Number	Object Category	Priority	Attribute Name	Explanation	Examples	Further comments
1	**STORY**					
		2	**Story Elevation**	Absolute elevation for story (the name "story" is prefered over "level", as level is used in e.g. Revit beyond the meaning of story - e.g. for any horizontal reference level). There are two elevation values for each story: - the relative elevation of the story against the reference height of the project. - the absolute elevation of the story against the relevant sea level (or geographic height datum)	Typically, our elevations for a project are all relative to a base elevation that is generally set to +100'-0". So, in Florida, +100'-0"' might be 3' above sea level. In Denver, Colorado, +100'-0" might be 5300' above sea level.	It is sufficient to have the relative elevation as an explicit measure for each story, and the absolute "above see level" elevation once at the building to which all stories references. The absolute elevation of each story can then be calculated by the receiving system.
		2	**Story Name**	Associated name for the story	Typical names are e.g. "foundation", "basement", "1st story", etc.	
2	**GRID**					
		2	**Grid element**	Grid element to exists in the exchange, requirement for grids in the structural exchange is to have a 3D grid, based on grid planes.	A structural grid is a vertically-oriented plane and therefore has 3D characteristics. A grid system is a collection of 3D planes. However this could be simulated by multiple 2D grids assigned to the stories in a building.	A grid based on 2D lines on a base plane is already needed in the exchange. A full 3D grid based on planes, rather then lines, is not widely supported by software. So 2D lines are sufficient but must be in multiple grid planes (at varying elevations) that define levels in order to get a "3D grid"
		2	**Grid layout**	Geometric layout of the grid, set of horizontal and vertical planes with intersection between them.		
		2	**Grid numbering**	A string attached to each grid plane (or line) representing the plane (or line) label.	E.g. "A", "B", "1", "2", etc.	
		2	**Reference to story**	Reference to the story where the grid planes (or lines) appears on.		The 2D gid is assigned to each story where it is valid. For now, it is necessary to copy the grid to each story.
3	**COLUMN**					
		1	**Column axis**	Definition axis of the column, used e.g. for determining the Cardinal point and as a first assumption for the linear structural member representing the column for structural analysis.		
		1	**Profile Name**	Name of the profile (or cross section) of the column. The naming convention, when applicable, should follow AISC naming convention.	Profile name is a string that represents a standard naming convention from a manual, handbook, or other external references. It is common in steel industry by using a AISC or CISC standard profile name. Some precast profiles have standard naming conventions, but most concrete profiles are not standarized. Name examples are (W14X90, 24X24).	For non-AISC profiles, is it required to also pass the profile table (or profile standard) name. Currently the best way to pass the profile information is by including it into a property set.
		1	**Material Name**	Name of the material of the column. It should be an indicator of the type of material (steel, concrete, timber) and not any specific material name ("lightweight concrete type ABC"). Only the material name should be exchanged, not the material properties, like Density, Specific Weight, etc.	Example for type of material are: Concrete, steel, timber, glass	We need to agree upon an enumeration of applicable type of material to reduce unecessary string interpretation.
		1	**Grade**	Grade is a futher classifier for particular material. It often refers to items from external standards such as ASTM e.g. ASTM 36.	for example A36, ASTM36, GRADE36. The question is whether a standard expression is available. Receiving applicaion therefore must be cabale to interpret all kinds of expressions.	Is grade considered as specific property of material, or of the element (or profile)? Is just a grade value sufficient, or a value with reference to a standard?
		1	**Length**	*Member length, it is software generated value that may be redundent to the length parameter embedded in the geometry representation.* There are different length measurements, best described as quantities: - logical length between two joints - physical length of the actual column body Since these can be redundent to the geometry representation it is importent to keep them consistent and to guarantee that there is no inconsistency. They are provided in addition to the geometric representation.	The logical length is a real length measure between the two joints and equal to the length of the column axis. The physical length is the length of the extrusion body (not taking cut-out's etc. into account). Having explicit real values is particularly important, if the geometry is not an extrusion (e.g. a boundary representation).	Is there a specific definition of how the length is measured? Is it the physical or cut length, or the logical length between two joints?
		1	**Roll**	*Member roll, software generated value that may be redundent to the placement and placement orientation parameters embedded in the geometric representation.* Roll is the rotation of the column profile (and body) about a vertical axis for columns. Since these can be redundent to the geometry representation it is importent to keep them consistent and to guarantee that there is no inconsistency. They are provided in addition to the geometric representation.	For example, for a 24x30 cast-in-place column, you have to know the orientation or roll of the column to know if the 30" dimension is pointing along x-axis or the y-axis (or somewhere in between).	Roll is handled for analytical models, but not (yet) for physical models, is it needed for physical models as well?
		1	**Cardinal point**	Offset of profile from longitudinal axis, essentially, it is the justification of the cross-section relatively to the working line between the two end joints. *Note: propose to rename it from insertion point to cardinal point (to make it similar to the CIS/2 concept).*	Cardinal point "lower-left", "center-right", etc.	
		1	**Element ID**	Unique identifier for element Note: Element ID is only for indexing model elements and used to uniquely identify elements that may have identical properties (length, profile, etc.). Element ID is typically defined by the modeling tool and the user should not be able to change this to ensure uniqueness.		is it a piecemark for structural steel? However, piecemarks are not necessarily unique across the entire model. Their might be many identical assemblies with the same parts with the same piecemarks. Or is it a GUID - a unique software ID that keeps identify across applications?

Number	Object Category	Priority	Attribute Name	Explanation	Examples	Further comments
		2	**Schedule Mark**	Identifier for scheduling same profile elements Note: Schedule marks do not need to be unique. Schedule mark is typically defined by the user and named based on the elements location on a grid and/or the properties of that element (depth, length, number of reinforcing bars, etc.).	This is generally a short string that is provided on a plan adjacent to a column (for example "CC12"). The "CC12" is then defined in the column schedule. It is generally used as a unique identifier in the plans. So, a CC12 would be at a specific gridline (or gridlines) and is not the same as a CC11 or other mark.	Unsure whether this is different to the ELEMENT ID and if both identifiers are needed.
		2	**Base Reference Story**	*Base location, reference to the story where the start point of the column resists. Start point is the lower point of the column axis.*	This is e.g. a level as defined in "0. Level", from which the member starts, could we have an example drawing? CLICK FOR SCREEN SHOT EXPLANATION	
		2	**Top Reference Story**	*Top location, reference to the story where the end point of the column resists. End point is the upper point of the column axis.*	This is e.g. a level as defined in "0. Level", at which the member ends. could we have an example drawing? CLICK FOR SCREEN SHOT EXPLANATION	
		2	**Base Offset**	*Offset from base level*	This is a length describing the distance above a given level where a column starts. For example, steel columns when spliced are generally cut ~4'-0" above a floor level. So, the column above the splice would have a +4'-0" offset at its start.	Does this information has to be exchanged as redundent additional offset value, as it is already captured in the column position.
		2	**Top Offset**	*Offset from top level*	Also a length. In the example in the cell above, the lower column would have a top offset of +4'-0".	Does this information has to be exchanged as redundent additional offset value, as it is already captured in the column position and column geometry.
4	**BEAM**					
		1	**Beam Axis**	Definition axis of the beam, used e.g. for determining the Cardinal point and as a first assumption for the linear structural member representing the column for structural analysis.		
		1	**Profile Name**	Name of the profile (or cross section) of the beam. The naming convention, when applicable, should follow AISC naming convention.	Profile name is a string that represents a standard naming convention from a manual, handbook, or other external references. It is common in steel industry by using a AISC or CISC standard profile name. Some precast profiles have standard naming conventions, but most concrete profiles are not standarized. Name examples are (W14X90, 24X24).	For non-AISC profiles, is it required to also pass the profile table (or profile standard) name?
		1	**Material Name**	Name of the material of the beam. It should be an indicator of the type of material (steel, concrete, timber) and not any specific material name ("lightweight concrete type ABC"). Only the material name should be exchanged, not the material properties, like Density, Specific Weight, etc.	Example for type of material are: Concrete, steel, timber, glass	How to agree upon an enumeration of applicable type of matierial to reduce unecessary string interpretation?
		1	**Grade**	Grade is a futher classifier for particular material. It often refers to items from external standards such as ASTM e.g. ASTM 36.	for example A36, ASTM36, GRADE36. The question is whether a standard expression is available. Receiving applicaion therefore must be cabale to interpret all kinds of expressions.	Is grade considered as specific property of material, or of the element (or profile)? Is just a grade value sufficient, or a value with reference to a standard?
		1	**Length**	*Member length, it is software generated value that may be redundent to the length parameter embedded in the geometry representation.* There are different length measurements, best described as quantities: - logical length between two joints - physical length of the actual column body Since these can be redundent to the geometry representation it is importent to keep them consistent and to guarantee that there is no inconsistency. They are provided in addition to the geometric representation.	The logical length is a real length measure between the two joints and equal to the length of the column axis. The physical length is the length of the extrusion body (not taking cut-out's etc. into account). Having explicit real values is particularly important, if the geometry is not an extrusion (e.g. a boundary representation).	Is there a specific definition of how the length is measured? Is it the physical or cut length, or the logical length between two joints?
		1	**Roll**	*Member roll, software generated value that may be redundent to the placement and placement orientation parameters embedded in the geometric representation.* Roll is the rotation of the column profile (and body) about a vertical axis for columns. Since these can be redundent to the geometry representation it is importent to keep them consistent and to guarantee that there is no inconsistency. They are provided in addition to the geometric representation.	For example, for a 24x30 cast-in-place column, you have to know the orientation or roll of the column to know if the 30" dimension is pointing along x-axis or the y-axis (or somewhere in between).	Roll is handled for analytical models, but not (yet) for physical models, is it needed for physical models as well?
		1	**Cardinal point**	Offset of profile from longitudinal axis, essentially, it is the justification of the cross-section relatively to the working line between the two end joints. *Note: propose to rename it from insertion point to cardinal point (to make it similar to the CIS/2 concept).*	Cardinal point "lower-left", "center-right", etc.	
		1	**Element ID**	Unique identifier for element Note: Element ID is only for indexing model elements and used to uniquely identify elements that may have identical properties (length, profile, etc.). Element ID is typically defined by the modeling tool and the user should not be able to change this to ensure uniqueness.		is it a piecemark for structural steel? However, piecemarks are not necessarily unique across the entire model. Their might be many identical assemblies with the same parts with the same piecemarks. Or is it a GUID - a unique software ID that keeps identify across applications?

Number	Object Category	Priority	Attribute Name	Explanation	Examples	Further comments
		2	**Schedule Mark**	Identifier for scheduling same profile elements Note: Schedule marks do not need to be unique. Schedule mark is typically defined by the user and named based on the elements location on a grid and/or the properties of that element (depth, length, number of reinforcing bars, etc.).	This is generally a short string that is provided on a plan adjacent to a column (for example "CC12"). The "CC12" is then defined in the column schedule. It is generally used as a unique identifier in the plans. So, a CC12 would be at a specific gridline (or gridlines) and is not the same as a CC11 or other mark.	Unsure whether this is different to the ELEMENT ID and if both identifiers are needed.
		2	**Base Reference Story**	*Base location, reference to the story where the start point of the beam resists. Start point is the lower point of the column axis.*	This is e.g. a level as defined in "0. Level", from which the member starts.	
		2	**Vertical Start Offset**	*Start offset in z direction,* Same concept as vertical end offset but for the beam start point. The end offset is measured to the axis (or reference line) of the beam.	See figure for explanation	A beam, provided it is horizontal, would have a base offset from the story (distance between it's bottom face and the story level, so what is the vertical start offset as additional value?
		2	**Vertical End Offset**	*End offset in z direction, v*ertical end offset is the offset distance of a beam endpoint from the insertion point (cardinal point) of that beam. The end offset is measured to the axis (or reference line) of the beam.	See figure for explanation	A beam, provided it is horizontal, would have a base offset from the story (distance between it's bottom face and the story level, so what is the vertical end offset as additional value?
5	**BRACE**					
		1	**Brace Axis**	Definition axis of the brace, used e.g. for determining the Cardinal point and as a first assumption for the linear structural member representing the column for structural analysis.		
		1	**Profile Name**	Name of the profile (or cross section) of the beam. The naming convention, when applicable, should follow AISC naming convention.	Profile name is a string that represents a standard naming convention from a manual, handbook, or other external references. It is common in steel industry by using a AISC or CISC standard profile name. Some precast profiles have standard naming conventions, but most concrete profiles are not standarized. Name examples are (W14X90, 24X24).	For non-AISC profiles, is it required to also pass the profile table (or profile standard) name?
		1	**Material Name**	Name of the material of the beam. It should be an indicator of the type of material (steel, concrete, timber) and not any specific material name ("lightweight concrete type ABC"). Only the material name should be exchanged, not the material properties, like Density, Specific Weight, etc.	Example for type of material are: Concrete, steel, timber, glass	How to agree upon an enumeration of applicable type of matieral to reduce unecessary string interpretation?
		1	**Grade**	Grade is a futher classifier for particular material. It often refers to items from external standards such as ASTM e.g. ASTM 36.	for example A36, ASTM36, GRADE36. The question is whether a standard expression is available. Receiving applicaion therefore must be cabale to interpret all kinds of expressions.	Is grade considered as specific property of material, or of the element (or profile)? Is just a grade value sufficient, or a value with reference to a standard?
		1	**Length**	*Member length, it is software generated value that may be redundent to the length parameter embedded in the geometry representation.* There are different length measurements, best described as quantities: - logical length between two joints - physical length of the actual column body Since these can be redundent to the geometry representation it is importent to keep them consistent and to guarantee that there is no inconsistency. They are provided in addition to the geometric representation.	The logical length is a real length measure between the two joints and equal to the length of the column axis. The physical length is the length of the extrusion body (not taking cut-out's etc. into account). Having explicit real values is particularly important, if the geometry is not an extrusion (e.g. a boundary representation).	Is there a specific definition of how the length is measured? Is it the physical or cut length, or the logical length between two joints?
		1	**Roll**	*Member roll, software generated value that may be redundent to the placement and placement orientation parameters embedded in the geometric representation.* Roll is the rotation of the column profile (and body) about a vertical axis for columns. Since these can be redundent to the geometry representation it is importent to keep them consistent and to guarantee that there is no inconsistency. They are provided in addition to the geometric representation.	For example, for a 24x30 cast-in-place column, you have to know the orientation or roll of the column to know if the 30" dimension is pointing along x-axis or the y-axis (or somewhere in between).	Roll is handled for analytical models, but not (yet) for physical models, is it needed for physical models as well?
		1	**Cardinal point**	Offset of profile from longitudinal axis, essentially, it is the justification of the cross-section relatively to the working line between the two end joints. *Note: propose to rename it from insertion point to cardinal point (to make it similar to the CIS/2 concept).*	Cardinal point "lower-left", "center-right", etc.	
		1	**Element ID**	Unique identifier for element Note: Element ID is only for indexing model elements and used to uniquely identify elements that may have identical properties (length, profile, etc.). Element ID is typically defined by the modeling tool and the user should not be able to change this to ensure uniqueness.		is it a piecemark for structural steel? However, piecemarks are not necessarily unique across the entire model. Their might be many identical assemblies with the same parts with the same piecemarks. Or is it a GUID - a unique software ID that keeps identify across applications?
		2	**Schedule Mark**	Identifier for scheduling same profile elements Note: Schedule marks do not need to be unique. Schedule mark is typically defined by the user and named based on the elements location on a grid and/or the properties of that element (depth, length, number of reinforcing bars, etc.).	This is generally a short string that is provided on a plan adjacent to a column (for example "CC12"). The "CC12" is then defined in the column schedule. It is generally used as a unique identifier in the plans. So, a CC12 would be at a specific gridline (or gridlines) and is not the same as a CC11 or other mark.	Unsure whether this is different to the ELEMENT ID and if both identifiers are needed.
		2	**Base Reference Story**	Base location, reference to the story where the start point of the brace resists. Start point is the lower point of the brace axis.	This is e.g. a level as defined in "0. Level", from which the member starts.	
		2	**Top Reference Story**	Top location, reference to the story where the end point of the brace resists. End point is the upper point of the brace axis.	This is e.g. a level as defined in "0. Level", at which the member ends.	

Number	Object Category	Priority	Attribute Name	Explanation	Examples	Further comments
		2	**Vertical Start Offset**	End offset in z direction Offset of the start from the base reference story, offset is measured from the axis or reference line.	see figures for brace	
		2	**Vertical End Offset**	Start offset in z direction Offset of the end from the top reference story, offset is measured from the axis or reference line.	see figures for brace	
6	**WALL**					
		1	**Thickness**	Dimensional thickness of the wall, applicable to standard wall, having a unique, not-changing thickness along the wall axis. Note: Typically, structural engineering packages doesn't support multiple layers for wall objects. We would define two walls separately.		
		1	**Material Name**	Name of the material of the wall. It should be an indicator of the type of material (steel, concrete, timber) and not any specific material name ("lightweight concrete type ABC"). Only the material name should be exchanged, not the material properties, like Density, Specific Weight, etc.	Example for type of material are: Concrete, steel, timber, glass Note: It assumes that structural walls are single layer walls	How to agree upon an enumeration of applicable type of matierial to reduce unecessary string interpretation?
		1	**Grade**	Grade is a futher classifier for particular material. It often refers to items from external standards such as ASTM e.g. ASTM 36.	for example A36, ASTM36, GRADE36. The question is whether a standard expression is available. Receiving applicaion therefore must be cabale to interpret all kinds of expressions.	Is grade considered as specific property of material, or of the element (or profile)? Is just a grade value sufficient, or a value with reference to a standard?
		1	**Wall Axis**	Definition of the wall axis, used e.g. for determining the Alignment and as a first assumption for the linear structural member representing the wall for structural analysis.		
		1	**Alignment**	Alignment of the wall body relative to the wall axis.	Values could be an enumeration, like centerline, interior, exterior face, or an absolute value.	
		2	**Base Reference Story**	*Base location, reference to the story where the start point of the wall resists. Base story is where the wall axis resists.*	This is e.g. a level as defined in "0. Level", from which the member starts.	
		2	**Top Reference Story**	*Top location, reference to the story where the end point of the column resists. End point is the upper point of the column axis.*	This is e.g. a level as defined in "0. Level", at which the member ends.	
		2	**Base Offset**	*Offset from base level*	This is a length describing the distance above a given level where a wall starts.	Does this information has to be exchanged as redundent additional offset value, as it is already captured in the column position.
		2	**Top Offset**	*Offset from top level*	This is a length describing the distance above (or below) a given level where a wall ends.	Does this information has to be exchanged as redundent additional offset value, as it is already captured in the column position and column geometry.
		2	**Load bearing**	Attribute associated to the wall as a disciplinary setting, indicates that the wall is designed to be load bearing.	Boolean value TRUE or FALSE for the wall.	
7	**SLAB**					
		1	**Thickness**	Dimensional thickness of the slab applicable to standard slab, having a unique, not-changing thickness. The thickness is the perpendicular thickness between the two upper/lower faces, not the extrusion thickness. Note: Typically, structural engineering packages doesn't support multiple layers for slab objects. We would define two walls separately.		
		1	**Material Name**	Name of the material of the slab. It should be an indicator of the type of material (steel, concrete, timber) and not any specific material name ("lightweight concrete type ABC"). Only the material name should be exchanged, not the material properties, like Density, Specific Weight, etc.	Example for type of material are: Concrete, steel, timber, glass Note: It assumes that structural slabs are single layer slabs.	How to agree upon an enumeration of applicable type of matierial to reduce unnecessary string interpretation?
		1	**Grade**	Grade is a futher classifier for particular material. It often refers to items from external standards such as ASTM e.g. ASTM 36.	for example A36, ASTM36, GRADE36. The question is whether a standard expression is available. Receiving applicaion therefore must be cabale to interpret all kinds of expressions.	Is grade considered as specific property of material, or of the element (or profile)? Is just a grade value sufficient, or a value with reference to a standard?
		2	**Base Reference Story**	*Base location, reference to the story where the slab resists.*	This is e.g. a level as defined in "0. Level", from which the member starts.	
		2	**Base Offset**	*Offset from base story level. Base story offest is measured to the reference plane of the slab.*	This is a length describing the distance above a given story where the slab reference level is located.	Does this information has to be exchanged as redundent additional offset value, as it is already captured in the column position.
		2	**Span direction**	Structural span direction, the span direction here is defining the orientation of the area object relative to the z-axis.		Different bearing types (fixed edge, one-way, two-way, ...) are not to be exchanged?
8	**FOOTING**					
		1	**Footing Type**	A type classifer for footings, that further specifies the subtype (or functional type) of the footing.	Examples are: pad, strip, mat	
		1	**Material Name**	Name of the material of the footing. It should be an indicator of the type of material (steel, concrete, timber) and not any specific material name ("lightweight concrete type ABC"). Only the material name should be exchanged, not the material properties, like Density, Specific Weight, etc.	Example for type of material are: Concrete, steel, timber, glass.	How to agree upon an enumeration of applicable type of matierial to reduce unnecessary string interpretation?

Number	Object Category	Priority	Attribute Name	Explanation	Examples	Further comments
		1	**Grade**	Grade is a futher classifier for particular material. It often refers to items from external standards such as ASTM e.g. ASTM 36.	for example A36, ASTM36, GRADE36. The question is whether a standard expression is available. Receiving applicaion therefore must be cabale to interpret all kinds of expressions.	Is grade considered as specific property of material, or of the element (or profile)? Is just a grade value sufficient, or a value with reference to a standard?
		2	**Top Reference Story**	Top location, reference to the story where the end point of the footing resists. End point is the upper face of the footing. Note: Similar to top reference story for columns. See screen shot in column section above.	Quote: *"I don't understand how it would be queried from the shape. Is the footing object defined by multiple end joints? As opposed to having, say, a center point, a length, width, thickness and orientation?"*	
		2	**Bottom Elevation**	*Dimensional elevation or thickness of the footing*	Quote: *"I don't understand how it would be queried from the shape. Is the footing object defined by multiple end joints? As opposed to having, say, a center point, a length, width, thickness and orientation?"*	
9	**PILE**					
		1	**Pile Type**	A type classifer for pile, that further specifies the subtype (or functional type) of the footing.	Example are: pile, caisson	
		1	**Material Name**	Name of the material of the pile. It should be an indicator of the type of material (steel, concrete, timber) and not any specific material name ("lightweight concrete type ABC"). Only the material name should be exchanged, not the material properties, like Density, Specific Weight, etc.	Example for type of material are: Concrete, steel, timber, glass.	How to agree upon an enumeration of applicable type of matierial to reduce unnecessary string interpretation?
		1	**Grade**	Grade is a futher classifier for particular material. It often refers to items from external standards such as ASTM e.g. ASTM 36.	for example A36, ASTM36, GRADE36. The question is whether a standard expression is available. Receiving applicaion therefore must be cabale to interpret all kinds of expressions.	Is grade considered as specific property of material, or of the element (or profile)? Is just a grade value sufficient, or a value with reference to a standard?
		2	**Top Reference.Story**	Dimensional elevation Note: Similar to top reference story for columns. See screen shot in column section above.	*Quote: "This is just like the top and bottom levels above for columns. I don't see how this is queried from the shape."*	
		2	**Bottom Elevation**	*Dimensional elevation or thickness of the pile*	*Quote: "This is just like the top and bottom levels above for columns. I don't see how this is queried from the shape."*	