Type	1	2	3	4	5	6	7	8	Definition	Code Se	ynonyn	Data Type	Units	lass	Clas	Status	IFC Object/Property
topic	**building code checking**																
subtype		**administration**										lin					
property			approvals						This is used to capture cases where an AHJ decision or approval is required. The 'Notes' field should contain a description who in the agency made the approval decision.			string					List of building authority approvals for the subject BIM. When MCS encounters this topic/property in the markup, it will add the section (check) to a list that must be checked maually. The 'value' field will also be included as it contains notes to the design reviewer.
property			certifications						This is used when the applicant or some third party provides certification that the requirement has been met. The 'Notes' field should contain a description of certification source and document.			string	n/a				A list of building product or assembly certifications documented in the subject BIM. When MCS encounters this topic/property in the markup, it will look for certification assertion (property) on the subject object types. - If found, the object type (e.g. door type) will be added to a list of 'conforming' products in the code check report. The design reviewer may elect to require additional documentation for these certification assertions. - If not found, the object type will be added to a list of 'non-conforming'
property			compliances						This is used to capture clauses that require compliance to another section or document. The 'Notes' field should containe a description of the referenced section or document for which compliancy is required.			string					List of sections (checks) that cannot be checked automatically with version 1. When MCS encounters this topic/property in the markup, it will add the section (check) to a list that must be checked maually by the design reviewer. The 'value' field will also be included as it contains notes to the reviewer.
property			inspections						This is used for properties/concepts that MCS cannot check because compliance with the requirement can only be checked through inspection. It is a boolean that will default to FALSE, but can be used to generate a checklist for the AHJ -- and provides some interesting opportunities for interaction between AHJ and MCS. The 'Notes' field will contain information			string					A list of product installation or assembly inspections that for which conformance can only be checked during construction. When MCS encounters this topic/property in the markup, it will add the section (check) to a required inspections list (inspection checklist). The 'value' field will also be included as it contains notes to the inspector
property			testing						This is used in cases where only manufacturer test data can be used to demonstrate compliance. Notes will describe the manufacturer or 3rd party testing source and documentation.			string					A list of building product or assembly testing assertions documented in the subject BIM. When MCS encounters this topic/property in the markup, it will look for a testing assertion (property) on the subject object types. - If found, the object type (e.g. door type) will be added to a list of 'conforming' products in the code check report. The design reviewer may elect to require additional documentation for these testing assertions. - If not found, the object type will be added to a list of 'non-conforming' products in the code check report. The 'value' field will also be included in the checking report list of required certifications as it defines the exact certification that is required.
property			references						Reference to another section, check, standard			string	n/a				** Legacy ** References to other regulations. This has pretty much been replaced by 'certifications' because the only reason for including a reference in the markup is if there is a requirement to be compliant with the referenced regulation.
subtype		**building code**							Building code designation. A code to which the subject building must be conformant. **NOTE: change words for enumerations to "enumeration value from ..." before the next round of SCB enhancements**			integer index into enumeration building_codes					Property List named building_code -- used in Pset_Building_Design_Criteria_ICC (see below) -- Added to BIM by
property			code name						Name of the building code			string					property in the PList
property			code version						Version of the building code			string					property in the PList
subtype		**jurisdiction**							Agency having primary jurisdiction over building permitting at the building location. Look up based ZIP code.		AHJ		n/a				Property List named building_jurisdiction -- used in Pset_Building_Design_Criteria_ICC (see below)
property			name						Name describing this jurisdiction			string					property in the PList
property			address 1						First line of street address			string					property in the PList
property			address 2						Second line of street address			string					property in the PList
property			city						Name of the city			string					property in the PList
property			state						Two character abbreviation for the state (e.g. DC for District of Columbia or VA for Virginia)			string					property in the PList
property			zip code						5 digit or 9 digit zip code - as an integer			integer number					property in the PList
topic	**spatial containment system**																
subtype		**site**									site, building site						The building location is modeled as an IfcSite object. Attach **Pset_Building_Design_Criteria** with the following properties:
property			climate zone						Geographic regions with similar weather patterns. All counties in the US are assigned a climate zone. 12 Climate zones are defined in IECC. See section 301. [A-Moist, B-Dry, C-Marine]. NOTE: 3 = 3A + 3B + 3C, 4= 4A + 4B + 4C	IECC 301.1		integer index into enumeration climate_zones	n/a				MCS derived
contained			site jurisdiction						Agency having primary jurisdiction over building permitting at the building location. Look up based ZIP code.		city, tov	**jurisdiction**	n/a				PList building_jurisdiction --- in the pset
contained			building code set						Codes applicable at the time the application for permit is submitted			set of **building code**	n/a				MCS derived
contained				building code					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			building code	n/a				Contained concept -- see source
subtype		**building**							Any structure used or intended for supporting or sheltering any use or occupancy.								Modeled as IfcBuilding. Attach Pset_Building_ICC with the following properties:
property			building function						Description of building function (as enumerated in Table 11 of Omniclass and the IBC)			integer index into enumeration building_type	n/a				simple property in pset
property			building height						Vertical distance from grade plane to the average height of the highest roof surface.			real number	ft				MCS derived
property			building id						Identifier for this building			string	n/a				simple property in pset
contained			**building story set**						The set of building stories in this building			set of **building story**	n/a				Modeled as IfcBuildingStorey (see building story below)
contained				building story					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			building story	n/a				Contained concept -- see source
property			building use group						Use Group as provided in the IBC (see chapter 3 of IBC)	IBC 300		integer index into enumeration building_use_groups	n/a				simple property in pset
property			floor area - all stories - gross						Gross floor area for all building stories			real number	sq ft				MCS generated
property			floor area - all stories - net						Net floor area for all building stories			real number	sq ft				MCS generated
contained			lighting system						Contained lighting systems			**lighting system**	n/a				**Contained concept -- see source**
property			number of stories						Number of building stories - above and below grade			integer number	n/a				MCS generated
contained			power system						contained power system			**power system**	n/a				**Contained concept -- see source**
property			PF average used for compliance						Boolean indicating that a PF average has been used for conformance assessment (an option allowed by IECC)			boolean	n/a				simple property in pset
property			PF average value						Average of the projection factors (PF) calculated for all vertical fenestration components. Used to instead individual PF values in alternate calc method for 502.3.2			real number	%				MCS generated
property			skylight area ratio						Ratio (%) of the total combined area of skylights over the gross roof area.			real number	%				Calculated by MCS -- based on the elements in the building envelope roof.
property			stories above grade						Number of building stories - above grade only			integer number	n/a				MCS generated
property			vertical fenestration area ratio						Ratio (%) of total fenestration area (combined area of all fenestration) to the total above grade exterior wall area.			real number	%				Calculated by MCS -- based on the elements in the building envelope.

Type	1	2	3	4	5	6	7	8	Definition	Code Se	ynonyn	Data Type	Units	lass Clas	Status	IFC Object/Property
topic	**building code checking**															
subtype			**commercial building**						IECC definition of commercial buildings -- from chapter 2 IECC: Buildings where 'building use group' property is NOT any of the following: R1, R2-LR, R3-LR, R4-LR							IfcBuildings where 'building use group' property is NOT any of the following: R1, R2-LR, R3-LR, R4-LR
subtype			**residential building**						IECC definition of residential buildings -- from chapter 2 IECC: Buildings where 'building use group' property IS any of the following: R1, R2-LR, R3-LR, R4-LR							Subtype - see above
subtype		**building story**														Modeled as IfcBuildingStory.
property			containing building name						name of the building containing			string				**MCS generated**
property			gross area						Gross area of this building story			real number	sq ft			**MCS generated**
property			name						Name of this building story			string	n/a			**MCS will pull from standard location in**
contained			space set						The spaces contained in this building story			set of **space**	n/a			Contained concept -- see source
contained				space					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			space	n/a			Contained concept -- see source
property			story number						1 based integer index from ground level -- i.e. ground floor = 1			integer number	n/a			**MCS generated**
subtype		**space**									room					Modeled as IfcSpace. Attach Pset_Space_Type_ICC with the following properties:
property			connected lighting power						Total wattage of light fixtures serving the space, divided by the space area.	IECC 505.5.2		real number	Watt/sq ft			Calculated by MCS -- for each space and then averaged -- based on the sum of wattage for all lighting fixtures related to the space
property			containing building story number						building story number from the containing building story			integer number	n/a			
property			enclosing wall type						Type of building elements that enclose this space	IECC 505		integer index into enumeration space_enclosing_wall_type	n/a			
property			is conditioned space						Boolean value specifying if the space is conditioned (heated and/or cooled) mechanically			boolean	n/a			Simple property in the Pset
property			is envelope space						Boolean indicating if the space is bounded by the building envelope (and thus should be included in thermal performance simulations). Value = TRUE if bounded by elements in the building envelope; otherwise FALSE.			boolean	n/a			Calculated by MCS -- based on space geometry
property			is occupiable						Boolean property defining whether the space is occupied by humans			boolean	n/a			simple property in Pset_Space_Common
property			is outside space						Boolean indicating if the space is interior or exterior space. Value = TRUE if the space is enclosed by building elements; otherwise Value = FALSE.	IECC 505		boolean	n/a			Calculated by MCS -- based on space geometry
property			is part of egress path						boolean value indicating is this space is part of an egress pathway	IECC 505.2.1		boolean	n/a			
property			is security or emergency						boolean value through which the designer declares this space to be for security or emergency purposes	IECC 505.2.1		boolean	n/a			Calculated by MCS -- based on look-up relative to a short list of space types considered by ICC to be either security or emergency space types
property			is vestibule						Boolean indicating if the space qualifies as a vestibule space (see definition below)			boolean	n/a			
contained			lighting circuit set						The lighting circuits illuminating this space			set of **lighting circuit**	n/a			Calculated by MCS = lighting circuits whose lighting fixture set includes light fixtures whose geometry penetrates the space
contained				lighting circuit					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			lighting circuit	n/a			Contained concept -- see source
property			net space area						Floor area inside the enclosing building elements, less any columns or contained spaces (bounded or not)			real number	sq ft			Calculated by MCS -- based on space geometry
property			space type						Classification for the intended use/funtion of the space	IBC 300, IMC 400,		integer index into enumeration space_type	n/a			Simple property in the Pset
subtype			**space - side 1**						Added temporarily -- because SCB property name must match contained object type for contained objects. In this case, we had two spaces connected to a door (side 1 & 2), so we needed two distinct names -- created as subtypes with no additional properties							Temp Subtype of Space (workaround for SCB limitation)
subtype			**space - side 2**						Added temporarily -- because SCB property name must match contained object type for contained objects. In this case, we had two spaces connected to a door (side 1 & 2), so we needed two distinct names -- created as subtypes with no additional properties							Temp Subtype of Space (workaround for SCB limitation)
subtype			*vestibule*						*Energy loss protection space between entrace doors and conditioned spaces*							Subtype of Space
subtype		**spatial zone**														Modeled as IfcZone (group). Attach the following: - Pset_Zone_Type_ICC (properties follow)
contained			space set						Set of spaces included in the suite.			set of **space**	n/a			Contained concept -- see source
contained				space					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			space	n/a			Contained concept -- see source
property			spatial zone type						Type descriptor			integer index into enumeration spatial_zone_type	n/a			simple property in Pset
subtype			**suite**						A collection of rooms used as one sleeping unit in hotels, motels, dormitorys, etc.							MCS filtered -- Subtype of zone -- Where spaces are contiguous
term	**architectural systems**									IECC 502						Concept recognized by MCS SW as being a supertype for Walls, Roofs, Floors, and Fenestration.
subtype		**building element**														Abstract supertype
subtype			**ceiling**													Modeled as IfcSlab with sub-type 'floor'. Attach the following: - Pset_SlabCommon and - Pset_Floor_ICC (properties follow)
property				construction type					IAI Standard 'construction type' property -- floor slab type in this case. Examples: ceiling slab type "C-1" or floor slab type "C-2".			string	n/a			'reference' property in Pset_SlabCommon
property				assembly type					The primary material or construction type in the ceiling assembly.			integer index into enumeration ceiling_assembly_type	n/a			simple property in pset
property				is ventilated					Boolean for whether the assembly is ventilated			boolean	n/a			MCS to check for air layer in material layers
property				is exterior					Boolean declaring whether this is an exterior ceiling -- meaning the space above is an attic			boolean	n/a			'IsExterior' boolean property in Pset_Slab_Common
contained				thermal insulation - building el					Insulation layer -- 'primary' as defined in chapter 502.1			**thermal insulation -**	n/a			Contained concept -- see source
contained				vapor retarder					vapor retarder layer -- as defined in 502.5			**vapor retarder**	n/a			Contained concept -- see source

Type	1	2	3	4	5	6	7	8	Definition	Code Se	ynonyn	Data Type	Units	lass Clas	Status	IFC Object/Property
topic	**building code checking**															
subtype				**framed ceiling**					The subset of ceilings where the property 'assembly type' is one of framed-wood, framed-metal, framed-other.							MCS filtering -- IfcSlab where either of the following are true: IfcSlab (subtype Floor) - Pset_Floor_ICC.AssemblyType .EQ. one of: framed-wood, framed-metal; IfcSlab (subtype Roof) - Pset_Roof_ICC.AssemblyType .EQ. one of: framed-wood, framed-metal, framed-other;
subtype			**door**						Doors with < 50% glazing	IECC 50	opaque door					Modeled as IfcDoor. Attach the following: - Pset_DoorCommon (properties by IAI) - Pset_Door_ICC (properties follow)
property				air leakage rate					ASTM E283 @ 1.57 psf	IECC 502.4.1		real number	cfm/sq ft			simple property in Pset_Door_ICC
property				assembly type					Manufactured or site constructed			integer index into enumeration door_window_assembly_type	n/a			simple property in Pset_Door_ICC
property				framing material					The material used to hold the glazing in the door.			integer index into enumeration glazed_door_framing_material	n/a			simple property in Pset_Door_ICC
property				closure type					Method by which the door is closed (e.g. manual or automatic)	IECC 502.4.6		integer index into enumeration door_closure_type	n/a			simple property in Pset_Door_ICC
property				construction type					IAI Standard 'construction type' property -- door type in this case. Examples: door type "D-1" or "D-2".			string	n/a			'reference' property in Pset_DoorCommon
property				functional type					Function of the door (e.g. entrance, loading dock, vehicular, etc)			integer index into enumeration door_function	n/a			simple property in Pset_Door_ICC
property				is exterior					Boolean declaring whether this is an exterior door			boolean	n/a			'IsExterior' boolean property in Pset_Door_Common
property				is weatherstripped					Boolean indicating if the door is to be weatherstripped according to requirements in IECC 502.4.3	IECC 502.4.3		boolean	n/a			simple property in Pset_Door_ICC
property				operating type					The manner in which the door opens.			integer index into enumeration door_operating_type	n/a			simple property in Pset_Door_ICC
contained				space - side 1					Space on one side of the door			**space - side 1**	n/a			Contained concept -- see source
contained				space - side 2					Space on the other side of the door			**space - side 2**	n/a			Contained concept -- see source
property				thermal transmittance					The coefficient of heat transmission (air to air) through a building com¬ponent or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (U-Factor - btu/h·ft2 ·°F).	IECC 202		real number	U-Factor			simple property in Pset_Door_ICC
property				weatherstripping location					The location of the door weatherstripping.	IECC 502.4.5		integer index into enumeration door_weatherstripping_location	n/a			simple property in Pset_Door_ICC
subtype			**fenestration**													Abstract Supertype -- Capture properties in Pset_Fenestration_ICC -- attached to the concrete subtypes below
property				air leakage rate					ASTM E283 @ 1.57 psf	IECC 502.4.2		real number	cfm/sq ft			simple property in Pset
property				construction type					IAI Standard 'construction type' property -- i.e. curtainwall type, door type, skylight type, window type. Examples: door type "D-1" or "D-2"; curtain wall type "CW-1" or "CW-2"; etc.			string	n/a			'reference' property in Pset_<ElementType>_Common
property				framing material					The material of which the curtain wall is made.			integer index into enumeration curtain_wall_framing_material	n/a			simple property in Pset
contained				glazing								**glazing**	n/a			Contained concept -- see source
property				is exterior					Boolean declaring whether this is an exterior wall.			boolean	n/a			'IsExterior' boolean property in Pset_<ElementType>_Common
property				openable area					The area of the fenestration object (window, skylight, etc.)			real number	sq ft			simple property in Pset
property				projection factor					Horizontal distance from furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical of the glazing divided by the vertical distance from the bottom of the glazing to the underside of the furthest continuous extremity.	IECC 502.3.2		real number	n/a			Calculated by MCS based on building geometry.
property				thermal transmittance					The coefficient of heat transmission (air to air) through a building com¬ponent or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h·ft2 ·°F).	IECC 202		real number	U-Factor			simple property in Pset
subtype				**curtain wall**					Fenestration products used to create an external nonload-bearing wall that is designed to separate the exterior and interior environments.		storefront glazing					Modeled as IfcCurtainWall. Attach the following: - Pset_CurtainWall_Common - Pset_Fenestration_ICC
subtype				**glazed door**					glazed door (>=50% glass area)		commercial entrace door					Modeled as IfcDoor containing a window of 50% area or more. Attach the following: - Pset_DoorCommon (properties defined by IAI) - Pset_Fenestration (properties above) - Pset_Door_ICC (properties follow)
property					assembly type				Manufactured or site constructed			integer index into enumeration door_window_assembly_type	n/a			simple property in Pset
property					functional type				Function of the door (e.g. entrance, loading dock, vehicular, etc)			integer index into enumeration door_function	n/a			simple property in Pset
property					closure type				Method by which the door is closed (e.g. manual or automatic)	IECC 502.4.6		integer index into enumeration door_closure_type	n/a			simple property in Pset
property					is weatherstripped				Boolean indicating if the door is to be weatherstripped according to requirements in IECC 502.4.3	IECC 502.4.3		boolean	n/a			simple property in Pset
property					operating type				The manner in which the door opens.			integer index into enumeration door_operating_type	n/a			IfcDoorStyleOperationEnum referenced by IfcDoor
contained					space - side 1				Space on one side of the door			**space - side 1**	n/a			Contained concept -- see source
contained					space - side 2				Space on the other side of the door			**space - side 2**	n/a			Contained concept -- see source
property					weatherstripping location				The location of the door weatherstripping.	IECC 502.4.5		integer index into enumeration door_weatherstripping_location	n/a			simple property in Pset

Type	1	2	3	4	5	6	7	8	Definition	Code Se	ynonyn	Data Type	Units	lass Clas	Status	IFC Object/Property
topic	**building code checking**															
subtype				**skylight**					Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing material in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls is included in this definition.	IECC 202	roof window					Modeled as IfcWindow. Attach the following: - Pset_WindowCommon (properties defined by IAI) - Pset_Fenestration_ICC (properties above) - Pset_Window_ICC (properties follow - under window)
subtype				**window**					Glass or other transparent (or translucent) glazing material and integral framing materials installed at less than 15 degrees from vertical.	IECC 202						Modeled as IfcWindow. Attach the following: - Pset_WindowCommon (properties defined by IAI) - Pset_Fenestration_ICC (properties above) - Pset_Window_ICC (properties follow)
property					assembly type				Manufactured or site constructed			integer index into enumeration door_window_assembly_type	n/a			simple property in Pset
property					is weatherstripped				Boolean indicating if the window is to be weatherstripped according to requirements in IECC 502.4.3	IECC 502.4.3		boolean	n/a			simple property in Pset
subtype				**vertical fenestration**					The subset of fenestration installed in vertical building elements. Generally speaking, this is all curtain walls, windows, and glazed doors							MCS interpretation = all fenestration types in walls > 75 degrees from the horizontal
subtype			**floor**													Modeled as IfcSlab with sub-type 'floor'. Attach the following: - Pset_SlabCommon (properties defined by IAI) - Pset_Floor_ICC (properties follow)
property				construction type					IAI Standard 'construction type' property -- floor slab type in this case. Examples: floor slab type "F-1" or floor slab type "F-2".			string	n/a			'reference' property in Pset_SlabCommon
property				assembly type					The primary material or construction type in the floor assembly.			integer index into enumeration floor_assembly_type	n/a			simple property in pset
property				is massive					TRUE if weight .GE. 35 psf surface area or 7.25 psf surface area if weight .LE. 120 pcf	IECC 502.2.5		boolean	n/a			simple property in pset
property				is ventilated					Boolean for whether the assembly is ventilated			boolean	n/a			MCS interpretation -- when assembly includes an air space
property				is exterior					Boolean declaring whether this is an exterior floor			boolean	n/a			'IsExterior' boolean property in Pset_Slab_Common
property				location relative to surrounding					Location relative to the adjacent grade (outside the exterior walls). Used in determining thermal resistance requirements in table 502.2(1)			integer index into enumeration location_relative_to_grade	n/a			simple property in pset
property				space below					The type of space below the floor assembly. This is used to determine the heat loss assumptions or calculations through the floor assembly.			integer index into enumeration floor_space_below	n/a			MCS interpretation -- checking for the space object below the floor assembly
contained				thermal insulation - building el					Insulation layer -- 'primary' as defined in chapter 502.1			**thermal insulation - building elements - primary**	n/a			Contained concept -- see source
contained				thermal insulation - building el					Insulation layer -- 'secondary' as defined in chapter 502.1			**thermal insulation - building elements - secondary**	n/a			Contained concept -- see source
contained				vapor retarder					vapor retarder layer -- as defined in 502.5			**vapor retarder**	n/a			Contained concept -- see source
subtype				**below grade floor**					Floor or slab on grade that is below the surrounding grade. Used in check minimum depth for below grade insulation in 502.2.4							MCS filtering -- IfcSlab where: IfcSlab (subtype Floor) - Pset_Floor_ICC.AssemblyType .EQ. one of: framed-wood, framed-metal;
subtype				**framed floor**					The subset of floors where the property 'assembly type' is one of framed-wood, framed-metal, framed-other.							MCS filtering -- IfcSlab where IfcSlab (subtype Floor) - Pset_Floor_ICC.AssemblyType .EQ. one of: framed-wood, framed-metal;
subtype				**massive floor**					Subset of 'massive' (above) that are floor slabs							MCS filtering -- IfcWall where Pset_Wall_ICC.IsMassive .EQ. TRUE
subtype				**slab on grade**					Concrete slab on grade -- either at grade level or below grade (e.g. basement floor) -- see 'location relative to surrounding grade' property on Floor.							MCS Filtering -- IfcSlab of type 'Floor Slab' -- where the primary structural material layer is concrete.
property					perimeter insulation confi				Configuration of perimeter insulation			integer index into enumeration perimeter_insulation_configuration	n/a			simple property in pset
property					perimeter inuslation depth				The depth from grade to the bottom of the perimeter insulation			real number	in			simple property in pset
property					perimeter inuslation locati				Placement of perimeter insulation relative to the perimeter walls.			integer index into enumeration perimeter_insulation_location	n/a			simple property in pset
property					slab is heated				TRUE if there are heating elements in or under the slab.			boolean	n/a			simple property in pset
property					water barrier under slab				Barrier to prevent ground water from leaching into the slab.			integer index into enumeration floor_slab_water_barrier	n/a			simple property in pset
subtype			**roof**													Modeled as IfcRoof. Attach the following: - Pset_RoofCommon (properties defined by vendors) - Pset_Roof_ICC (properties follow)
property				construction type					IAI Standard 'construction type' property -- roof slab type in this case. Examples: roof slab type "R-1" or roof slab type "R-2".			string	n/a			'reference' property in Pset_SlabCommon
property				configuration					The type of roof assembly.			integer index into enumeration roof_configuration	n/a			simple property in pset
property				assembly type					The primary material or construction type in the roof assembly.			integer index into enumeration roof_assembly_type	n/a			simple property in pset
property				is ventilated					Boolean for whether the assembly is ventilated			boolean	n/a			MCS interpretation -- when assembly includes an air space
property				is exterior					Boolean declaring whether this is an exterior roof			boolean	n/a			'IsExterior' boolean property in Pset_Slab_Common on the Roof slabs
property				roof pitch					Geometric angle of the top-of-roof plane, above horizontal.			real number	degrees of rotation			MCS calculation -- based on geometry
property				solar reflectance					<get definition from ASHRAE amendments>			real number	n/a			simple property in pset
property				thermal emittance					<get definition from ASHRAE amendments>			real number	n/a			simple property in pset
property				thermal resistance of thermal					inner most layer in the material layer set of the roof	IECC 502.2		real number	R-Value			Thermal block should be modeled as the inner-most layer in the roof slab. Attach Pset_ThermalBlock_ICC
contained				thermal insulation - building el					Insulation layer -- 'primary' as defined in chapter 502.1			**thermal insulation - building elements - primary**	n/a			Contained concept -- see source
contained				thermal insulation - building el					Insulation layer -- 'secondary' as defined in chapter 502.1			**thermal insulation - building elements - secondary**	n/a			Contained concept -- see source
contained				vapor retarder					vapor retarder layer -- as defined in 502.5			**vapor retarder**	n/a			Contained concept -- see source

Type	1	2	3	4	5	6	7	8	Definition	Code Se	ynonyn	Data Type	Units	lass Clas	Status	IFC Object/Property
topic	**building code checking**															
subtype			**wall**								above grade wall, below grade wall					Modeled as IfcWall. Attach the following: - Pset_Wall_Common (properties by IAI) - Pset_Wall_ICC (properties below)
property				construction type					IAI Standard 'construction type' property -- wall type in this case. Examples: wall type "IW-1" or wall type "EW-2".			string	n/a			Reference' property in Pset_Wall_Common
property				assembly type					The primary material giving shape/strucutre to the wall. Note: this property applies to all walls -- even non structural walls. See enumeration of possible values. NOTE: Framed = subset (framed-wood, framed-metal, framed-other)			integer index into enumeration wall_assembly_type	n/a			'AssemblyType' integer property in pset
property				height					Height of the wall in inches			real number	in			IfcWall.Height
property				thickness					Thickness of the wall in inches			real number	in			IfcWall.Thickness
property				is massive					TRUE if weight .GE. 35 psf/sq ft surface area or 7.25 psf/sq ft surface area if weight .LE. 120 pcf	IECC 502.2.5		boolean	n/a			'IsMassive' boolean property in Pset_Wall_ICC
property				is ventilated					Boolean for whether the assembly is ventilated			boolean	n/a			MCS interpretation -- when assembly includes an air space
property				is exterior					Boolean declaring whether this is an exterior wall.			boolean	n/a			'IsExterior' boolean property in Pset_Wall_Common
property				location relative to surrounding					Classification of wall relative to grade. Walls with more than 15% of their exterior surface area above grade are considered to be 'Above Grade' walls. Conversely, wall that are 85% or more below grade are classified as 'Below Grade' walls.			integer index into enumeration location_relative_to_grade	n/a			'LocationRelativeToGrade' integer property in Pset_Wall_ICC. Note: if a ground terrain is not provided, we could add a 'grade at midpoint' property on all exterior walls. This would allow MCS to come up with good approximations
property				below grade insulation depth					Length measure from grade to bottom of wall.			integer index into enumeration wall_below_grade_insulation_depth_of_burial	n/a			calculated by MCS based on geometry
contained				thermal insulation - building el					Insulation layer -- 'primary' as defined in chapter 502.1			**thermal insulation - building elements - primary**	n/a			Contained concept -- see source
contained				thermal insulation - building el					Insulation layer -- 'secondary' as defined in chapter 502.1			**thermal insulation - building elements - secondary**	n/a			Contained concept -- see source
contained				vapor retarder					vapor retarder layer -- as defined in 502.5			**vapor retarder**	n/a			Contained concept -- see source
subtype				**above grade wall**					Walls completely above grade or more than 15 percent above gradel. Note that this is on a story by story basis.							MCS filtering -- IfcWall where location relative to surrounding grade = above grade. See note above about location relation to surround grade.
subtype				**below grade wall**					Walls that are at least 85 percent below grade. Note that this is on a story by story basis.							MCS filtering -- IfcWall where location relative to surrounding grade = above grade See note above about location relation to surround grade.
subtype				**framed wall**					The subset of walls where the property 'assembly type' is one of framed-wood, framed-metal, framed-other.							MCS filtering -- IfcWall where: Wall: Pset_Wall_ICC.AssemblyType .EQ. one of: framed-wood, framed-metal, framed-other;
subtype				**massive wall**					Subset of walls for which the 'is massive' property is TRUE							MCS filtering -- IfcWall where Pset_Wall_ICC.IsMassive .EQ. TRUE
subtype		**building element assembly**														MCS filtering -- see below
subtype			building element assembly - frostp						Assembly that is not damaged when penetrated by moisture which then freezes. Assemblies where the materials are concrete, masonry, or stone		frostproof					MCS filtering -- IfcWall or IfcFloor where the materials are concrete, masonry, or stone
subtype			building element assembly - moistu						Assembly that is not damaged when penetrated by moisture. Assemblies where the materials are concrete, masonry, or stone		moistureproof					MCS filtering -- IfcWall or IfcFloor where the materials are concrete, masonry, or stone
subtype			building element assembly - opaqu						Non-glazed building elements including: Walls, Floors, Roofs, Ceilings, and opaque doors							MCS filtering -- IfcWall, IfcSlab, or IfcDoor without any inserted fenestration
subtype			building element assembly - ventila						Assemblies (wall, floor, ceiling, roof) that include an air space vented to outside air such that moisture does not condensate on the adjacent material layers		ventilated					MCS filtering -- IfcWall or IfcSlab where the property "is ventilated" .EQ. TRUE;
subtype		**building envelope**							Building elements (walls, floors, roofs, doors, windows) that make up the 'skin' (exterior) of the building. In general, these are the elements of these types where the 'IsExterior' property in Pset_<bldg element>Common is TRUE.		envelope, building skin					MCS filtering -- IfcWall, IfcSlab, IfcDoor, IfcWindow where: - Wall: Pset_WallCommon.IsExterior .EQ. TRUE; - Slab: Pset_SlabCommon.IsExterior .EQ. TRUE; - Door: Pset_DoorCommon.IsExterior .EQ. TRUE; - Window: Pset_WindowCommon.IsExterior .EQ. TRUE;
subtype		**building envelope closure system**														IfcSystem named "buiding envelope closure system" -- attached to the IfcBuilding object. Attach the following: - Pset_Envelope_Closure_ICC (properties follow)
contained			air opening set						collection of air openings in the building envelope			set of **air opening**	n/a			Set of IfcOpening = the members of the system
contained				air opening					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			air opening	n/a			Contained concept -- see source
property			method of sealing openings/penetrations							IECC 502.4.3		integer index into enumeration sealing_methods_openings	n/a			simple property in pset
property			method of sealing joints/seams						joints and seams between envelope assemblies, materials, fenestration, etc. (also seals, tapes, mastics)	IECC 502.4.3		integer index into enumeration sealing_methods_joints	n/a			simple property in pset
property			number of openings						The count of openings used for			integer number	count			Calculated by MCS
property			total opening area						sum of the opening areas for all openings in the envelope			real number	sq ft			Calculated by MCS
term	**mechanical systems**															
term	**plumbing systems**															
topic	**electrical systems**															
subtype		**electrical meter**								IECC 505.7						Modeled as an IfcFlowControlElement of type IfcFlowMeterType --- that should be a member of the 'Electrical System' group. Attach Pset_Electrical_Meter_ICC with the following properties:
property			meter type							IECC 505	electric	integer index into enumeration electrical_meter_type	n/a			simple property in pset
subtype		**electrical power system**														IfcSystem (subtype of IfcGroup) whose members are power circuits
contained			electrical meter									**electrical meter**	n/a			Contained concept -- see source

Type	1	2	3	4	5	6	7	8	Definition	Code Se	ynonyn	Data Type	Units	lass	Clas	Status	IFC Object/Property
topic	**building code checking**																
subtype		**illuminated exit sign**									emergency signs						Model this as a light fixture (IfcFlowTerminal of type LightFixtureType) with the name "Exit Sign". Note: this will be included in the "Lighting Fixures" group. Attach Pset_LightFixtureTypeExitSign_ICC (from Singapore) and add the following properties:
property			watts per side						Energy (in watts) used by exit signs - each side.	IECC 505.4		real number	watt				simple property in pset
subtype		**lighting circuit**									light circuit						IfcSystem (subtype of IfcGroup) whose members are the group of Light Fixtures (see below) and the group of Lighting Controls in the circuit. IfcGroup 'Name' = "Lighting Circuit". Attach the following: - Pset_Lighting_Circuit_ICC (properties below)
property			circuit name						A human interpretable identification of the circuit.			string	n/a				simple property in pset
property			lighting circuit function									integer index into enumeration lighting_circuit_function	n/a				simple property in pset
property			power source						The source for power to this lighting circuit	IECC 505.6		integer index into enumeration lighting_circuit_power_source					simple property in pset
property			is interior circuit						Boolean value indicating if this is an interior or exterior lighting circuit			boolean	n/a				Calculated by MCS = TRUE if all of the illuminated
property			number of stories served						Count the number of unique building stories served by checking the building story property on the space served for each lighting fixture			integer number	count				Calculated by MCS = number of stories that contain the set of Illumindated spaces
property			number of spaces served						Count the number of unique spaces served by all the lighting fixtures in the circuit			integer number	count				Calculated by MCS = count of Illumindated spaces
property			area of spaces served						Total net area of all spaces server by this circuit. Calculated by summing the net areas from all the spaces served by all the lighting fixtures.	IECC 505.2.1		real number	sq ft				Calculated by MCS = find all the spaces served by the group of fixtures in this circuit
property			connected lighting power						Total connected lighting power in this circuit	IECC 505.6.2		real number	Watt				Calculated by MCS = sum of the wattage of all connected lighting fixtures in this circuit
property			connected lighting power density						lighting power density (watts/sq ft) average for all the spaces in this circuit	IECC 505.6		real number	Watt/sq ft				Calculated by MCS = sum of the wattage of all connected lighting fixtures in this circuit / sum of 'area of spaces served'
property			connected lighting power - linear						MCS calculated value where lighting budget is specified as W/ft rather that W/sq ft. Examples include building façade, walkways, entrance doors, street frontage	IECC 505.6.2		real number	Watt/ft				Calculated by the MCS in the following cases: (1) bldg façade lighting, (2) ext walkway lighting, (3) entry door lighting, and (4) street frontage for vehicle sales lots
property			lighting circuit voltage							IECC 505.6		integer index into enumeration lighting_circuit_voltage	n/a				simple property in pset
property			wiring topology						Wiring method used for the light fixtures in this circuit -- e.g. in tandem, series, or parallel	IECC 505.3		integer index into enumeration lighting_circuit_wiring_topology	n/a				simple property in pset
property			number of fixtures						Number of light fixtures			integer number	count				Calculated by MCS = count of Light Fixtures in the in the circuit
property			center to center fixture spacing						The distance between light fixtures in this circuit -- center to center	IECC 505.3		real number	ft				Calculated by MCS = Check geometry of light fixtures. ISSUE: is this an average, min, or max
property			edge to edge fixture spacing						The distance between light fixtures in this circuit -- edge to edge	IECC 505.3		real number	ft				Calculated by MCS = Check geometry of light fixtures. ISSUE: is this an average, min, or max
property			number of controls						Number of lighting controls in this circuit			integer number	count				Calculated by MCS = count of controls in the group of controls
contained			illuminated space set						The collectoin of spaces served by the light fixtures in this circuit			set of **space**	n/a				Calculated by MCS = The spaces containing the light fixtures
contained				space					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			space	n/a				Contained concept -- see source
contained			light fixture set						A list of IDs for the lighting fixtures connected to this circuit.			set of **lighting fixture**	n/a				Object reference (in Pset) -- to an IfcGroup whose members are the Light Fixtures (see [o]) in this circuit. IfcGroup 'Name' = "Lighting Fixtures for <circuit name>"
contained				lighting fixture					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			lighting fixture	n/a				Contained concept -- see source
property			2 or more fixtures in each space							IECC 505.3		boolean	n/a				Calculated by MCS = TRUE if all spaces containing light fixtures, contains 2 or more
contained			lighting control set						Properties defining the types of controls for this circuit. Example: auto-on/off + energy reduction	IECC 505	light sw	set of **lighting control**	n/a				The lighting control set will be modelec as a systems group (IfcGroup) whose members are the group of control objects (modeled as IfcControl). IfcGroup 'Name' = "Lighting Control Set". Attach Pset_Lighting_Control_Set that contains the following properties.
contained				lighting control					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			lighting control	n/a				Contained concept -- see source
property			has manual lighting control						Boolean indicating if this lighting control set includes a manual control.	IECC 505.2.1		boolean	n/a				Calculated by the MCS - by checking the types of lighting controls
property			has automatic reduction and shuto						Boolean indicating if this lighting control set includes automatic reduction and/or shutoff: at night and on holidays for interior circuits, during the day for exterior lighting circuits.	IECC 505.2.2.2		boolean	n/a				Calculated by the MCS - by checking the types of lighting controls
property			has occupant light reduction contro						Circuite includes a control that allows the occupant to reduce the lighting level by 50% or more	IECC 505.2.2.1		boolean	n/a				Calculated by the MCS - by checking the types of lighting controls
property			light reduction %						% light reduction in this circuit for low light periods	IECC 505.2.1, IEC		real number	%				simple property in pset
property			light reduction method						method used to achieve lighting reduction in for this circuit	IECC 505.2.2.1		integer index into enumeration lighting_control_reduction_methods	n/a				simple property in pset
subtype		**lighting control**							The collection of controls in the 'set' for this circuit	IECC 505							Each control will be modeled as an IfcControl of type (?lookup?). Attach Pset_Lighting_Control_ICC with the following properties.
property			control type						The way in which the lighting circuit is turned on and of.	IECC 505.2.1, IEC		integer index into enumeration lighting_control_type	n/a				simple property in pset
property			location						Physical location of the manual lighting control (switch)	505.2.2.2.1		integer index into enumeration lighting_control_location	n/a				simple property in pset
property			is occupant override to auto-off						A control used to manually turn lights in a circuit back when they have been automatically shut off in low light or setback periods			boolean	n/a				simple property in pset
property			is occupant light reduction control						A control used to manually reduce lighting to the low light' state -- as defined by the 'light reduction %' property in the lighting control set.			boolean	n/a				simple property in pset
property			is unit master switch						A singular switch that controls all permanently wired luminaries and switched recepticles, other than bathrooms, in a hotel, motel, boarding house, or similar building.	IECC 505.2.2, IEC		boolean	n/a				simple property in pset
subtype		**lighting fixture**								IECC 505	light fixture, light		n/a				The lighting fixture is modeled as an IfcFlowTerminal of type LightFixtureType. Attach Pset_Light_Fixture_ICC with the following properties:

Type	1	2	3	4	5	6	7	8	Definition	Code Se	ynonyn	Data Type	Units	lass Clas	Status	IFC Object/Property
topic	**building code checking**															
property			fixture type						Type of light fixture. Note: the type also addresses mounting type and 'sealed box' requirements for recessed luminaries			integer index into enumeration lighting_fixture_type	n/a			simple property in pset
property			lamp type						Type of lamp (light bulb)			integer index into enumeration lighting_fixture_bulb_type	n/a			simple property in pset
property			lamp count						Number of light lamps (light bulbs)			integer number	count			simple property in pset
property			lamp count is odd						Boolen to indicate if the light fixture qualifies for tandem wiring for reduced energy in low light times			boolean	n/a			
property			lamp wattage						Power used by the lamp (light bulb)			real number	Watt			simple property in pset
property			lamp efficacy						Efficiency of the lamp = lumens per watt used			real number	lumens/watt			simple property in pset
property			method of sealing fixture						designer's intended method for sealing openings in the envelope	IECC 502.4.7		integer index into enumeration sealing_methods_light_fixture	n/a			
property			air movement						ASTM E283 @ 1.57 psf			real number	cfm			simple property in pset
contained			electrical ballast						The ballast for this fixture -- if there is one.			**electrical ballast**	n/a			
subtype			**recessed luminaire**						Lighting fixture contained in a box or housing that is recessed into a framed ceiling or roof. All of the following light fixture types are considered to be recessed luminaries: recessed - IC - no penetrations, recessed - IC - in sealed box, recessed - IC - other, recessed - non-IC - no penetrations, recessed - non-IC - in sealed box, recessed - non-IC - other		recessed light					Subtype -- IfcFlowTerminal of type LightFixture where ...
subtype		**lighting system**														IfcSystem (subtype of IfcGroup) whose members are lighting circuits
property			average interior lighting power den						This is the average of lighting power density across all interior lighting circuits.			real number	Watt/sq ft			
contained			lighting circuit set									set of **lighting circuit**	n/a			Contained concept -- see source
contained				lighting circuit					Added temporarily -- because properties are not exposed by SCB for 'sets of' objects			lighting circuit	n/a			
term	**shared and low level concepts**								These are generally specific configurations of terms above (e.g. framed assembly is a configuration of wall, floor, roof, or ceiling).							
subtype		**air opening**							An opening in the building envelop that is not filled with a door, window, skylight, or curtain wall							IfcOpeningElement in an exterior wall or slab (roof or floor). Attach Pset_Envelope_Opening_ICC with the following properties:
property			opening type						The type or purpose of this air opening			integer index into enumeration envelope_opening_type	na/			simple property in pset
property			opening area						open area for this opening				sq ft			MCS calculated -- based on opening geometry
property			covering type						Covering on outside of opening (e.g. for rain protection)	IECC 502.4.4		integer index into enumeration opening_covering_type	n/a			simple property in pset
property			leakage rate						The rate at which conditioned air will leak from the envelope opening. *(Must be <= 4 cfm @ 1.0 in - per AMCA 500D)*			real number	cfm/sq ft			simple property in pset
contained			air flow damper						a manually or automatically controlled device to regulate the flow of air or other gases through the air opening			**air flow damper**	n/a			Contained concept -- see source
subtype		**air flow damper**							a manually or automatically controlled device to regulate the flow of air or other gases							IfcFlowControl -- of type 'Air Flow Damper'. Attach Pset_AirFlowDamper
property			damper type						type of damper (from enum)			integer index into enumeration damper_type	n/a			simple property in pset
property			leakage rate						rate at which air leaks through the damper			real number	cfm/sq ft			simple property in pset
subtype		**electrical ballast**														An electrical ballast is modeled as part of a lighting fixture. Attach Pset_ElectricalBallast_ICC to lighting fixtures
property			is high frequency							IECC 505.3		boolean	n/a			simple property in pset
property			wattage									real number	Watt			simple property in pset
subtype		**glazing**														Glazing is modeled as part of an IfcWindow, IfcDoor, IfcCurtainWall, etc. Attach Pset_Glazing_ICC with the following properties:
property			material						The material of which the glazing is made.			integer index into enur	n/a			simple property in pset
property			area						Area of the rough opening for building element that contains the glazing.			real number	sq in			mcs generated
property			glazing panel thickness						Thickness of sealed glass unit			real number	in			simple property in pset
property			thermal transmittance						The coefficient of heat transmission (air to air) through a building com¬ponent or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h·ft2 ·°F).	IECC 202		real number	U-Factor			
property			SHGC						Solar Heat Gain Coefficient - The ratio of the solar heat gain entering the space through the fenestra¬tion assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radi¬ation which is then reradiated, conduted, or converted into the space.	IECC 502.3		real number	n/a			simple property in pset
subtype		**plenum**							Air space between ceiling and floor above used as a return air 'ducting' space.							Plenum is modeled as an IfcSpace (between ceiling and next floor structure). Attach Pset_IECC_Plenum with the following properties:
property			type						supply, return, exhaust			integer index into enumeration plenum_system_type	n/a			simple property in pset
property			location						The location of the plenum, relative to the spaces conditioned by this HVAC system			integer index into enumeration plenum_location	n/a			simple property in pset
property			pressure						supply, return, exhaust			real number	psi			simple property in pset
property			pressure rating						Duct classification rating, based on maximum operating pressure of the duct. Low is defined as .LE. 2 in w.g. Medium is defined to be .GT. 2 in w.g. and .LE. 3 in w.g. High is .GT. 3 in w.g.	IECC 503.2.7.1		integer index into enumeration duct_system_pressure_rating	n/a			simple property in pset
property			sealing						The method for sealing the duct system.			integer index into enumeration duct_system_sealing	n/a			simple property in pset
property			flow rate						volume of air moving through the plenum			real number	cfm			simple property in pset
subtype		**thermal insulation - building elements - primary**									insulation					Insulation modeled as IfcMaterialLayer. Attach Pset_Thermal_Insulation_Envelope_ICC with the following properties:

Type	1	2	3	4	5	6	7	8	Definition	Code Se	ynonyn	Data Type	Units	lass Clas	Status	IFC Object/Property
topic	**building code checking**															
property			type						physical configuration of the insulation			integer index into enumeration thermal_insulation_envelope_type	n/a			simple property in pset
property			material						material from which the insulation is made			integer index into enumeration thermal_insulation_envelope_material	n/a			simple property in pset
property			density									real number	lb/cu ft			simple property in pset
property			sound transmission class							IBC 1207		real number	stc			simple property in pset
property			flame spread						The propagation of flame over a surface	IBC 802		real number	fsi			simple property in pset
property			thickness									real number	in			MCS extracted from material layer definition
property			thermal resistance						The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area (R-Value = $h \cdot ft^2 \cdot °F/Btu$)	IECC 502.2		real number	R-Value			simple property in pset
property			is continuous						TRUE means insulation layer is a continuous layer, FLASE means insulation spans between structural frame elements (e.g. studs)	IECC 502.2		boolean	n/a			simple property in pset
property			location									integer index into enumeration thermal_insulation_envelope_location	n/a			simple property in pset --- NOTE: this _could_ be derived by MCS if we agree to the different configurations to be supported. E.G. if this is only a material layer then outside layer could be interpreted as "above deck" --- if not outside layer, then it is "material layer"
subtype		**thermal insulation - building elements - secondary**									insulation					Insulation modeled as IfcMaterialLayer. Attach Pset_Thermal_Insulation_Envelope_ICC with the following properties:
property			type						physical configuration of the insulation			integer index into enumeration thermal_insulation_envelope_type	n/a			simple property in pset
property			material						material from which the insulation is made			integer index into enumeration thermal_insulation_envelope_material	n/a			simple property in pset
property			density									real number	lb/cu ft			simple property in pset
property			sound transmission class							IBC 1207		real number	stc			simple property in pset
property			flame spread						The propagation of flame over a surface	IBC 802		real number	fsi			simple property in pset
property			thickness									real number	in			simple property in pset
property			thermal resistance						The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area (R-Value = $h \cdot ft^2 \cdot °F/Btu$)	IECC 502.2		real number	R-Value			simple property in pset
property			is continuous						TRUE means insulation layer is a continuous layer, FLASE means insulation spans between structural frame elements (e.g. studs)	IECC 502.2		boolean	n/a			simple property in pset
property			location									integer index into enumeration thermal_insulation_envelope_location	n/a			simple property in pset --- NOTE: this _could_ be derived by MCS if we agree to the different configurations to be supported. E.G. if this is only a material layer then outside layer could be interpreted as "above deck" --- if not outside layer, then it is "material layer"
subtype		**vapor retarder**							A vapor resistant material, membrane or covering such as foil, plastic sheeting, or insulation facing havingapermeanceratingof1 perm(5.7 × 10-11kg/Pa · s · m2) or less when tested in accordance with the dessicant method using Procedure A of ASTM E 96. R	IECC 502	vapor barrier, membrane, coating					Vapor Retarder modeled as an IfcMaterialLayer. Attach Pset_Vapor_Retarder_ICC with the following properties:
property			material									integer index into enumeration vapor_retarder_material	n/a			simple property in pset
property			permeance rating									real number	perm			simple property in pset
property			on warm-in-winter side						Boolen value indicating if the barrier is on the warm-in-winter side of the insulation layer --- based on the climates zone			boolean	n/a			MCS calculated, based on the climate zone and the relative position of this material layer and the insulating material layer