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We're fetching your file...Please wait a moment while we retrieve your file from its home on the internet I've always wanted to download HVAC excel calculators to assist my design calculations. But, I couldn't find a single one that is easy enough for me to understand and use. So, I've always ended up deleting them. Since nobody can let me download a useful one, I had to make myself one. For more than 7 years of working in the HVAC industry from being a project engineer to becoming a project manager, I developed 8 HVAC excel calculators. They helped me to perform design calculations such as chilled water pipe sizing and grille sizing. Ever since I had my HVAC excel calculators, I noticed that I became much more efficient and productive. My colleagues often took 2-3 hours to finish their sizing work while I've done it in less than an hour. This allows me to move on to other things and produce more results. Excel calculators allow me to free up time to focus on important things that matter the most." Yu Chang ZhenDeveloping these excel calculators is not an easy task. Not only that I need to know how to do the calculation in the first place, but I also need to test and refine the results through construction projects. Basically, it took me a few years to put together the excel calculators. The first and my favourite excel calculator is the chilled water pipe sizing calculator. Among all the calculators, I use this calculator the most. It's really been helping me to quickly find the corresponding chilled water pipe size based on the water flow rate.I developed this chilled water pipe sizing calculator based on the friction loss chart method. If you don't know how to find chilled water pipe size using a friction loss chart, I suggest you check out my post on how to size chilled water pipe size.From the friction loss chart, I've set the friction loss and water velocity limit. So, all you have to do is to enter the water flow rate either in gpm, m3/hr or l/s and the calculator will show you the appropriate pipe size in mm and inch.I remember I developed this HVAC grille size calculator because I was sizing almost a hundred units of return air grilles and external weather louvers. The manual way is quite simple but when you're dealing with hundreds of grilles, it is so much better to use an excel calculator.If you don't know how to calculate grille size, check out my post on return air grille sizing guide where I included the exact grille sizing formula as well as three grille CFM charts for you to quickly find the suitable grille size. The grille sizing formula involves airflow and the free area of the grille. With both values, you can calculate the required grille area and thus, match the grille size. For extra convenience, you can print out my grille CFM charts to match the grille area.Sizing the cooling tower make-up water tank is relatively easy. However, many people don't actually know how to size it. For the manual way, see my blog post on how to size cooling tower make-up water tank where I'll walk you through the calculation process step by step.From there, I translated the manual way to excel calculator. Sometimes, I need to change the operation hour and the tank size. Thus, this excel calculator is very handy.By the way, you can speed up your design calculation process with my HVAC excel calculators. They are great for basic sizing and design. However, if you're a design engineer, I encourage you to learn cooling load calculation as it is an extremely valuable skill to have.Learn how to calculate cooling load using the ASHRAE's Radiant Time Series method that accounts for solar heat gain, conductive heat gain, radiant heat gain and internal heat gain in a 24 hours load profile manager.Pressure drop in pipes, valves and fittings is not easy to calculate. There are a few ways to do it but I find that the ASHRAE K factor method is the easiest and understandable way to estimate the pressure drop.Again, if you have no idea how to calculate pressure drop in valves and fittings, I suggest you read my post on how to calculate pressure drop across a valve. I've included the ASHRAE pressure drop formulate in the post.In addition to the formula, ASHRAE also split the calculation for threaded and flange valves and pipe fittings. However, ASHRAE didn't discuss the required water velocity in the same section but I've included it in my excel calculator.I've had a blog post about closed loop chilled water system pressure. If you haven't read it, I encourage you to do so because it debunked the myth about flanges, valves and fittings pressure rating in the chilled water system.Basically, many engineers calculate pressure ratings wrongly or allow too high of a safety factor thereby increasing the overall cost of the chilled water system. Not many engineers understand the stagnation pressure that I've mentioned in my blog post.Using the static and dynamic pressure, we can calculate the stagnation pressure and thus, I brought the formula into excel and created the pressure rating calculator.Many engineers don't know how to calculate the required fan airflow of staircase pressurization. I previously completed two projects that have the staircase pressurization system and thus, I refined the excel calculator based on my experience.As for the lift lobby pressurization fan airflow calculation, the estimation of the number of doors open during a fire is critical. We use a minimum of 2 doors or 10% of the total doors whichever is higher to determine the required pressurization fan capacity.Although it is not difficult to calculate smoke extraction fan capacity manually, it is still very useful to have an excel calculator especially when you're dealing with large-scale projects.However, I only included the calculation for the basement carpark which is very common in HVAC construction projects. Almost every high-rise residential and commercial buildings required a basement smoke extraction system.Many excel calculators out there are difficult and complicated to use. Hence, I designed these 7 excel calculators to be user-friendly which each calculator included a user guide. So, check out my Design Engineer Starter Pack now to see more about these excel calculators.Again, consider using my HVAC excel calculators to ease your design work and learn how to use the latest (more accurate) RTS method to calculate cooling load and plot a 24 hours load profile for better equipment sizing and load optimization.Learn how to calculate cooling load using the ASHRAE's Radiant Time Series method that accounts for solar heat gain, conductive heat gain, radiant heat gain and internal heat gain in a 24 hours load profile manner. 0 ratings0% found this document useful (0 votes)91 viewsThis document contains instructions for using a calculator to assess the water efficiency of a cooling tower. It includes input tables for utility rate data, cooling tower operational param...AI-enhanced title and descriptionSaveSave calculator_cooling towers For Later0% found this document useful, undefined 07 Sep 2024 Tags: cooling tower design calculations xls Abstract: Cooling towers are essential components of many industrial processes, including power plants, chemical processing facilities, and air conditioning systems. The design of a cooling tower requires careful consideration of various factors, including the heat transfer rate, airflow, and water flow rates. This article presents a comprehensive approach to cooling tower design calculations using Microsoft Excel. We will provide formulas and examples in BODMAS (Brackets, Orders, Division, Multiplication, Addition, Subtraction) format, as well as ASCII art for clarity. Introduction: Cooling towers are used to dissipate heat from industrial processes, such as power plants, chemical processing facilities, and air conditioning systems. The design of a cooling tower involves calculating the required airflow, water flow rate, and heat transfer rate to ensure efficient heat dissipation. This article will focus on the calculations involved in designing a cooling tower using Microsoft Excel. Heat Transfer Rate Calculation: The heat transfer rate (Q) is calculated using the following formula: Q = (m * c_p * T_in - m * c_p * T_out) / (t_out - t_in) Where: Q = Heat transfer rate (kW) m = Mass flow rate of water (kg/s) c_p = Specific heat capacity of water (kJ/kg°C) T_in = Inlet temperature of water (°C) T_out = Outlet temperature of water (°C) t = Temperature of the air leaving the tower (°C) t_in = Temperature of the air entering the tower (°C) Airflow Calculation: The airflow rate (Q_a) is calculated using the following formula: Q_a = Q / (h * f * c_p * T_in - h * c * c_p * T_out) Where: Q_a = Airflow rate (m³/s) h_f = Heat transfer coefficient from water to air (W/m²K) c_p = Specific heat capacity of air (kJ/kg°C) T_in = Inlet temperature of air (°C) T_out = Outlet temperature of air (°C) Water Flow Rate Calculation: The water flow rate (Q_w) is calculated using the following formula: Q_w = Q / (h * f * c_p * T_in - h * c * c_p * T_out) Where: Q_w = Water flow rate (m³/s) h_f = Heat transfer coefficient from water to air (W/m²K) c_p = Specific heat capacity of water (kJ/kg°C) T_in = Inlet temperature of water (°C) T_out = Outlet temperature of water (°C) Example Calculation: Suppose we want to design a cooling tower for a power plant that requires a heat transfer rate of 500 kW. The inlet and outlet temperatures of the water are 30°C and 40°C, respectively. The air entering the tower has a temperature of 25°C, while the air leaving the tower has a temperature of 35°C. Using the formulas above, we can calculate the airflow rate (Q_a) as follows: Q_a = 500 kW / ((0.05 W/m²K * 1 kJ/kg°C * 30°C) - 0.02 W/m²K * 1 kJ/kg°C * 40°C)) = 12.5 m³/s Similarly, we can calculate the water flow rate (Q_w) as follows: Q_w = 500 kW / ((0.05 W/m²K * 1 kJ/kg°C * 30°C) - 0.02 W/m²K * 1 kJ/kg°C * 40°C)) = 12.5 m³/s Conclusion: In this
article, we have presented a comprehensive approach to cooling tower design calculations using Microsoft Excel. We have provided formulas and examples in BODMAS format, as well as ASCII art for clarity. The heat transfer rate, airflow rate, and water flow rate are calculated using the formulas above. These calculations can be used to design a cooling tower that meets the specific requirements of an industrial process. References: ASME Standard TPT-2017: Cooling Towers ASHRAE Handbook: Fundamentals ASCII Art: / | COOLING | | TOWER | | | v HEAT TRANSFER RATE (Q) AIRFLOW RATE (Q_a) WATER FLOW RATE (Q_w) Note: The above ASCII art is a simple representation of the cooling tower design calculations. It is not intended to be a comprehensive or detailed illustration of the process. Related articles for 'cooling tower design calculations xls': Calculators for 'cooling tower design calculations xls' 5 Votes cooling tower water loss calculator With just a few inputs, this calculator will find:Various lossesTotal makeup waterSide stream flow capacityDimensions of cooling tower basinThis title is available in metric units only. Disclaimer: All software provided "As-Is" with no warranty, expressed or implied, available. See our Terms of Use for more information. In this article, I addresses both the important question what is cooling tower & how many types of cooling tower?Are you ready to learn?Let's start.Cooling tower is simply a one type of heat exchange equipment where air & water comes in to the direct contact with each other.The main function of cooling tower is to reject heat of hot water into atmosphere & cooling down the water for further reuse. There are different types of cooling towerEvaporation of water is responsible for majority of heat rejected from water in cooling tower. Typically 75% to 80% of heat is removed from water by evaporation process. Remaining heat removed by passing airflow through the cooling tower. Cooling Tower is also a water saver equipment where you can save huge amount of water by recycling the water. Open recirculation system is very popular in all types of industries because of water recycling feature.In most of the industrial process, water is widely used as a cooling medium because it is very efficient, readily available & relatively cheap.Cooling towers are mainly divide in two categories:Natural DraftMechanical DraftLet us discuss each of them in detail.Natural draft cooling towers use very large concrete chimneys to induce air through the media. Warm, moist air naturally rises due to the density difference compared to outside air which is cool & dry.Hyperbolic shape of tower drive moist air upwards (buoyancy) & pulls cold air into the tower. Due to the large size of these towers typically 350 to 500 feet, they are generally used for water flow rates above 45,000 m3/hr. usually, large utility power stations uses these types of towers.The principle is same as mechanical draft tower but here fan unit is missing because Heat removed from water by natural draft. This type of tower reduce both operating & energy consumption cost due to its natural draft given by height & stack dimension. Additionally, natural draft cooling tower has a long service life, low noise emissions & low maintenance.Mechanical draft cooling towers utilize power driven motor fans to force or draw air through the tower. These large fans force or suck air through circulated water. The water then falls downward over fill surfaces, which helps increase the contact time between the water and the air and maximizes heat transfer between them.Cooling rates of Mechanical draft towers depend upon their fan diameter and speed of operation.Mechanical draft towers are available in the following airflow arrangements:Induced draftForced draftAn Induced draft cooling tower is a mechanical draft tower with a fan at the discharge to pull air through it. The fan induces hot moist air out the discharge. This produces low entering and high exiting air velocities, reducing the possibility of recirculation in which discharged air flows back into the air intake.This fan/fill arrangement is also known as "Draw-through".This is the diagram of counter flow induced draft design. In this design hot water enters at the top & air enters from the bottom and exit at the top of the tower.This is the diagram of induced draft cross flow cooling tower. In this arrangement water enters from the top and passes over the fill but here the difference is in the air inlet path. Air is enters from the side of the tower as you can see in the diagram. An induced draft fan draws air across the wet fill and expels it through the top of the structure.A Forced draft cooling tower is a mechanical draft tower with a blower type fan at the intake. The fan forces air into the tower, creating high entering and high exiting air velocities.The low exiting velocity is much more susceptible to recirculation. With the fan on the air intake, the fan is more susceptible to complications due to freezing conditions.Another disadvantage is that a forced draft design typically requires more motor horsepower than an equivalent induced draft design.The benefit of forced draft tower is ability to work with high static pressure. 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