RLT-Guideline 05

Building information modelling for Air Handling Units

Issue December 2019

For the latest version please refer to the internet.

Herstellerverband Raumlufttechnische Geräte e. V.
AHU Manufacturers Association

Preface

Rapid progress in digitisation is changing the way buildings are planned, built, used and managed. BIM is the abbreviation for "Building information Modelling" and aims to increase both quality and transparency of building projects, as well as the cost, efficiency and reliability of delivering on time. There are often many ambiguities and questions regarding this comparatively new topic in technical building services. The resulting research, clarification and correction work will destroy many of the advantages that BIM promises for the entire construction process.

With this guideline, the AHU manufacturers' association is trying to provide some clarity to the discussions and at least simplify and standardize communication and data exchange with the manufacturers of heating and ventilation equipment. A procedure for creating neutral data sets for a central AHU is also to be generated.

Due to the dynamic development processes currently taking place, it is in the nature of things that the guideline is a living document and is constantly evolving. This guideline will be supplemented and further developed in the light of technical progress.

Further guidelines of the Herstellerverband Raumlufttechnische Geräte e. V. have been published on the following subjects regarding central air handling units:
RLT-Guideline 01: General requirements for AHUs
RLT- Guideline 02: Explosion protection requirements for AHUs
RLT- Guideline 03: EC conformity assessment for AHUs
RLT- Guideline 04: Ventilation systems with smoke extraction function – AHUs with maintenance of function during smoke extraction mode
RLT- Guideline Zertifizierung: Audition guideline and certification program for the evaluation of the energy efficiency of AHUs

Bietigheim-Bissingen, in November 2019

Herstellerverband Raumlufttechnische Geräte e. V.

This RLT-Guideline can be downloaded free of charge from the homepage of the Herstellerverband Raumlufttechnische Geräte e. V. (www.rlt-geraete.de).

Content

1. Introduction to BIM

Building Information Modelling, or BIM for short, is a method for optimizing the planning, execution and management of building projects, usually with the help of appropriate software. In this system all relevant building data is digitally recorded and the building project is visualized or displayed digitally. The spatial structure, all components and their properties, equipment, design and geometry are mapped and managed throughout the entire life cycle.

BIM has many advantages. For the TGA industry and especially for the manufacturers of AHUs, these can be summarised as follows:

By offering simplified coordination, BIM brings all project participants together on a common basis via neutral interfaces during the planning phase and facilitates simplified interface coordination.

Any revision, modification or addition to each piece of information will be communicated by BIM to all project participants and presented in a transparent manner due to the use of a common database. Technical changes, such as an increase in the air volume of a central AHU, can directly cause the re-dimensioning of the entire air distribution system with BIM and are implemented in a comprehensible manner in the complete plan.

Material lists, costs, deadlines etc. are newly determined for all trades. The fast access to the detailed building data, which is always available, enables all participants in the project, such as architects, planners, clients, in fact the entire TGA industry, right up to operators and facility management, to cooperate efficiently. It is therefore clear that BIM is not just a planning tool, but can be used throughout the entire lifecycle of the building.

In general, BIM can be used to perform simulations on the virtual model, so that any errors can be detected and corrected at an early stage, including through cross-checks. In the planning phase, collision checks can be carried out among the trades, for example, and costly changes can be logged transparently. The use of BIM, therefore, offers significant potential for increasing the quality of the planning and, hopefully, an increase in efficiency, not only during the construction phase, but also during the life cycle of the building project.

The prerequisite for this is firstly the acceptance of BIM as an instrument for providing information, and secondly open communication between the interests of groups and the careful and responsible handling of the data models provided.

Since the gradual introduction of its mandatory use for public buildings in Europe, BIM has become an integral part of the TGA industry, and trend research sees BIM as the new standard for the whole of the construction industry. Any company that refuses to address the subject of BIM will face loss of market share and competitive disadvantages. Missing interactions with BIM systems will lead to a loss of visibility and coordination outside these systems and can only lead to increased costs and time spent.

The German Association RLT-Herstellerverband e. V. has recognized this scenario and started to work on solutions.

2. Current situation

It should be said that BIM is not a software package, but a method. It must be understood that the exchange of information no longer takes place via physical means, but as interactive communication of structured datasets according to established or yet to be defined standards without manual intervention.

As a result, changes to internal and cross-company processes may become necessary. The positive aspect of the method is shown here, for example, how the interaction between the manufacturer/supplier of the product and the other companies can be optimized.

Instead of the conventional exchange of technical documentation (drawings) in 2D-CAD format or even in the form of paper printed plans, geometric data is transferred via software-independent interfaces.

3. Standardization measures

The AHU manufacturer's association has established the international, open standard **IFC** (Industry Foundation Classes) as the basis for the exchange of data. The current standard is reflected in **Version 4**, which serves as the basis for this guideline.

It is important to note that this document is always based on the **"IFC-First"** principle. This means that all data fields to be used (so-called properties) have already been defined on an international basis. Only if there are no fields for a specific case will they be supplemented by their own specifications. The aim here is to have particular specifications transferred to the general standard later.

The open process, which is generally called **Open BIM**, was chosen for the exchange of data. In this process, the choice of software products is free, but the project partners coordinate on a planning platform. Neutral, open data formats are used which enable data to be exchanged between products of different manufacturers.

4. Notes on the implementation of the guideline

It must also be pointed out that the changeover to BIM cannot take place at short notice. Even if the legislation has already defined obligations, only a gradual introduction and implementation of this technology is possible and meaningful.

It should, therefore, be noted that users cannot claim completeness and correctness for this guideline. As the name suggests, it should merely be a guideline for the simple implementation of the creation of neutral data sets for AHUs. Likewise no information is provided for the creation of a unique identification of the product geometric data. The creator of the interface is, thus, free to choose what he likes.

Nor are statements made about the level of detail (**LOD**), which mainly describe the creation of the geometric data, or about the level of information (**LOI**). The last one describes the respective target group and the specific data that is of interest to them.

5. Laws, regulations, standards, guidelines and leaflets

The subject of BIM has been dealt with in various standards and in some cases for a long time. The information in this guideline is described in more detail in the following technical rules:

- VDI 3805
  Product data exchange in the Building Services
- EN ISO 16757 (10/2019)
  Data structures for electronic product catalogues for building services
- EN ISO 16739 (04/2017)
  Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries
- VDI 2552 (06/2019)
  Building information modeling - Fundamentals

6. BIM and IFC data format

For details on BIM and the IFC data format, please refer to the official site **www.buildingsmart-tech.org** .

All elements, enumerations (**Enum**) and properties as well as their groupings (**PSet** = PropertySet) are described in detail there. A set of properties (**PSets**) can be repeated or redefined for each individual element.

This includes, for example:

- Pset_SoundGeneration
- Pset_ElectricalDeviceCommon
- Pset_EnvironmentalImpactIndicators
- Pset_EnvironmentalImpactValues
- Pset_Condition
- Pset_ManufacturerOccurrence
- Pset_ManufacturerTypeInformation
- Pset_ServiceLive
- Pset_Warranty

The standard specifies a scheme for data exchange, where the file format must correspond to

EXPRESS (defined in ISO 10303-11)
or
XML (defined in the XML Scheme W3C recommendation).

The BIM model of an AHU can contain not only the 3D representation of the device, but also component data, which can be "hung" directly on the corresponding component and thus easily found. In a simplified way, BIM could simply be described as a 3D drawing with integrated technical data.

IFC supports a wide range of popular building planning software applications. However, programs such as Revit or Allplan currently only support this open format in a rudimentary way, they are limited to what is necessary. It will take some time before all data contained in IFC can be imported and used. In the meantime, a specific and standardized IFC model enables easy translation into the other formats by means of so-called "Mapping". This is usually done through external platforms or software.

The standard used must be specified in the file header. Mixing the standards is not allowed. Neither in version 2.3 nor in version 4.0 of the IFC standard is it possible, to depict all technical characteristics of AHUs in an exhaustive manner. As the standard continues to develop it is hoped that in a future release all the data required for AHUs can be captured. However, this is only possible through the concrete input of experts from the industry, i.e. the RLT-Herstellerverband.

The IFC file consists of a header that contains information about the IFC standard used, some basic information about the file, and the data section that must contain information about the organization or manufacturer, drawing, units, and much more. The following diagram shows the structure of the data section.

7. 3D geometry

The 3D drawing consists of IFCSHAPEs. The elements contained in IFC format or simple IFCFACEs can be used for this purpose. Experience has shown that IFCFACEs are presented uniformly in all common software applications for CAD or building planning. However, if other drawing elements, such as IFCCIRCLEHOLLOWPROFILE are used they are often not displayed as intended.

The following structure is recommended for creating the 3D drawing (in abbreviated form):

- Definition of corner points in the 3D space using IFCCARTESIANPOINT
- Grouping the corner points using IFCPOLYLOOP and IFCOUTERBOUND
- Assigning the surface using IFCFACE
- Combining the surfaces into IFCCLOSEDSHELL

Further using IFCFACEDBREP, IFCSTYLEDITEM, IFCSHAPEREPRESENTATION and IFCPRODUKTDEFINIENIFSHAPE the graphic can be linked with technical properties (IFCRELAGGREGATES).

8. Basic information

AHUs are defined in IFC format as **IFCUNITARYEQUIPMENT** , the subgroup from IFCELEMENT -> IFCDISTRIBUTIONELEMENT -> IFCDISTRIBUTIONFLOWELEMENT -> IFCENERGYCONVERSIONDEVICE.

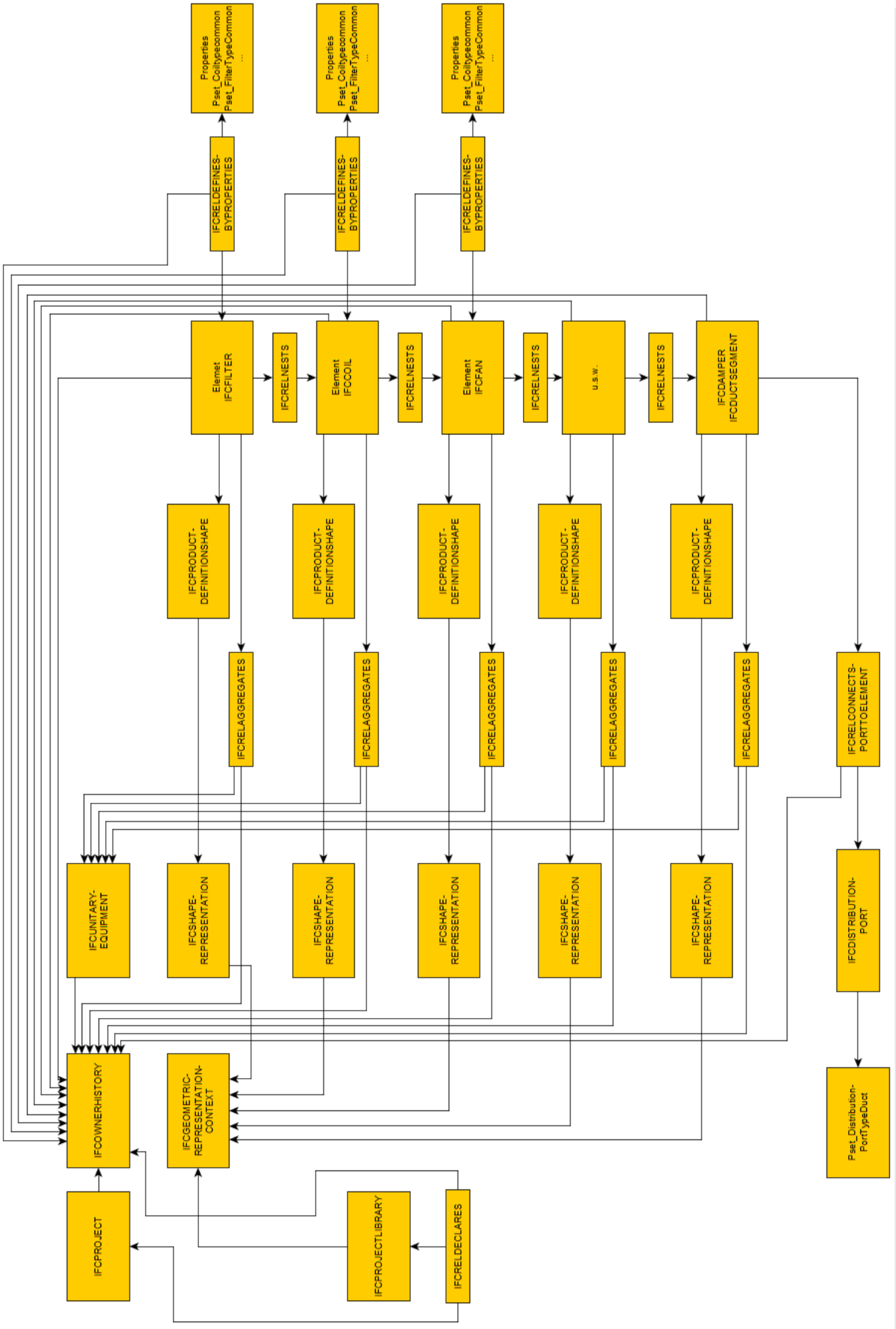
There are several Enums to choose from (Section 7.5.2.31):

- AIRHANDLER
- AIRCONDITIONINGUNIT
- DEHUMIDIFIER
- SPLITSYSTEM
- ROOFTOPUNIT
- USERDEFINED
- NOTDEFINED

Specific properties can be assigned to the AHU as IFCUNITARYEQUIPMENT using the property fields available in the standard.

Pset_UnitaryEquipmentTypeCommon

In version 4.0 of the BIM/IFC standard, there are no predefined elements for base frames, device feet, roof and similar components that can be part of the AHU. Parts of this type must be drawn, and it is possible to assign material properties to the drawn parts (-> IFCMATERIAL, IFCMATERIALDEFINITIONREPRESENTATION).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Element IFCFAN
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IFCDAMPER IFCDUCTSEGMENT
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IFCRELCONNECTS-PORTTOELEMENT
IFCUNITARY-EQUIPMENT
IFCSHAPE-REPRESENTATION
IFCSHAPE-REPRESENTATION
IFCSHAPE-REPRESENTATION
IFCSHAPE-REPRESENTATION
IFCSHAPE-REPRESENTATION
IFCDISTRIBUTION-PORT
IFCOWNERHISTORY
IFCGEOMETRIC-REPRESENTATION-CONTEXT
Pset_Distribution-PortTypeDuct
IFCPROJECT
IFCPROJECTLIBRARY
IFCRELDECLARES

9. Application of the standard to AHU components

9.1 Front wall, intake part, mixing part

IFCAIRTERMINALBOX. Although this element is listed under HVAC in the standard IFC 4.0, it probably corresponds more to an air distribution component in the duct network. In the absence of an alternative, it is used as a component on which flaps, nozzles etc. are "docked". The pre-defined enumerations are CONSTANTFLOW, VARIABLEFLOWPRESSUREDEPENDANT, VARIABLEFLOWPRESSUREINDEPENDANT, USERDEFINED, and NOTDEFINED, where USERDEFINED should be set for AHUs. The property sets Pset_AirTerminalOccurence and PSet_AirTerminalBoxTypeCommon etc. are available for additional properties.

Pset_AirTerminalIOccurrence contains

- AirFlowType (SUPPLYAIR, RETURNAIR, EXHAUSTAIR, OTHER, NOTKNOWN, UNSET)
- AirFlowRate
- Location (SIDEWALL, SIDEWALLOW, CEILINGPERIMETER, CEILINGINTERIOR, FLOOR, SILL, OTHER, NOTKNOWN, UNSET)

Pset_AirTerminalBixTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- Shape (ROUND, RECTANGULAR, SQUARE, SLOT, OTHER, NOT-KNOWN, UNSET)
- FaceType (FOURWAYPATTERN, SINGLEDEFLECTION, SIGHT-PROOF, EGGCRATE, PERFORATED, LOUVERED, OTHER, NOT-KNOWN, UNSET)
- SlotWidth
- SlotLenght
- NumberOfSlots
- FlowPattern (LINEARSINGLE, LINEARDOUBLE, LINEARFOUR-WAY, RADIAL, SWIRL, DISPLACEMEN, COMPACTJET, OTHER, NOTKNOWN, UNSET)
- AirFlowrateRange
- TemperatureRange
- DischargeDirection
- ThrowLength
- AirDiffusionPerformanceIndex
- FinishType (ANNODIZED, PAINTED, NONE, OTHER, NOT-KNOWN, UNSET)
- FinishColor
- MountingType (SURFACE, FLATFLUSH, LAYIN, OTHER, NOT-KNOWN, UNSET)
- CoreType (SHUTTERBLADE, COVERBLADE, REMOVABLE, RE-VERSIBLE, NONE, OTHER, NOTKNOWN, UNSET)
- CoreSetHorizontal
- CoreSetVertical
- HasIntegralControl
- FlowControlType (DAMPER, BELLOWS, NONE, OTHER, NOT-KNOWN, UNSET)
- HasSoundAttenuator
- HasThermalInsulation
- NeckArea
- EffectiveArea
- AirFlowRateVersusFlowControlElement

9.2 Covers

IFCDAMPER. Among the available enumerations, the enumeration CONTROLDAMPER corresponds to the covers used on the AHUs, further properties can be defined via the Psets Pset_DamperOccurence, PSet_DamperTypeCommon etc.

Pset_DamperOccurrence contains

- SizingMethod (NOMINAL, EXACT, NOTKNOWN, UNSET)

Pset_DamperTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- Operation (AUTOMATIC, MANUAL, OTHER, NOTKNOWN, UNSET)
- Orientation (VERTICAL, HORIZONTAL, VERTICALHORIZON-TAL, OTHER, NOTKNOWN, UNSET)
- BladeThickness
- BladeAction (FOLDINGCURTAIN, PARALLEL, OPPOSED, SINGLE, OTHER, NOTKNOWN, UNSET)
- BladeShape (FLAT, FABRICATEDAIRFOIL, EXTRUDE-DAIRFOIL, OTHER, NOTKNOWN, UNSET)
- BladeEdge (CRIMPED, UNCRIMPED, OTHER, NOTKNOWN, UNSET)
- NumberOfBlades
- FaceArea
- MaximumAirFlowRate
- TemperatureRange
- MaximumWorkingPressure
- TemperatureRating
- NominalAirFlowRate
- OpenPressureDrop
- LeakageFullyClosed
- LossCoefficientCurve
- LeakageCurve
- RegeneratedSoundCurve
- FrameType
- FrameDepth
- FrameThickness
- CloseOffRating

9.3 Connecting pieces

IFCDUCTSEGMENT. The RIGIDSEGMENT enumeration can be used for rigid connection frames and the FLEXIBLESEGMENT enumeration for flexible connecting pieces, other properties can be defined via the PSEts PSet_DuctSegmentOccurence, PSet_DuctsegmentTypeCommon etc.

Pset_DuctSegmentOccurrence contains

- InteriorRoughnessCoefficient
- HasLiner
- Color

Pset_DuctSegmentTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- Shape (FLATOVAL, RECTANGULAR, ROUND, OTHER, NOT-KNOWN, UNSET)
- WorkingPressure
- PressureRange
- TemperatureRange

- LongitudinalSeam
- NominalDiameterOrWidth
- NominalHeight
- Reinforcement
- ReinforcementSpacing

9.4 Openings

IFCDISTRIBUTIONPORT can be assigned to openings, even if no mounting parts, such as covers or connection pieces are associated. Enumerations are IfcFlowDirectionEnum SOURCE or SINK, IfcDistribution- PortTypeEnum DUCT, PIPE and IfcDistributionSystemEnum, for which AIR CONDITIONING, VENTILATION or EXHAUST are to be used from the many available Enums. One PORT from Enums SOURCE, DUCT, AIRCONDITIONING corresponds to a central connection for supply air, SINK for exhaust air. Properties can be set using Pset_DistributionPortCommon, Pset_Distributionport- TypeDuct. It is worth mentioning here that Pset_SoundGeneration can also be used here to transmit the sound values.

Pset_DistributionPortCommon contains

- PortNumber
- ColorCode

Pset_DistributionPortTypeDuct contains

- ConnectionType (BEADEDSLEEVE, COMPRESSION, CRIMP, DRAWBAND, DRIVESLIP, FLANGED, OUTSIDESLEEVE, SLIPON, SOLDERED, SSLIP, STANDINGSEAM, SWEDGE, WELDED, OTHER, NONE, USERDEFINED, NOTDEFINED)
- ConnectionSubType
- NominalWidth
- NominalHeight
- NominalThickness
- DryBulbTemperature
- WetBulbTemperature
- VolumetricFlowRate
- Velocity
- Pressure

9.5 Filters

IFCFILTER, enumerations are IfcFilterTypeEnum, AIRPARTICLEFILTER, ODORFILTER. Pset_Filter-TypeCommon is available for properties. In the properties, the property class can be defined using NominalParticleGeometricMeanDimeter and NominalParticleGeometricStandardDeviation. Unfortunately, there is no way to determine in IFC 4.0 whether it is a compact filter, pocket filter, etc. In this case, an attempt should be made to extend the standard in the future by corresponding Enums and Psets.

Pset_FilterTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- Weight
- InitialResistance
- FinalResistance
- OperationTemperatureRange
- FlowRateRange
- NominalFilterFaceVelocity
- NominalMediaSurfaceVelocity
- NominalPressureDrop
- NominalFlowRate
- NominalParticleGeometricMeanDiameter
- NominalParticleGeometricStandardDeviation

9.6 Silencers

IFCDUCTSILENCER. The description of this element does not correspond to a silencer for installation in an AHU, but in a duct. However, there is little reason not to use this element for silencers in the AHU device, especially since the available enumeration RECTANGULAR also indicates the box devices frequently used in sound absorbing cushions. The properties in Pset_DuchtSilencerTypeCommon allow the geometric description, weight, air volume and pressure drop, but there are no other properties such as damping material, coatings, covers, etc. In this case, an attempt should be made to extend the standard with corresponding Enums and Psets in the future.

Pset_DuctSilencerTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- HydraulicDiameter
- Length
- Weight
- AirFlowRange
- WorkingPressureRange
- TemperatureRange
- HasExteriorInsulation

9.7 Humidifiers

IFCHUMIDIFIER, the enumeration STEAMINJECTON stands for steam humidifiers, ADIABATICAIRWASHER for air scrubbers or other spray humidifiers, ADIABATICPAN or ADIABATICWETTELEMENT for surfaces or honeycomb humidifiers, ADIABATICATOMIZING for high pressure atomizers, ADIABAICULTRASONIC for ultrasonic atomizers ADIABATICCOMPRESSEDAIRNOZZLE for compressed air atomizers.

Using Pset_humidifiertypeCommon, additional properties can be described, which are not sufficient for this element to pass on all necessary data. In this case, an attempt should be made to extend the standard in the future by corresponding Enums and Psets.

Pset_HumidifierTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- Application (PORTABLE, FIXED, OTHER, NOTKNOWN, UNSET)
- Weight
- NominalMoistureGain
- NominalAirflowRate
- InternalControl
- WaterRequirement
- SaturationEfficiencyCurve
- AirPressureDropCurve

9.8 Heat exchangers

IFCCOIL, the enumeration DXCOOLINGCOIL stands for direct evaporators, ELECTRICHEATINGCOIL for electric heating registers, GASHEATINGCOIL for condensers and possibly also for combustion chambers, HYDRONICCOIL for liquid coolers or heaters, STEAMHEATINGCOIL for heaters with steam, WATERHEATINGCOIL for car radiators, WATERHEATINGCOIL for PWW heater. Additional properties can be defined using the properties Pset_CoilOccurence (only affects sound), Pset_CoilTypeCommon and PSet_CoilTypeHydronic. Unfortunately, important features are also missing in the IFC 4.0 standard. Attempts should be made to extend the standard.

Heat exchangers require an operating medium, the intake and discharge of which can be determined by means of IFCDISTRIBUTIONPORTS, which are "docked" to the heat exchanger connections. The properties of the heat exchangers can be extended using these connection ports.

Pset_CoilTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- OperationTemperatureRange
- AirFlowRateRange
- NominalSensibleCapacity
- NominalLatentCapacity
- NominalUA
- PlacementType (FLOOR, CEILING, UNIT, OTHER, NOTKNOWN, UNSET)

Pset_CoilTypeHydronic contains

- FluidPressureRange
- CoilCoolant (WATER, BRINE, GLYCOL, OTHER, NOTKNOWN, UNSET)
- CoilConnectionDirection (LEFT, RIGHT, OTHER, NOTKNOWN, UNSET)
- CoilFluidArrangement (CROSSFLOW, CROSSCOUNTERFLOW, CROSSPARALLELFLOW, OTHER, NOTKNOWN, UNSET)
- CoilFaceArea
- HeatExchangeSurfaceArea
- SecondarySurfaceArea
- TotalUACurves
- WaterPressureDropCurve
- BypassFactor
- SensibleHeatRatio
- WetCoilFraction

9.9 Heat recovery units

IFCAIRTOAIRHEATRECOVERY, the enumerations FIXEDPLATECOUNTERFLOWEXCHANGER and FIXEDPLATECROSSFLOWEXCHANGER stand for alternating heat storage media, such as those frequently used by Menerga, for example; others know this heat recovery system as a battery block, among other things. FIXEDPLATEPARALLELFLOWEXCHANGER are classic plate exchangers also the so-called counter-flow exchangers, ROTARYWHEEL are rotary exchangers, RUNAROUNDCOILLOOP circuit-system and HEATPIPE stand for heat pipes. Other enumerations are TWINTOWERENTHALPYRECOVERYLOOPS, THERMOSIPHONEALEDTUBEHEATEXCHANGERS and THERMOSIPHONCOILTYPEHEATEXCHANGERS.

Properties are described in Pset_AirToAirHatRecoveryTypeCommon, but are far from adequate. Here too efforts should be made to expand the existing properties.

Pset_AirToAirHeatRecoveryTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- HeatTransferTypeEnum (SENSIBLE, LATENT, OTHER, NOTKNOWN, UNSET)
- HasDefrost
- OperationTemperatureRange
- PrimaryAirflowRateRange
- SecondaryAirFlowRateRange

9.10 Fans

IFCFAN, the enumerations CENTRIFUGALFORWARDCURVED, CENTRIFUGALRADIAL, CENTRIFUGALBACHWARDINCLINEDCURVED, CENTRIFUGALAIRFOIL are suitable for the majority of fans used in AHUs. Other enumerations TUBEAXIAL, VANEAXIAL, PROPELLORAXIAL are seldom used in AHUs. The properties Pset_FanOccurence and Pset_FanTypeCommon are not sufficient to describe all the characteristics of the fans. The properties Pset_SoundGeneration (sound values) and Pset_ElectricalDeviceCommon can still be used to transmit other properties, but in this case too, the properties in IFC 4.0 are insufficient. Efforts should be made to extend the standard.

Pset_FanOccurrence contains

- DischargeType (DUCT, SCREEN, LOUVER, DAMPER, OTHER, NOTKNOWN, UNSET)
- ApplicationOfFan (SUPPLYAIR, RETURNAIR, EXHAUSTAIR, COOLINGTOWER, OTHER, NOTKNOWN, UNSET)
- CoilPosition (DRAWTHROUGH, BLOWTHROUGH, OTHER, NOTKNOWN, UNSET)
- MotorPosition (INAIRSTREAM, OUTOFAIRSTREAM, OTHER, NOTKNOWN, UNSET)
- FanMountingType (MANUFACTUREDCURB, FIELDERECTEDCURB, CONCRETEPAD, SUSPENDED, WALLMOUNTED, DUCTMOUNTED, OTHER, NOTKNOWN, UNSET)
- FractionOfMotorHeatToAirStream
- ImpellerDiameter

Pset_FanTypeCommon contains

- Reference
- Status (NEW, EXISTING, DEMOLISH, TEMPORARY, OTHER, NOTKNOWN, UNSET)
- MotorDriveType (DIRECTDRIVE, BELTDRIVE, COUPLING, OTHER, NOTKNOWN, UNSET)
- CapacityControlType (INLETVANE, VARIABLESPEEDDRIVE, BLADEPITCHANGLE, TWOSPEED, DISCHARGEDAMPER, OTHER, NOTKNOWN, UNSET)
- OperationTemperatureRange
- NominalAirFlowRate
- NominalTotalPressure
- NominalStaticPressure
- NominalRotationSpeed
- NominalPowerRate
- OperationCriteria
- PressureCurve
- EfficiencyCurve

Pset_ElectricalDeviceCommon enthält

- RatedCurrent
- RatedVoltage
- NominalFrequencyRange
- PowerFactor
- ConductionFunction (PHASE_L1, PHASE_L2, PHASE_L3, NEUTRAL, PROTECTIVEEARTH, PROTECTIVENEUTRAL, OTHER, NOTKNOWN, UNSET)
- NumberOfPoles
- HasProtectiveEarth
- InsulationStandardClass (CLASS0APPLIANCE, CLASS0IAPPLIANCE, CLASSIAPPLIANCE, CLASSIIAPPLIANCE, CLASSIIIAPPLIANCE, OTHER, NOTKNOWN, UNSET)
- IP_Code
- IK_Code

10. Additional comments

The components of AHUs can be arranged as required according to the description in the IFC4 standard using IFCRELNEST, however, there is no software yet that takes this order into account when importing IFC files. However, the components are not wrongly arranged because they have been "docked" to graphic elements previously created in the 3D drawing.

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