 0.6170892, respectively. **From these values, the resulting approximation terminal height Z, on both angles were 0.997 meters and 1.6520 meters that closely matches the results obtained from the fluid simulation** presented in figure 16.

Summary

The results of the far-field dilution values at 30° were similar to case 1 with insignificant density difference at same sample points. The major difference of the two cases were the terminal height. The terminal height or peak height reached by the plume were 1.7 meters compared to the 1.1 meters at case 1. It was observed as well that the impact dilution distance and near-field dilution were shorter than of case 1, implying that case 3 has lesser chance of re-circulation. But in the context of varying lake depths, the water level at the Laguna lake ranges from +2 meters minimum, +3.6 meters average and +5.1 meters maximum levels all in reference from the lake bed. With these depth values, +1.7 meters terminal height at 30° jet angle is still possible but with a high risk of lower dilution and faster transport due to surface current caused by stratified density depth layers and basically the free-surface waves and wind. At the case where the lake water level is at or below the minimum, high risk of re-circulation, stratification and progressive brine transport is likely to occur if the angle of jet is at 30°. Thus, it can be other angles such as 20° can be studied if the terminal height is acceptable with associated lower risk compared to this current case.

5.4 Case 4 - 30° jet inclination and underwater current

Similar to the approach done in case 2 and 3 to determine the significant changes, if there are, when the angles was changed to 30°. As observed from figure 17, the difference in the far-field dilution area was similar to that of case 2. It is presented in closer look in figure 18 that the diffusion shape is similar and the diffusion levels are also similar. The difference seems insignificant when compared in the far-field but can be observed to have minor differences in the concentration values in the near-field. Nonetheless, the difference were still insignificant aside from plume characteristics (thinner and longer) at 30° as seen in the plan view.

LAGUNA LAKE PROJECT. The contract is for the design and construction of a Drinking Water Treatment Plant (DWTP) sludge with a production capacity of 50,000m3 per day in the Pakil Lake area, Laguna Lake, east of Manila.

CONSULTANCY SERVICES FOR NEW CHILLER SYSTEM CAPEX OF THE PHILIP MORRIS PLANT IN BATANGAS

Bulacan | June 2023

- RBS design and consultancy services for NEW CAPEX CHILLERS AND UPGRADE OF CHILLER PIPING SYSTEMS FOR ENERGY SAVINGS.

- RBS optimizing the existing chilled water distribution, chiller piping and pumps loads as well as the **“Sequence of Operations”** of Siemens controls and instrumentation of the plant.

CONSULTANCY SERVICES FOR COMPRESSED AIR SYSTEM CDA OF THE PHILIP MORRIS PLANT IN BATANGAS

Sto Tomas, Batangas| August 2022

- RBS design and consultancy services for CDA Air compressor systems for **EFFICIENCY and ELECTRICAL SAVINGS**

- RBS to optimized the existing CDA system and

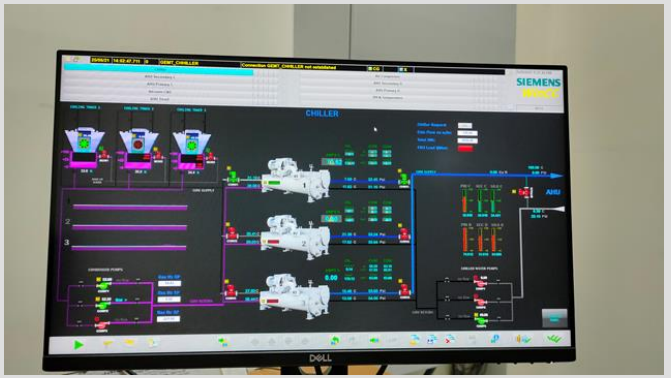
  and cooling tower system as well as the **“Sequence of Operations”** of the PLC controls and instrumentation of the plant.

ENERGY SAVINGS CONSULTANCY for CHILLED WATER OF THE MARIKINA PLANT PRODUCTION AREA 1 & 2

Brgy. Fortune Marikina City| May to July 2021

RBS delivered **MERALCO ELECTRICAL SAVINGS savings of 109kw.**

- This saved **PHP2M MERALCO** electricity charges annually only by **controls adjustments** (without any upgrade of equipment or other expenses).



SAVINGS REALIZED AFTER MULTIPLE CALCULATIONS

RBSANCHEZ PME CONSULTANTS & ASSOCIATES, INC

CHILLER – CONDENSER PUMP – COOLING TOWER

	CURRENT PLANT OPERATIONAL CONDITION					OPTIMIZED PLANT OPERATIONAL CONDITION			
	1	2	3	kW reading	DIFF	1	2	3	kW reading
COOLING TOWER	60 Hz	-	60 Hz	59.50 kW	**42.00 kW**	30 Hz	30 Hz	30 Hz	17.50 kW
CONDENSER PUMP	60 Hz	-	-	64.90 kW	**23.20 kW**	45 Hz	-	-	41.70 kW
CHILLED WATER PUMP	38.59 Hz	-	-			38.65 Hz	-	-	
CHILLER	-	-	88.30% Part-load condition	127.90 kW	**44.00 kW**	-	-	56.63% Part-load condition	83.9 kW
			TOTAL KW READING	**252.30 kW**	**109.20 kW**			**TOTAL KW READING**	**143.1 kW**

109.20 kW x Php 6.00 per kW-hr x 10 hr = Php 6,552.00 per day OR Php 196,560.00 per month

- RBS optimized the existing **"Sequence of Operations"** of controls and instrumentation of the plant.

WHOLE CHILLER PLANT EFFICIENCY ASSESSMENT KW/TON AND STUDY for HITACHI SEMI-CONDUCTOR PLANT

HGST Plant. 109 Technology Ave SEPZ, Laguna Technoparkm. August 2021 to current.

- **RBS supplies DESIGN AND CONSULTANCY SERVICES for the Kw/ton evaluation, capex upgrade and remodelling for the existing HGST plant.**

- **HGST has requested and RBS agreed to have a "single-point responsibility".**

  RBS will be responsible for the complete design of ARCHITECTURAL, STRUCTURAL, CIVIL WORKS. ELECTRICAL, MECHANICAL I.T. & DATA INFRASTRUCTURE & ALL OTHER TRADES REQUIRED FOR THE PLANT.

DESIGN AND CONSULTANCY OF MECHANICAL SYSTEM FOR STEEL ASIA MANUFACTURING PLANT

Plaridel, Bulacan

- RBSanchez Inc is the design engineer and consultant for the Steel Manufacturing Plant Year 2016 to 2017

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF ROBINSONS MALL SAN PEDRO

179 Manila S Road, San Pedro, Laguna | 2021

ROBINSONS LAND CORPORATION

YOUR DREAMS, OUR FOUNDATION.

- RBSanchez Inc. is the HVAC Design Consultant for the 104,500 sqm mall building of Robinson's San Pedro Mall, Laguna.

WHOLE CHILLER PLANT EFFICIENCY ASSESSMENT KW/TON AND STUDY for HITACHI SEMI-CONDUCTOR PLANT

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ELECTRICAL, MECHANICAL I.T. & DATA INFRASTRUCTURE & ALL OTHER TRADES REQUIRED FOR THE PLANT.

DESIGN AND CFD CONSULTANCY FOR ENVIRONMENTAL PROJECT EAST BAY WATER TREATMENT PLANT

Laguna Lake Reverse Osmosis Plant, Phillippines
Laguna Lake, August 2021

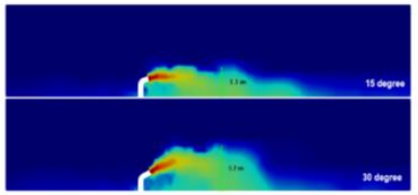
MANILA WATER
CARE IN EVERY DROP

First Balfour

- **RBS supplies consultancy for the CFD Engineering and environmental marine expertise** for the diffusion and dispersal of inflows and outflows from the Plant.

- **MANILA EAST BAY WATER TREATMENT RO PLANT**

  (REVERSE OSMOSIS plant) Tedagua with Philippine construction company First Balfour secured a contract in December 2020 for the design and construction of the East Bay Drinking Water Treatment Plant.



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DESIGN OF VISCOUS PUMPING SYSTEMS OF LA CARLOTA SUGAR REFINERY

RHi
ROXAS HOLDINGS, INC.

La Carlota Sugar Refinery, Negros Occidental | August 2020

- Tanks, Piping and pump system design using CFD simulation to predict and model the design of the VISCOUS FLUIDS behavior for molasses and magma pumping systems.

- RBSanchez Inc. is a long-term Partner with Global Horizons Inc. in various industrial projects.

BRINE CHILLER TEST AND MEASURE OPERATIONAL STUDY for THE HITACHI SEMI-CONDUCTOR PLANT

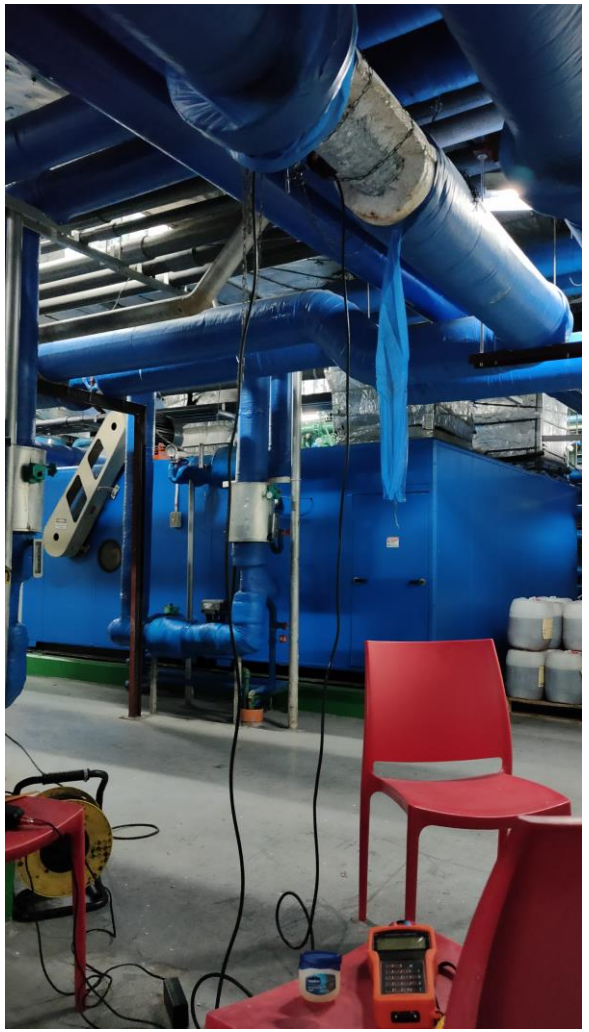
HITACHI Plant. Laguna Technopark. August 2021

HITACHI

- **RBS supplies DESIGN AND CONSULTANCY SERVICES for the re-design and remodelling of BRINE CHILLER piping works. August 2021 and ongoing.**

HITACHI
Inspire the Next

The Future of
Digital Payments



CONSULTANCY SERVICES FOR CLASS 100 to CLASS 10,000 MEDICAL DEVICES CLEANROOMS

ARTHRO LOGIC, INC. Plant, Brgy. Fortune , Marikina City, MM, June 2021

- RBS is the HVAC PME Engineering Consultancy Services for the design of new Cleanrooms, and Controls system designer for the Plant.

  Project starts June 1, 2021.

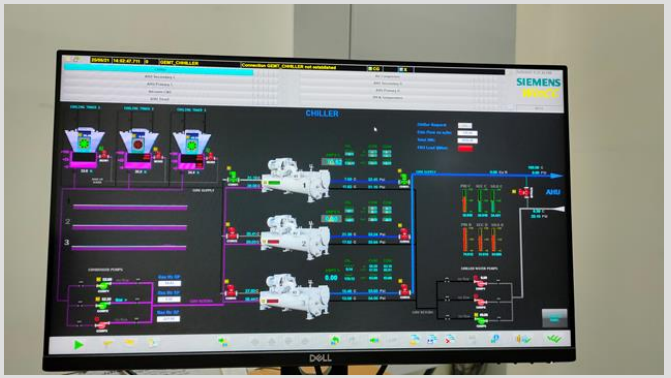
- **ARTHRO LOGIC, INC. Plant will manufacture medical orthopedic devices and implants under Class 100 and 10k cleanroom conditions.**

CONSULTANCY SERVICES FOR CHILLED WATER ENERGY AND COOLING OF THE MARIKINA PLANT PRODUCTION AREA 1 &

Brgy. Fortune Marikina City| May to June 2021

RBS delivered **MERALCO ELECTRICAL SAVINGS savings of 109kw.**

- This saved **PHP2M MERALCO** electricity charges annually without any upgrade of equipment or expenses.



SAVINGS REALIZED AFTER MULTIPLE CALCULATIONS

RBSANCHEZ PME CONSULTANTS & ASSOCIATES, INC

CHILLER – CONDENSER PUMP – COOLING TOWER

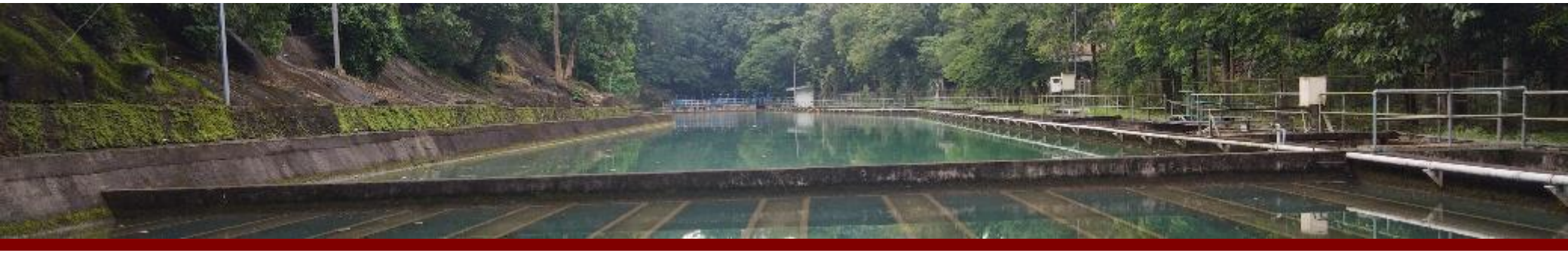
	CURRENT PLANT OPERATIONAL CONDITION					OPTIMIZED PLANT OPERATIONAL CONDITION			
	1	2	3	kW reading	DIFF	1	2	3	kW reading
COOLING TOWER	60 Hz	-	60 Hz	59.50 kW	**42.00 kW**	30 Hz	30 Hz	30 Hz	17.50 kW
CONDENSER PUMP	60 Hz	-	-	64.90 kW	**23.20 kW**	45 Hz	-	-	41.70 kW
CHILLED WATER PUMP	38.59 Hz	-	-			38.65 Hz	-	-	
CHILLER	-	-	88.30% Part-load condition	127.90 kW	**44.00 kW**	-	-	56.63% Part-load condition	83.9 kW
			TOTAL KW READING	**252.30 kW**	**109.20 kW**			**TOTAL KW READING**	**143.1 kW**

109.20 kW x Php 6.00 per kW-hr x 10 hr = Php 6,552.00 per day OR Php 196,560.00 per month

- RBS optimized the existing **"Sequence of Operations"** of controls and instrumentation of the plant.

Project done from Jan to April, 2021.

CFD CONSULTANCY FOR MANILA WATER & FF CRUZ CONSTRUCTION INC.



CONSULTANCY SERVICES FOR BALARA WATER TREATMENT PLANT 1

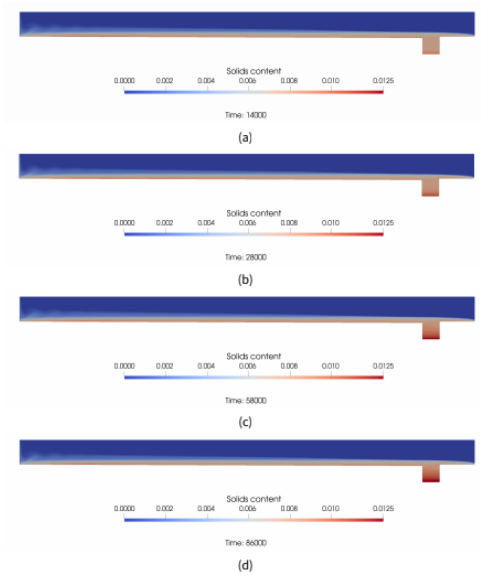


Figure 8. Sludge bed development after *t* hours

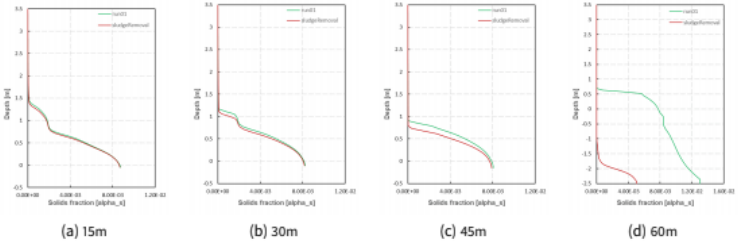


Figure 10. Sludge concentration along basin depth at different sections, *t* = 24 hours

OPTIMAL AND COST-EFFECTIVE SLOPE AND SUMP PIT INTERVALS

Using measurements and results of the CFD model, the recommendation is to have a basin bed slope of 1:300 at sump pit intervals every 60 meters. These figures were realized after series of parametric studies and cost effective solutions analysis.

Analysis of Gravity Induced Sludge Collection and Removal for Sedimentation Basin 1 and 2 of Balara Treatment Plant 1

RBSanchez PME Consultants and Associates Inc.[1]

[1] *RBSanchez Engineering Department, Makati Executive Tower 2, Makati, Manila*
Website: www.rbs-engineers.com

Executive Summary

Proposed sludge removal method for two continuous sedimentation basins were investigated prior to retrofitting. The initial system includes three sump pumps in pits at 60-m interval along the 180-m basin. The floor were sloped at 1:300 for gravity induced sludge transport.

CFD simulations were conducted to determine the behavior of pertinent parameters such as flow field, sludge detention, basin dimensions, sludge zone depth and rheological properties both for the accumulation period and during sludge removal operation. OpenFOAM solver driftFluxFoam was employed to perform the calculation for mass and momentum conservation for two-phase flow as a mixture. Applying the mixture model, water was set as the continuous phase and the settle-able sludge as dispersed phase. Furthermore, the sludge was modelled as a non-Newtonian fluid with rheological properties similar to bingham plastics. Measurements and validation tests were conducted to verify numerical solver predictions. Caution was exercised in using available data on best effort basis to represent actual site conditions.

The following items are summarized as the findings and corresponding recommendation, as proposed:

1. **Gravity-induced transport of sludge to the sump by floor slope of 1:300 is insufficient.** The initial design for sludge collection and removal will not be effective for long term operation. In this slope, the transport is very minimal that the sludge were accumulated in the interval span even after sludge pump operations. **Recommendation: Increasing the slope to 1:150 to improve sludge transport without significant effect to the sedimentation process. Although, steeper slopes were observed to greatly improve the transport than 1:150 and shown in the concentration curves. Partial velocity disturbance and minor eddy formation may occur in the basin floor that may cause partial re-suspension in the floor depth.**
2. **Shortened distance between sump pits will improve the sludge collection and removal.** Aside from increasing the slope, another parametric study findings in decreasing the interval was observed. It was observed that shortening the intervals significantly increases the collection rate overall as the area of removal is proportionally increased. However, further decreasing the interval may incur higher operational cost and maintenance cost as the sludge pumps would require regular maintenance due to its purpose. **Recommendation: In-depth cost analysis are not included in this tender. Considering operational and maintenance cost, it is still recommended to reduce the interval up to 45-meter interval from the 60-interval. It is necessary to test run sludge operation to set optimum interval for each section of the basin so that issues previously discussed are avoided.**
3. **The study were set to consider an initial inlet of 300 NTU turbidity condition, as provided to be one of the highest in record.** The study considered also a 100 NTU computational domain, however yields to insignificant findings difference compared to the 300 NTU domain, thus is not pursued further.
4. Adjust the floor slope of the sump pit section towards the pump base accordingly, to allow sludge movement in the sump pit to be drawn towards the pump and ensure sludge transport from the sides of the pit.
5. Selected pump specification (capacity and TDH) suffices as the sludge pump is operated intermittently to draw sludge out of the basin. In addition, verify the pump's capability at fluid viscosity.

Continuous Sedimentation CFD Analysis (2020)

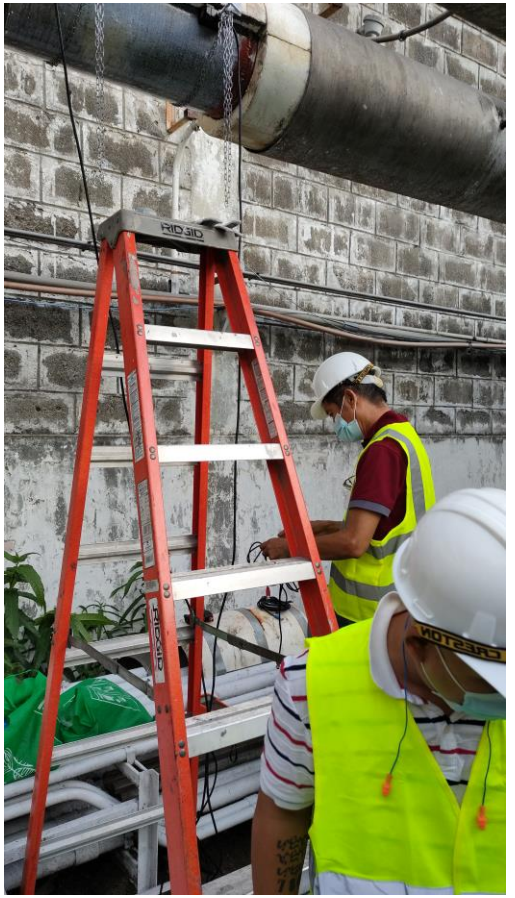
REF: 11.2019/RBS-OM-SED-BAS-CFD-000A

Written by
Dnes Dela Torre

CHILLER PLANT EFFICIENCY ASSESSMENT @ HGST SEMI-CONDUCTOR WAFER PLANT

HGST Plant. 109 Technology Ave SEPZ, Laguna Technoparkm. August 2021 to November 2021

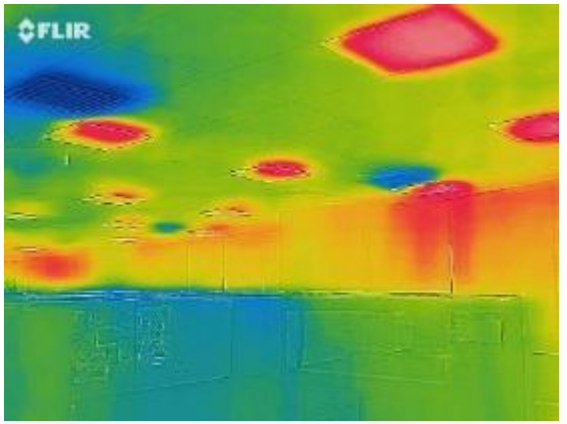
- **RBS supplies HVAC CONSULTANCY SERVICES for the assessment, evaluation, and operational chiller upgrades and CFD fluid modelling and design of chillers, pumps, cooling towers and piping works for the HGST plant.**



ASSESSMENT AND AUDIT CONSULTANCY FOR CHEVRON MSSC HVAC

RCBC Plaza, Makati, Manila | July 2019-Feb 2020

- **HVAC HEAT MAPPING, CFD Analysis and Consultancy for the Improvement for Chevron BPO Offices, a 10,000 sqm, total of 12 floors in RCBC Building, Ayala, Makati CBD.**



- **System consultancy for Cooling load Improvement, airflows of AHUs, fans, ducting, ACH, cooling and ensure proper room**

MECHANICAL DESIGN CONSULTANCY SERVICES FOR MANILA WATER

Balara Water Treatment Plant 1 and 2. Quezon City, Manila | Jan 2020

Analysis of Gravity Induced Sludge Collection and Removal by Suction Pumps for Sedimentation Basin 1 and 2 of Balara Treatment Plant 1

RBSanchez PME Consultants and Associates Inc.[1]

[1]*Drex Dela Torre, Mechanical Engr. RBSANCHEZ PME Consultants and Associates Inc., 36th Flr. Makati Executive Tower 2 Cor. Dela Rosa St. Makati. Website: www.rbs-engineers.com*
[2]*Engineering Department*

Executive Summary

The proposed sludge removal method on the two continuous sedimentation basin are investigated prior to their retrofit. The system includes 3 sump pits each with a transfer pump and placed at every 60 meters along the basin. The bottom floor is sloped towards the sump pit at a 1:300 gradient for gravity induced transport of sludge.

CFD simulations were conducted to determine the behavior of pertinent parameters such as flow field, sludge detention, dimensions of the tank, sludge zone depth and rheological properties both for the accumulation period and during sludge removal operation. OpenFoam solver driftFluxFoam was employed to perform the calculation for mass and momentum conservation for two-phase flow as a mixture. Applying the mixture model, water was set as the continuous phase and the settle-able sludge as dispersed phase. Furthermore, the sludge was modelled as a non-Newtonian fluid with rheological properties similar to bingham plastics.

Measurements and validation tests were conducted to verify numerical solver predictions. Caution was exercised in using available data on best effort basis to represent actual site conditions.

The findings of the study are summarized in the following:

1. The initial design for sludge collection and removal will not be effective for long term operation.
   (a) Gravity-induced transport of sludge to the sump by floor slope of 1:300 is insufficient.
2. Steeper slopes and shortened distance to sump pit and will improve sludge collection and removal.
   (a) Increasing floor slope to 1:50 and 1:30 will improve sludge transport significantly.
   (b) Decreasing the sump pit interval will proportionally increase area of effect of suction pumps leading to better collection.
3. Selected pump capacity suffices as the sludge pump is operated intermittently to draw sludge out of the basin
4. Numerical solver well estimates settling time in validation experiments and predicts sludge concentration curves at different points in the basin.

From these findings, the corresponding recommendations are herein proposed:

1. Retain frequency of collection points (sump pits) at every 60 meters.
2. Increase basin floor slope to 1:50 for effective sludge transport towards the sump pit.
3. Adjust floor at sump pit section to approach sump pit base to ensure sludge transport from the sides of the sump pit.
4. Select pump capacity considering sludge viscosity ranging from *X-Y* mPa-s.
5. It is necessary to test run sludge operation to set optimum interval for each section of the basin so that issues previously discussed are avoided.

Continuous Sedimentation CFD Analysis (2020)

REF: 11.2019/RBS-OM-SED-BAS-CFD-000A

Written by
Drex Dela Torre

MANILA WATER
CARE IN EVERY DROP

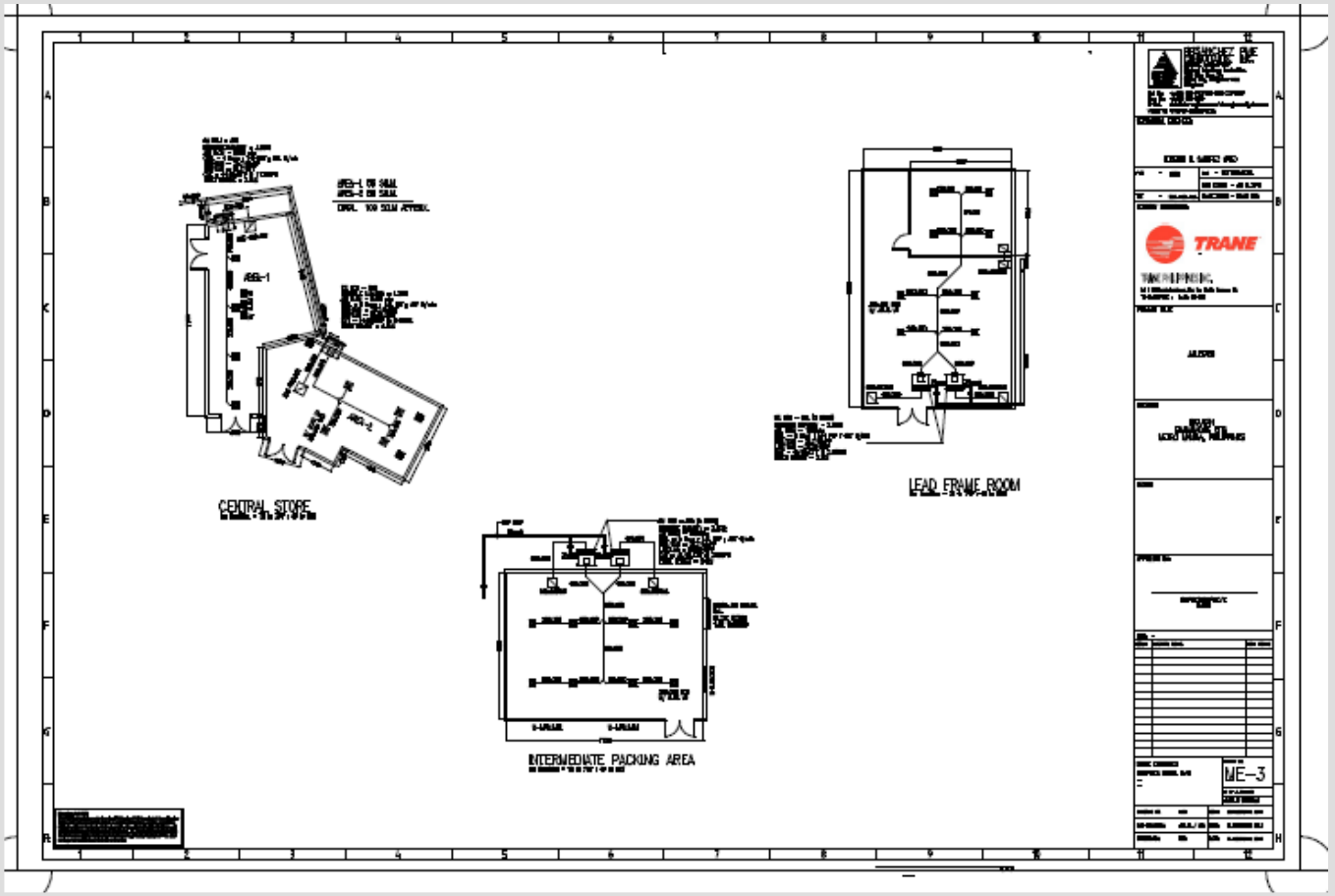
CFD CONSULTANCY FOR MANILA WATER @ BALARA WATER TREATMENT PLANT 1 AND 2

- Balara Treatment Plant (BTP) Sedimentation Basin 1 and
- 2 facilities Quezon City, Manila | 2019-2020

  - Computerized Fluid Dynamics simulation to predict the sedimentation through the basins and sludge accumulation . CFD results to be used as a basis for design for continuous sludge pumping system.

HVAC DESIGN AND CONSULTANCY OF ALLEGRO MICROSYSTEMS PHILS INC.

Sampaguita, Marimar Village, Parañaque



AVON PLANT DESIGN OF CLEANROOMS

AVON PHIL. CORP

Analysis of Chilled Water and HVAC Plant with RBS as Consultant 2006

HVAC system design consultant

CONSULTANCY SERVICES FOR CHILLERS OF THE BATANGAS PLANT

First Philippine Industrial Park Batangas, Sto Tomas | January 2021 to April 2021

PHILIP MORRIS

- RBS is the HVAC PME Engineering Consultancy Services for the Optimization, Trouble-shooting and retrofit for the Chilled water system, Air Side AHUs and Cleanrooms, and Controls system designer for the Plant.

  Project starts Dec 1, 2020.

CFD AND DESIGN CONSULTANCY SERVICES FOR DESIGN OF GLAS TOWER PROJECT

Ruby St, Ortigas Commercial Center | Aug 2020

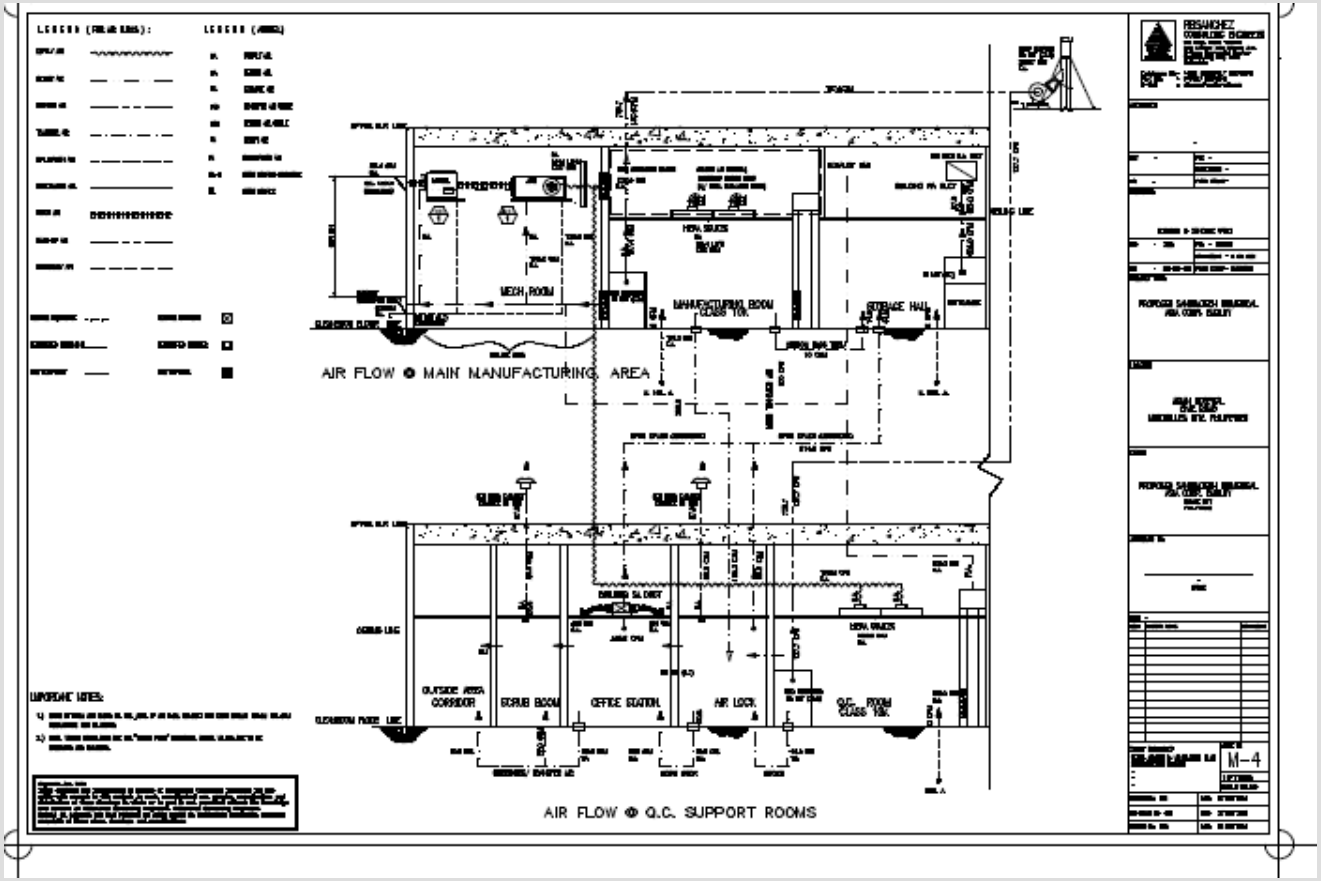
- RBS is the HVAC System Design Engineer and PME CFD Consultant. For the first double-glazed, triple Low-E glass tower in Ortigas @ 188-meter with are of 102,000 square meters with 9MW gensets.

  Multi use building for BPOs, Offices and Hotel. (Year 2020)

DESIGN AND CONSULTANCY OF SANGRATECH INC. BIO-MEDICAL CLASS 100 CLEANROOMS FOR BLOOD TRANSFUSIONS/STERILIZATION

Asian Hospital, Alabang, Muntinlupa City, Metro Manila

- SANGRATECH INTERNATIONAL CORP. CLEANROOM DESIGN FOR HVAC.

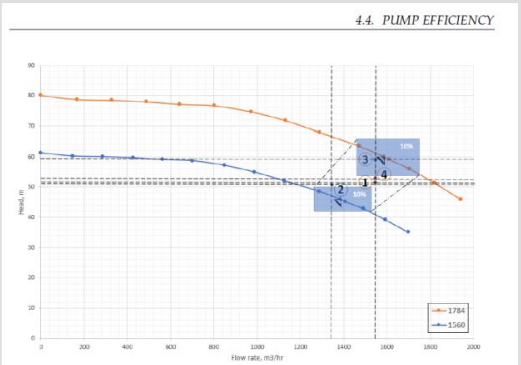


CONSULTANCY SERVICES AND PUMP PERFORMANCE ASSESSMENT AND RE DESIGN OF TWELVE (12) METRO MANILA PUMP STATIONS

Maynilad Pump Stations in Metro Manila and Cavite | December 2018 to October 2019

- RBSanchez Inc. is the Mechanical Consultant for the Maynilad Water System Assessments, measurements and analysis for 120 pumping units in various pumping stations for a total of 120 large water pumps under the GHD contract.

RBSanchez Inc. was also tasked by GHD to select and manage electrical consultant as subcontractor.



DESIGN OF 200TR “PAINT BOOTHS” HVAC FOR MAU “ONCE THROUGH” AND “CHILLERS IN SERIES”

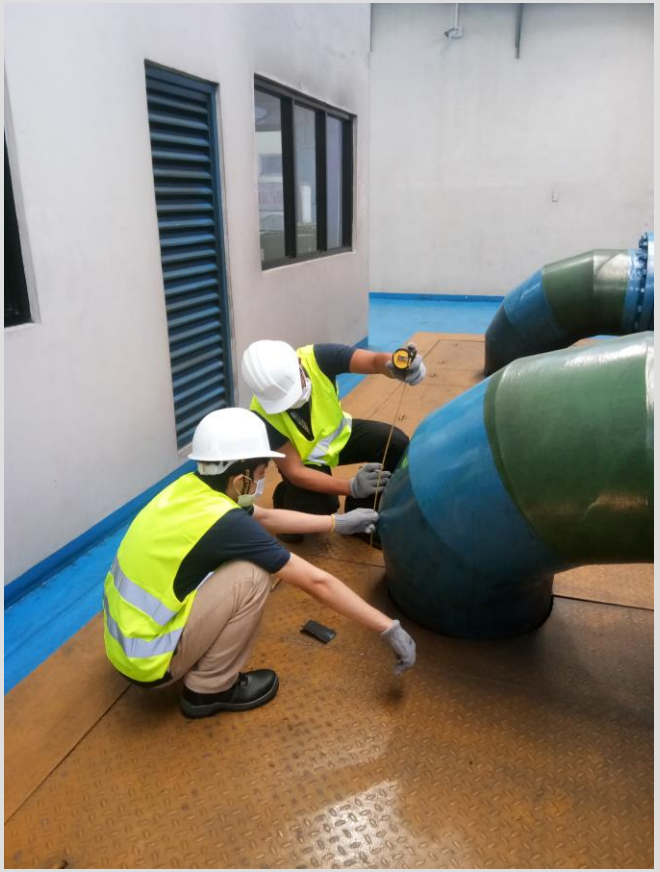
Toyota Special Economic Zone, Sta. Rosa, Laguna

- RBS Design of Plant HVAC with Xtreme Engineering for “Once Through” and “Chillers-in-Series and MAU/AHUs design for 100% Fresh air supply for the Paint Spray Booths car painting works.
- RBS is the HVAC system design consultant.

OTHER SERVICES DONE FOR MAYNILAD :

ULTRASONIC PIPE THICK NESS MONITORING, VIBRATION ANALYSIS, LIGHTHING ASSESSMENT, RELIABILITY CENTERED MAINTENANCE RCM 2 ASSESSMENT FOR LONG TERM ASSET MANAGEMENT SERVICES.

Maynilad Pump Stations in Manila and Cavite | 2019



CONSULTANCY SERVICES AND PUMP PERFORMANCE ASSESSMENT OF 120 PUMPS IN MAYNILAD PUMPING STATIONS

Maynilad Pump Stations in Metro Manila and Cavite | 2019

Synthesis Report

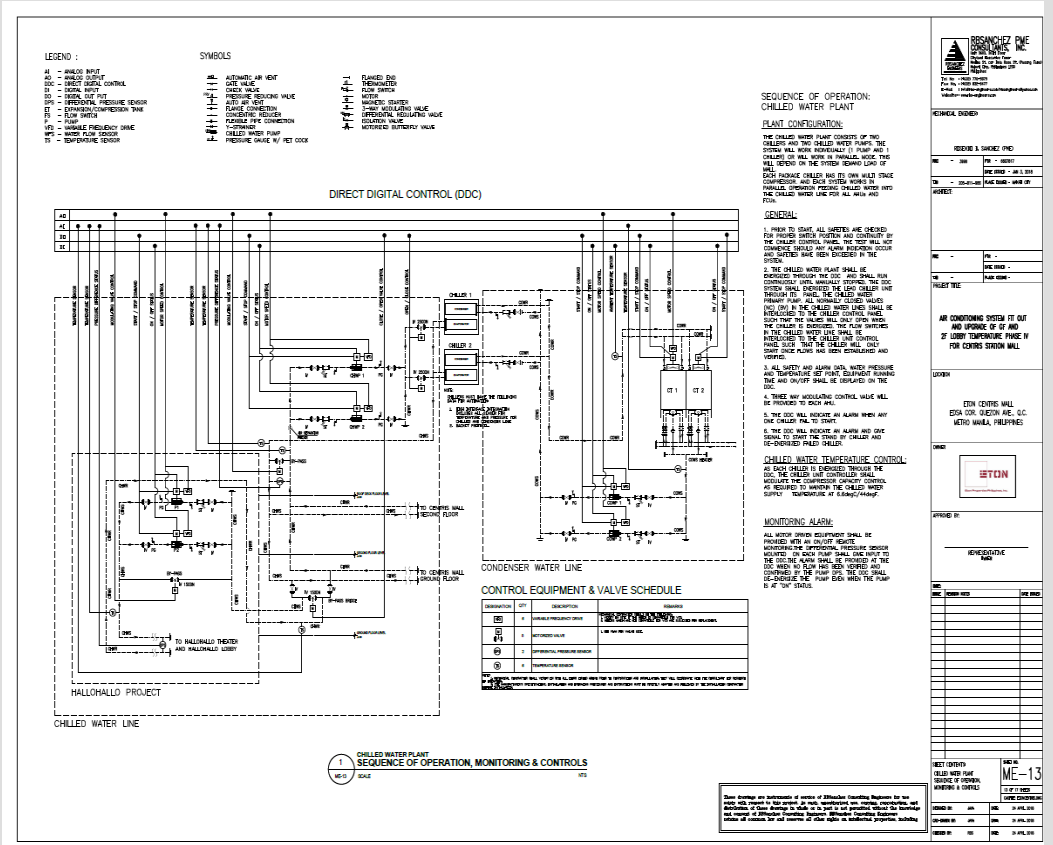
Filter: Equipment name (+) \ Tree order (+)

Location	Equipment	Diagnosis		Recommendations
		Previous Date	Current Date	
PAGCOR\	BOOSTER PUMP #1		FAIR 15/11/2018 10:55:42 Oper. Oper. DfCnd Misalignment and Pump cavitations	Realign Motor and Pump Shaft
PAGCOR\	BOOSTER PUMP #2		FAIR 15/11/2018 10:52:36 Oper. Oper. DfCnd Pump Bearings Fault - Lubrication	Purge Pump Bearings with fresh greases
PAGCOR\	BOOSTER PUMP #3		FAIR 15/11/2018 10:49:19 Oper. Oper. DfCnd Misalignment and Pump Cavitations	Realign Motor & Pump Shaft, Monitor Cavi
PAGCOR\	BOOSTER PUMP #4		GOOD 15/11/2018 10:46:08 Oper. Oper. DfCnd Vibrations are within acceptable levels	Continue monitor vibrations periodically
PAGCOR\	BOOSTER PUMP #5		FAIR 15/11/2018 10:40:18 Oper. Oper. DfCnd Pump Cavitations & Bearing Noise at Pump	Monitor the evolution
PAGCOR\	BOOSTER PUMP #6		FAIR 15/11/2018 10:36:28 Oper. Oper. DfCnd Pump Cavitations & Pump OB Brg Noise	Monitor Slight cavitations
PAGCOR\	STORAGE PUMP #1		FAIR 15/11/2018 11:02:24 Oper. Oper. DfCnd Misalignment and Pump Cavitations	Realign Motor and Pump Shaft
PAGCOR\	STORAGE PUMP #2		FAIR 15/11/2018 10:59:20 Oper. Oper. DfCnd Pump Cavitations	Monitor the evolution

DESIGN AND CONSULTANCY FOR THE BMS CONTROLS AND INSTRUMENTATION OF CENTRIS STATION MALL

Quezon Ave, Diliman, Quezon City, M. Manila | 2019 to present

RBSanchez Inc. is the HVAC system design consultant and BMS controls system



DESIGN AND OPERATIONS SERVICES

FABRICATION PLANT FAB 1 SEMICONDUCTOR

- Supply of HVAC Design Consultancy and Chiller Operations Services in Cleanroom environments

  Laguna Technopark, Biñan, Laguna

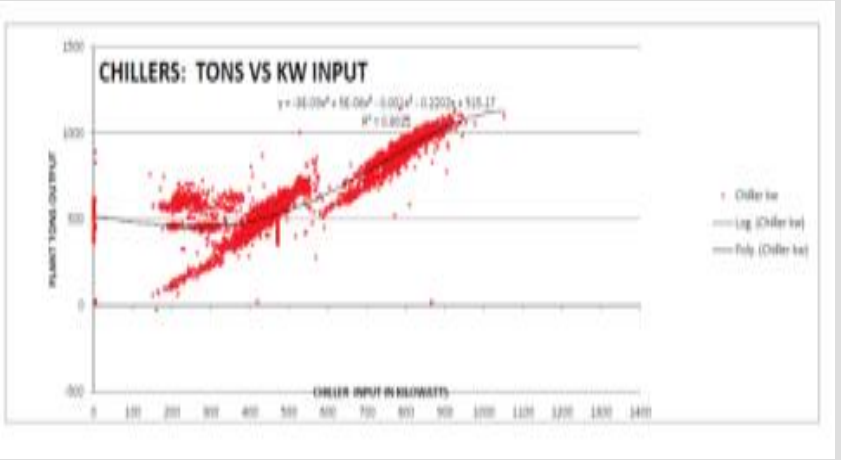
RBS has own personnel deployed on-site from Years 2007-2014 on a non-stop on a 24/7/365 basis.

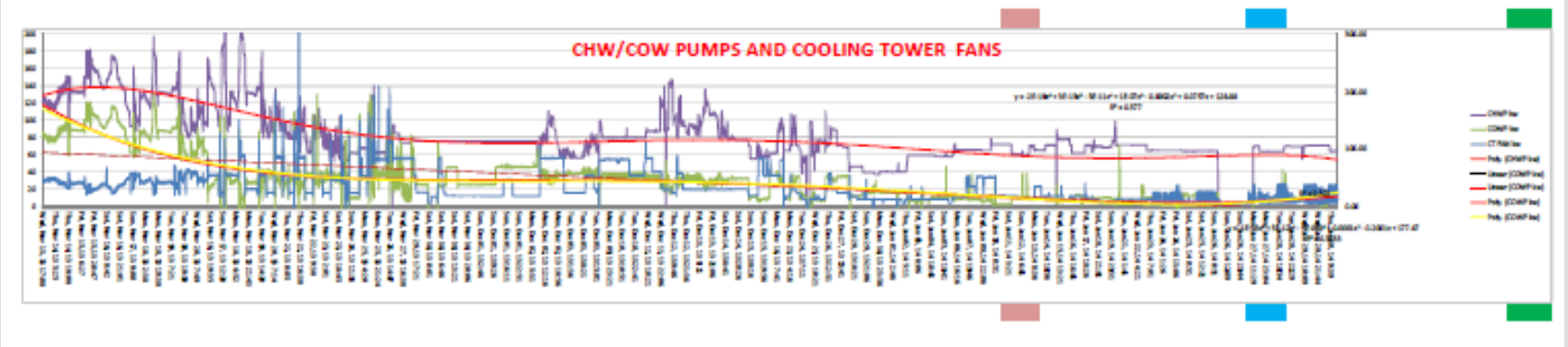
CONSULTANCY SERVICES FOR THE CHILLER PLANT SYSTEM HVAC ENERGY OPTIMIZATION

FPIP, Sto.Tomas , Batangas

PHILIP MORRIS

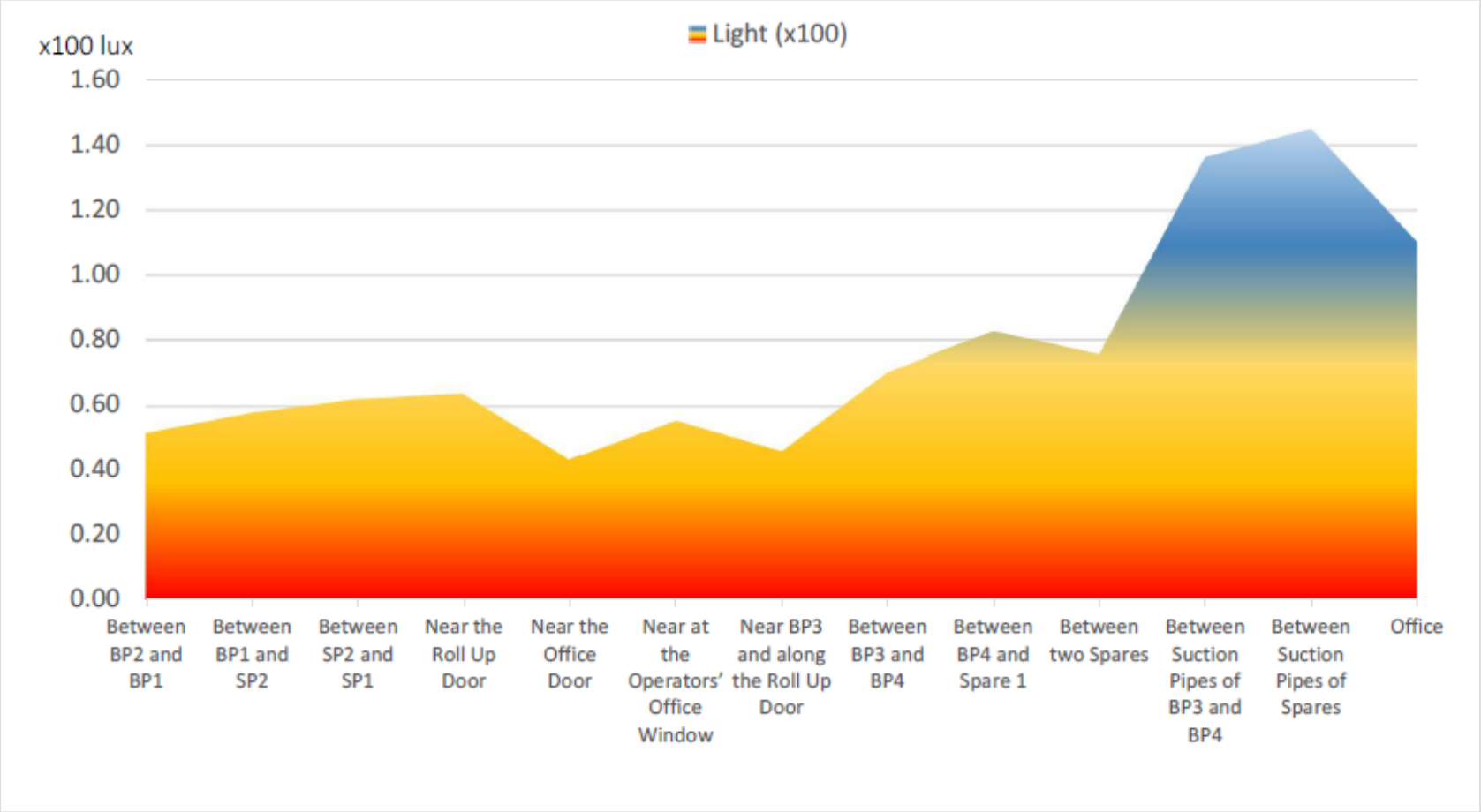
- The HVAC optimization and control system design results to drop in energy consumption and optimization of operations of the plant as shown.
- The optimization also recommended the removal of the primary pumps of chiller plant leading to drop in energy consumption.





ENVIRONMENTAL AND MAINTENANCE ASSESSMENT OF MAYNILAD PUMP STATIONS IN METRO MANILA

Maynilad Pump Stations in Manila and Cavite | 2019



MODCO DESIGN AND OPERATIONS CLEANROOM SERVICES

SUNPOWER®

East Main Ave, Laguna Technopark Sta. Rosa, Laguna

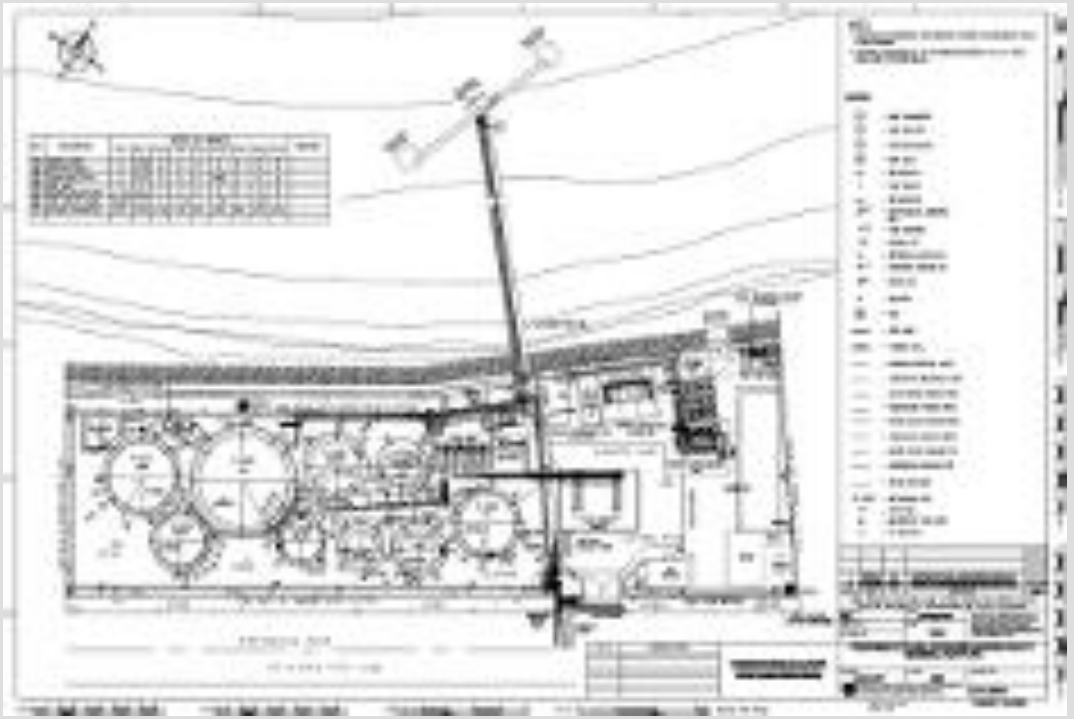
- **MODCO MODULE SEMICON SunPower Corporation**
  Supply of HVAC Consultancy and Trane Chiller Operations Services for MODCO Module Manufacturing Plant

  RBS has own personnel deployed on-site from Years 2007-2016 on a non-stop on a 24/7/365 basis.

ILIGAN LANAO SHELL TERMINAL ETHANOL AND BLENDING FACILITY

Iligan, Lanao del Norte

- Mechanical Design and Consultancy of the Iligan Depot Ethanol and Blending Facilities.



CONSULTANCY SERVICES OF THE FIRE-TUBE BOILER REINSTALLATION

PMFTC Plant C&D, Marikina, Manila | Sept 2019

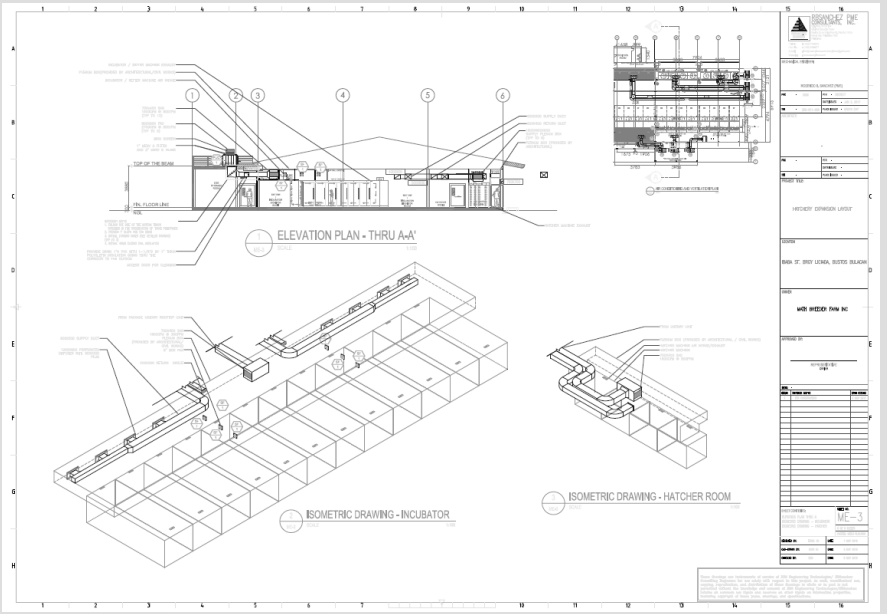
- Consultancy services and management of various teams and discipline for the boiler transfer from Batangas Factory to Marikina Factory. The project management includes the decommissioning phases, system passivation, packaging, hauling and transport, installation, testing and commissioning works in conformance to local standards and codes.

DESIGN AND CONSULTANCY FOR THE HVAC OF BULACAN HATCHERY BREEDER FARM

Math Breeder Farm Inc., Bustos, Bulacan | 2019

- Design and consultancy services for a cleanroom HVAC. Math Breeder Farm is biological area serving setters and hatchers of chicken and egg.

- RBSanchez Inc. is the HVAC system design consultant of the Math Breeder Farm.



DESIGN, CONSULTANCY AND ANALYSIS OF HGA-15 CLEANROOM HVAC SYSTEM FOR HITACHI GLOBAL TECHNOLOGIES

HGST, Laguna Technopark, Biñan, Laguna | September 2014

- HVAC Analysis and Consultancy for System retrofit for Class 10,000 cleanroom to balance airflows among three (3) air handling units, resizing of fans, ducting, ACH, cooling and ensure proper room pressurization for the 1,150 sqm cleanroom space.

- RBSanchez Inc is the Mechanical Systems Design Consultant of HGST Philippines.

REDESIGN OF PROBLEMATIC MAU AND AHU SYSTEM OF CLEANROOMS HGA-14 FOR HITACHI GLOBAL TECHNOLOGIES

HGST, Laguna Technopark, Biñan, Laguna | December 2012

- Psychrometric design and specifications of coil for Make-up Air units, ducting and fan systems to enable accurate relative humidity control without the use of reheat. Ensure even cleanroom room temperature, uniform movement, and balance cooling.

- RBSanchez Inc is the Mechanical Systems Design Consultant of HGST Philippines.

RBSanchez PME Consultants & Associates, Inc.

DESIGN FILE OF CLEAN ROOM HGA-14 AIR-CONDITIONING
AND VENTILATION DESIGN
FOR HGST PLANT, LAGUNA TECHNOPARK, BINAN, LAGUNA

DOCUMENT FILE NAME: Clean Room System Design Report

RBS JOB NO: RBS-CR-003

DESCRIPTION	DATE	AUTHOR	CHECKED BY	APPROVED BY	REV
Issuance to Client for Review Comments/Approval	21 January 2014	Engr Arnold Ampiz	Engr RBSanchez	GHHGST	0

KARFT FOODS HVAC DESIGN OF PHASED COOLING OF FOOD GRADE CHEESE COOLING TUNNEL PRODUCTION LINE

CLASS 10K CLEANROOMS OF KRAFT FOOD CORP

RBS Design of New Chilled Water Plant and COOLING TUNNEL DESIGN with Trane Phils. Inc. with Air cooled 230 ton TRANE chillers

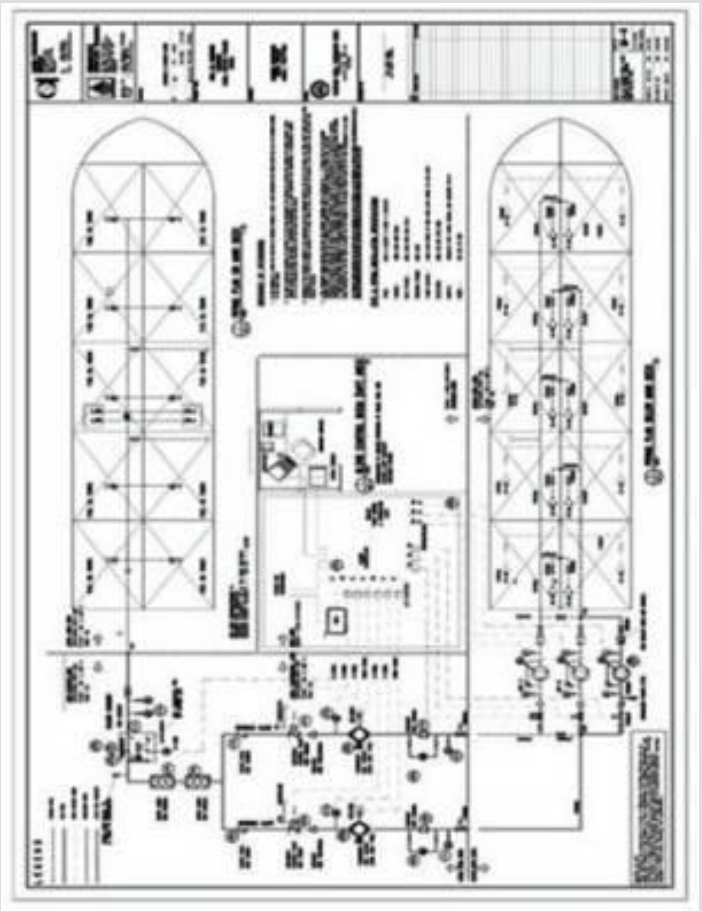
2007 HVAC system design

SHELL SWIFT PROJECT VESSELS

DESIGN OF INSTRUMENTATION, PUMPS & PIPING FOR FUEL OIL BLENDING FACILITIES FOR PANDACAN TERMINALS

Pandacan, Metro Manila

- A Shell Marine Swift project, of pump and piping design project for the fuel oil blending of four (4) vessel designs of Floating Fuel Oil Blending Facilities for transfer of Pandacan Terminals is a design project of RBS Engineering (now RBSanchez Inc).



DESIGN AND CONSULTANCY OF LITHIUM-BROMIDE STEAM ABSORPTION INDUSTRIAL CHILLER SYSTEM

Bagumbayan, Libis, Quezon City, Metro Manila

OLEO-FATS INCORPORATED

- Design and Installation of green energy lithium-bromide steam absorption chiller for the Oleochemical Processing Plant's HVAC system.

Lithium-Bromide STEAM ABSORPTION CHILLER & HVAC SYSTEM (800 TONS) OLEO-FATS INC.

HVAC AND CHILLER PLANT ENERGY OPTIMIZATION FOR THE MANILA COATS TEXTILE PLANT

Marikina City, Marikina Metro Manila

- The HVAC optimization yields to a savings of Php 480k per month of MERALCO bills (See letter from Coats Manila Bay Inc.). RBSanchez Inc. is the Mechanical Design Consultant for Manila Coats.

Coats
Manila Bay

Coats Manila Bay, Inc.
Lopez Jaena Street
Tañong, Marikina City 1804
Philippines
Tel. No.: (632) 941-9590 to 99
General Fax: (632) 941-3677

MR. RENE LAFIGUERA
Facilities Manager
MANILA BAY SPINNING MILLS INC.
COATS MANILA BAY INC.

12th January 2006

SUBJECT: PROJECT REFERENCE PERMISSION

"RBS Engineering Technologies (through the consultancy services of Engr Rosen Sanchez) was able to save our company a total of 120,000 kilowatt-hours of energy (Savings approx @Pesos 4.00 /kw-hr = PHP480,000.00 / month) for every month of operation".

"We are pleased with their in-depth analysis and low-cost yet effective solutions they have recommended in improving our plant's energy efficiency."

I hereby give my consent for RBS Engineering Technologies or its assignees to use my comments quoted above for the purpose of reference. I understand that I will receive no payment or compensation for this permission.

MR. RENE LAFIGUERA
Facilities Manager
MANILA BAY SPINNING MILLS INC.
Lopez Jaena St, Bo. Tanong, Marikina City
Metro Manila, Philippines (Tel Nos. 941-9590 to 99)

CONSULTANCY SERVICES FOR THE DESIGN OF TOBACCO DRYER and LEAF DRYING FACILITIES

PMFTC Cagayan De Oro, Misamis Oriental | June to August 2019

- RBSanchez Inc. is the Dryer Leaf HVAC Design Consultant.

  The dryer must perform and adapt to the product specs and ambient conditions at all times of the year, to minimize the losses due to over and under/over drying of tobacco leaves through different phases and air conditions.

CONSULTANCY SERVICES FOR DISCUSSIONS WITH NINE (9) PHILIP MORRIS PLANTS WORLDWIDE

PMFTC Plant C&D, Marikina, Manila | Year 2019

- RBS services includes the Training and Discussion groups on Energy Savings schemes for HVAC Chillers Systems, Boilers and Compressed Air for Plant operation, Maintenance and Energy Efficiency Optimization.

  Held in PMFTC Marikina Plant with thirty (30) Philip Morris Plant Engrs (Local and Foreign) in attendance.

Affiliate	Location
Pakistan (Sahiwal)	Sahiwal
Russia (Izhora)	St. Petersburg
Russia (Kuban)	Krasnodar
Kazakhstan (Almaty)	Almaty Oblast
Ukraine (Kharkiv)	Kharkiv
Turkey (PHILSA)	Izmir
Indonesia (Sukorejo)	Sukorejo
Indonesia (Karawang)	Karawang
Korea (Sanmak)	Yangsan-si, Gyeongsangnam

DESIGN AND CONSULTANCY OF NEW FOOD GRADE 10K CLEANROOMS FOR NESTLE WYETH

Canlubang Factory, Cabuyao, Laguna

- Psychrometric design and specifications of coil for Make-up Air units, CLEANROOM Class 10000, food grade for AHU and coli selection and equipment, ducting and fan systems to enable accurate relative humidity control without the use of reheat. Ensure even cleanroom room temperature, uniform movement, ACH and balance cooling.
- Nestle Wyeth Canlubang Plant is a food-grade milk canning and dryer cleanrooms with AHU and fresh air system design.

DESIGN AND CONSULTANCY OF NEW HVAC CHILLER PLANT SYSTEM and MEDICAL 10K CLEANROOMS

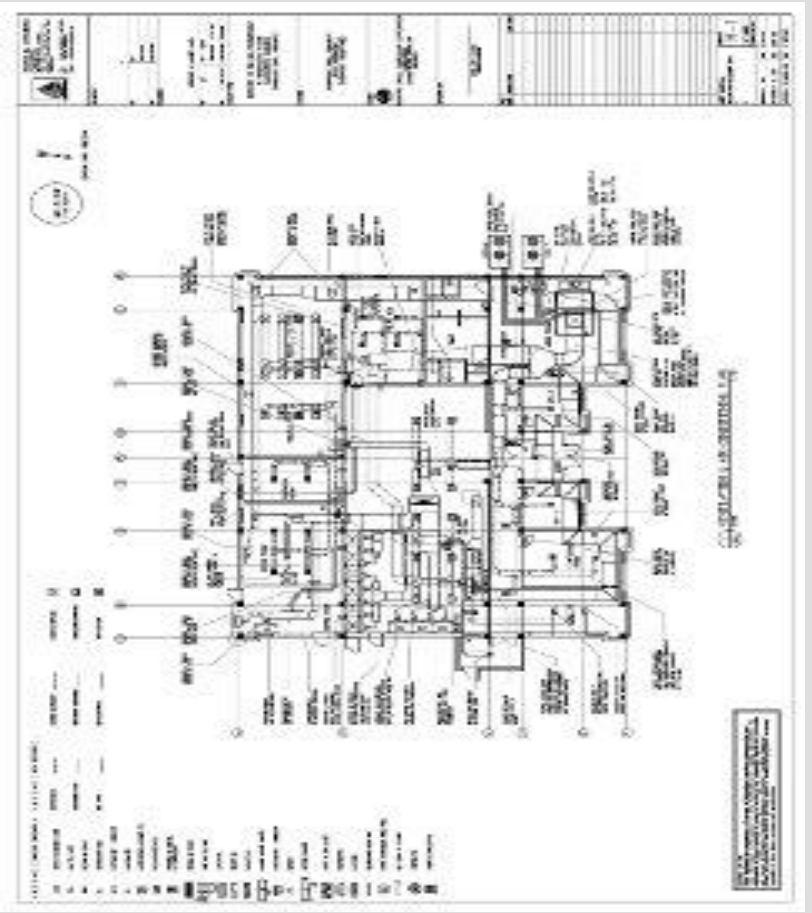
Laguna Technopark, Biñan, Laguna

- Design and Installation of new chiller system including the piping and pumping system, air handling units, and fan coil units for cleanrooms as well as the control systems for the Terumo Plant.

SHELL TABANGAO OIL REFINERY
DESIGN OF SHELL LABORATORY HVAC AND AIR AND EXHAUST SYSTEM

Tabangao Refinery, Batangas

- An HVAC and Exhaust Design system for toxic fumes ventilation system at Pilipinas Shell Petroleum Oil Refinery.



DESIGN AND CONSULTANCY FOR THE HVAC CLEANROOMS AND FIRE PROTECTION OF NEW PEPSICO SNACK PLANT

PEPSICO INTERNATIONAL

PEPSI Snack Plant Cabuyao, Laguna

- RBSanchez Inc. is the HVAC Design Consultant and Fire protection system design engineer for the New PEPSICO Pepsi Snack Plant Clean rooms food grade for a total of 15,000 sqm.

DESIGN AND CONSULTANCY OF HVAC SYSTEM FOR INDUSTRIAL TEXTILE PLANT WITH EVAPORATIVE COOLING WASHERS

FTI Complex, Taguig, Taguig

- HVAC Design and consultancy services for PENN Philippines Textile plant with Evaporative Washers and 430-TR Trane Chillers.

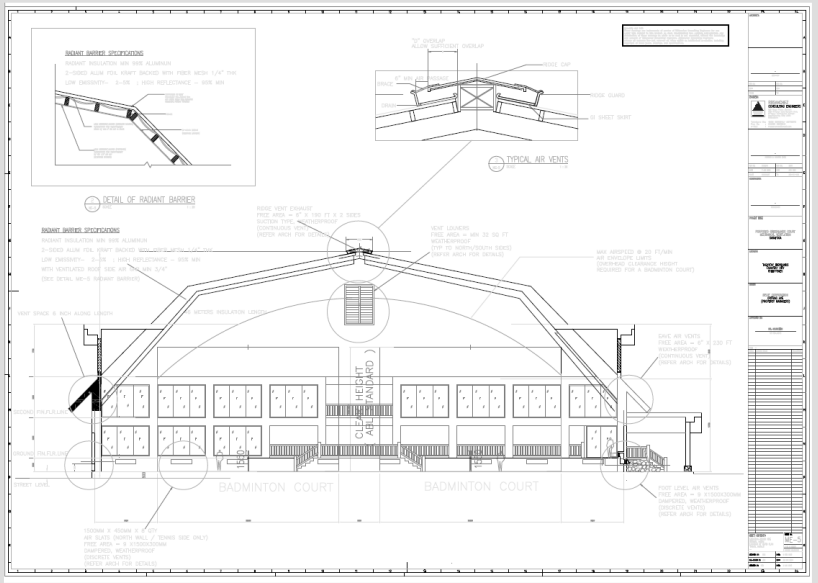
CFD DESIGN AND CONSULTANCY

"GREEN" NATURAL VENTILATION

TAGAYTAY HIGHLANDS BADMINTON COURT

Tagaytay City | 2006

- RBSanchez Inc. is the HVAC Design Consultant for the CFD NATURAL VENTILATION DESIGN OF THE SIX (6) INDOOR BADMINTON COURTS



DESIGN AND CONSULTANCY OF NEW AIR-COOLED CHILLED WATER PLANT FOR CLEANROOMS

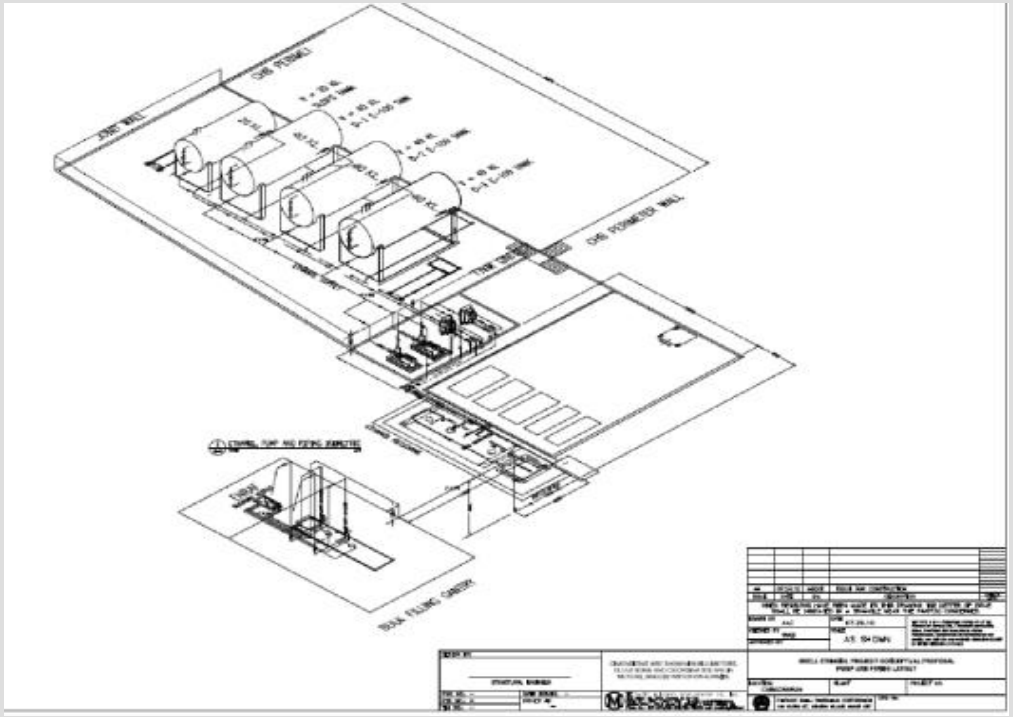
Corinthian Plaza, Legazpi Village, Makati, Metro Manila

- Design and consultancy services for the new 120-TR air cooled chilled water plant with new AHU and ducting system for the Rolex Corinthian Plaza.

CONSULTANCY SERVICES FOR THE SHELL AGUSAN TERMINAL NEW PUMPING FACILITIES

Cabadbaran, Agusan, Mindanao

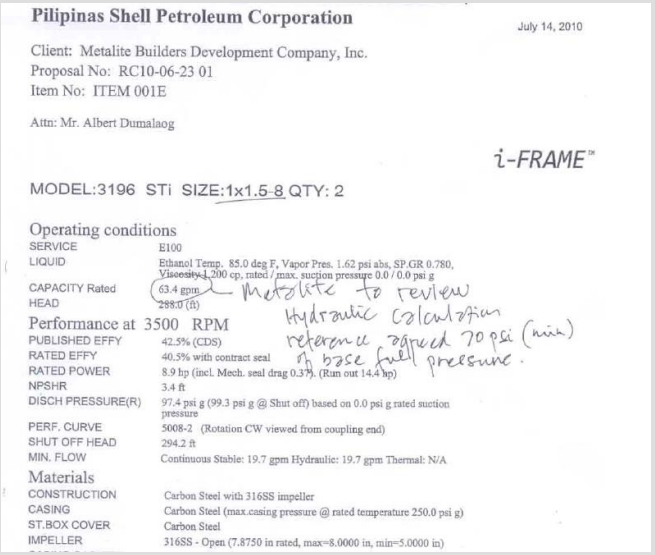
- Mechanical Design and Consultancy of the new **SHELL PUMPING FACILITIES,** The design of Shell Ethanol and Blending Storage Facilities in Cabadbaran, Agusan, Mindanao



CONSULTANCY SERVICES FOR NEW SHELL CAGAYAN DE ORO PUMPING FACILITIES

Cagayan de Oro

- Mechanical Design and Consultancy of the new **SHELL PUMPING FACILITIES,** The design of Shell Ethanol and Blending Storage Facilities in Cagayan de Oro Shell Depots



Pilipinas Shell Petroleum Corporation July 14, 2010

Client: Metalite Builders Development Company, Inc.
Proposal No: RC10-06-23 01
Item No: ITEM 001E

Attn: Mr. Albert Dumalaog

i-FRAME™

MODEL:3196 STi SIZE:1x1.5-8 QTY: 2

Operating conditions

SERVICE	E100
LIQUID	Ethanol Temp. 85.0 deg F, Vapor Pres. 1.62 psi abs, SP.GR 0.780, Viscosity 1.200 cp, rated / max. suction pressure 0.0 / 0.0 psi g
CAPACITY Rated	63.4 gpm
HEAD	288.0 (ft)

Metalite to review
Hydraulic calculation reference agreed 70 psi (min) at base fuel pressure.

Performance at 3500 RPM

PUBLISHED EFFY	42.5% (CDS)
RATED EFFY	40.5% with contract seal
RATED POWER	8.9 hp (incl. Mech. seal drag 0.3%). (Run out 14.4 hp)
NPSHR	3.4 ft
DISCH PRESSURE(R)	97.4 psi g (99.3 psi g @ Shut off) based on 0.0 psi g rated suction pressure
PERF. CURVE	5008-2 (Rotation CW viewed from coupling end)
SHUT OFF HEAD	294.2 ft
MIN. FLOW	Continuous Stable: 19.7 gpm Hydraulic: 19.7 gpm Thermal: N/A

Materials

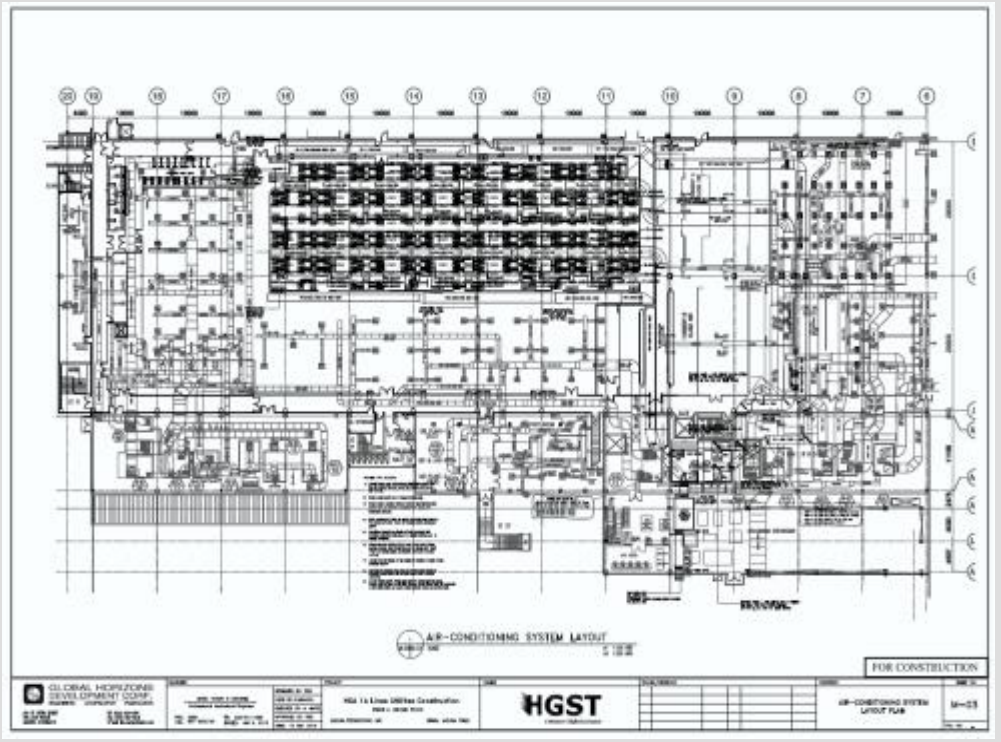
CONSTRUCTION	Carbon Steel with 316SS impeller
CASING	Carbon Steel (max.casing pressure @ rated temperature 250.0 psi g)
ST.BOX COVER	Carbon Steel
IMPELLER	316SS - Open (7.8750 in rated, max=8.0000 in, min=5.0000 in)

DESIGN AND CONSULTANCY OF A CLEANROOM HVAC SYSTEM FOR HITACHI GLOBAL TECHNOLOGIES

HGST, Laguna Technopark, Biñan, Laguna | May 2014

- Complete HVAC System design for a CLASS 1000 1,200 sqm cleanroom with a 750 kVA equipment load to ensure moisture balance and uniform cooling and room pressures, and controllable relative humidity without the use of 65 kW Reheat.

- RBSanchez Inc is the Mechanical Systems Design Consultant of HGST Philippines.



DESIGN AND CONSULTANCY OF THE NEW FILINVEST FESTIVAL SUPERMALL EXPANSION

Fil-Invest Festival Mall, Alabang, Muntinlupa

- The Fil-Invest Festival Supermall is a 12.5 hectares air conditioned area and the first mall in the Philippines with a low energy-friction drop chilled water piping system, using reverse-return piping technique of a

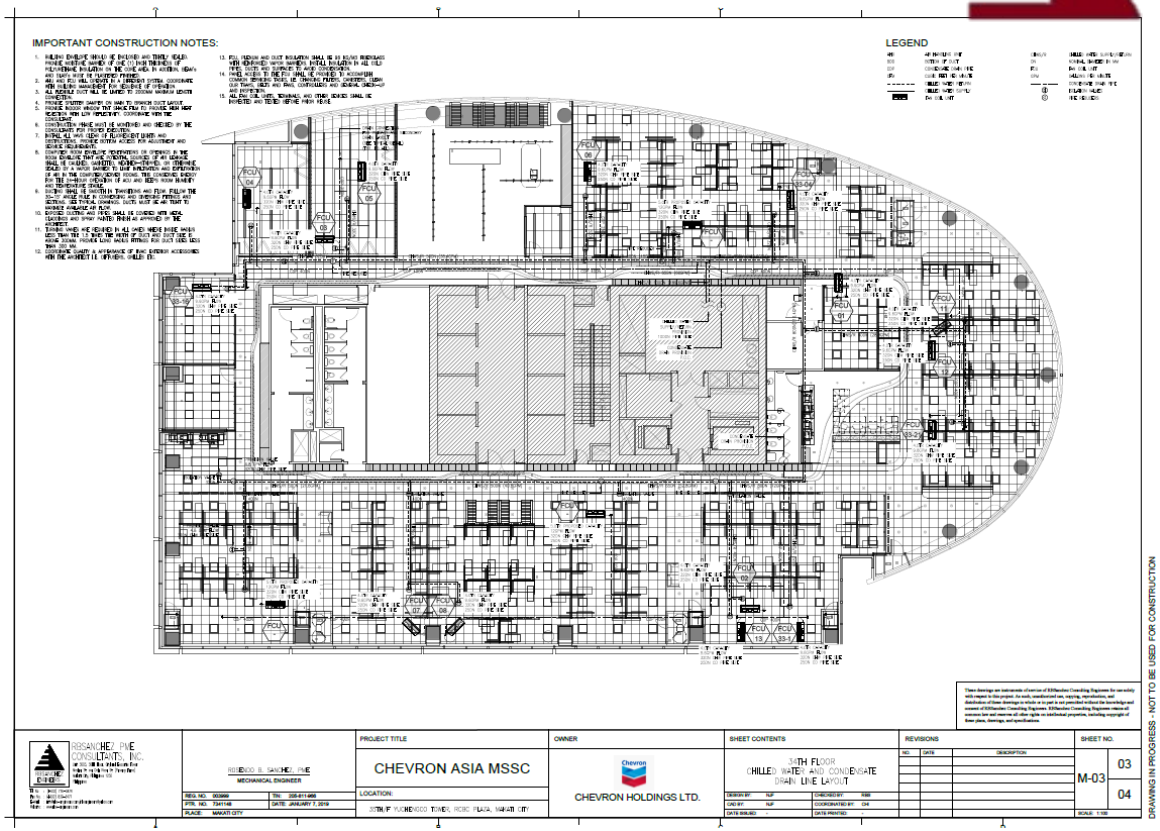
  5,350-TON dual-compressor chiller plant design.

- RBSanchez Inc was subcontracted by AECOM Inc to serve as its HVAC System Design Consultant for the Year 2012 to 2016.

DESIGN AND CONSULTANCY FOR CHEVRON MSSC OFFICES HVAC SYSTEM – PHASE 2

RCBC Plaza, Makati, Manila | September 2019 to February 2020

- **System HVAC Design and Consultancy services**
- **RBS was also tasked to handle Testing And Commissioning Services**



BPO COMMERCIAL BUILDING HVAC DESIGN AND CONSULTANCY OF THE MERIDIAN PLAZA

Double Dragon Plaza, Pasay City, Manila

- RBSanchez Inc is the HVAC system design engineer and consultant for the 278,131 sqm for a total of 11 floors of the Double Dragon Plaza located at Edsa Extension corner D. Macapagal Avenue in Pasay City near the Mall of Asia.

DESIGN AND CONSULTANCY FOR DESIGN OF THE NEW CHILLED WATER PLANT

San Jose del Monte City, Bulacan

- Design and Consultancy services for the Upgrade of HVAC DX System to a new Chilled Water Plant for the 50,000 sqm commercial mall.
- RBSanchez Inc. is doing the complete design and consultancy services for the Manuela Properties.

Surviving starmall
MANUELA CORPORATION

COMMENDATION

Presenting this commendation to Engr. Rosendo B. Sanchez (PME) for exemplary handling airconditioning system design in our San Jose del Monte, Bulacan Starmall. Despite the challenges of high ceilings and with no place for additional ducts within corridors nor ceiling cavities, he managed to find a way to make the airconditioning system work. Furthermore, he made it in such away that the duct and piping design blended well with the architectural requirements ,thus minimum renovations were made resulting to a lower cost.

The quality of air inside the mall is now undeniably better, requiring just a slight air movement and pressure, producing a comfort cooling inside without draft and moisture problem.

Overall, we are very satisfied with the work he has done. Engr. Sanchez proved to have an in- depth HVAC knowledge, and could take up unconventional challenges.

GIVEN THIS 27TH DAY OF MAY 2013

STARMALLS INC.

WORLD WIDE CORPORATE CENTER

SHAW BLVD. MANDALUYONG CITY

BY: MR. JERRY M. NAVARRETE

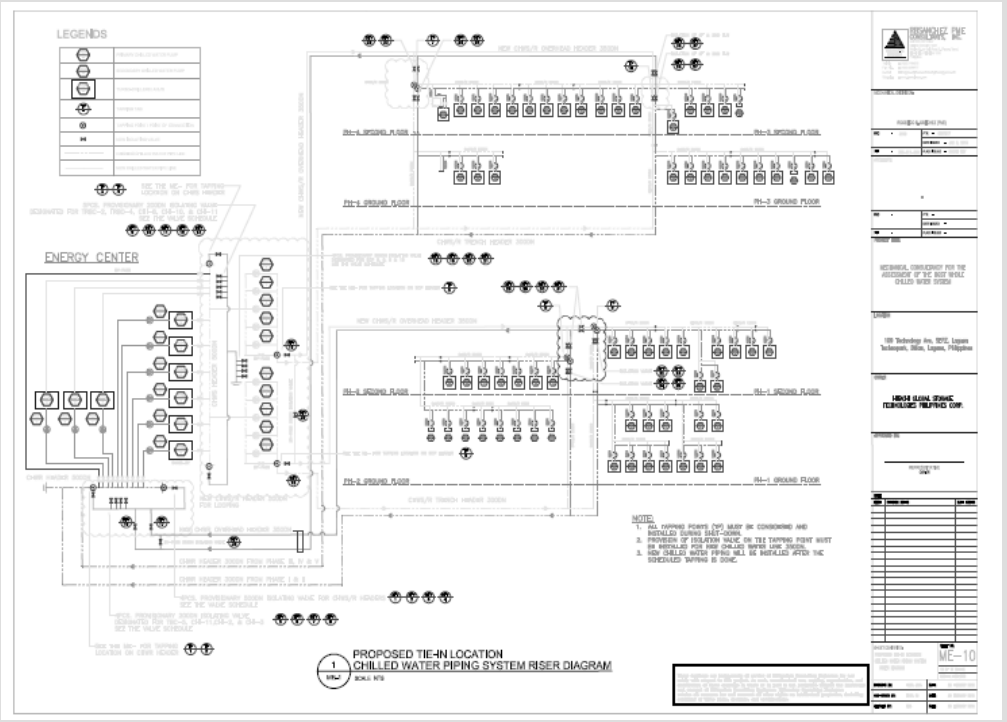
PRESIDENT

DESIGN AND CONSULTANCY OF WHOLE PLANT HVAC CHILLED WATER SYSTEM OPTIMIZATION

HGST, Laguna Technopark, Biñan, Laguna | 2018

- Chilled water equipment system redesign of existing main chilled water pipeline supply and return, sub-branches & main chilled water pipeline in Phase 1-5.

- RBSanchez Inc is the Mechanical Systems Design Consultant of HGST Philippines Year 2020.



DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF STARMALL PRIMA TAGUIG

Levi Mariano Ave., Taguig, Metro Manila | June 2017

- RBSanchez Inc. is the HVAC Design Consultant for the Starmall Prima Taguig located at L. Mariano Ave. Taguig beside Camella Greenville and Pacific Residences.

CONSULTANCY SERVICES FOR HVAC

- **ASCOTT HOTEL AND GLORIETTA 4 HVAC SYSTEM**
  HVAC Consultancy and Chiller Operations/Maintenance. RBS has technical personnel deployed on-site on a 24/7/365 basis.

- Years 2007-2018

BPO HIGH RISE BUILDING HVAC DESIGN AND CONSULTANCY OF A ARANETA CYBERPARK TOWER 2

Araneta Center, Cubao | Years 2016 to 2017

- HVAC Design Engineer and Consultancy for Mechanical Plant Systems of Araneta Cyberpark Tower 2 of a total of 86,689 sqm high rise building.

Cyberpark
ARANETA CENTER

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF ROBINSONS MALL ORMOC

Carigara, Ormoc City, Leyte | 2016

ROBINSONS LAND CORPORATION

YOUR DREAMS, OUR FOUNDATION.

- RBSanchez Inc. is the HVAC Design Consultant for the 35,80 sqm mall building at Ormoc, Leyte.

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF NCCC MALL BUHANGIN

Buhangin District, Davao City, Davao del Sur | 2016

- RBSanchez Inc. is the HVAC Design Consultant for the 26,704 sqm commercial mall building, New City Commercial Corp. located at Davao City, Davao del Sur.

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF ROBINSONS TACLOBAN TERMINAL

Tabuan, Marasbaras, Tacloban City, Leyte | 2017

- RBSanchez Inc. is the HVAC System Design engineer and consultant for the whole air-conditioning system of Robinson's Place Tacloban Terminal in Tabuan, Tacloban in Leyte.

HVAC DESIGN AND CONSULTANCY OF ALASKA HEAD OFFICES

RBS Design of New Chilled Water Plant and Cooling System of ALL Offices

2007 HVAC system design

DESIGN AND CONSULTANCY OF MEP FOR ST. LUKES HOSPITAL AT THE FORT

5th Avenue, Global City, Taguig, Metro Manila | 2008

- MEP Design and Consultancy Services of St. Luke's Medical Center Global City and RBS was subcontracted by Meinhardt Philippines Inc. for the designs analysis.

TESTING AND COMISSIONING OF CHILLED WATER SYSTEM AND AIR SIDE SYSTEM FOR ST. LUKES HOSPITAL AT THE FORT

5th Avenue, Global City, Taguig, Metro Manila | 2008

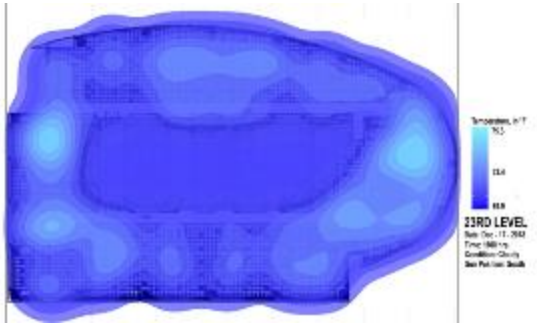
- HVAC Test and Commissioning Services and Consultancy to TRANE Philippines Inc for Chillers and Medical AHU systems

CHEVRON Inc. CONSULTANCY
PHASE 1

HVAC HEAT MAPPING, Analysis and Consultancy for the Improvement for Chevron BPO Offices, a 10,000 sqm, total of 12 floors in RCBC Building, Ayala, Makati CBD.

System consultancy for Cooling load Improvement, airflows of AHUs, fans, ducting, ACH, cooling and ensure proper conditions.

2018 December



RBSanchez PME Consultants & Associates, Inc.

DESIGN AND CONSULTANCY FOR AIR-CONDITIONING SYSTEM OF NATIONAL GRID CORP OFFICES

Quezon Ave. Diliman, Quezon City | 2015

- HVAC system design engineer and consultant for 1,400 sqm building using psychrometric design and specifications of coil for make-up air units, ducting and fan systems.

HVAC CONSULTANCY, OPERATIONS & MAINTENANCE SERVICES

- WELLS FARGO LLC **Wells Fargo** Drive, **McKinley** Hill, Upper **McKinley** Road, Taguig City, Metro Manila

RBS has personnel deployed on-site from Years 2017-2020 on a 24/7/365 basis.

MAINTENANCE SERVICES

- GLAXO SMITH KLINE

  Chino Roces Avenue, **Pasong Tamo** Ext. Makati City

RBS has own personnel deployed on-site from Years 20017-2019 on a non-stop on a 24/7/365 basis.

ENERGY SAVINGS AND MAINTENANCE SERVICES

- ROBINSONS MALLS MAGNOLIA

Aurora Boulevard, Q.C.

Supply of HVAC Consultancy and Trane Chillers Operators Maintenance Services from Year 2013-2019

DESIGN AND CONSULTANCY FOR CHILLED WATER SYSTEM AND PIPING FOR CHEESE CLASS 1K CLEANROOMS

Sucat, Parañaque City

- Design and consultancy for the cooling tunnel process for Class 1000 cleanrooms FOOD GRADE in Kraft Foods Inc. Plant.

- RBSanchez Inc. was also the HVAC system design consultant.

WG&A RELIABILITY CENTERED MAINTENANCE SERVICES (RCM) CONSULTANCY w/ FB AMARRA SERVICES.

- FB AMMARA and RBSANCHEZ jointly serves the Consultancy for the WGA SHIPPING LINES Cargo Handling Improvement Systems Operations at the PORT, PIER 15, MANILA.

  System consultancy for Improvement of availability and reliability of CARGO handling equipment of WG&A thru the DELMARINE CORP. for the nationwide expansion of shipping fleet of WG&A company (Year 2002-2003)

Delmarine Corporation

DESIGN OF NEW CHILLER, AHU AND CONTROL SYSTEM IN GLAXO SMITHKLINE INC. MEDICAL SUPPLIES

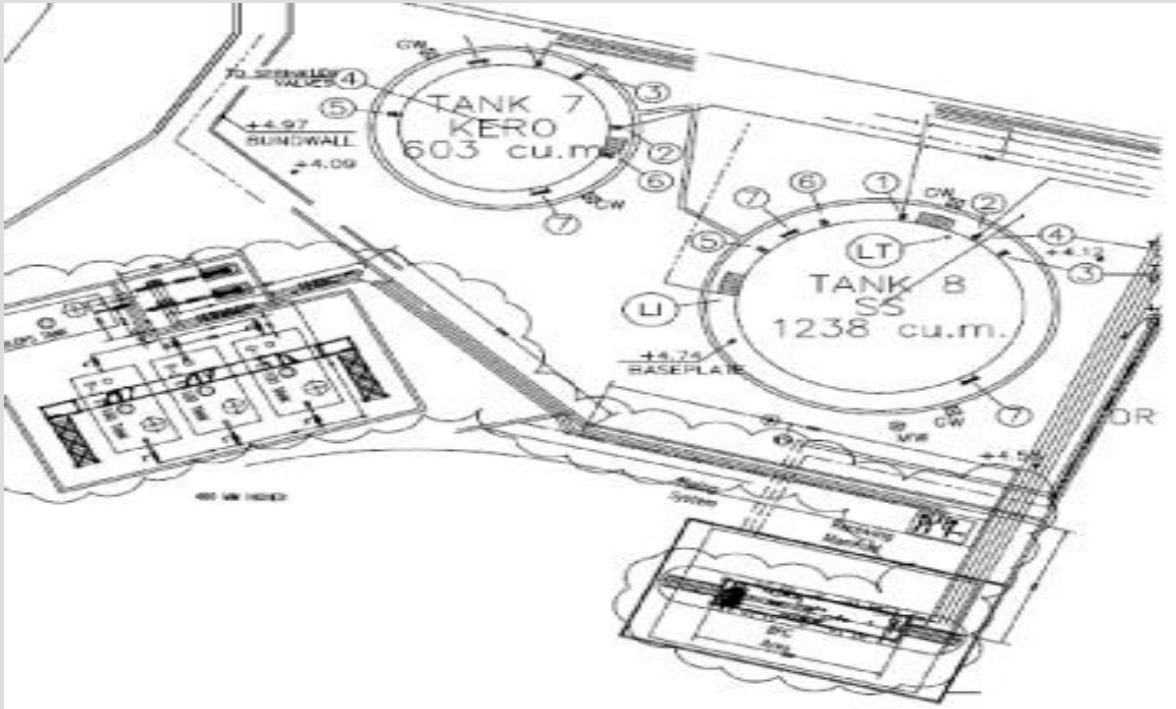
Chino Roces Ave., Makati City

- RBSanchez was the HVAC system design consultant of the new Chiller plant and AHU systems, including the pipe and pumping system, fan coil units and control systems of Glaxo SmithKline Inc.

NEW ANIBONG LEYTE SHELL ETHANOL PLANT

Anibong, Tacloban, Leyte

- Mechanical Design and Consultancy of the new Anibong Depot Ethanol and Blending Storage Facilities for SHELL Depot facilities.



DESIGN AND CONSULTANCY FOR NEW HVAC CHILLER PLANT OF STARMALL METROPOLIS

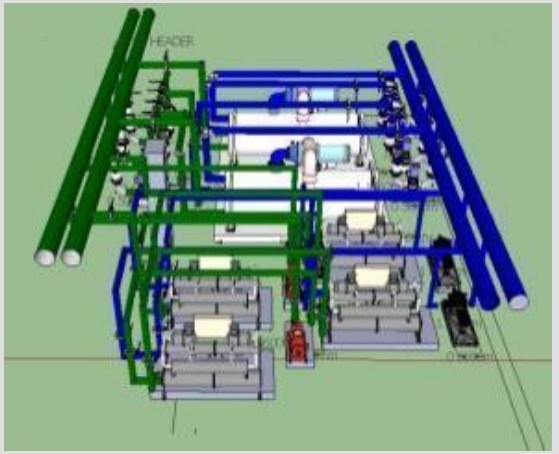
Alabang, Muntinlupa, Metro Manila | June 2012

- RBSanchez Inc. is the HVAC Design Consultant of brand new 4500 TR Chiller Plant yielding to save a Php 3M – 4M per month in actual MERALCO bills as per Starmall records.

DESIGN AND CONSULTANCY FOR NEW HVAC SYSTEM OF STARMALL EDSA

Mandaluyong, Metro Manila | June 2012

- Design and Consultancy Services for the Upgrade of Chiller System for the 50,000 sqm commercial mall. RBSanchez Inc doing the complete design and consultancy services. The design yields to a monthly savings of Php. 1.5M on MERALCO bills as per Manuela records.



RESIDENTIAL BUILDING HVAC DESIGN AND CONSULTANCY FOR SM BLOOM RESIDENCES

SM Bloom Residences, Parañaque City | 2017

- RBSanchez is the HVAC system design engineer and consultant for the 450,546 sqm residential building of SM Bloom Properties from the Year 2016 to 2017.

DESIGN AND CONSULTANCY OF CLEANROOMS FOR SMDC SHOWROOMS AT FMC PROPERTY

Chino Roces Avenue, Makati, Metro Manila | 2016

- Complete HVAC system design and consultancy services for the cleanroom designs of SMDC Showrooms at FMC Property.

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF ROBINSONS MALL SAN PEDRO

179 Manila S Road, San Pedro, Laguna | 2018

ROBINSONS LAND CORPORATION

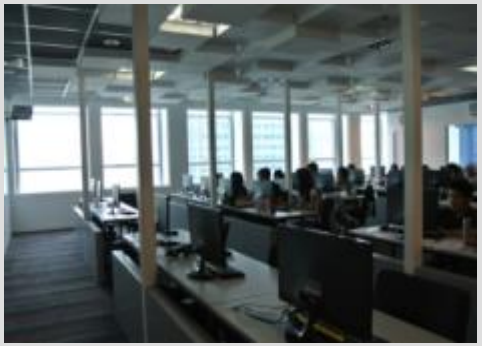
YOUR DREAMS, OUR FOUNDATION.

- RBSanchez Inc. is the HVAC Design Consultant for the 104,500 sqm mall building of Robinson's San Pedro.

DESIGN AND CONSULTANCY OF NEW FIRE PROTECTION SYSTEM OF OFFICE TOWER AYALA 6780

Ayala Avenue, Makati City, Manila

- Fire Protection System Design and Consultancy for the NEW Fire alarm and sprinkler, Fire Tank and Pump system of the 15-storey building as contracted by LANDEV Corp of RCBC Inc. Group.



CONSULTANCY FOR TROUBLE SHOOTING AND RETROFIT DESIGN FOR HVAC SYSTEM OF CENTURY HOTEL

FB Harrison St, Manila | 2005

- This project is the start of RBSanchez Inc. services as Design Consultant for many other projects for Century properties.

CENTURY PARK SHERATON HOTEL
Trouble-shooting, Cooling Load Analysis and retrofit of the chilled-water HVAC system and AHU duct distribution. Successful completion of the project **saved PHP8M** from the ordered purchase of new units of AHUS.

Century Park Hotel
AN ANA HOTEL

21st December, 2005

"RBS Engineering Technologies (through the consultancy services of Engr Rosen Sanchez) was able to save our company PHP8.0 Million worth of new AHUs from being purchased. Our AHUs are 25 years old and were on the verge for replacement. RBSanchez suggested keeping the old AHUs but has recommended some changes. A year has passed now and the hotel is still cool using our old AHUs. This is even with the passing of the hottest summers of 2005"

"I know Mr. R.B. Sanchez applies in-depth design analysis and investigation but recommends practical solutions. His engineering skills, hands-on analytical approach and good engineering judgment is very valuable and hard to find these days."

21 DEC 2001

MR. EDGARDO NAKPIL
Chief Engineer, CENTURY PARK HOTEL
599 P. Ocampo St., 1004 Malate, Manila City, Philippines

DESIGN AND CONSULTANCY FOR NEW HVAC SYSTEM OF AYALA MALL AND BPO IN BACOLOD

Bacolod, Negros Occidental | July 2016

- RBSanchez Inc. is the HVAC Design Engineer and Consultant for the 13,353 sqm commercial Ayala Malls Bacolod in Negros Occidental.

.

DESIGN AND CONSULTANCY OF HVAC FOR ONE SHANGRI-LA (OSP) TOWER AND MALL COMPLEX

Ortigas Center, Mandaluyong, Metro Manila | 2009

- RBS Engineering (now RBSanchez Inc) was sub contracted by Meinhardt Philippines Inc. for a specia design and consultancy for HVAC services of One Shangri-La Towers.

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF ROBINSONS BOGO TERMINAL

Cayang, Bogo City, Cebu | 2017

- RBSanchez Inc. is the HVAC System Design engineer and consultant for the whole air-conditioning system of Robinson's Place Bogo Terminal in Bogo City at Cebu.

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF ROBINSONS MALL PLACE ANTIQUE

San Jose de Buenavista, Antique | 2016

- RBSanchez Inc. is the HVAC System Design engineer and consultant for the 18,242 sqm building at Robinson's Place Antique.

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF STARMALL LAS PIÑAS

CV Starr Avenue, Las Piñas, Manila | June 2015

- RBSanchez Inc. is the HVAC Design Consultant for the 20,673 commercial mall building of Starmall Las Piñas.

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF STARMALL TALISAY CEBU

Talisay, Cebu | September 2016

- RBSanchez Inc. is the HVAC Design Consultant for the 26,404 commercial mall building of Starmall Talisay at Cebu.

DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM OF STARMALL MALOLOS

Longos, Malolos, Bulacan | June 2016

- RBSanchez Inc. is the HVAC Design Consultant for the 30,654 sqm commercial mall building.

DESIGN AND CONSULTANCY FOR UPGRADE OF THE STARMALL SAN JOSE DEL MONTE PHASE 2

San Jose del Monte City, Bulacan | September 2015

- HVAC System Design Engineer and Consultant for the 15,503 sqm commercial building.

DESIGN AND CONSULTANCY FOR THE HVAC SYSTEM AUDIT, RETROFITTING AND REDESIGN

Quezon Ave, Diliman, Quezon City, M. Manila | 2018

- HVAC system assessment, retrofitting and redesign of the whole HVAC systems and upgrade.
- Serves as a consultant for the 18,673 mall building and its expansions.

HVAC CONSULTANCY, OPERATIONS & MAINTENANCE SERVICES

- **RCBC CORPORATE BLDG THE FORT**

  25th St, Mckinley Hills, Taguig

RBS has own personnel deployed on-site from Years 2017-2020 on a 24/7/365 basis.

CHILLED WATER SYSTEM AND AHU DISTRIBUTION RETROFITTING AT CENTURY PARK SHERATON HOTEL

- CENTURY PARK SHERATON HOTEL Retrofit of the chilled-water HVAC system and AHU duct distribution. project saved PHP8M from the ordered purchase of new units of AHUs. RBSanchez is the HVAC system design consultant of Century Park Hotel.

Design & Consultancy

Design of Fire Protection, Electrical & HVAC Ducted Systems of 19, 20, & 21ST FLOORS at PBCOM TOWERS, AYALA.

(All disciplines)

Filinvest Corporation, 1st, 2nd, 3rd Flr, COMPUTER & SERVER FARMS CyberGate Building, FILINVEST CITY

Technistock Corporation, PhilamLife Building, Ayala (All disciplines)

Linea Italia, Greenbelt 3 (All disciplines)

SHELL DESIGN FOR SHELL BUILDING (2003) (All disciplines).

MANDARIN HOTEL SMOKING ROOM VENTILATION

EASTWEST BANK

Building Relationships. Completing Lives.

EAST WEST BANK OFFICES HVAC DESIGNS. All bank branches designed nationwide (2002- 2004).

Design & Consultancy for Retrofits

CENTURY PARK SHERATON HOTEL Trouble-shooting, Cooling Load Analysis and retrofit of the chilled-water HVAC system and AHU duct distribution. Successful completion of the project **saved PHP8M** from the ordered purchase of new units of AHUS.

AVON MANUFACTURING PLANT, Batino Exit, South Superhighway. The HVAC analysis, and retrofitting consultancy services for the AVON PLANT in Laguna.

DRAGON MALL PROJECT – a MEP DESIGN of a proposed 3-storey 30,000 sqm mall located at the Alabang Zapote Road, Las Pinas.

Design & Consultancy for Retrofits

DRAGON MALL PROJECT – DESIGN of a proposed 3-storey 30,000 sqm mall located at the Alabang Zapote Road, Las Piñas.

RBS did the design and consultancy of the HVAC (chilled water systems), FIRE PROTECTION. Mechanical Consultancy value: Paid PHP1.2M for the Mechanical HVAC design.

.

Design & Consultancy for Fort Bonifacio Stopover Buildings

The FORT. Taguig, Metro Manila

DESIGN of a 2-storey 4,000 sqm mall and gas station. Architect is Environments Collaborative. Inc,

RBS did the design and consultancy of the HVAC and FIRE PROTECTION, Genset. Year 2001

.

DESIGN AND CONSULTANCY FOR NEW HVAC SYSTEM OF CITYMALL SURIGAO

Surigao City, Surigao del Norte | February 2016

- Design and Consultancy Services for the HVAC systems of an 8,570 sqm commercial building of CityMall Surigao.

R.B. SANCHEZ
CONSULTING ENGINEERS

DESIGN AND CONSULTANCY FOR NEW HVAC SYSTEM OF CITYMALL PAVIA

Old Iloilo – Capiz Rd. Pavia, Iloilo | February 2016

- Design and Consultancy Services for the HVAC systems of a 9,989 sqm commercial mall building.

ENERGY SAVINGS AND MAINTENANCE SERVICES

- ROBINSONS MALLS MAGNOLIA

Aurora Boulevard, Q.C.

Supply of HVAC Consultancy and Trane Chillers Operators Maintenance Services from Year 2013-2019

OPERATIONS & MAINTENANCE SERVICES

- **RCBC CORPORATE BLDG**
  THE FORT
  25th St, Mckinley Hills, Taguig

TRANE

Supply of HVAC Consultancy and Chiller Operators and Maintenance Services from Year 2017-2020

DESIGN AND CONSULTANCY OF HVAC SYSTEM FOR VARIOUS JOLLIBEE STORES

Various Jollibee Stores Nationwide

- HVAC Design and consultancy services for various stores of Jollibee Corporation nationwide.

JOLLIBEE		
JB-Lipa Batangas	666.62	
JB-PNB Aurora	708.41	
JB-Waltermart Makati	263.51	
JB-Atimonan V2	360.50	
JB-Tungkong Mangga	767.01	
JB-SM City Batangas	305.40	
JB-LRT Baclaran	554.33	
JB-Ronquillo	758.70	
JB-Catarman	336.00	
JB-Puregold Deparo	442.61	
JB-Lachmi Davao	345.68	
JB-Tandang Sora	723.50	
JB-Waltermart Cabanatuan		335.95
JB-Petron Diego Silang	659.42	
JB-Maa Road	1,861.04	
JB-North Harbour	1,978.32	
JB-Sm Fairview Annex 2	275.33	
JB-Legarda Bustillos	1,359.80	
JB-SM Bicutan	278.58	
JB-Tanay	2,286.12	
JB-Molave	1,502.57	
JB-Tabul	936.99	
JB-Orion	387.15	
JB-Mexico	598.67	
JB-Mandaue	517.00	
JB-Oroquieta	272.17	
JB-Asturias	555.70	
JB-Lucena	314.43	
JB-Sto. Nino	319.70	
JB-One Mall SM Valenzuela		607.94
JB-Guagua	854.83	
JB-Sto. Tomas Pampanga	598.46	
JB-Caltex Canlubang	433.17	
JB-Waltermart Bel-air	302.60	
JB-Atimonan Quezon Province		2,578.49
JB-SM Valenzuela	405.00	
JB-Tumauini	620.35	
JB-Rosario La Union	749.02	
JB-Macapagal	739.65	
JB-Legarda Bustillos Phase 1		676.82
JB-Hermosa	854.83	
JB-Sto. Tomas V2	606.10	
JB-SM Jaro Iloilo	363.00	
JB-LRT Baclaran Total Revision		554.33
JB-Narvacan	365.77	
JB-Pasig Rotonda	316.59	
JB-Iponan Highway	361.31	
JB-Binalonan	831.80	
JB-P. Tuazon	676.69	
JB-SM Rosales Pangasinan		344.00
JB-San Pedro Sto. Tomas	578.49	

DESIGN AND CONSULTANCY OF HVAC SYSTEM FOR VARIOUS JOLLIBEE STORES

Various Jollibee Stores Nationwide

JOLLIBEE VARIOUS PROJECTS			
PROJECTS	**AREA(sqm)**	**PROJECTS**	**AREA(sqm)**
JOLLIBEE AURORA	477.42	JOLLIBEE MAA ROAD	1,861.04
JOLLIBEE WALTERMART	263.51	JOLLIBEE NORTH HARBOR	2,412.77
JOLLIBEE TUNGKONG MANGGA	767.01	JOLLIBEE SM FAIRVIE ANNEX	275.33
JOLLIBEE SM CITY BATANGAS	305.40	JOLLIBEE LERDA BUSTILLOS	1,753.40
JOLLIBEE DAVAO LACHMI	357.21	JOLLIBEE SM BICUTAN ANNEX	278.58
JOLLIBEE WALTERMART CABANATUAN	335.95	JOLLIBEE TANAY	2,286.12
JOLLIBEE RONQUILLO	758.70	JOLLIBEE MOLAVE	1,905.89
JOLLIBEE GAISANO CATARMAN	395.91	JOLLIBEE ORION	1,576.68
JOLLIBEE PUREGOLD DEPARO	442.61	JOLLIBEE CASUNTINGAN MANDAUE	2,108.27
JOLLIBEE TANDANG SORA	723.50	JOLLIBEE ATIMONAN	593.86
JOLLIBEE PETRON DIEGO SILANG	659.42		

Design & Consultancy Services for Scaffolding of NAIA AIRPORT RAMP

NINOY AQUINO TERMINAL 3 AIRPORT, Pasay City, Metro Manila

TERMINAL 3- NAIA AIRPORT CONSULTANCY for SAFETY STUDY OF ELEVATED ACCESS SCAFFOLD DESIGN (ear 2001)

RBS predicted the PHP50M collapse and damage of Terminal 3 Access Road undertaken by Wiley Australia and Takenaka Corp. Engr Rosen B Sanchez used the RBS copyrighted “SCAFFPRO Software” for stress and strength analysis of the structures.

EEI Corp purchased the US$5,000 from RBS software hereinafter in 2002.

DESIGN AND CONSULTANCY FOR NEW HVAC SYSTEM OF CITYMALL BULUA CDO

Cagayan de Oro. Misamis Oriental | August 2015

- Design and Consultancy Services for the HVAC systems of an 8,726 sqm commercial mall building in Cagayan de Oro.

DESIGN AND CONSULTANCY FOR NEW HVAC SYSTEM OF CITYMALL ISULAN

Tacurong City Rd., Isulan, Sultan Kudarat | August 2015

- Design and Consultancy Services for the HVAC systems of an 8,160 sqm commercial mall building in Sultan Kudarat.

DESIGN AND CONSULTANCY OF HVAC & KITCHEN VENTILATION FOR VARIOUS CHOWKING STORES

Various Chowking Stores Nationwide

- HVAC Design and consultancy services for various stores of Chowking nationwide.

CHOWKING		
CK-Commonwealth		
CK-Buhangin Davao		324.89
CK-Green Meadows		431.05
CK-Roxas Isabela		306.02
CK-GMA Cavite	381.00	
CK-San Nicolas	241.18	
CK-Matina	356.66	
CK-Valenzuela City Hall		430.08

DESIGN AND CONSULTANCY OF HVAC & KITCHEN VENTILATION FOR VARIOUS CHOWKING STORES

Various Chowking Stores Nationwide

- HVAC Design and consultancy services for various stores of Greenwich Stores nationwide.

GREENWICH		
GW-Cabahug	285.48	
GW-Dahlia Fairview QC		347.78
GW-Green Meadows		482.19
GW-Muntinlupa City Hall		362.52
GW-Taytay Uptown		170.79
GW-Valencia	285.65	
JB-Balayan Stop Over		587.36

VARIOUS DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM

Various Locations

- **GLAXO SMITHKLINE INC. OFFICES IN PASONG TAMO, MAKATI. Design and Installation of new chiller system, pipe and pumping system, AHUs, FCUs, and control system. August 2013.**

HTMI CALL CENTER PROJECT, Libis, Quezon City, Metro Manila. – the design and construction consultancy of a 2-storey 3,000 sqm new call center building in The HVAC system was designed and constructed by Trane Phils. RBSanchez served as the design consultant of Trane Philippines for the design, construction and commissioning works of the project. (June 2005 to Feb 2006). Contract value awarded to RBSanchez: PHP1.05M for Mechanical design.

VARIOUS DESIGN AND CONSULTANCY FOR WHOLE HVAC SYSTEM

Various Locations

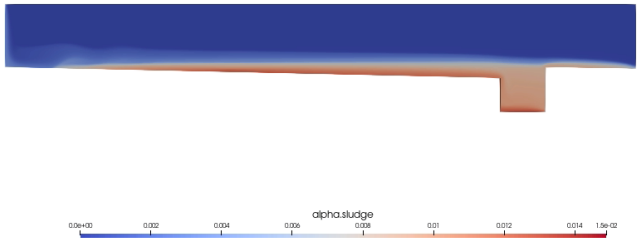
- **MEGAWORLD CORP. FORBESWOOD PROJECT.** the design and consultancy for the RETAIL PROJECTS in Burgos Circle, the Fort. Design of HVAC Aircon, All HVAC ducting, and ventilation works and all related accessories. (May 2010 –July 2010).

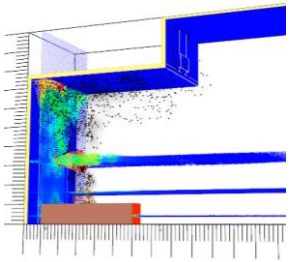
  KINGS COURT RETROFITTING PROJECT, Makati City. the redesign, consultancy and commissioning of the new AHU and associated systems for Ground floor, 2nd ,3rd,4th, 5th and 6th floors, 500 tons total and effects on chiller units as well as associated ducting and accessories. To address moisture problems and chiller problems (July 2010- Aug 2010).

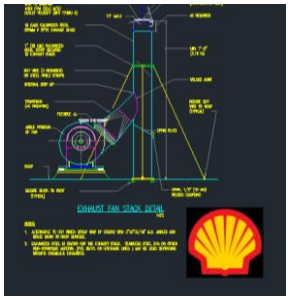
  ADDITIONAL SHELL ETHANOL STORAGE FACILITIES, The design of Shell Depot, Ethanol and Blending Storage Facilities in Cabadbaran,Agusan, Mindanao, The design includes pumping stations, piping and tanks and loading gantry system. (June 2010 – August 2010).

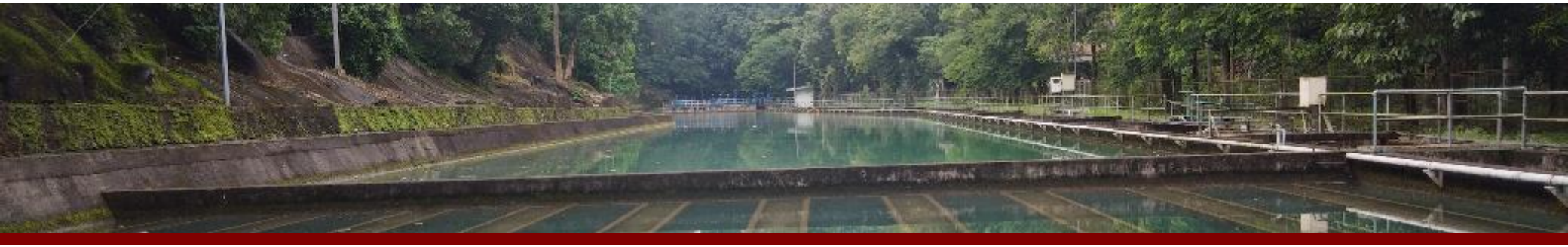
VARIOUS CFD PROJECTS

CFD DESIGN AND CONSULTANCY





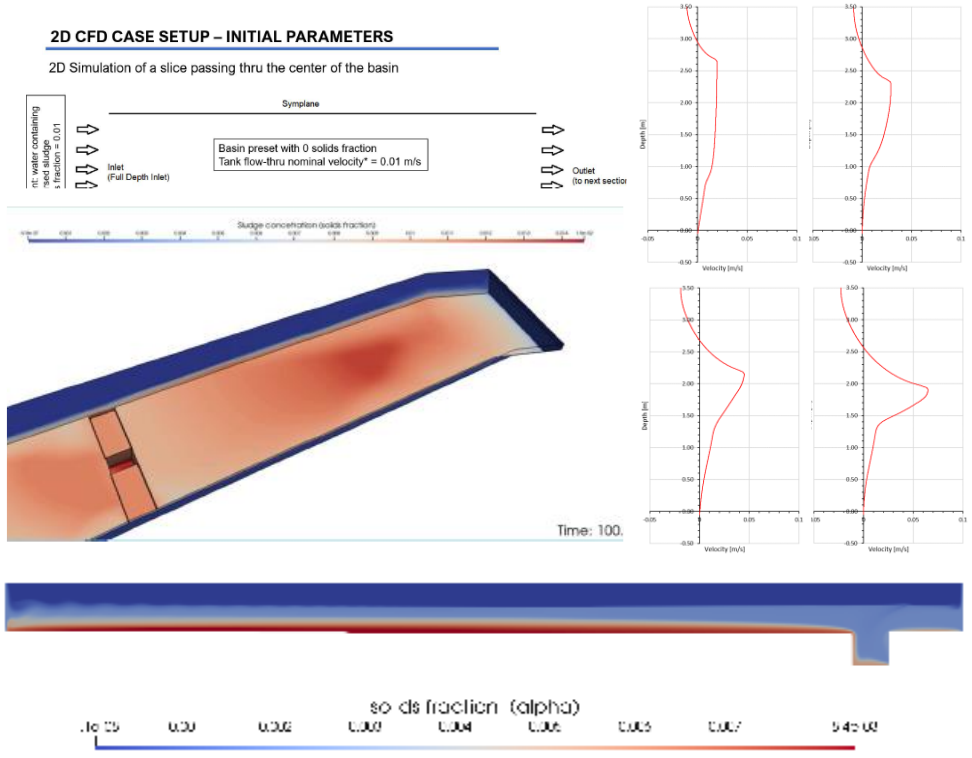




CONSULTANCY SERVICES FOR BALARA WATER TREATMENT PLANT 1

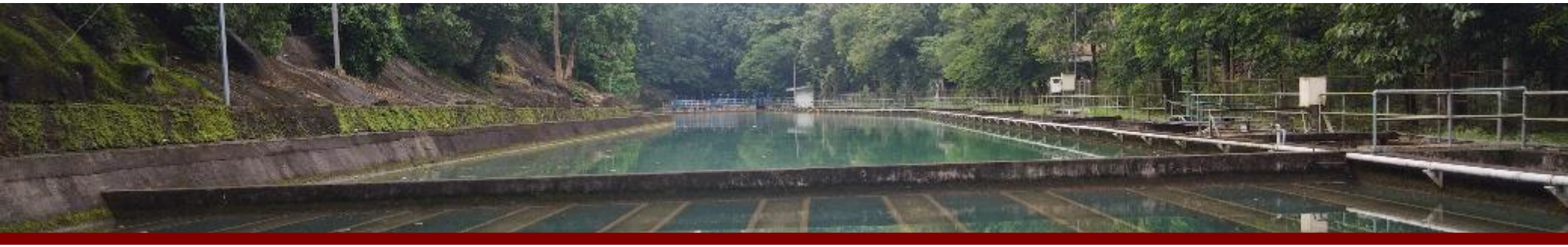
Solver: OpenFOAM v1902 – driftFluxFoam
Post-processing: Paraview

CFD simulation to predict the sedimentation through the basins and sludge accumulation. The results to be used as a confirmatory for design and reference for sludge pumping system. This includes parametric study of bed slopes and sludge pump pit intervals in the reference of velocity profile, effluent turbidity quality and concentration prediction along the depth of the basin.



MANILA WATER
CARE IN EVERY DROP

F.F. CRUZ & CO., INC.
CIVIL & GEODETIC ENGINEERS • CONSTRUCTORS
FF



CONSULTANCY SERVICES FOR BALARA WATER TREATMENT PLANT 1

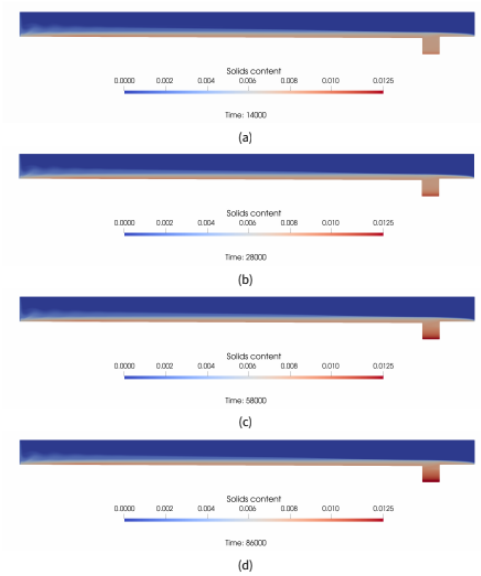


Figure 8. Sludge bed development after *t* hours

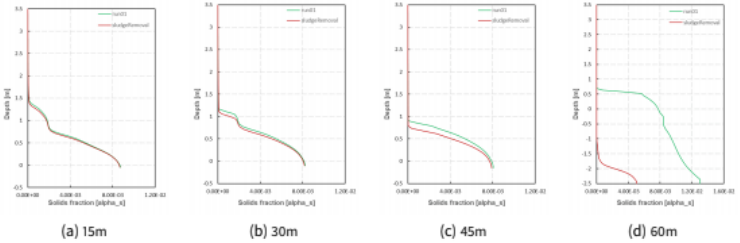


Figure 10. Sludge concentration along basin depth at different sections, *t* = 24 hours

OPTIMAL AND COST-EFFECTIVE SLOPE AND SUMP PIT INTERVALS

Using measurements and results of the CFD model, the recommendation is to have a basin bed slope of 1:300 at sump pit intervals every 60 meters. These figures were realized after series of parametric studies and cost effective solutions analysis.

Analysis of Gravity Induced Sludge Collection and Removal for Sedimentation Basin 1 and 2 of Balara Treatment Plant 1

RBSanchez PME Consultants and Associates Inc.[1]

[1]*RBSanchez Engineering Department, Makati Executive Tower 2, Makati, Manila*
Website: www.rbs-engineers.com

Executive Summary

Proposed sludge removal method for two continuous sedimentation basins were investigated prior to retrofitting. The initial system includes three sump pumps in pits at 60-m interval along the 180-m basin. The floor were sloped at 1:300 for gravity induced sludge transport.

CFD simulations were conducted to determine the behavior of pertinent parameters such as flow field, sludge detention, basin dimensions, sludge zone depth and rheological properties both for the accumulation period and during sludge removal operation. OpenFOAM solver driftFluxFoam was employed to perform the calculation for mass and momentum conservation for two-phase flow as a mixture. Applying the mixture model, water was set as the continuous phase and the settle-able sludge as dispersed phase. Furthermore, the sludge was modelled as a non-Newtonian fluid with rheological properties similar to bingham plastics. Measurements and validation tests were conducted to verify numerical solver predictions. Caution was exercised in using available data on best effort basis to represent actual site conditions.

The following items are summarized as the findings and corresponding recommendation, as proposed:

1. **Gravity-induced transport of sludge to the sump by floor slope of 1:300 is insufficient.** The initial design for sludge collection and removal will not be effective for long term operation. In this slope, the transport is very minimal that the sludge were accumulated in the interval span even after sludge pump operations. **Recommendation: Increasing the slope to 1:150 to improve sludge transport without significant effect to the sedimentation process. Although, steeper slopes were observed to greatly improve the transport than 1:150 and shown in the concentration curves. Partial velocity disturbance and minor eddy formation may occur in the basin floor that may cause partial re-suspension in the floor depth.**
2. **Shortened distance between sump pits will improve the sludge collection and removal.** Aside from increasing the slope, another parametric study findings in decreasing the interval was observed. It was observed that shortening the intervals significantly increases the collection rate overall as the area of removal is proportionally increased. However, further decreasing the interval may incur higher operational cost and maintenance cost as the sludge pumps would require regular maintenance due to its purpose. **Recommendation: In-depth cost analysis are not included in this tender. Considering operational and maintenance cost, it is still recommended to reduce the interval up to 45-meter interval from the 60-interval. It is necessary to test run sludge operation to set optimum interval for each section of the basin so that issues previously discussed are avoided.**
3. **The study were set to consider an initial inlet of 300 NTU turbidity condition, as provided to be one of the highest in record.** The study considered also a 100 NTU computational domain, however yields to insignificant findings difference compared to the 300 NTU domain, thus is not pursued further.
4. Adjust the floor slope of the sump pit section towards the pump base accordingly, to allow sludge movement in the sump pit to be drawn towards the pump and ensure sludge transport from the sides of the pit.
5. Selected pump specification (capacity and TDH) suffices as the sludge pump is operated intermittently to draw sludge out of the basin. In addition, verify the pump's capability at fluid viscosity.

Continuous Sedimentation CFD Analysis (2020)

REF: 11.2019/RBS-OM-SED-BAS-CFD-000A

Written by
Dnes Dela Torre

Analysis of Gravity Induced Sludge Collection and Removal for Sedimentation Basin 1 and 2 of Balara Treatment Plant 1

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5. Selected pump specification (capacity and TDH) suffices as the sludge pump is operated intermittently to draw sludge out of the basin. In addition, verify the pump's capability at fluid viscosity.

Continuous Sedimentation CFD Analysis (2020)

REF: 11.2019/RBS-OM-SED-BAS-CFD-000A

Written by
Drex Dela Torre

A Numerical Solver for the Hydrodyanimcs of Sedimentation Process

OpenFoam solver driftFluxFoam was employed to perform the calculation for mass and momentum conservation for two-phase flow as a mixture. Applying the mixture model, water was set as the continuous phase and the settle-able sludge as dispersed phase. Furthermore, the sludge was modelled as a non-Newtonian fluid of rheological properties that behaves similar to bingham plastics.

Mixture Continuity Equation By assuming multi-phase flow as a pseudo multi-phase mixture, only one set of governing equations is needed in solver 'driftFluxFoam'. They are continuity equation and momentum equation for mixture and a continuity equation for dispersed phase. Theoretically, continuity and momentum equations can be derived from Eulerian-Eulerian model (Brennan 2001). Considering a two-phase flow, one phase is continuous basefluid and the other phase consists of dispersed solid particles. A continuity equation is required for each of the two phases:

$$\frac{\partial (\phi_f \rho_f)}{\partial t} + \nabla \cdot (\phi_f \rho_f U_f) = 0 \tag{1}$$

$$\frac{\partial (\phi_s \rho_s)}{\partial t} + \nabla \cdot (\phi_s \rho_s U_s) = 0 \tag{2}$$

where ρ_f and ρ_s are the densities of continuous phase and dispersed solid phase, respectively. ϕ_f and ϕ_s are the volume fractions of continuous phase and dispersed solid phase, respectively. U_f and U_s the velocities of continuous phase and dispersed solid phase, respectively.

If added (1) to (2), the result can be written as:

$$\frac{\partial (\phi_f \rho_f + \phi_s \rho_s)}{\partial t} + \nabla \cdot (\phi_f \rho_f U_f + \phi_s \rho_s U_s) = 0 \tag{3}$$

For the two-phase mixture, key properties and flow features can be estimated using (Ishii and Grolmes, nd):

$$\rho_m = \phi_f \rho_f + \phi_s \rho_s \tag{4}$$

$$U_f = U_{fm} + U_m \tag{5}$$

$$U_s = U_{sm} + U_m \tag{6}$$

$$\phi_f \rho_f U_{fm} + \phi_s \rho_s U_{sm} = 0 \tag{7}$$

where U_{fm} and U_{sm} are relative velocities of continuous phase and dispersed solid phase to the mixture, respectively. U_m is the velocity of the mixture.

Then the contents in the second bracket of (3) can be rewritten as:

$$\phi_f \rho_f U_{fm} + \phi_s \rho_s U_{sm} = \rho_m U_m \tag{8}$$

Therefore, (3), the continuity equation for the two phases can be written in a very similar form as that for a normal single phase flow:

$$\frac{\partial \rho_m}{\partial t} + \nabla \cdot (\rho_m U_m) = 0 \tag{9}$$

In solver 'driftFluxFoam', (9) is not used directly in any header files. However, it will be used implicitly in file 'pEqn.H' for pressure-velocity correction.

Mixture Momentum Equation Momentum equations for continuous and dispersed solid phases can be given as:

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$$U_f = U_{fm} + U_m \tag{5}$$

$$U_s = U_{sm} + U_m \tag{6}$$

$$\phi_f \rho_f U_{fm} + \phi_s \rho_s U_{sm} = 0 \tag{7}$$

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Mixture Momentum Equation Momentum equations for continuous and dispersed solid phases can be given as:

Free Surface For free surface, symmetry boundary is applied here. Similar to zeroGradient for scalars, the normal component is set to zero for vectors.

Physical Properties of Activated Sludge Sewage sludge exhibits Bingham Plastic behaviour as was shown from several studies. Two quantities need to be specified in order to characterise this rheology, namely the yield stress, τ_y, and the plastic viscosity, η. A constitutive relationship for settling velocity is also needed in order to carry out numerical simulations with the Drift Flux model.

Yield stress and plastic viscosity vary with concentration. Various authors as reviewed by (Casey and Newman 1983), have formulated exponential relationships for these quantities. They have the general form;

$$\Phi = aC^{b\alpha} \tag{21}$$

where Φ is the physical property in question, α is the solids fraction and a and b are constants. The exponent stet, C, is generally the natural logarithm base e, or the base 10.

The exponent from the experimentally derived settling velocity can be adjusted using equation 22. This essentially scales the physical properties of the sludge used in initial cases for other experiments.

$$\Phi = aC^{\frac{\alpha_{in}-0.002}{\alpha_{in}} b\alpha} \tag{22}$$

The coefficients used for the calculation of sludge properties from are summarized in Table 2 - 5. Several sets of sludge properties have been opted to determine extent of effects of their properties to the workability of the proposed sludge removal method. Since there are no sludge scrapers to be installed, sludge displacement have been left virtually on gravitational effects induced by basin floor sloping.

Table 2. Coefficients used to estimate sludge properties

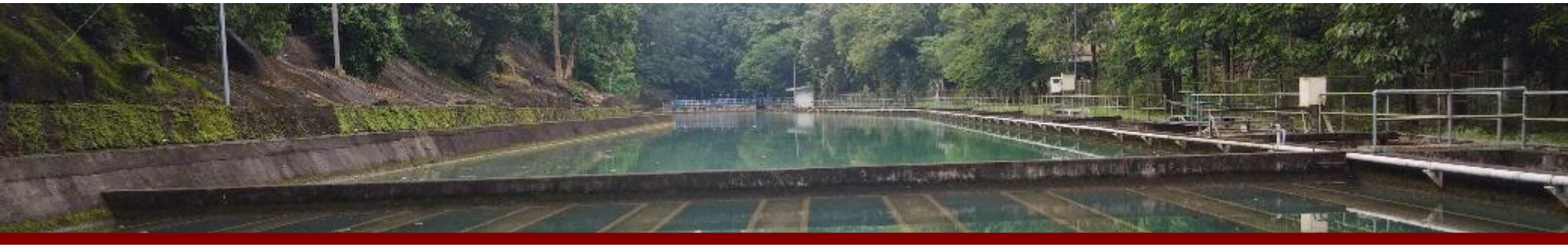
Property	Coefficient a		Exponent b	
			$\alpha_i n = 0.001$	$\alpha_i n = 0.002$
Yield Stress	5.55E-05	kg/(m.s^2)	1050.8	951.25
Bingham Viscosity	2.31E-04	kg/m.s	179.26	179.26
Settling Velocity	-2.20E-03	m/s	285.84	285.84

Table 3. Coefficients used to estimate sludge properties (low density)

Property	Coefficient a		Exponent b
			$\rho_d = 1042 kg/m^3$
Yield Stress	5.55E-05	kg/(m.s^2)	39.95
Bingham Viscosity	2.31E-04	kg/m.s	7.35
Settling Velocity	-2.20E-03	m/s	12.97

Table 4. Coefficients used to estimate sludge properties (medium density)

Property	Coefficient a		Exponent b
			$\rho_d = 2000 kg/m^3$
Yield Stress	5.55E-05	kg/(m.s^2)	951.25
Bingham Viscosity	2.31E-04	kg/m.s	179.26
Settling Velocity	-2.20E-03	m/s	285.84



CONSULTANCY SERVICES FOR BALARA WATER TREATMENT PLANT 1

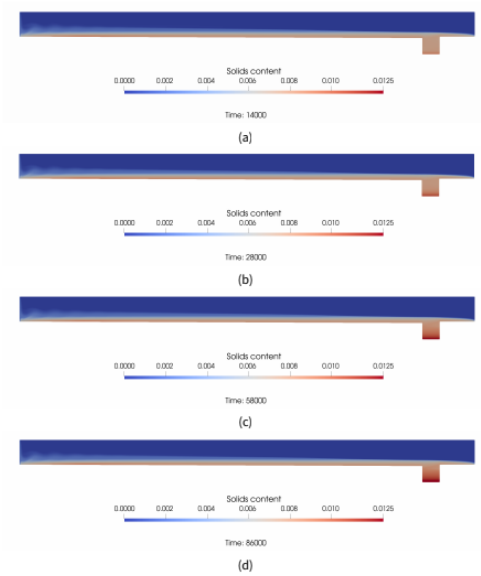


Figure 8. Sludge bed development after *t* hours

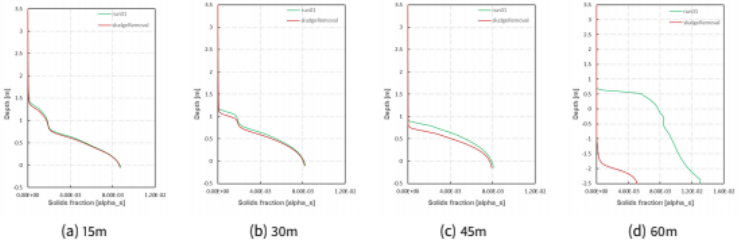


Figure 10. Sludge concentration along basin depth at different sections, *t* = 24 hours

OPTIMAL AND COST-EFFECTIVE SLOPE AND SUMP PIT INTERVALS

Using measurements and results of the CFD model, the recommendation is to have a basin bed slope of 1:300 at sump pit intervals every 60 meters. These figures were realized after series of parametric studies and cost effective solutions analysis.

Analysis of Gravity Induced Sludge Collection and Removal for Sedimentation Basin 1 and 2 of Balara Treatment Plant 1

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[1]*RBSanchez Engineering Department, Makati Executive Tower 2, Makati, Manila*
Website: www.rbs-engineers.com

Executive Summary

Proposed sludge removal method for two continuous sedimentation basins were investigated prior to retrofitting. The initial system includes three sump pumps in pits at 60-m interval along the 180-m basin. The floor were sloped at 1:300 for gravity induced sludge transport.

CFD simulations were conducted to determine the behavior of pertinent parameters such as flow field, sludge detention, basin dimensions, sludge zone depth and rheological properties both for the accumulation period and during sludge removal operation. OpenFOAM solver driftFluxFoam was employed to perform the calculation for mass and momentum conservation for two-phase flow as a mixture. Applying the mixture model, water was set as the continuous phase and the settle-able sludge as dispersed phase. Furthermore, the sludge was modelled as a non-Newtonian fluid with rheological properties similar to bingham plastics. Measurements and validation tests were conducted to verify numerical solver predictions. Caution was exercised in using available data on best effort basis to represent actual site conditions.

The following items are summarized as the findings and corresponding recommendation, as proposed:

1. **Gravity-induced transport of sludge to the sump by floor slope of 1:300 is insufficient.** The initial design for sludge collection and removal will not be effective for long term operation. In this slope, the transport is very minimal that the sludge were accumulated in the interval span even after sludge pump operations. **Recommendation: Increasing the slope to 1:150 to improve sludge transport without significant effect to the sedimentation process. Although, steeper slopes were observed to greatly improve the transport than 1:150 and shown in the concentration curves. Partial velocity disturbance and minor eddy formation may occur in the basin floor that may cause partial re-suspension in the floor depth.**
2. **Shortened distance between sump pits will improve the sludge collection and removal.** Aside from increasing the slope, another parametric study findings in decreasing the interval was observed. It was observed that shortening the intervals significantly increases the collection rate overall as the area of removal is proportionally increased. However, further decreasing the interval may incur higher operational cost and maintenance cost as the sludge pumps would require regular maintenance due to its purpose. **Recommendation: In-depth cost analysis are not included in this tender. Considering operational and maintenance cost, it is still recommended to reduce the interval up to 45-meter interval from the 60-interval. It is necessary to test run sludge operation to set optimum interval for each section of the basin so that issues previously discussed are avoided.**
3. **The study were set to consider an initial inlet of 300 NTU turbidity condition, as provided to be one of the highest in record.** The study considered also a 100 NTU computational domain, however yields to insignificant findings difference compared to the 300 NTU domain, thus is not pursued further.
4. Adjust the floor slope of the sump pit section towards the pump base accordingly, to allow sludge movement in the sump pit to be drawn towards the pump and ensure sludge transport from the sides of the pit.
5. Selected pump specification (capacity and TDH) suffices as the sludge pump is operated intermittently to draw sludge out of the basin. In addition, verify the pump's capability at fluid viscosity.

Continuous Sedimentation CFD Analysis (2020)

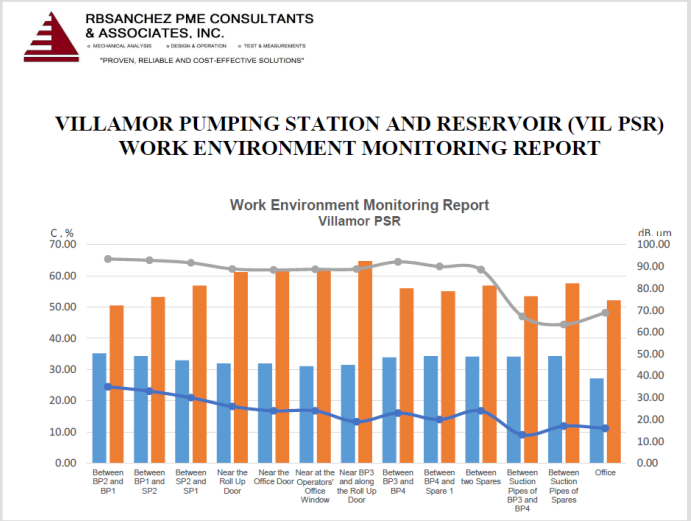
REF: 11.2019/RBS-OM-SED-BAS-CFD-000A

Written by
Dnes Dela Torre

ENVIRONMENTAL ASSESSMENTS OF ALL MAYNILAD PUMPING STATIONS

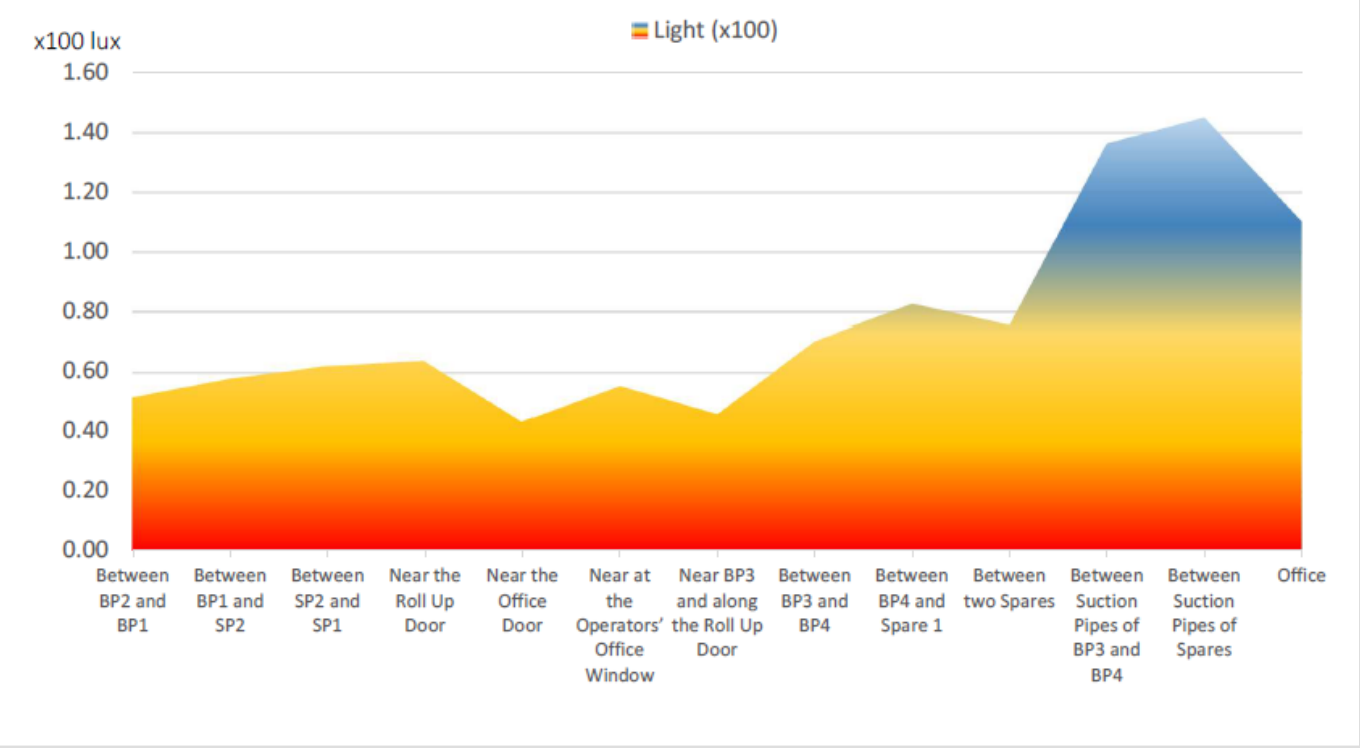
Maynilad Pump Stations in West Manila and Cavite | 2019

- RBSanchez Inc. is the Mechanical Consultant for the Maynilad Water HVAC and Environments System Assessments, measurements and Analysis of Building of pumping stations.



ENVIRONMENTAL ASSESSMENT OF PUMPS STATIONS

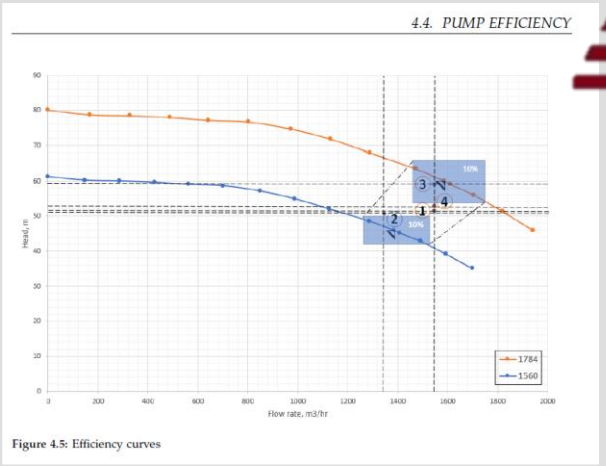
Maynilad Pump Stations in Manila and Cavite | 2019



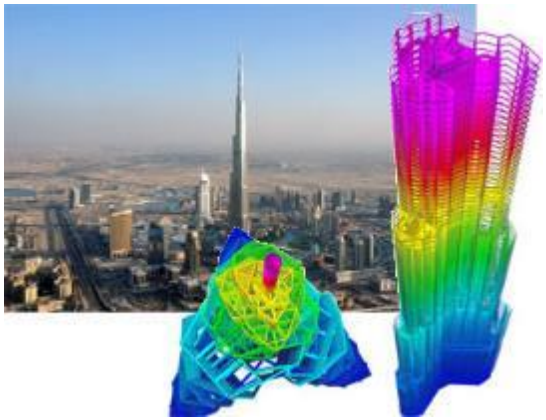
CONSULTANCY SERVICES AND PUMP PERFORMANCE ASSESSMENT of MAYNILAD PUMP STATIONS

Maynilad Pump Stations in Metro Manila and Cavite | December 2018 to October 2019

- RBSanchez Inc. is the Mechanical Consultant for the Maynilad Water System Assessments, measurements and analysis for 120 pumping units in various pumping stations to 1100 hp water pumps.



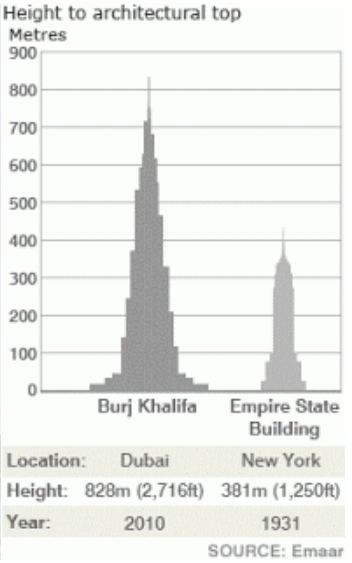
RBS contributes to the CFD designs for the TALLEST BUILDING IN THE WORLD



"WORLD'S TALLEST BUILDING" THE BURJ KHALIFA TOWER Dubai, UAE.

ARMANI HOTEL HVAC DESIGN. The only Armani branded Hotel in the world.

- Engr RBSanchez served as "HVAC DESIGN MANAGER"
- Engr. Rosen Sanchez is the official signatory of all Khalifa Bldg HVAC and CFD construction drawings in the Year 2006-2007.



Actual CFD Simulations

CFD FOR FLUE GAS MODELLING

OF

SHELL REFINERY IN TABANGAO, BATANGAS

Done by RBS ASSOCIATE

ENGR FRANCISCO AMARRA

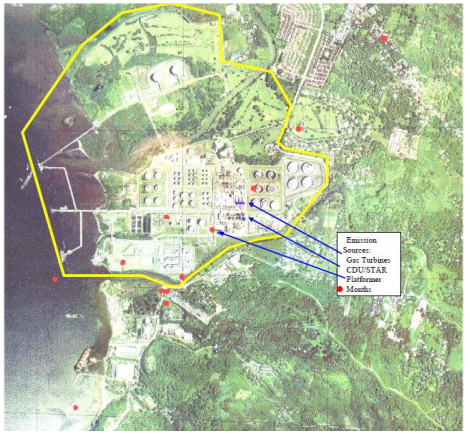
CFD FOR REFINERY GAS EMISSIONS IN SHELL TABANGAO REFINERY

Program: AERMOD and AERMET

CFD analysis done by our associate Engr Francisco Amarra to study the SO_2 and NO_x concentrations from stack emissions in the Shell Tabangao Refinery

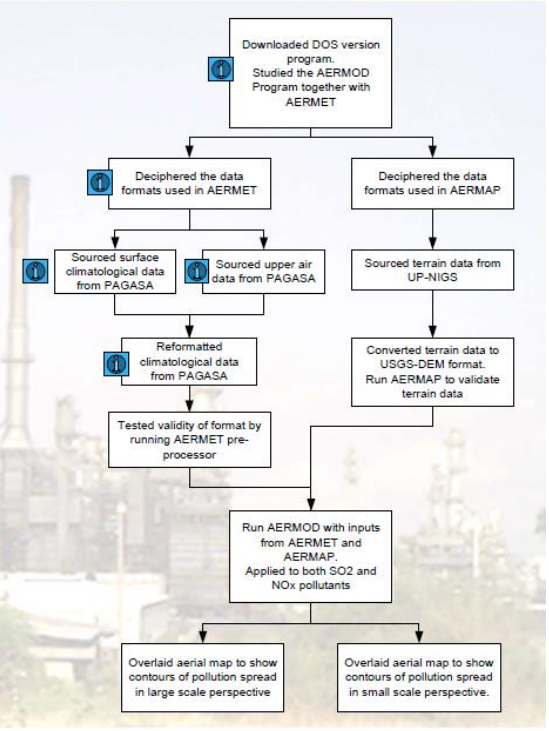
Input Data Required for AERMOD:

- Meteorological Pathways
  - –Site data for surface climate & upper air stations
  - –Study site data
- Surface Parameters
  - –Albedo, Bowen ratio, surface roughness
- **AERMAP**
  - –Terrain files converted to USGS-DEM format
- **AERMET**
  - –Raw data: Surface Climate } Surface File
  - –Raw data: Upper Air } Profile File



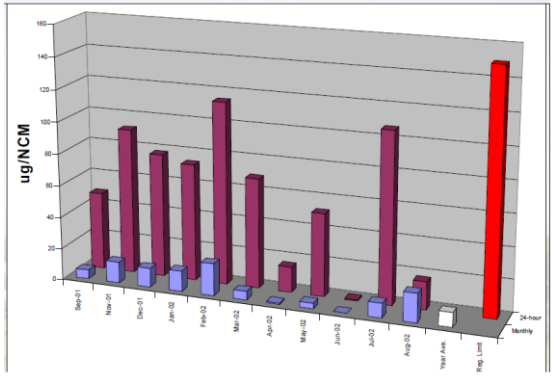
INPUTS AND DATA GATHERING ON THE TOPOGRAPHY

Detailed study in the area of study were conducted including the terrain mapping around the refinery using available data from different sources.

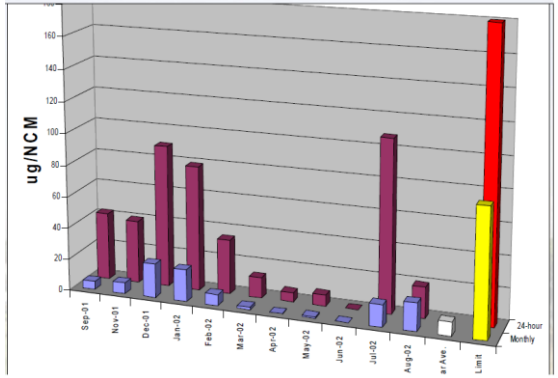


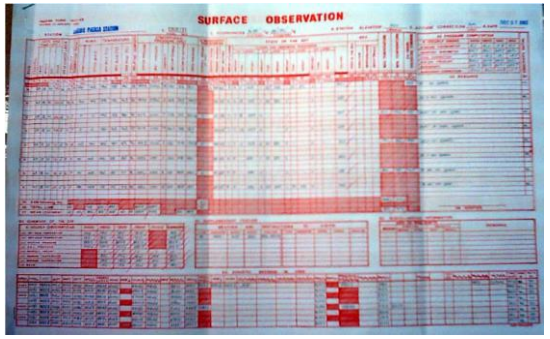
CFD FOR REFINERY GAS EMISSIONS IN SHELL TABANGAO REFINERY

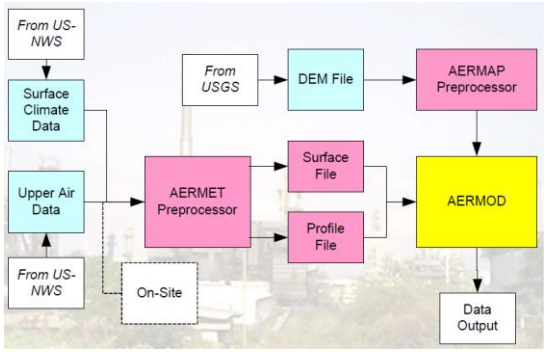
Results: NOx Concentrations



Results: SO_2 Concentrations







RESULTS OF THE STUDY

Results shown above are the actual gathered and measured concentrations on site. The following concentrations are used for basis of calculations for recommendation and conclusion.

CFD FOR REFINERY GAS EMISSIONS IN SHELL TABANGAO REFINERY

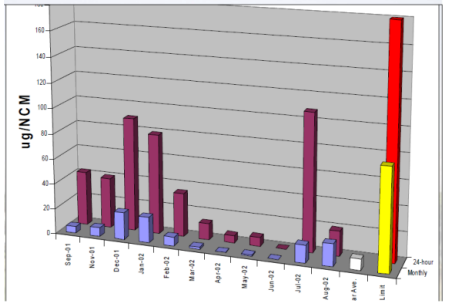
CONCLUSION

- Shell Tabangao Refinery emission concentrations were below the regulatory limits.
- Problems were encountered during acquisition of raw data:
  - Surface climate data not in required format;
  - Upper air climate data is not always available due to budget limitations
  - Terrain data is not readily available and expensive to produce.
- Conversion of raw data was successful. AERMOD program is applicable in the Philippines and was successfully applied using the Shell Tabangao Refinery.

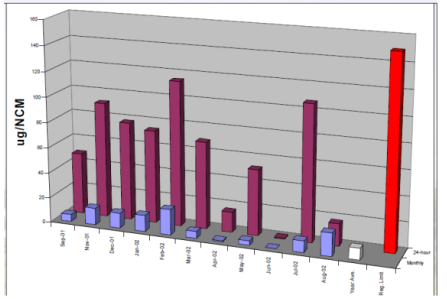
RECOMMENDATION

- **Air Dispersion Models** – EMB should focus on encouraging industries to make use of air modeling programs.
- **Surface and Upper Climatological Data** – bring up-to-date all encoding requirements for surface data and convert to CD-144 format: including encode of upper air data into CLICOM system and convert to TD-6201 formats
- **Terrain Data** – NAMRIA should develop digitized map in USGS-DEM format.

Results: SO_2 Concentrations



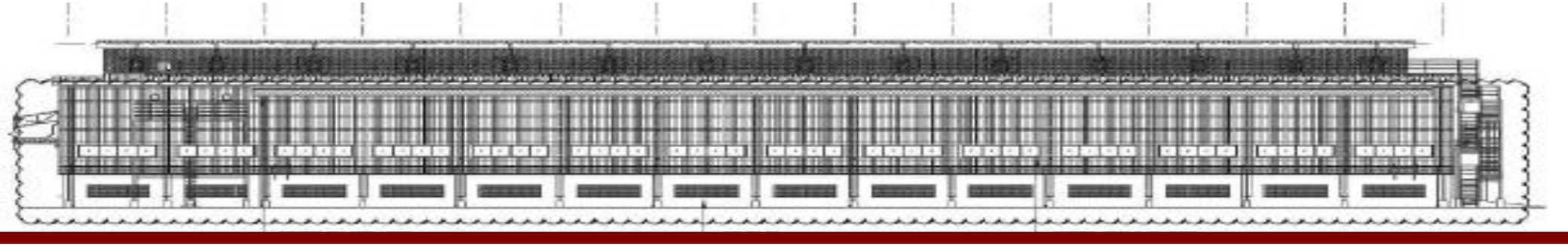
Results: NOx Concentrations



COMPUTERIZED FLUID DYNAMICS (CFD) STUDIES of ZAMA PRECISION DIE-CASTING LINES

By:

RBSANCHEZ PME CONSULTANTS & ASSOCIATES, INC.
● MECHANICAL ENGINEERS ● DESIGN ● HVAC OPERATIONS & STUDIES
WWW. RBS-ENGINEERS.COM



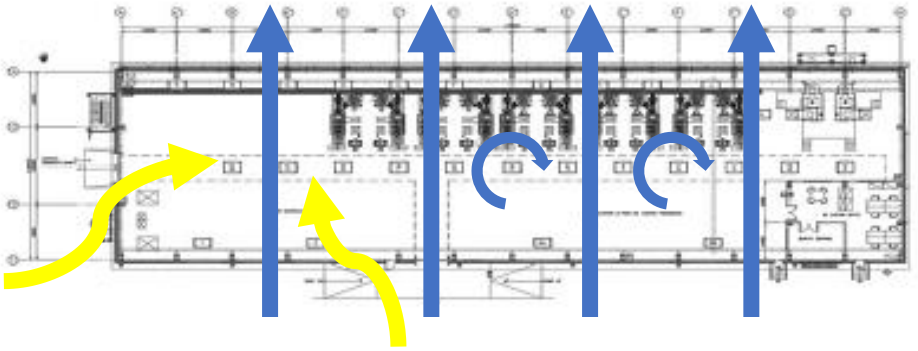
CFD ANALYSIS OF ALUMINUM-DIE CAST WAREHOUSE AT ZAMA PRECISION

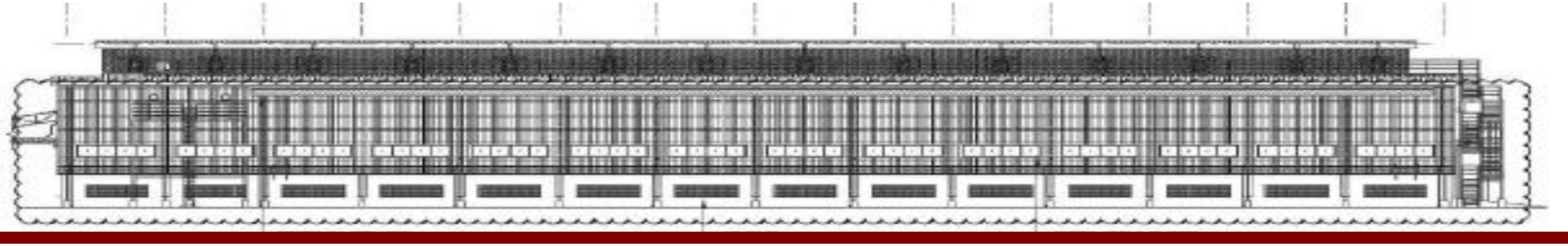
Solver: Fire Dynamic Simulation (FDS) Ver 6 and SmokeView and PyroSim

CFD simulation to solve the smog and high particle concentration PM2,5 inside the warehouse. Different options were designed and simulated to best address the air quality, including additional upper vents and enlargement of lower vents to follow natural buoyancy laws, cross-flow ventilations and local push-pull option as recommendation.

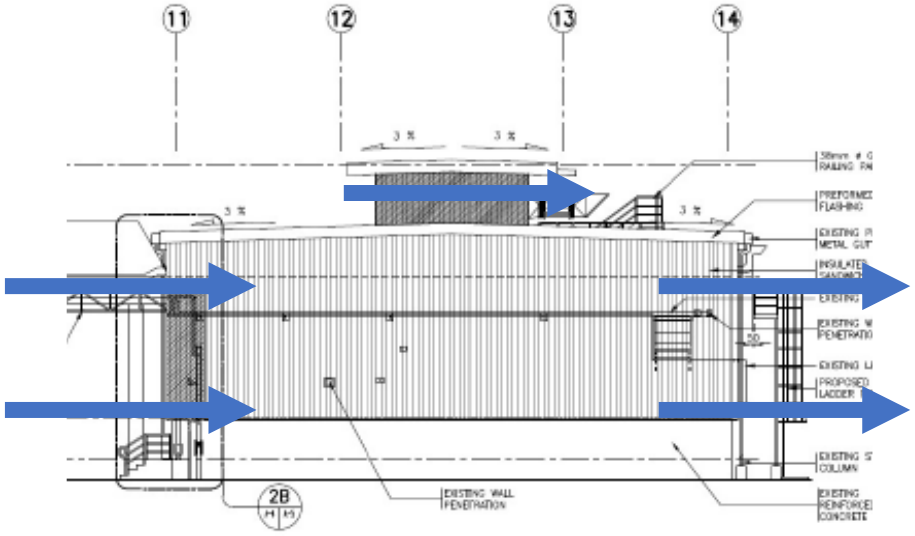
NO “CROSS VENTILATION” AT THE NORTHERN SIDE OF THE WAREHOUSE

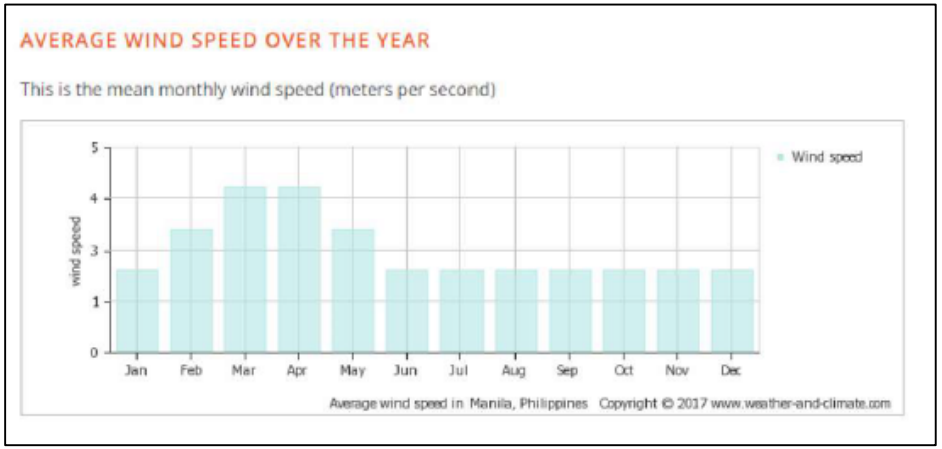
Current velocity measurements shows that the air is only recirculating “plan-wise” (and not exhausting) across the building in the northern side near the furnaces.





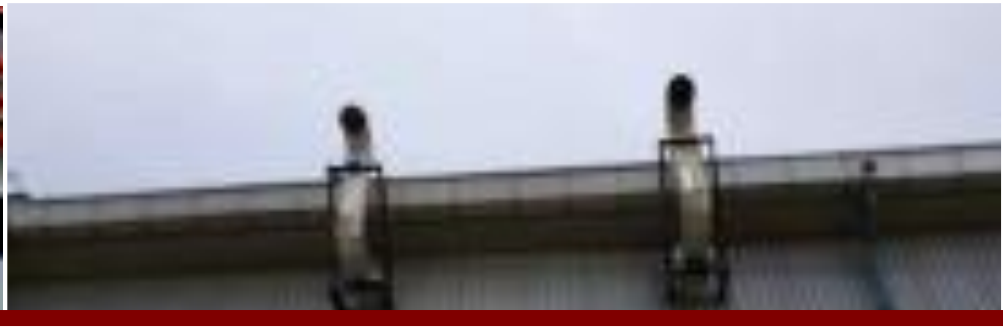
CFD ANALYSIS OF ALUMINUM-DIE CAST WAREHOUSE AT ZAMA PRECISION





NO "CROSS VENTILATION" AT THE NORTHERN SIDE OF THE WAREHOUSE

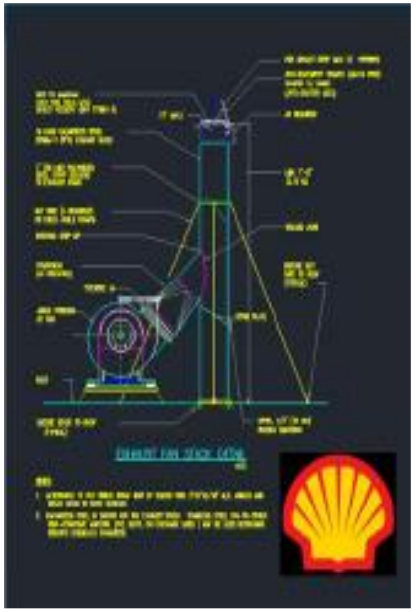
As a recommendation, we recommended to take advantage of the natural wind power at 322,900 cfm.

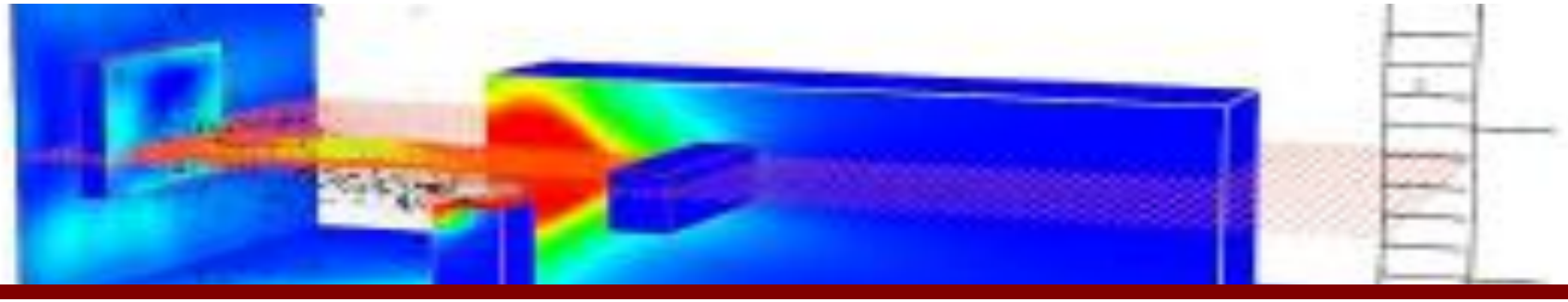


CFD ANALYSIS OF ALUMINUM-DIE CAST WAREHOUSE AT ZAMA PRECISION

PARTICLE ACCUMULATION OCCURS AT GROUND LEVEL OUTSIDE THE BUILDING AT NORTHEASTERN SIDE

Particles on the rooftop tends to fall off due to the layout of the fans relative to the roof profile and the gooseneck exhaust layouts. As a standard, exhausted air and particles shall be vented to the atmosphere at high levels for proper dispersion. Particle readings show higher levels of PM2.5 matter in the area with 705 ug/m3 especially when furnace exhausts are in operation.





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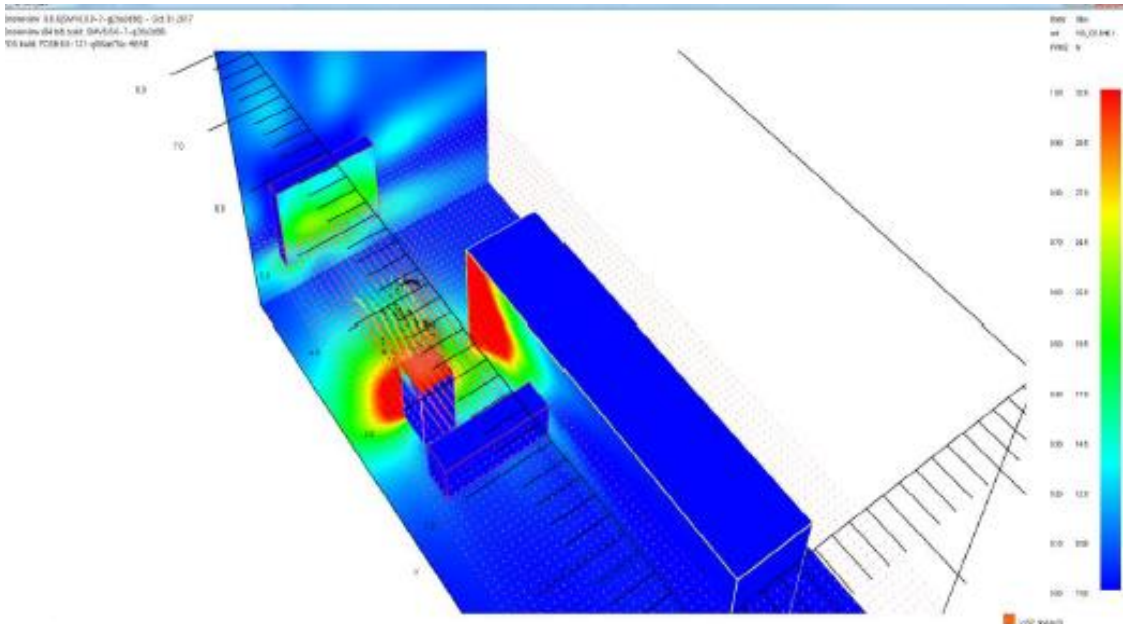
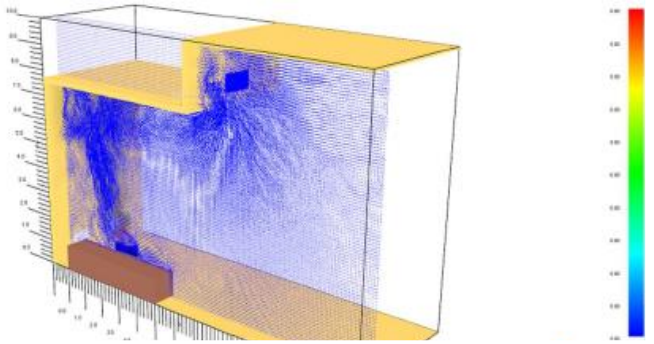
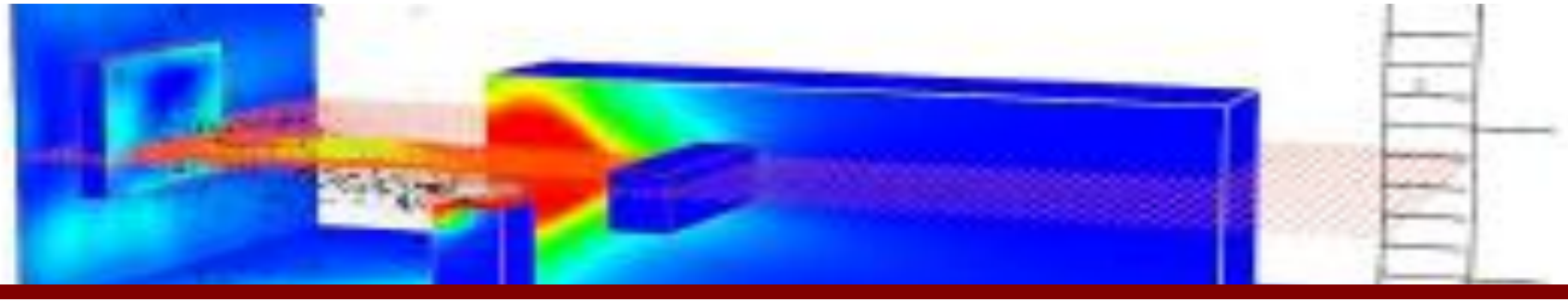




LOCAL EXHAUSTS VENTILATIONS SUCH AS PUSH-PULL OPTIONS WITH MULTIPLE CFD SCHEMES

Different schemes were exercised and validated to identify the optimum solution for the exhaust of the particles from the furnaces. The following options were derived from different validated cases and studies and investigated if applicable in the warehouse situation.



CFD ANALYSIS OF ALUMINUM-DIE CAST WAREHOUSE AT ZAMA PRECISION

COMMENT ON THE PROPOSAL TO COMPLETELY INSULATE THE WAREHOUSE TO REDUCE INTERNAL TEMPERATURES

We were invited to comment on the proposal of insulating the warehouse. We don't recommend the insulation in the attempt to lower the internal temperatures of the warehouse, as it will only cost money, time, and space and moreover, increase the internal temperatures (not decrease).

However, we recommended high "solar reflectance" radiant barriers coupled with "air/insulation" technologies.

CFD CONSULTANCY SERVICES FOR DESIGN OF GLAS TOWER PROJECT

Ruby St, Ortigas Commercial Center | Aug 2020

- RBS is the HVAC System Design Engineer and PME Consultant. For the first double-glazed, triple Low-E glass tower in Ortigas @ 188-meter with are of 102,000 square meters.

  Multi use building for BPOs, Offices and Hotel. (Year 2020)

RBSanchez Inc. is a long-term Asya Partner in Mechanical and Structural Design aspects of the Building.

CFD DESIGN OF VISCOUS PUMPING SYSTEMS OF LA CARLOTA SUGAR REFINERY

La Carlota Sugar Refinery, Negros Occidental | July 2020

- Tanks, Piping and pump design with Fluid Dynamics and CFD simulation to predict the VISCOUS FLUIDS behavior for molasses and magma pumping systems.

- RBSanchez Inc. is a long-term Partner with Global Horizons Inc. in various industrial projects.

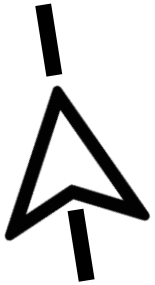
Actual CFD Simulations performed to date

FESTIVAL EXPANSION SUPERMALL

Alabang, Muntinlupa

CFD ANALYSIS OF 5400-TR COOLING TOWER AT NEW FESTIVAL SUPER MALL

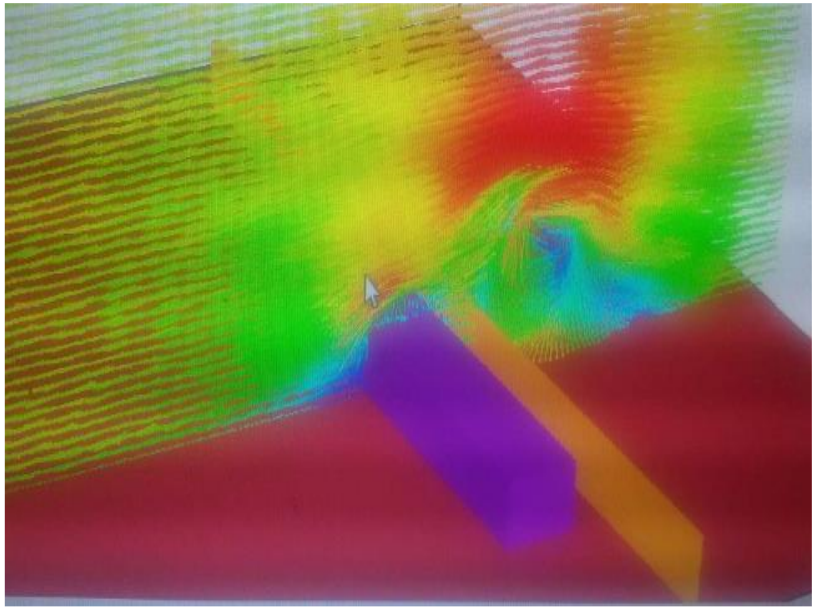
Different CFD schemes for the multiple configurations of the cooling towers based on orientation and layout arrangements. This includes single line tower configuration, separated towers at different tower orientation against prevailing wind direction.



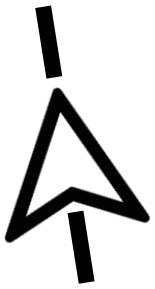
WIND DIRECTION

OPTION 1 – SINGLE LINE TOWERS CONFIGURATION AT 90DEG AGAINST THE WIND

Results show that abnormal backflow occurs at the back side of the cooling towers suction influenced by the suction of the tower flows.



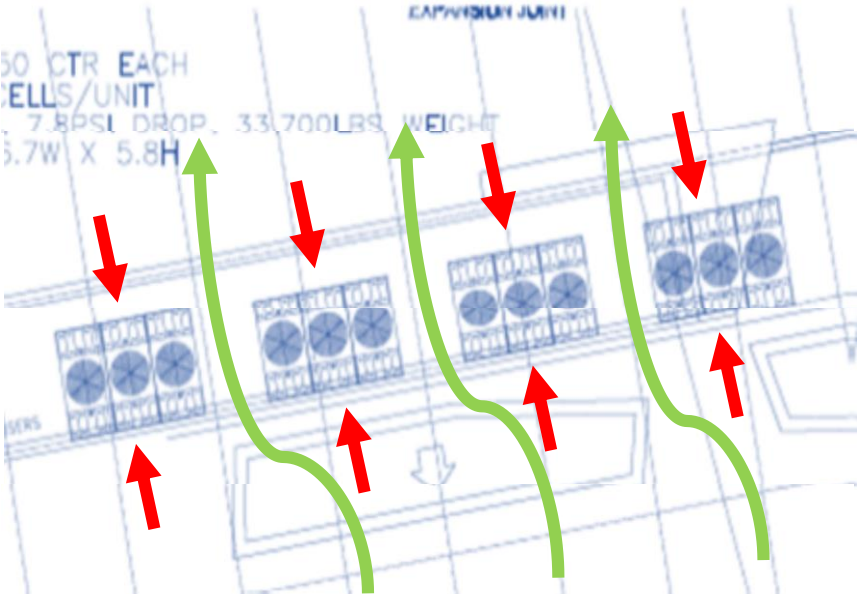
CFD ANALYSIS OF 5400-TR COOLING TOWER AT NEW FESTIVAL SUPER MALL



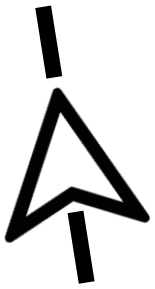
WIND DIRECTION

OPTION 2 – SEPARATED TOWERS CONFIGURATION AT 90DEG AGAINST THE WIND

Same configurations except that the towers are separated to allow natural wind to flow between towers. Although improved airflow is observed in this case, abnormal pressure changes can still be observed in the back side of the towers suction.



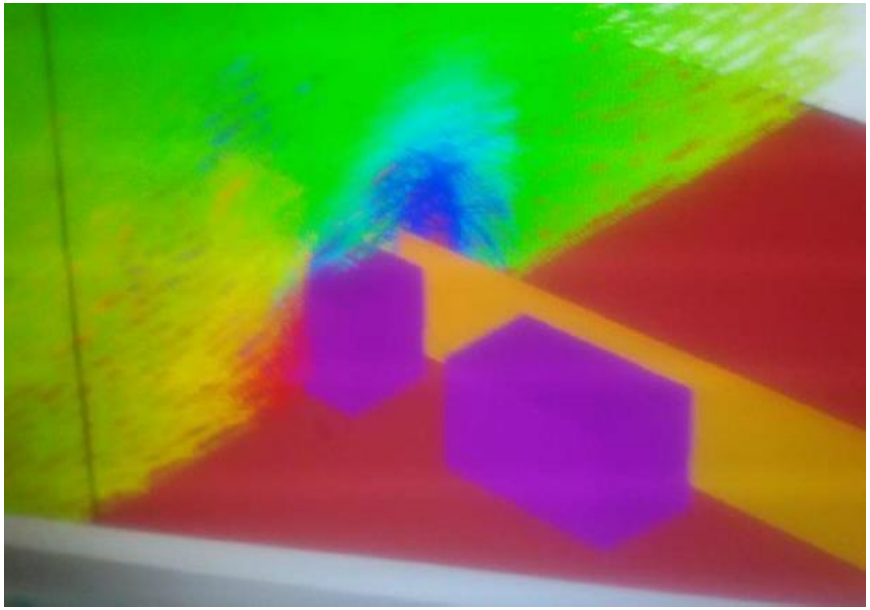
CFD ANALYSIS OF 5400-TR COOLING TOWER AT NEW FESTIVAL SUPER MALL



WIND DIRECTION

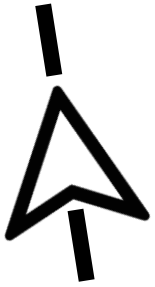
OPTION 2 – SEPARATED TOWERS CONFIGURATION AT 90DEG AGAINST THE WIND

Similar results are observed compared to option 1. However, this configuration resulted to less disturbed airflow at the back side of the tower influenced by the tower fans suction effect.



CFD ANALYSIS OF 5400-TR COOLING TOWER AT NEW FESTIVAL SUPER MALL

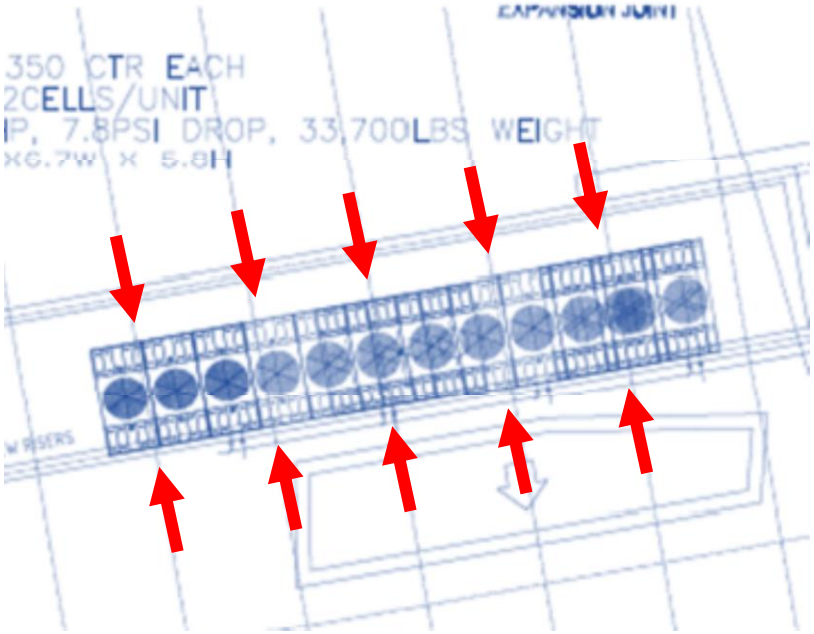
Different CFD schemes for the multiple configurations of the cooling towers based on orientation and layout arrangements. This includes single line tower configuration, separated towers at different tower orientation against prevailing wind direction.



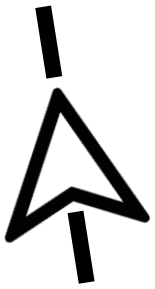
WIND DIRECTION

OPTION 1 – SINGLE LINE TOWERS CONFIGURATION AT 90DEG AGAINST THE WIND

Aligned towers along the wind direction at one side of tower suction. This CFD run results to abnormal pressure changes on the back side due to the counter-acting forces from the wind blow and tower suction.



CFD ANALYSIS OF 5400-TR COOLING TOWER AT NEW FESTIVAL SUPER MALL

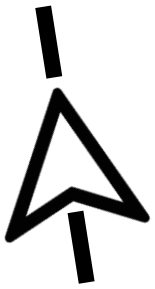


WIND DIRECTION

OPTION 3 – SEPARATED TOWERS CONFIGURATION AT 0DEG AGAINST THE WIND

Same configuration with the option 2 but with 0 degree orientation to the wind direction. In this configuration, the velocity profile shows good agreement and results at the downstream profile. Separation of towers and both suction faces results to almost uniform flow and acceptable pressure domains.

CFD ANALYSIS OF 5400-TR COOLING TOWER AT NEW FESTIVAL SUPER MALL

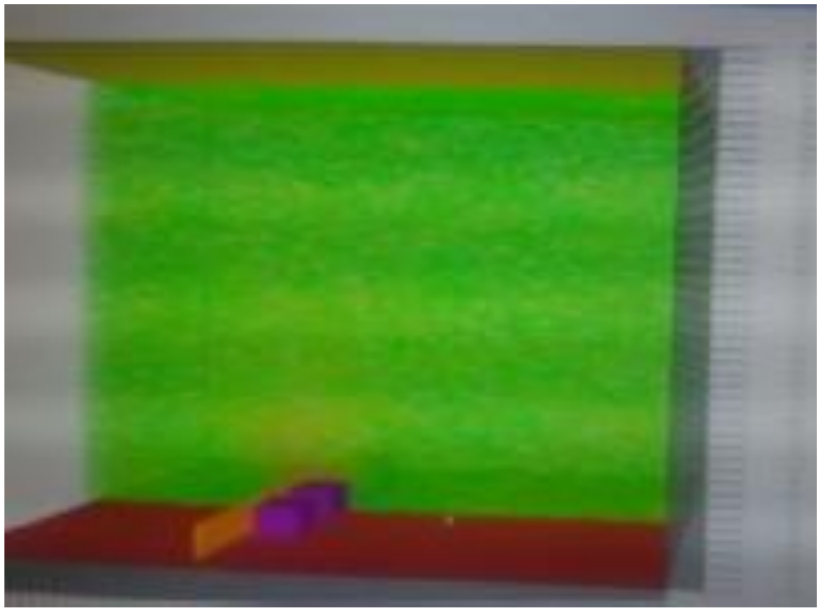


WIND DIRECTION

OPTION 3 – SEPARATED TOWERS CONFIGURATION AT 0DEG AGAINST THE WIND

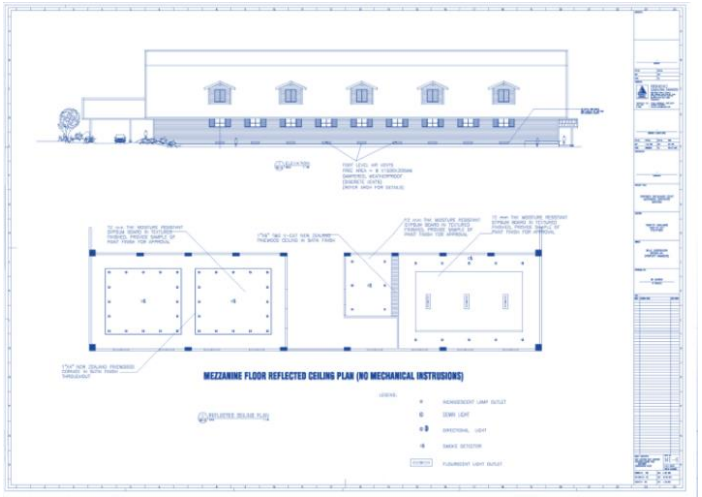
This configuration shows good agreement compared to previous cases and options. Additionally, this case shows most improved airflow profile upstream and downstream.

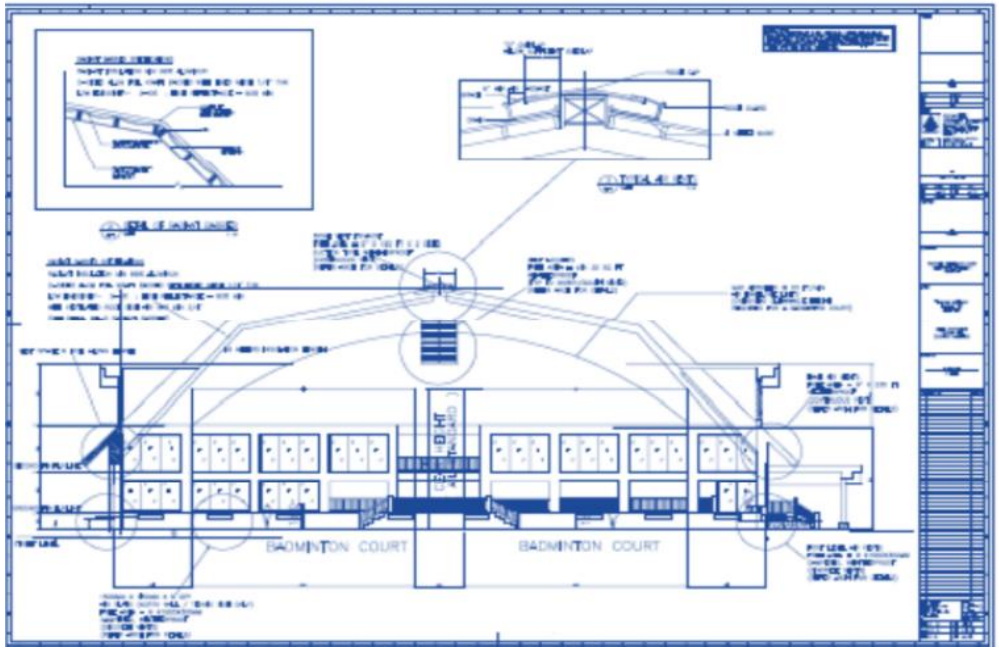
Thus, this option is the best configuration and was recommended to be tower layout and configuration.



CFD ANALYSIS AND CALCULATION FOR TAGAYTAY HIGHLANDS NATURAL VENTILATION

Under roof solar shield with 13mm hot air gap for insulation, huge solar cap covers and cross flow air ventilation and high ridge vents.



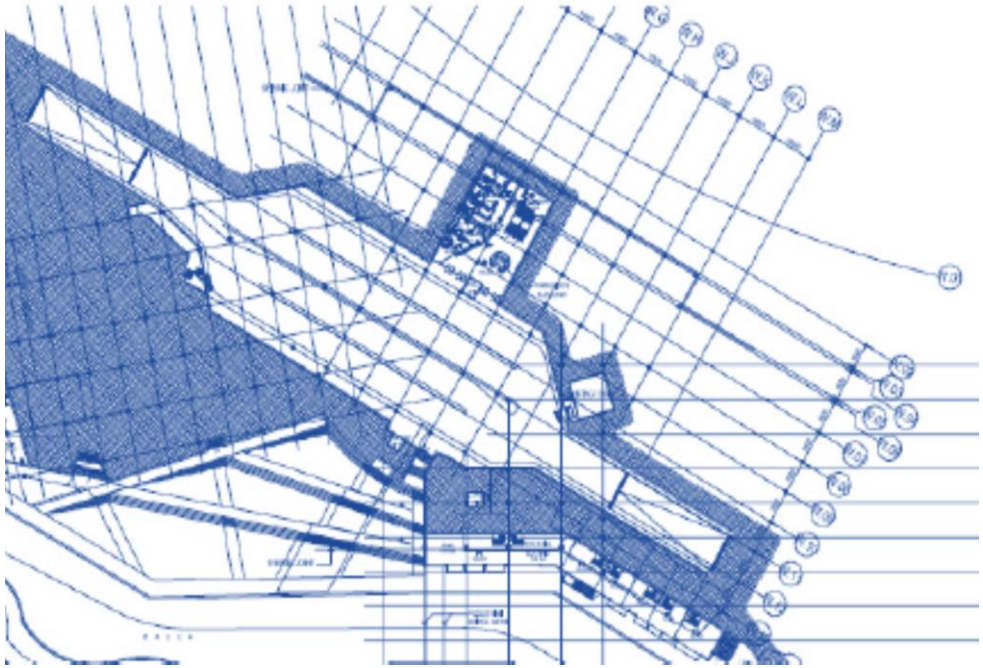


CFD ANALYSIS FOR AN UNDERGROUND SUPERMALL CARPARK TUNNEL

Solver: Fire Dynamic Simulation (FDS)

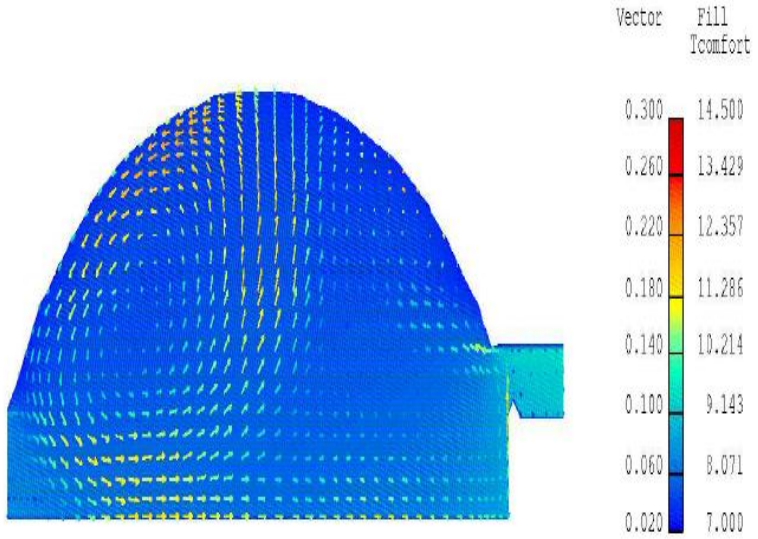
An underground road tunnel design for oxygen, car fire scenarios, carbon monoxide and carbon dioxide levels at such scenarios.

This tunnel design aims to determine the levels of dangerous pollutants that will occupy the tunnel and identify mitigating conceptual designs to counter the predicted conditions. This will also reduce the amount of time and money to be if such failure occurred in actual.



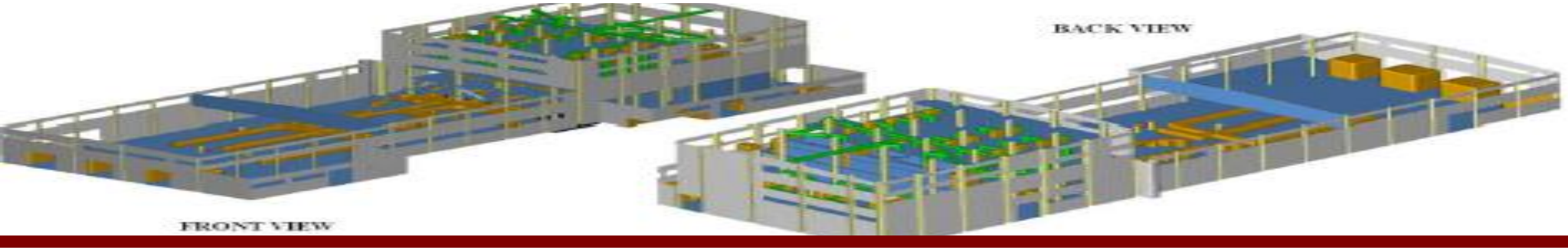
CFD ANALYSIS FOR THE METROPOLIS MALL
AIR CAVERN CATCHER FOR NATURAL VENTILATION

A 3600-TR mall natural ventilation study in the opening of the glass façade to accommodate and act as a wind catcher intake.

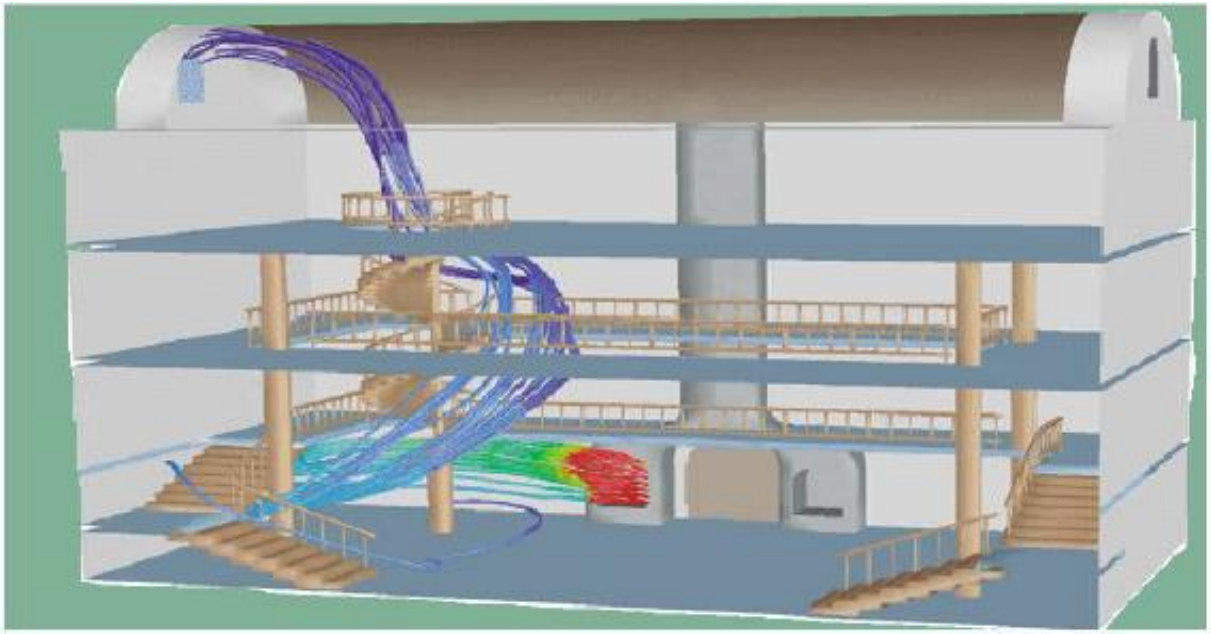


PRINCIPLES OF NATURAL VENTILATION

Different airflow principles that follows the law of natural ventilation and buoyancy were adopted in this project.



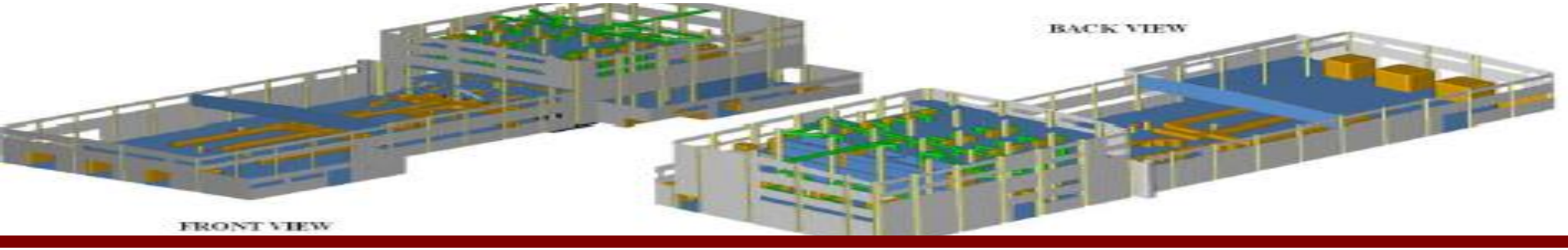
CFD ANALYSIS FOR THE METROPOLIS MALL
AIR CAVERN CATCHER FOR NATURAL VENTILATION



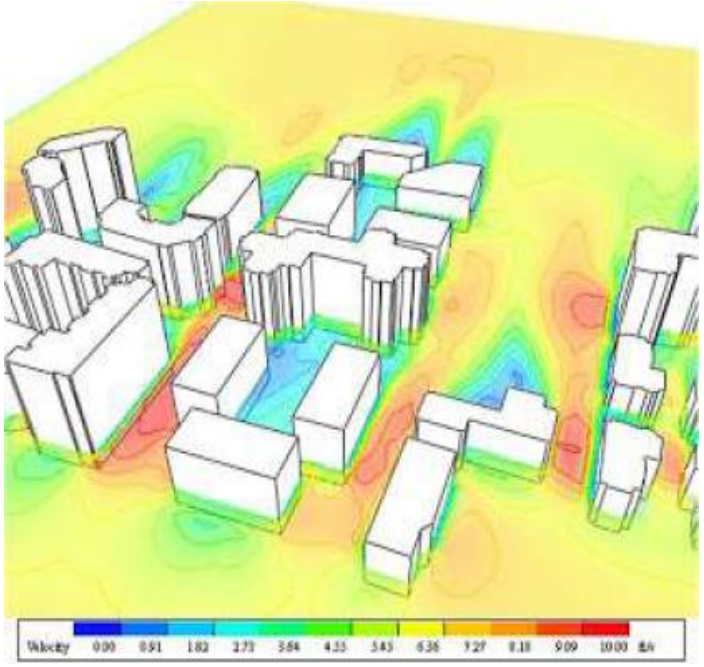
NATURAL VENTILATION – SPENT AIR

The use of the shuttered open the main hallways and corridors to serve as exit and entry of wind driven air. The use of spent cool air from the three lower floors to be released upward to assist in cooling the natural ventilation of 4th and 5th floors.

The design and provision (for occasional use during humid months) of swimming pool fountain as chilled water curtain air dehumidifier during hot and humid days to dry incoming air in the wind catcher intake. It is estimated int two to three months a year that the wind will be too hot and humid and need the cooling assistance from chilled water.

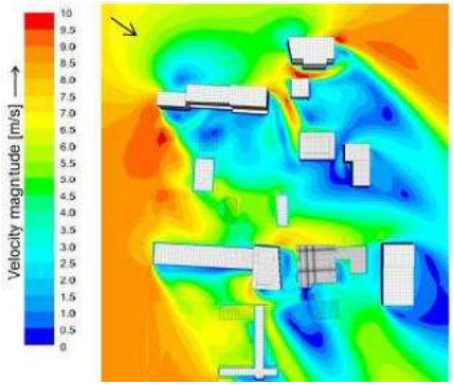


CFD ANALYSIS FOR THE METROPOLIS MALL AIR CAVERN CATCHER FOR NATURAL VENTILATION



NATURAL WIND PROFILE OVER THE AREA

The velocity and pressure profile over the buildings surrounding the malls. Study were conducted to determine the traverse air direction influenced by barriers.

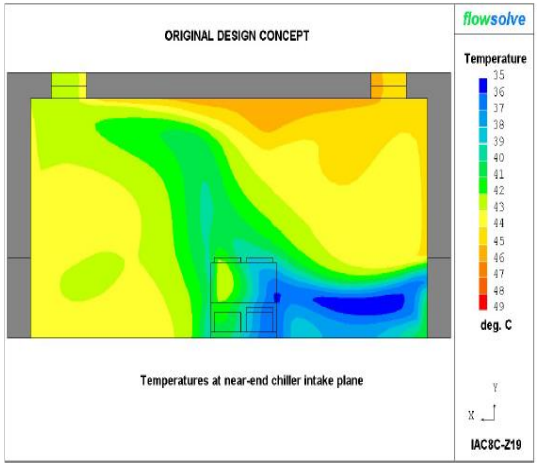


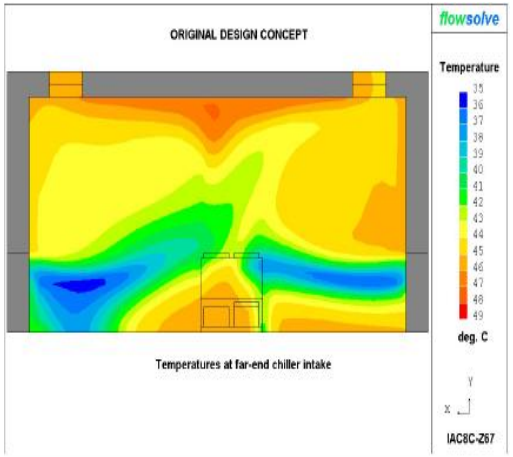
ROOF RIDGES DESIGNS

The design of the roof apex and ridges as wind-driven cross ventilation, where natural wind will be pushed and sucked out the hot air trapped in the roof level. The design acts as a cool air intake and hot air exhaust from the influence of wind driven pressures.

CFD ANALYSIS FOR AN AIR COOLED CHILLER AIR INTAKE STUDY

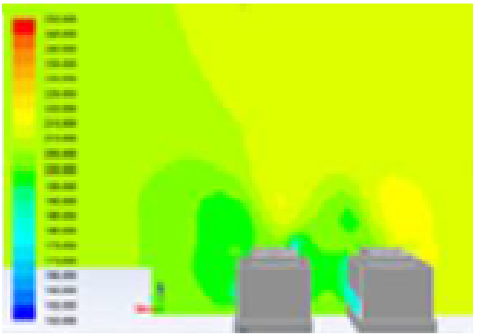
A study of air-cooled chiller configuration and the intake velocity and temperature profile in the near and far-end intake planes.

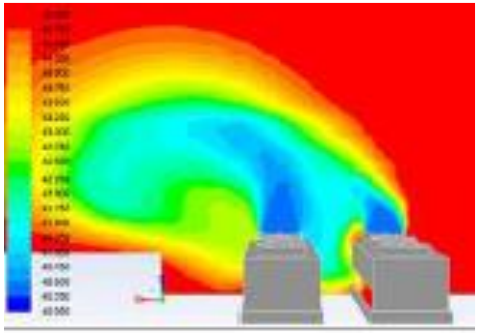




TEMPERATURE AND VELOCITY PROFILES

The results shows the velocity profiles (right) and temperature profiles (left) for the chiller intake and exhaust planes. The results agreed and validated the actual conditions on site.



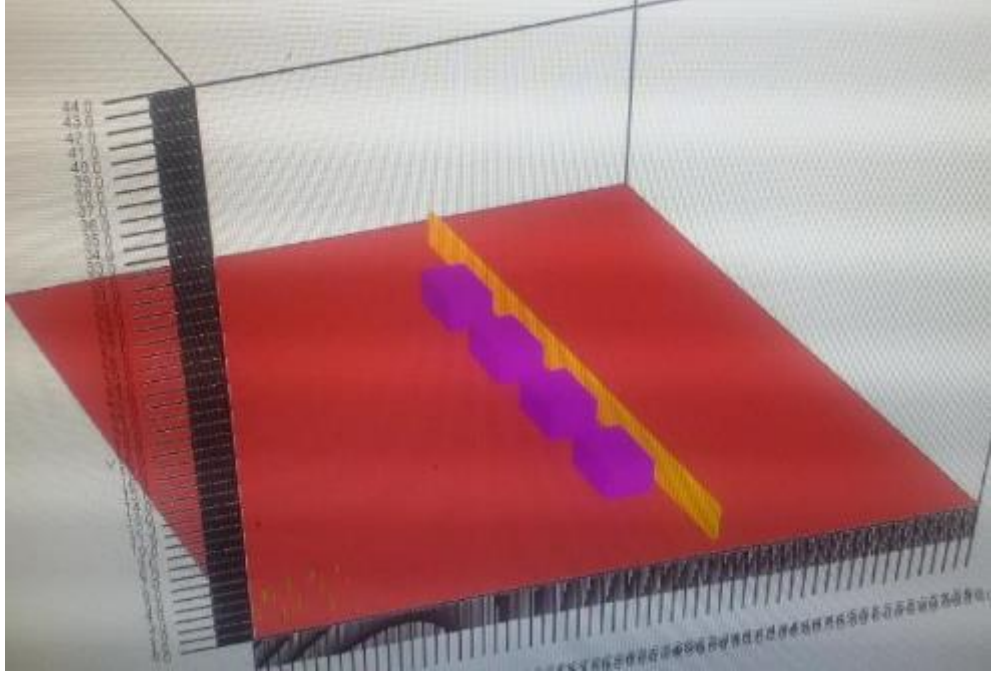


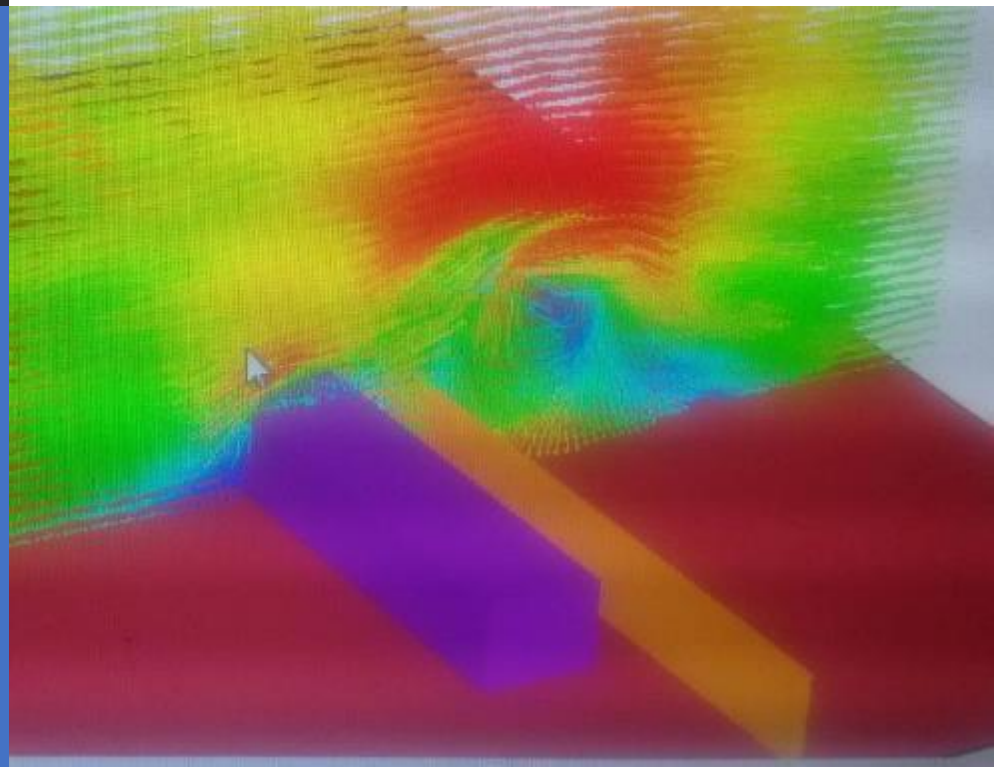
OTHER CFD PROJECTS HANDLED

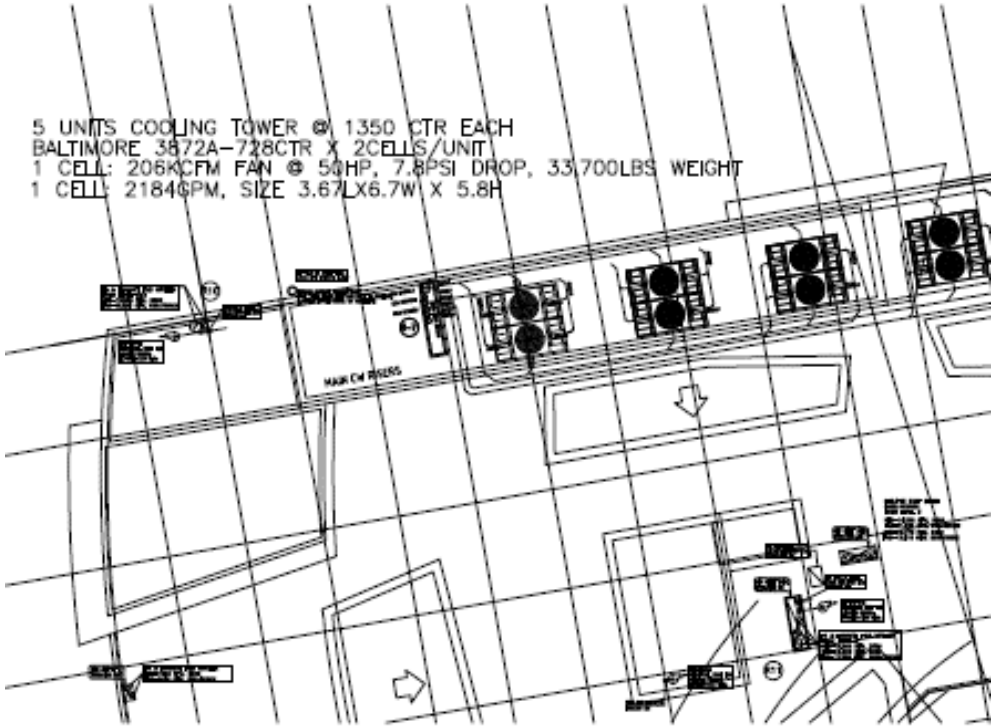
- Computer Server Farms and Server Rooms
- Industrial Plant Cleanrooms
- Healthcare Facilities and Cleanrooms
- Highrise Building Wind and Stack Effects
- Carpark and Underground Tunnels ventilation
- Underground Spaces
- Naturally Ventilation of Structures
- Kitchen Comfort and Hood Exhaust Design

“AS DESIGNED” CFD RUN ON COOLING TOWERS

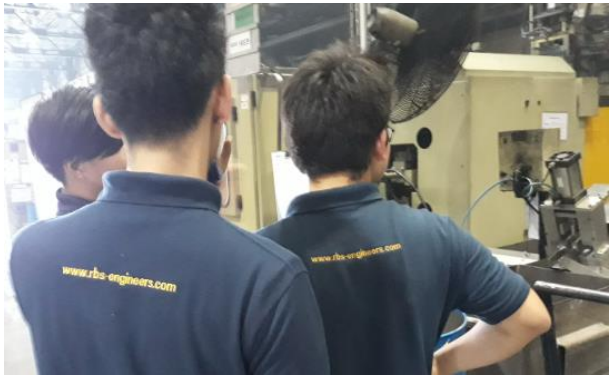
NEW FESTIVAL SUPER MALL

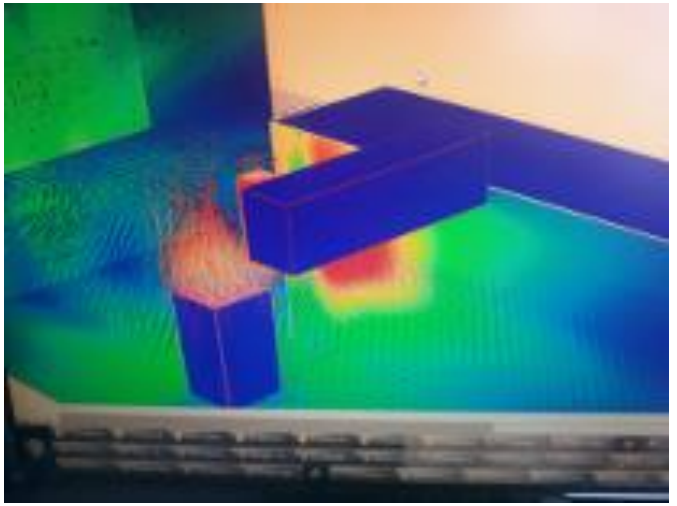






READINGS OF LOCAL VENTILATION PM2.5 PARTICLE CONCENTRATIONS





OPERATIONS & MAINTENANCE (O&M)

MAKATI MEDICAL CENTER

SUNPOWER®

ASCOTT
MAKATI

OPERATIONS & MAINTENANCE SERVICES

FABRICATION PLANT 1

- Supply of HVAC Consultancy and Chiller Operations Maintenance Services. RBS supplied consultancy and technical operations staff on a 24/7/365 basis for Years 2007-2014. Laguna Technopark, 100, East Main Avenue, Binan City

Year 2007-2014

SUNPOWER®

OPERATIONS & MAINTENANCE SERVICES

- **MODULE MANUFACTURING MODCO PLANT. SunPower Corporation** Supply of HVAC Consultancy and Chiller Plant Operations and Maintenance for MODCO.

RBS supplied consultancy and technical operations staff on a 24/7/365 basis Year 2007-2016 Module Manufacturing (SPMM) Plant Binan, Laguna.

SUNPOWER®

OPERATIONS & MAINTENANCE SERVICES

- **ASCOTT HOTEL / GLORIETTA 4**
- Supply of HVAC Consultancy and Chiller Operations and Maintenance Services to Trane Phils. Inc, from Year 2007-2018

OPERATIONS & MAINTENANCE SERVICES

- WELLS FARGO LLC **Wells Fargo** Drive, **McKinley** Hill, Upper **McKinley** Road, Taguig City, Metro Manila

Supply of HVAC Consultancy and Trane Chiller Operators and Maintenance Services from Year 2017-2020

OPERATIONS & MAINTENANCE SERVICES

- **RCBC CORPORATE BLDG**
  THE FORT
  25th St, Mckinley Hills, Taguig

Supply of HVAC Consultancy and Trane Chiller Operators and Maintenance Services from Year 2017-2020

OPERATIONS & MAINTENANCE SERVICES

- Makati Medical Center
  Ayala, Makati

- Supply of HVAC Consultancy and Chiller Operation and Services to Trane Phils. Inc. 2007-2013

MAINTENANCE SERVICES

- GLAXO SMITH KLINE

  Chino Roces Avenue, **Pasong Tamo** Ext. Makati City

Supply of Maintenance Services from Year 2017-2019

RBS has personnel deployed on-site.

TESTING AND COMISSIONING OF CHILLED WATER SYSTEM AND AIR SIDE AHUS FOR ST. LUKES HOSPITAL AT THE FORT

5th Avenue, Global City, Taguig, Metro Manila | 2008

St. Luke's Medical Center
Quezon City · Global City

TRANE

- HVAC Test and Commissioning Services and Consultancy to TRANE Philippines Inc for Chillers and Medical AHU systems

ASSOCIATES, PARTNERS, ENGINEERS & STAFF

ASSOCIATE DIRECTOR

ROLANDO B. SANCHEZ

STRUCTURAL CIVIL An experienced Structural Engineer with more than 32 years of experience in design and analysis of high rise buildings up to 40-storey, industrial plants,oil refinery, mining, cement plants, communication towers, guyed tower,silos, piers, revetment structures, slope protection, rockfall analysis, civil works, mining primary crusher, etc. here and abroad.

Date	Position	Company
2001 – present	Managing Principal	RBSanchez Consulting Engineers
1996 – 2000	Structural Design Manager	R.S. Caparros and Associates
1992 – 1994	Rendered Structural Design Services	International Design Group – Canada
1989 – 1992	Structural Design Head	R.S. Caparros and Associates
1990 – 1992	Rendered Structural Design Services	Various Company
1987 – 1998	Structural Design Engineer	Design Management and Development Corporation

EDUCATION

- **Advanced Structural Steel Design, Advanced Structural Analysis, Hydraulics and Hydrology, Engineering Economics**
  University of Toronto, Canada
- **Computer Aided Structural Analysis and Design**
  Seneca College, Canada
- **Bachelor of Science in Civil Engineering**
  University of Sto. Tomas

ASSOCIATE PARTNER

MARIO ALIX, PEE

Professional Electrical Engineer and Systems Specialist

CORE SKILLS

1. Detailed Design Engineering
2. Electrical System and Analysis
3. Construction ProjectManagement
4. Cleanrooms ElectricalProvisions
5. Power Distributions
6. Industrial & Commercial Designand Applications

Owner of Mario A. Alix Philippines, Inc.

- **The Outstanding Mapuan(TOM) Awardee 2008 in Professional Practice in Electrical Engineering**
- **Institute of Integrated ElectricalEngineers Awardee 2012 of The Most Outstanding Electrical Engineer**

EDUCATION

- **Bachelor of Science in Electrical Engineering** Mapua Institute of Technology,Manila

ASSOCIATE PARTNER
OSCAR RELUCIO
PME (PROFESSIONAL MECHANICAL ENGINEER)

BS IN MECH ENGG. - U.P. DILIMAN YEAR 1981

Major Experiences & Design

- Intel Technology Philippines, 2001-2007
- Amkor/Anam Phils Muntinlupa, 1991
- American Microsystems Phils. Inc., 1993
- Sunpower Phils. Inc. Fab1/Fab2 Line Expansion,
- Microsemi Semi-Conductors Manila, 2015
- 30,000sqm HSBC Data Center Project at Hongkong
- Mead Johnson (Phils) Inc., Johnson & Johnson (Phils), Inc.,
- Texas Instrument Phase 2 Bump Module Expansion, 2011
- Cypress Decatech Project Laboratory, 2010
- Procter & Gamble – Beijing
- Ford Motors Phils Inc.
- Bayer Headquarters
- Knauf Manufacturing Facility at Batangas
- Nestle Phils. Inc
- Astra Head Office and Pharmaceutical Plant Complex, 1989
- Malt Extract Plant, Lipa, Batangas
- St. Lukes's Medical Center, BGC Taguig City
- Philippine Orthopedic Center, Quezon City
- Taguig Hospital, Taguig City
- Eastern Visayas Regional Medical Center, Tacloban City
- Ospital ng Makati, Makati City
- Childrens Hospital, Pasig City
- Okada Manila, Paranaque City

Date	Position	Company
2019 – present	Associate Director	RBSanchez PME Consultants & Associates
1998 – 2019	Mechanical Director	Meinhardt Philippines, Inc.
1993 – 1998	Mechanical Head & Project Manager	PT Arnan Pratama Consultants
1989 – 1993	Mechanical Engineering Manager	RN Ferrer Associates,
1984 – 1986	Senior Mechanical Designer & Estimator	OV Roy Construction Inc.
1982 – 1983	Junior Mechanical Designer	Trans-Asia Philippines, Inc.
1981 – 1982	Junior Mechanical Estimator & Designer	Capitol Industrial Construction Group, Inc.

ASSOCIATE PARTNER

DR. ENRICO C. NERA

UP Diliman B.S. in Metallurgical Engineering

ASEAN Engg., APEC Engr., MSMEP, MAusIMM,
Masters in SME, AFEO Honorary Fellow
PRC Regulatory Board Member, Board of Metallurgical Engineering
Past President and CEO, Atlas Consolidated Mining and Development Corp

July 2021 - current	Offshore Mining Operations Manager, RBSanchez PME Consultants Inc.
September 2015 February 2020 CEO	President and CEO, Atlas Consolidated Mining and Development Corp.
September 2014 February 2018	EVP-Operations & Chief Operating Officer Carmen Copper Corporation
July 2007 – Mar 2015	President and Chief Operating Officer Minercon International
November 2002 – June 2007	Professional Regulation Commission Board Member, Professional Regulatory Board of Metallurgical Engineering
1988–1993	Philex Mining Corp. Benguet, Philippines Sr. Metallurgist
1983–1988	Marcopper Mining Corp. Marinduque, Phil. Metallurgical Engineer

ASSOCIATE PARTNER

Hilbert M. Cardenas ACP Met. E. (PMRC), MAusIMM

Education

Master of Management, 2004-2005
B.S. Metallurgical Engineering, 1986-1991 University of the Philippines, Diliman
Metallurgical Plant Practice: Metals Industry Research and Development Center

Second Placer in 1992 PRC Board Exam for Metallurgical Engineer with a rating of 88%
And **Registered Metallurgical Engineer** In the Professional Regulation Commission
.

Experience. Twenty (20) years of experience in Minging and Plant **metallurgy in major corporations, Consultancy** and **Operations management** inclusive of **15 years in senior roles**, Five (5) of which in **senior EXPATRIATE** roles in Vietnam and Tanzania.

Awards:
Outstanding Professional of the Year Award in the Field Of Metallurgical Engineering– PRC 2021
Professional Degree Award in Metallurgical Engineering – UP Alumni Engineers. 2021
Distinction Awardee in Metallurgical Engineering, Philippine Federation of Professional Associations Awards, 2022
DO-IT Award for Sustainability – OceanaGold Philippines Inc. 2017

ASSOCIATE ENGINEER

JOSE FRANCISCO R. SANCHEZ Mining Engineer / Specialist

Apex Mining Company, Incorporated, Mining Consultant – 2021

EHMC Consulting, Inc., Principal Geotechnical Engineer – 2019

Besra Gold Inc., Vietnam, Consultant and Project Manager – 2016

Besra Gold Inc., Malaysia, Senior Geotechnical Engineer – 2012 to 2014

Golder Associates, Australia, Senior Geotechnical Engineer – 2012

Olympus Pacific Minerals Inc., Malaysia, Environment Manager – 2010-2012

Kinbauri Gold Espana S.L., Spain, Chief Mining Engineer – 2008-2009

RRMI Lafayette Mining Ltd, Rapu-Rapu Mine, Mine Geotechnical Engineer – 2005

Lepanto Consolidated Mining Co., Senior Mining, Geotechnical Engineer – 1999–2005.

Philex Mining Corporation and Philex Gold Philippines Inc., Sibutad Project, Mining Engineer – 1996-1999

EDUCATION

- **Board Topnotcher, 1st PLACER** in the 1996 Mining Engineering Licensure Examination
- **M.S. Civil Engineering, major in Geotechnical Engineering**, Mapua Institute of Technology. 2014-2015
- **B.S. Mining Engineering**. Mapua Institute of Technology. 1996.

ASSOCIATE ENGINEER

RAFAEL M. SANCHEZ BSCE Masters in Science

Structural Engineering, Civil Engg. and CPEng Onshore/Offshore

MSc Oil and Gas Structural Engineering, University of Aberdeen, Scotland, 2013

B.S., Civil Engineering, University of the Philippines, 2003

SPECIAL AWARDS

14th Place	**Out of over 6000 examiners in the National CE board exam**	**November 2003**
Top Performer of the Month	MPP Project – Worleyparsons	February 2016
With commendation award	MSc in oil and gas structural Engineering	September 2013
Spotlight Award	DOW/PIC Olefins II Kuwait Project - Fluor	November 2006

2017 – 2020	Director / Senior Engineer – RMS Offshore Engineering Pty Ltd, Melbourne, Australia
2014 - 2017	Principal Civil and Structural Engineer - WorleyParsons, Al Khobar, Saudi Arabia
2008 - 2014	Civil and Structural Engineer – Woodgroup PSN, Melbourne, Australia
2005 - 2008	Civil and Structural Engineer – Fluor Corporation, Alabang, Philippines

RBSanchez PME Consultants & Associates, Inc.

ENGINEERS & STAFF

DIRECTOR of ENGINEERING

Nick Johnsonn B. Fernandez, BSME

President Ramon Magsaysay State University

PRC Mechanical Board Exams 2018
Possible "12th PLACE", Board Licensure Score of 92%.

A WELL-ROUNDED Engineer who combines both theory and practical experience.

Excellent in complex math, programming in using **CFD tools such as Open Foam, RHINO, Arduino, Grasshopper, BREAM, IESVE and LEED** design, etc. down to ISO Cleanroom Class 100 and design of Server Farms, and final multi-discipline projects complete with testing and CX works, turover, maintenance and operations.

Expert in the use of test equipment and measurements to confirm CFD models for thermodynamics, hydrodynamics, environmental and CFD projects in IT SERVER airflows, heat island effects in cleanrooms in semiconductors, water treatment and chemical and sludge and viscuous slurries and mine processing plants.

RBSanchez PME Consultants & Associates, Inc.

ENGINEERING ASSOCIATE

JOEY MICHAEL PEÑA PORTE

PME (PROFESSIONAL MECHANICAL ENGINEER)

PRC Mechanical Board Exams 1996

Sixth (6th Placer) in the PRC Mechanical Engineer Board Licensure Examination

- **University of Nueva Caceres** 1990-1995 Naga City, Philippines

WORK EXPERIENCE:

Mechanical Engineer - (HVAC, Plumbing , Drainage & Fire Fighting)
Construction Development Company (CDC) / (2008 – 2017)
Doha, Qatar
2013 Ministry of Municipality in Urban Planning & Development Authority
Certified Mechanical Engineer – MM UPDA (Qatar)- Grade “A”
2021 U.S. Army Corps of Engineers (USACE)
Al Udied US Air Base – Qatar
Corps of Engineers and Naval Facility Engineering Command Training Course
Construction Quality Management (CQM) - Certified Mechanical Engineer

MECHANICAL ENGINEER

ROBERTO F. MENDOZA JR., M.E.

DON MARIANO MARCOS MEMORIAL STATE UNIVERSITY – MLUC

San Fernando City, La Union Bachelor of Science in Mechanical Engineering 1983 - 1988

Mechanical Package Superintendent
PT Saipem Indonesia
LNG Tangguh Expansion -Train 3
March 14, 2021 – January 13, 2022

MECHANICAL ENGINEER

KYLE ADRIAN APONESTO, ME

Mapua University
Bachelor of Science in Mechanical Engineering
(2018-2022)

Board exam rating: 89.3

Skills: Autocad, Autodesk Fusion 360, Matlab

ADMIN MANAGER

ROSE R. SABIO

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY
PHILIPPINE COLLEGE OF TECHNOLOGY(DAVAO CITY, 2012-2015)

COMPUTER HARDWARE SERVICING NC11
ASIAN BUSINESS INSTITUTE OF E-TECHNOLOGY (BACOLOD CITY, 2008-2009)

VIRTUAL ASSISTANT FOR 5 YEARS
*MANAGER OF EBAY STORES IN AUSTRALIA, U.S.A AND U.K ACCOUNTS (RESPONSIBLE TO TRAIN OTHER VA, SET-UP BUSINESS POLICIES, SEARCH PROFITABLE PRODUCTS, CUSTOMER SERVICES, HANDLE PAYPAL DISPUTES, AND DAILY SALES OF THE ACCOUNTS)

MCR Bles Foods Trading Co.
*ENCODER FOR 6 MONTHS

PHILIPPINE STATISTICS AUTHORITY
*OJT ENCODER FOR 3 MONTHS

ADMIN EXECUTIVE

Charo T. Tamayo

Administration Business Management (ABM)
AMA Education System
ABE International Business College Makati(2016-2019)

TECHNICAL ASSISTANT

Cipriano T. Tamayo Jr.

Mechanical Field Technician
Electrical-Acres Professional Institute Dagupan city (2009)

Experienced in Data gathering, logging and Instruments, IT, Electrical and Mechanical Field Technical Assistant

RBSANCHEZ PME CONSULTANTS & ASSOCIATES INC.,
PERSONNEL ORGANIZATIONAL CHART

ROSENDO B. SANCHEZ
MANAGING PRINCIPAL

ROLANDO SANCHEZ
ASSOCIATE DIRECTOR

OSCAR RELUCIO
ASSOCIATE PARTNER

MARIO ALIX PEE
ASSOCIATE PARTNER

JOSE FRANCISCO SANCHEZ
ASSOCIATE PARTNER

CHARO T. TAMAYO
CORPORATE SECRETARY

NICK JOHNSON FERNADEZ
DIRECTOR ENGINEER

ROSE R. SABIO
ADMIN MANAGER

JOEY

ELMER

KYLE

ROBERT

CIPRIANO

ARMANDO

RESOURCE/OFFICES:

With complete Personnel Support and resources for:

1. AutoCad Drafting and Large format Plotting
2. Complete Engineering softwares (with license): Elite Duct Size 3.0, PsychartHD 7.4, Flite FluidFlow Pipe and Duct Ver 3.0., ASHREA Fundamentals 2013, Trace 700 Cooling Load, CHVAC Heat Load, PipeSizer, Autocad Suite 2013, Cloud computing, and a lot more.
3. Dedicated FTP site for large file transfer

RBSanchez PME Consultants & Associates, Inc.

RBSanchez PME Consultants & Associates, Inc.

RBSanchez PME Consultants & Associates, Inc.

GOVERNMENT LICENCES AND REGISTRATION PAPERS

RBS Engineering Technologies

S.E.C. AND BUSINESS PERMITS

REPUBLIC OF THE PHILIPPINES
SECURITIES AND EXCHANGE COMMISSION
SEC Building, EDSA, Greenhills
City of Mandaluyong, Metro Manila

COMPANY REG. NO. CS201000511
COMPANY TIN 007-570-182

CERTIFICATE OF INCORPORATION

KNOW ALL PERSONS BY THESE PRESENTS:

This is to certify that the Articles of Incorporation and By-Laws of

RBSANCHEZ PME CONSULTANTS & ASSOCIATES INC.

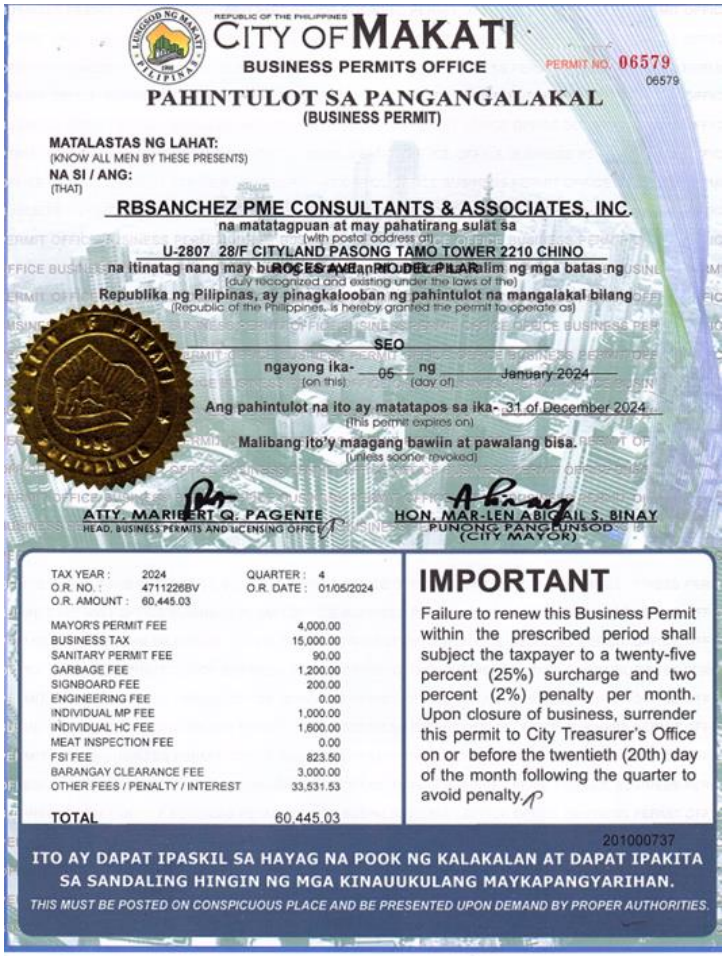
were duly approved by the Commission on this date upon the issuance of this Certificate of Incorporation in accordance with the Corporation Code of the Philippines (Batas Pambansa Blg.68), and copies of said Articles and By-Laws are hereto attached.

This Certificate grants juridical personality to the corporation but does not authorize it to undertake business activities requiring a Secondary License from this Commission such as, but not limited to acting as: broker or dealer in securities, government securities eligible dealer (GSED), investment adviser of an investment company, close-end or open-end investment company, investment house, transfer agent, commodity/financial futures exchange/broker/merchant, financing company, pre-need plan issuer, general agent in pre-need plans and time shares/club shares/membership certificates issuers or selling agents thereof. Neither does this Certificate constitute as permit to undertake activities for which other government agencies require a license or permit.

As a registered corporation, it shall submit annually to this Commission the reports indicated at the back of this certificate.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of this Commission to be affixed at Mandaluyong City, Metro Manila, Philippines, this 26th day of January, Twenty Ten.

BENITO A. CATARAN
Director
Company Registration and Monitoring Department



REPUBLIC OF THE PHILIPPINES
CITY OF MAKATI
BUSINESS PERMITS OFFICE
PERMIT NO. 06579
06579

PAHINTULOT SA PANGANGALAKAL
(BUSINESS PERMIT)

MATALASTAS NG LAHAT:
(KNOW ALL MEN BY THESE PRESENTS)
NA SI / ANG:
(THAT)

RBSANCHEZ PME CONSULTANTS & ASSOCIATES, INC.
na matatagpuan at may pahatirang sulat sa
(with postal address at)
U-2807 28/F CITYLAND PASONG TAMO TOWER 2210 CHINO
na itinatag nang may bu[illegible] alim ng mga batas ng
(duly recognized and existing under the laws of the)
Republika ng Pilipinas, ay pinagkalooban ng pahintulot na mangalakal bilang
(Republic of the Philippines, is hereby granted the permit to operate as)

SEO

ngayong ika- 05 ng January 2024
(on this) (day of)

Ang pahintulot na ito ay matatapos sa ika- 31 of December 2024
(this permit expires on)

Malibang ito'y maagang bawiin at pawalang bisa.
(unless sooner revoked)

ATTY. MARIBERT Q. PAGENTE
HEAD, BUSINESS PERMITS AND LICENSING OFFICE

HON. MAR-LEN ABIGAIL S. BINAY
PUNONG PANGUNSOD
(CITY MAYOR)

TAX YEAR :	2024	QUARTER :	4
O.R. NO. :	4711226BV	O.R. DATE :	01/05/2024
O.R. AMOUNT :	60,445.03		

MAYOR'S PERMIT FEE	4,000.00
BUSINESS TAX	15,000.00
SANITARY PERMIT FEE	90.00
GARBAGE FEE	1,200.00
SIGNBOARD FEE	200.00
ENGINEERING FEE	0.00
INDIVIDUAL MP FEE	1,000.00
INDIVIDUAL HC FEE	1,600.00
MEAT INSPECTION FEE	0.00
FSI FEE	823.50
BARANGAY CLEARANCE FEE	3,000.00
OTHER FEES / PENALTY / INTEREST	33,531.53
TOTAL	60,445.03

IMPORTANT

Failure to renew this Business Permit within the prescribed period shall subject the taxpayer to a twenty-five percent (25%) surcharge and two percent (2%) penalty per month. Upon closure of business, surrender this permit to City Treasurer's Office on or before the twentieth (20th) day of the month following the quarter to avoid penalty.

201000737

ITO AY DAPAT IPASKIL SA HAYAG NA POOK NG KALAKALAN AT DAPAT IPAKITA SA SANDALING HINGIN NG MGA KINAUUKULANG MAYKAPANGYARIHAN.

THIS MUST BE POSTED ON CONSPICUOUS PLACE AND BE PRESENTED UPON DEMAND BY PROPER AUTHORITIES.

BIR AND SSS REGISTRATION

Page 1 of 1

REPUBLIKA NG PILIPINAS
KAGAWARAN NG PANANALAPI
KAWANIHAN NG RENTAS INTERNAS
REVENUE REGION NO. 008 - MAKATI
REVENUE DISTRICT OFFICE NO. 048 - WEST MAKATI

BIR Form No. **2303** Revised: November 2014

OCN: 9RC0001418871E
Date: February 08, 2018

CERTIFICATE OF REGISTRATION

TIN / BRANCH CODE	NAME OF TAXPAYER	TIN ISSUE DATE
007-570-182-00000	RBSANCHEZ PME CONSULTANTS & ASSOCIATES INC.	February 12, 2010

REGISTERING OFFICE : X Head Office | Branch

REGISTERED ADDRESS
U-2807 28/F CITYLAND PASONG TAMO TOWER, 2210 CHINO ROCES AVE., PIO DEL PILAR, CITY OF MAKATI NCR, FOURTH DISTRICT PHILIPPINES 1230

TAX TYPES	FORM TYPES	FILING START DATE	TAX TYPES	FORM TYPES	FILING START DATE
DOCUMENT STAMP TAXES - REGULAR	2000	February 12, 2010	WITHHOLDING TAX - COMPENSATION	1601C	March 31, 2010
REGISTRATION FEE	0605	December 31, 2010	VALUE ADDED TAX	2550M	March 31, 2010
MISCELLANEOUS TAX	0605	October 11, 2011	VALUE ADDED TAX	2550Q	March 31, 2010
CORPORATE INCOME TAX	1702	December 31, 2010	WITHHOLDING TAX - EXPANDED/OTHERS	1601E	February 08, 2018
CORPORATE INCOME TAX	1702Q	March 31, 2010	WITHHOLDING TAX - EXPANDED/OTHERS	1604E	February 08, 2018
WITHHOLDING TAX - COMPENSATION	1604CF	December 31, 2010			

TAXPAYER TYPE/S: DOMESTIC CORPORATION

		CATEGORY	REGISTRATION DATE
TRADE NAME 1	RBSANCHEZ PME CONSULTANTS & ASSOCIATES INC.		February 12, 2010
Line of Business (PSIC)	70200 MANAGEMENT CONSULTANCY ACTIVITIES	Primary	

REMINDERS:
1. PAYMENT OF ANNUAL REGISTRATION FEE ON OR BEFORE JANUARY 31, USING BIR FORM NO. 0605
2. FILING OF REQUIRED TAX RETURN/S TO CONFORM WITH THE ABOVE TAX TYPE/S, WHETHER WITH OR WITHOUT BUSINESS OPERATION. TO AVOID PENALTIES
3. THE FOLLOWING SHALL LIKEWISE BE ACCOMPLISHED:
   - APPLICATION FOR REGISTRATION OF MANUAL BOOKS OF ACCOUNTS AND/OR COMPUTERIZED ACCOUNTING SYSTEM OR COMPONENTS THEREOF (BIR FORM NO. 1900)
   - APPLICATION FOR AUTHORITY TO PRINT MANUAL RECEIPTS AND INVOICES (BIR FORM NO. 1906)
4. IMMEDIATELY INFORM THIS DISTRICT OFFICE IN CASE OF TRANSFER/CESSATION OF BUSINESS AND OTHER CONCERNS BY FILING BIR FORM NO. 1905 TO STOP GENERATION OF OPEN CASES

I HEREBY CERTIFY THAT THE ABOVE NAMED PERSON IS REGISTERED AS INDICATED ABOVE, UNDER THE PROVISIONS OF THE NATIONAL INTERNAL REVENUE CODE, AS AMENDED.

REBE D. DETABLAN
REVENUE DISTRICT OFFICER (Signature over Printed Name)

LUCY DC. ABRASIA
Revenue District Officer
RDO No. - West Makati

THIS CERTIFICATION MUST BE EXHIBITED CONSPICUOUSLY IN THE PLACE OF BUSINESS.

DBWIS DST 2017 06577881
DBWIS DST 2017 06577866

COV-01315 (03-2017)

Republic of the Philippines
SOCIAL SECURITY SYSTEM

2019
OCTOBER

CERTIFICATE OF REGISTRATION

This is to certify that

RBSANCHEZ PME CONSULTANTS
2210 U2807 28/F CITYLAND PASONG TAMO TOWER CHINO ROCES AVENUE, PIO DEL PILAR, CITY OF MAKATI, NCR 1230

has been duly registered with the Social Security System (SSS) as employer on ***01 July 2010*** *with Employer Number* ***03-9248034-1-000****.*

Pursuant to the Social Security Law, the employer has the responsibility to report all its employees to the SSS for coverage, deduct from their monthly salaries their respective shares of the SS contributions and, with the corresponding employer's share, remit the same to the SSS. It also has the responsibility to deduct from the salaries of its employees, their monthly loan amortization, if any, and remit them to the SSS.

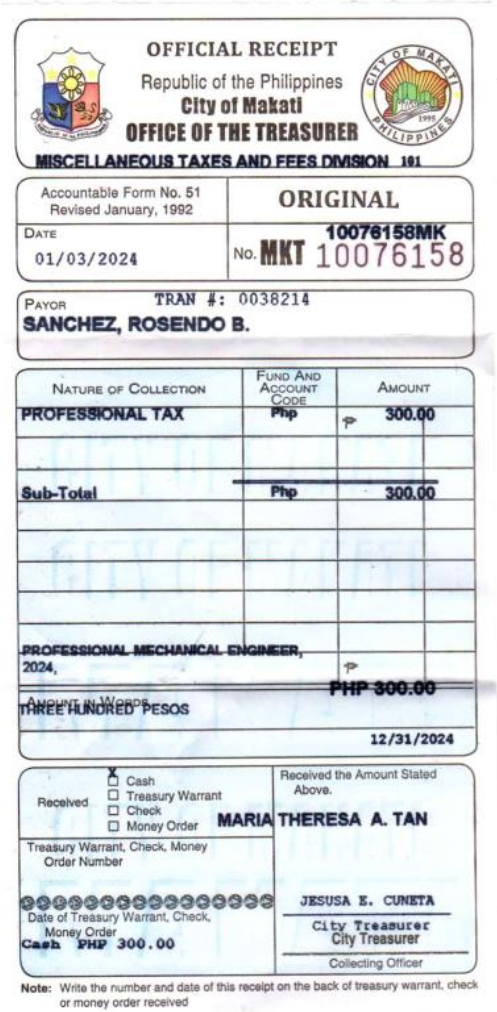
This certification is issued this 17th day of October, 2019.

AURORA C. IGNACIO
President and CEO

20191017-124212-6

RBSanchez PME Consultants & Associates, Inc.

PROFESSIONAL PRC PTR TAX & PME REGISTRATION



OFFICIAL RECEIPT
Republic of the Philippines
City of Makati
OFFICE OF THE TREASURER
MISCELLANEOUS TAXES AND FEES DIVISION 101

Accountable Form No. 51
Revised January, 1992

ORIGINAL

DATE 01/03/2024

No. MKT 10076158 10076158MK

PAYOR SANCHEZ, ROSENDO B.

TRAN #: 0038214

NATURE OF COLLECTION	FUND AND ACCOUNT CODE	AMOUNT
PROFESSIONAL TAX	Php	₱ 300.00
Sub-Total	Php	300.00
PROFESSIONAL MECHANICAL ENGINEER, 2024,		₱ PHP 300.00

AMOUNT IN WORDS
THREE HUNDRED PESOS

12/31/2024

Received
☒ Cash
☐ Treasury Warrant
☐ Check
☐ Money Order
MARIA

Treasury Warrant, Check, Money Order Number

Date of Treasury Warrant, Check, Money Order
Cash PHP 300.00

Received the Amount Stated Above.
THERESA A. TAN

JESUSA E. CUNETA
City Treasurer
City Treasurer
Collecting Officer

Note: Write the number and date of this receipt on the back of treasury warrant, check or money order received

Republic of the Philippines
PROFESSIONAL REGULATION COMMISSION
PROFESSIONAL IDENTIFICATION CARD

LAST NAME ▶ SANCHEZ
FIRST NAME ▶ ROSENDO
MIDDLE NAME ▶ BARRIOS
REGISTRATION NO. ▶ 0003999
REGISTRATION DATE ▶ 05/05/2003
VALID UNTIL ▶ 12/22/2025

PROFESSIONAL MECHANICAL ENGINEER

RBSanchez PME Consultants & Associates, Inc.

SAMPLE TESTING AND MEASUREMENT PRECISION INSTRUMENTS

USE OF SUPERCOMPUTERS FOR “REALISTIC” PROBLEM-SOLVING SIMULATION OF DESIGN CONCEPTS AND OPERATIONAL PROBLEMS

THREE (3) SUPERCOMPUTER SERVERS units of Hewlett Packard Proliant Brand and HP DL-380 Servers each of 32-cores 3.0 MHz Intel Xeon Double Processors

SAMPLE CALIBRATION CERTIFICATES

CALTEK PTE LTD

23 Tagore Lane, #04-08/09/10/11 Tagore 23 Warehouse, Singapore 787601
Tel: (65) 6452 0300 | Fax: (65) 6452 0500
www.caltekgroup.com | info@caltekgroup.com

CALIBRATION CERTIFICATE

CERTIFICATE NUMBER	: CTM 3073-18	JOB NUMBER	: CTJ 18-6556
DATE RECEIVED	: 28-Sep-18	ISSUE DATE	: 16-Oct-18

Instrument	: ULTRASONIC FLOW METER	Ambient Temperature	: (23 ± 5) °C
Manufacturer	: ---	Relative Humidity	: (55 ± 10) % r.h.
Model No.	: TUF-2000M	Date Calibrated	: 16-Oct-18
Part No.	: ---	Recommended Due Date	: 16-Oct-19
Serial No.	: 18207057		
Customer	: RBSANCHEZ PME CONSULTANTS & ASSOCIATES, INC Unit 3603,36th Floor, Makati Executive Tower 2 cor Osmena & Buendia Ave, Makati City, Postal Code: 1230 Metro Manila, Philippines	Range	: ---
		(Tag No.)	: ---
		Page	: 1 of 2
		Status	: As Found

The described instrument has been calibrated at **Caltek Laboratory** under the ambient conditions stated above.

This certificate provides traceability of measurement to the International System of Units **(SI)** and/or to units of measurement realised at the National Metrology Centre **(NMC)** , Singapore or other recognized national metrology institutes.

METHOD : The calibration method was carried out according to In-house Technical Calibration Procedure CTTM - M22.2007 as a guide.

REFERENCE INSTRUMENT(S)	SERIAL NO
1. Liquid Flow Calibrator	23140

RESULTS OF CALIBRATION

1. The results of calibration are given on the attached calibration data sheet(s).
2. The expanded uncertainty of measurement associated with the calibration is 2.0 % of reading estimated at a confidence level of approximately 95 % with a coverage factor of k=2.00.
3. The user should determine the suitability of the instrument for its intended use.

Calibrated by :
PREMKUMAR. S
EMP ID : 1022

Approved by :
AYYAPPAN. M
EMP ID : 1011

This certificate may not be reproduced other than in full, except with the prior written approval of the issuing Laboratory

CALTEK PTE LTD

23 Tagore Lane, #04-08/09/10/11 Tagore 23 Warehouse, Singapore 787601
Tel: (65) 6452 0300 Fax: (65) 6452 0500
www.caltekgroup.com | info@caltekgroup.com

TEST REPORT

REPORT NUMBER	: CTM 3014-18	JOB NUMBER	: CTJ 18-6556
DATE RECEIVED	: 28-Sep-18	ISSUE DATE	: 16-Oct-18

Item	: FORMALDEHYDE DETECTOR	Ambient Temperature	: (23 ± 5) °C
Manufacturer	: WAYSEAR	Reative Humidity	: (55 ± 10) % r.h.
Model No.	: GT58A	Date of Tested	: 16-Oct-18
Part No.	: ---	Recommended Due Date	: 16-Oct-19
Serial No.	: ---		
Customer	: RBSANCHEZ PME CONSULTANTS & ASSOCIATES, INC Unit 3603,36th Floor, Makati Executive Tower 2 cor Osmena & Buendia Ave, Makati City, Postal Code: 1230 Metro Manila, Philippines	Range	: ---
		(Tag No.)	: ---
		Page	: 1 of 1
		Status	: As Found

The described instrument has been tested at **Caltek Laboratory** under the ambient conditions stated above.

METHOD : The test method was carried in accordance with manufacturer's specification procedure as a guide.

RESULTS OF TEST

FUCTION TEST	CHECK	REMARKS/RESULTS
VISUAL INSPECTION	DENT/PHYSICAL DAMAGE	ACCEPTABLE
RESPONSE TIME	DIGITS SENSITIVITY	ACCEPTABLE
SAMPLING PUMP	VACUUM ACTION	ACCEPTABLE
HCHO DETECTION(mg/m^3)	DETECTED	ACCEPTABLE
TVOC DETECTION(mg/m^3)	DETECTED	ACCEPTABLE
PM 2.5 DETECTION (<2.5 µg/m^3)	DETECTED	ACCEPTABLE

Remark: The user should determine the suitability of the item for its intended use.

Tested by :
AYYAPPAN. M
EMP ID : 1011

Approved by :
V.SIVA
EMP ID : N.A

This certificate may not be reproduced other than in full, except with the prior written approval of the issuing Laboratory

RBSanchez PME Consultants & Associates, Inc.

RBS Office Location

Unit 3603, 36F Makati Executive Tower II, Buendia Ave. cor. Dela Rosa St. Brgy. Pio Del Pilar, Makati City Philippines 1230

RBS has eight (8) private parking spaces at Cityland Complex CondoAlternatively, public may park just across the RBS offices is SM Hypermarket and also at nearby Cash and Carry Mall, Buendia Makati.

CONTACT US!

RBSanchez PME Consultants & Associates, Inc.

Unit 3603, 36F Makati Executive Tower II, Buendia Ave. cor. Dela Rosa St.
Brgy. Pio Del Pilar, Makati City Philippines 1230

(+632) 8776-5879, 8638-2604,
8809-8106;

(+63) 927-300-6000 / 947-507-000

info@rbs-engineers.com
rosensanchez@yahoo.com

www.rbs-engineers.com

Thank you!

RBSanchez PME Consultants & Associates, Inc.

Unit 3603, 36F Makati Executive Tower II, Buendia Ave. cor. Dela Rosa St.
Brgy. Pio Del Pilar, Makati City Philippines 1230

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