

**Evaluation of the Structural Steel Framing
Data Model**

by

D. H. Douglas Phan
H. Craig Howard

**TECHNICAL REPORT
Number 41**

November, 1990

Stanford University

Copyright © 1990 by
Center for Integrated Facility Engineering

If you would like to contact the authors please write to:

*c/o CIFE, Civil Engineering,
Stanford University,
Terman Engineering Center
Mail Code: 4020
Stanford, CA 95305-4020*

TABLE OF CONTENT

ABBREVIATIONS AND ACRONYMS.....	v
GLOSSARY.....	vi
1. Introduction.....	1
1.1 Synopsis of the Structural Steel Framing Data Model.....	1
1.2 Evaluation Task Description.....	2
2. Evaluation Report.....	3
2.1 Prototype Modelling.....	3
2.1.1 Prototype Description.....	3
2.1.2 Modelling the Prototype.....	8
2.2 Conclusions.....	11
2.2.1 Strengths of the Structural Steel Framing Data Model.....	11
2.2.2 Weaknesses of the Structural Steel Framing Data Model.....	11
2.2.2.1 Clarifications needed.....	12
2.2.2.2 Problem Areas.....	12
2.2.2.3 Missing Elements.....	14
2.3 Summary.....	14
2.4 Discussion.....	15
3. Prototype Data Model.....	15
3.1 Abstract Data Type (ADT) Definitions.....	15
3.2 Entity Definitions.....	16
3.3 Detailed Data Dictionary of the Prototype Model.....	20
3.3.1 Standard Notation of Entity Types and Attributes.....	20
3.3.2 Naming Abbreviation Schema.....	20
3.3.3 Data Dictionary of Abstract Data Type and Entity Definitions...	22
4. Acknowledgements.....	40
5. References.....	40
<u>APPENDIX A:</u> Detailed data model of the steel pole prototype.....	42

LIST OF FIGURES

FIGURE 2-1:	Top View of the Transmission Steel Pole.....	4
FIGURE 2-2:	Front View of the Transmission Steel Pole.....	5
FIGURE 2-3:	Twelve-Sided Taper Pole Shaft.....	6
FIGURE 2-4:	Typical Static Arm-to-Pole Connection Plate Assembly.	7
FIGURE 2-5:	Tree Diagram of the Pole Prototype Model.....	9
FIGURE 2-6:	Tree Diagram of the Basic Pole of the Prototype Model.	10
FIGURE 3-1:	Hierarchical Aggregation Levels in the Pole Prototype..	19

LIST OF TABLES

TABLE 3-1:	Abstract Data Types in the Pole Prototype Model.....	16
TABLE 3-2:	Entity Definitions of the Pole Prototype Model.....	17
TABLE 3-3:	Naming Abbreviation Schema.....	21

ABBREVIATIONS AND ACRONYMS

AEC	<u>A</u> rchitecture, <u>E</u> ngineering, <u>C</u> onstruction
CACE	<u>C</u> omputer- <u>A</u> ided <u>C</u> ivil <u>E</u> ngineering
CAD	<u>C</u> omputer- <u>A</u> ided <u>D</u> esign
CIFE	<u>C</u> enter for <u>I</u> ntegrated <u>F</u> acility <u>E</u> ngineering
GARM	<u>G</u> eneral <u>A</u> EC <u>R</u> eference <u>M</u> odel
HVAC	<u>H</u> eating, <u>V</u> entilating, and <u>A</u> ir <u>C</u> onditioning
IPIM	<u>I</u> ntegrated <u>P</u> roduct <u>I</u> nformation <u>M</u> odel - PDES
ISO	<u>I</u> nternational <u>S</u> tandards <u>O</u> rganization
NIDDESC	<u>N</u> avy/ <u>I</u> ndustry <u>D</u> igital <u>D</u> ata <u>E</u> xchange <u>S</u> tandard <u>C</u> ommittee
PDES	<u>P</u> roduct <u>D</u> ata <u>E</u> xchange using <u>S</u> TEP
STEP	<u>S</u> Tandard for the <u>E</u> xchange of <u>P</u> roduct model data
SSFDM	<u>S</u> tructural <u>S</u> teel <u>F</u> raming <u>D</u> ata <u>M</u> odel

GLOSSARY

ABSTRACT DATA TYPE.

A data structure defined in a particular domain D and described by a set of operations or services P [1].

ASSOCIATED-WITH relationship.

Relationship which represents the semantic association between two instantiated entities. Compared to the connected-to relationship, this association may not imply a physical connectivity. The inverse relationship is also *associated-with* [2].

ATTRIBUTE.

A formal property of an entity, an abstraction of a single characteristic true for all occurrences of the entity type [1]. The value of an attribute is of a simple data type (integer, real, character string, etc.) or an abstract data type.

CARDINALITY.

Number of entities mapped by the slot [2].

CONNECTED-TO relationship.

Relationship which represents a topological or physical connectivity of between two instantiated entities. The inverse relationship is also *connected-to* [2].

DATA.

Representation of a unit of information suitable for interpretation, communication, and processing by people and/or automated means [3].

DATA BASE.

A formal collection of related data.

DATA BASE SYSTEM.

A system whose purpose is to maintain information and to make such information available on demand [4].

DATA MODEL.

Collection of conceptual tools for describing data, data relationships, data semantics and constraints among data items [5].

ENTITY.

Any distinguishable real-world object which may be as concrete or as abstract as we please [6].

GENERIC ENTITY.

Entity whose definition includes the parametric descriptions of the object it represents [2]. For instance, BUILDING is a generic entity.

INSTANCE relationship.

Relationship which creates an instance of a typical or generic entity. The inverse relationship is the *instance-of* relationship [2].

IS-A relationship.

Relationship representing a specialization which enables an entity to inherit all the slots and slot values from a parent entity definition. The inverse relationship is the *subclass* relationship [2].

OBJECT-ORIENTED PARADIGM.

A paradigm in which problems and applications are viewed as interrelated classes of real objects characterized by their common attributes and services, and software systems are formulated as structured collection of object classes modeling the interrelated objects of the real world problem [1].

PART-OF relationship.

Relationship which relates an entity to another entity which the former is part of. This relationship does not provide any inheritance. The inverse relationship is the *subpart* relationship [2].

Rel./Attr. TYPE.

Data type (simple or abstract) of the value of an attribute or related slot [2].

RELATIONSHIP.

An association among entities in the data model; or formally a tuple of entities $[e_1, e_2, \dots, e_n]$ from a mathematical relation R_i among n entities, each of which belongs to an entity set E_i [7].

SLOT.

Data structure within an entity to describe its properties and behavior. It can be an attribute or a relationship with other entities [2].

TYPICAL ENTITY.

Entity whose definition includes typical properties and relationships of a particular subset of objects [2]. For instance, STEEL_FRAMED_BUILDING is a typical entity of a steel framed building.

INSTANTIATED ENTITY.

Unique representation of a specific object occurring only once in the model [2]. For instance, Terman_Engineering_Building is an instantiated entity that represents the one and only Terman Engineering building on Stanford University campus.

1. Introduction

The Structural Steel Framing Data Model (SSFDM) is an object-oriented data model for structural steel framing. The model was originally developed by Mr. Ajay Lavakare, a graduate research assistant in the Civil Engineering Department at Stanford University, under the guidance of Professor H. C. Howard. The work was initiated in November 1988. The research effort was part of the "Multiple Views of Architecture / Engineering / Construction (AEC) Data" project supported by the Center for Integrated Facility Engineering (CIFE) at Stanford University [8]. The purpose of the development of the model is to gain a better insight in the area of computer-based data modelling for structural steel framing, to acquire a better knowledge of the PDES standard for data exchange, and to initiate a first step in developing a global data model for the applications within CIFE [2].

In this section, we provide a quick overview of the SSFDM and relate it to today's leading data modelling efforts. We also describe the model evaluation task which is the focal point of this report. In Section 2, we will discuss our approach in modelling a real life steel structure as prototype using the SSFDM. More importantly, we will draw conclusions about the strengths and weaknesses of the SSFDM and discuss our future plan of enhancing and expanding the model. The interested reader can continue with the reading of Section 3, which presents the data dictionary of the prototype data model, and Appendix A, which contains the detailed data model of the prototype structure.

1.1 Synopsis of the Structural Steel Framing Data Model

The SSFDM provides a general framework and conceptual tools for the modelling of steel framed structures. By our definition, steel framed structures are structures whose load carrying and load transferring elements are made of standard AISC members or fabricated from steel plate material, and framed together by conventional connection methods such as bolting, welding, and riveting. This definition helps focusing our initial research in the area of data modelling for structural steel framing, in contrast to other types of structural design such as reinforced-concrete buildings, suspension bridges, shell domes, etc.

The SSFDM employs many object-oriented concepts as extensions to the basic entity-relationship paradigm in order to represent structural engineering objects and their intricate relationships. It introduces the taxonomy of generic entities (equivalent to object classes), instantiated entities (equivalent to object instances), and typical entities as an intermediate entity level between generic and instantiated entities. Relationships such as is-a, instance, part-of, connected-to, and associated-with are defined in order to capture the various ways structural entities are related to one another in the data model. These relationship definitions are based on the premises of key abstraction methods such as generalization/specialization, decomposition/aggregation, and association. The current version of the SSFDM includes a detailed data dictionary, entity relationship definition, constraints definition on the entity slots, and points of integration to other key data models. For more detail about the model and its development work, the reader may refer to the June 1989 CIFE Technical Report (No. 012), titled "Structural Steel Framing Model" [2]. It is the primary reference material for the evaluation task described herein.

In the area of national and international data exchange standards, there are a number of leading efforts in defining data standards as well as baseline data modelling approaches in order to meet the challenge of integration among heterogeneous systems and applications within the computing environment. These efforts include:

- STandard for the Exchange of Product model data (STEP), the first international standard for data exchange which aims toward providing an "open integrated computer-aided design and construction environment". Its development evolves from the work of many current de facto standards for data modelling in the U.S. and many countries within the European communities [9].
- Product Data Exchange using STEP (PDES), the major contribution to STEP from the U.S. Its goal is to develop standards for exchanging intelligent data to support integration of data base, CAD, and knowledge base systems [10].
- and a number of specific data model components under the umbrella of PDES. The General AEC Reference Model (GARM) [12] provides the general framework for the data modelling of engineering products to support their design, production, and life-cycle maintenance. The Architecture/Engineering/Construction (AEC) Building Systems Model [13] introduces a high level model for general building systems. The NIDDESC Ship Structural Information Model [14] is a more detailed data model exclusively for ship structures.

With respect to these major data modelling efforts, the SSFDM focuses upon the definition of detailed entities and relationships for modelling steel framed structures. Its potential contribution lies within the in-depth study of the data modelling of this particular type of structures. It identifies the common areas of interest as well as points of integration to the aforementioned data models.

1.2 Evaluation Task Description

The objective of this task is to verify and validate the SSFDM through the exercise of modelling a real life steel framed structure using the model as the initial template.

Much of the initial effort in the evaluation task went into the review of the original development work of the SSFDM described in Reference [2]. The next activity was to select a real life steel framed structure to be used in the modelling exercise. An electrical utility transmission steel pole structure was chosen for this purpose because:

- The pole structure has the engineering elements which constitute a good modelling prototype. It also fits well into our definition of a steel framed structure.
- The size and scope of the pole structure, in terms of the number of aggregates and their degree of complexity, are easily manageable within the context of a research prototype development. The structure consists of approximately fifty objects of various sizes and levels of design/fabrication detail, ranging from a simple pole shaft to complex plate connection assemblies. It is designed with an elegant balance in term of topological and geometric symmetry, which facilitates the modelling of the structure.
- The design of the pole structure is a design/optimization problem in which a number of constraints are considered in order to satisfy the electrical, physical and structural requirements of the structure. Much design-dependent knowledge went into the design of the pole and engineered the characteristics of the pole

in the data modelling area, particularly in identifying and incorporating design-dependent knowledge into the model.

From the outcome of the prototype modelling, we drew conclusions about the strength of the model as well as its weaknesses in terms of clarifications needed, problem areas, and missing elements. The lessons we learned greatly benefit our ongoing research in the data modelling area in general and in enhancing and expanding the current version of the SSFDM in particular.

2. Evaluation Report

2.1 Prototype Modelling

2.1.1 Prototype Description

The selected prototype is an electrical utility pole structure. It carries a 345 kilo-volt transmission line tangential to the structure with a small line angle. Figure 2-1 illustrates the top view of the pole setting. The span between two consecutive poles in the same transmission line measures 800 feet. Figure 2-2 shows the front view of the pole structure. The pole electrical configuration is a vertical 2-circuit design, meaning that the pole structure has three levels of transmission line: top, middle, and bottom. Electrical conductor wires are attached on each side of the extending arms of the pole at each level. These wires are referred to as top, middle, and bottom conductor wires. In addition to the conductor level, the pole also has a static level at the top of the structure where static wires are attached in order to provide static shielding for the entire structure.

The pole measures 190 feet tall, with a basic pole body and the pole extension to make up the 190-foot height. The basic pole is also used for other poles in the same transmission line, the pole extension is added to attain different pole heights. The basic pole and pole extension shafts, as illustrated in Figure 2-3, are twelve-sided hollow cylindrical members of tapered form. These sections are fabricated from high strength steel plate. They are stacked one on top of the other, and connected together by frictional splice connections between the overlapping sections of consecutive shafts. The pole arms also have the same cross-section as the pole shafts. The static arms at the top of the pole provide attachment points to the pole static wires. The conductor arm pair carry conductor wires at each of the three levels. These arms are connected to the shaft sections of the basic pole via plate connections welded together into complex assemblies. Figure 2-4 shows a typical connection assembly of the static arm to the pole shaft.

The pole foundation was not incorporated in the model. At the time, modelling the pole foundation was beyond the interest of our evaluation study, considering the existing size and complexity of the pole structure itself.

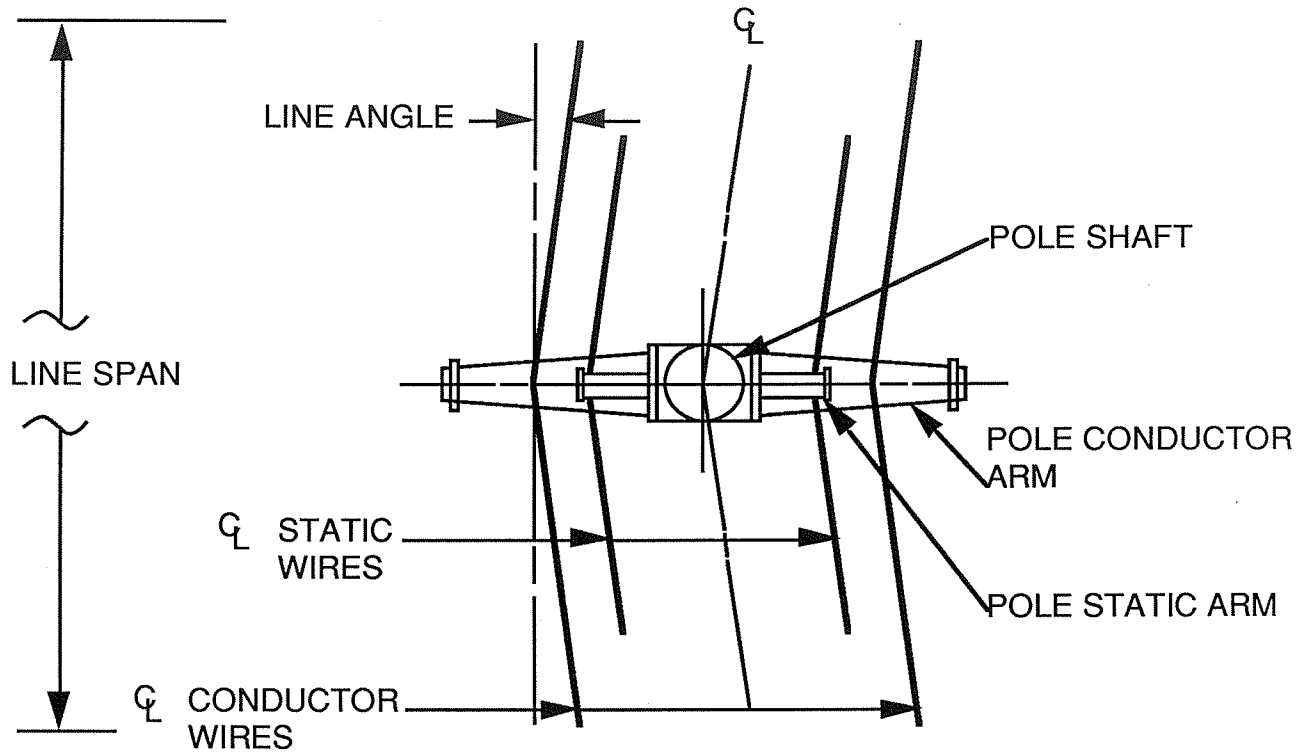


FIGURE 2-1: TOP VIEW OF THE TRANSMISSION STEEL POLE. The selected prototype is an electrical utility pole structure. It carries a 345 kilo-volt transmission line tangential to the structure with a small line angle. The transmission line span between consecutive poles measures 800 feet.

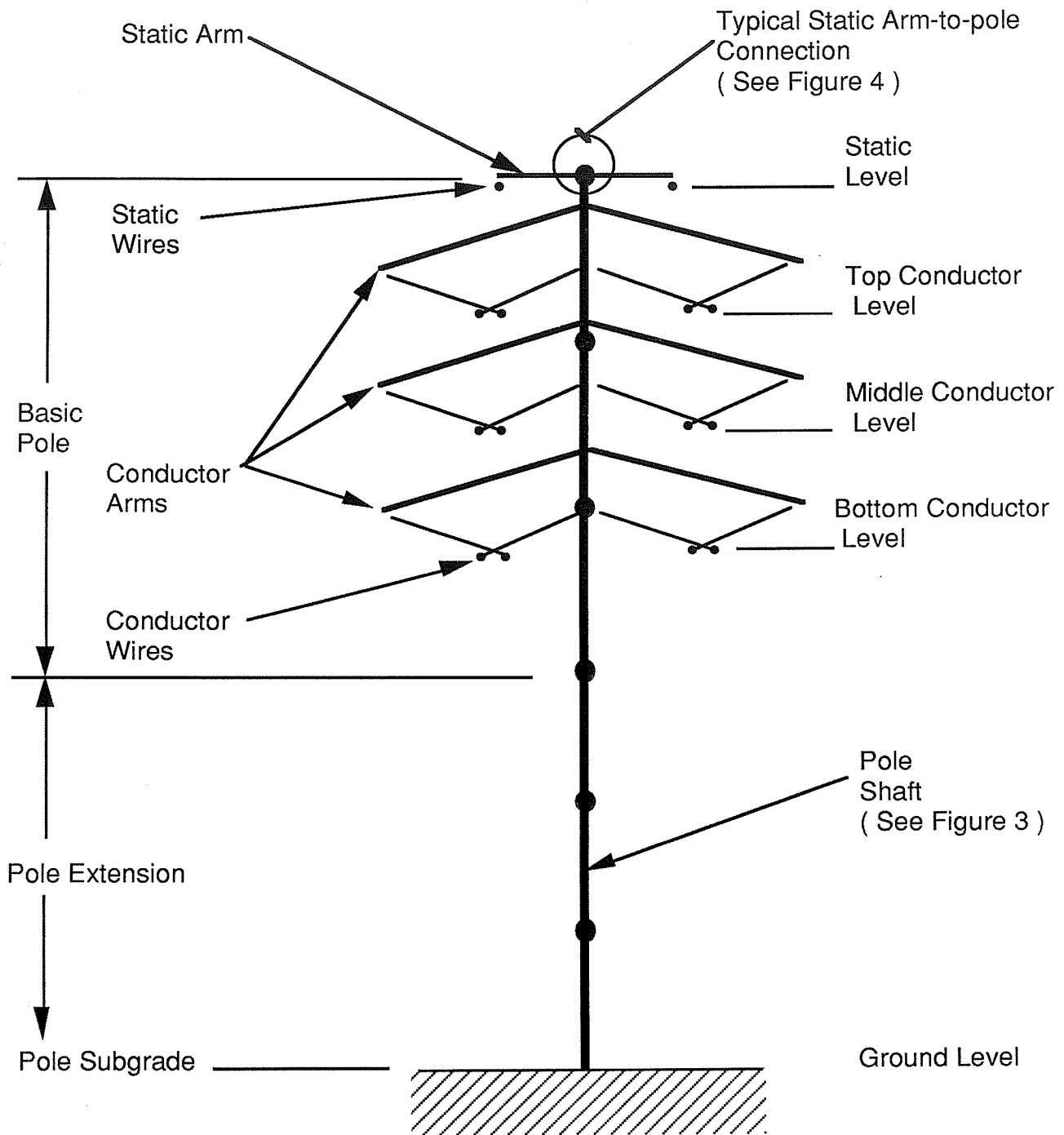
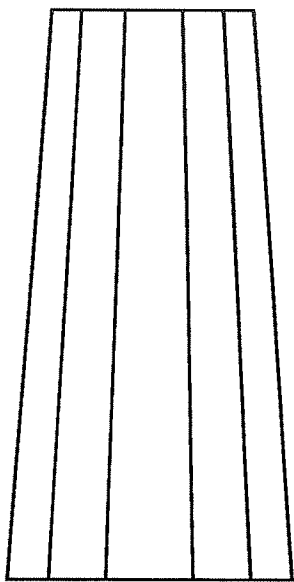
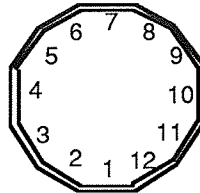


FIGURE 2-2: FRONT VIEW OF THE TRANSMISSION STEEL POLE. The pole measures 190 feet tall, with a basic pole body and the pole extension to make up the 190-foot height. The pole structure has three levels of transmission line: top, middle, and bottom. Electrical conductor wires are attached on each side of the extending arms of the pole at each level. In addition, the pole also has a static level at the top of the structure where static wires are attached in order to provide static shielding for the entire structure.



FRONT VIEW



TYPICAL CROSS SECTION

FIGURE 2-3: TWELVE-SIDED TAPERED POLE SHAFT. The basic pole and pole extension shafts are twelve-sided hollow cylindrical members of tapered form. These sections are fabricated from high strength steel plate bending. They are stacked one on top of the other, and connected together by frictional splice connections between the overlapping sections of consecutive shafts. The pole arms also have the same cross-section.

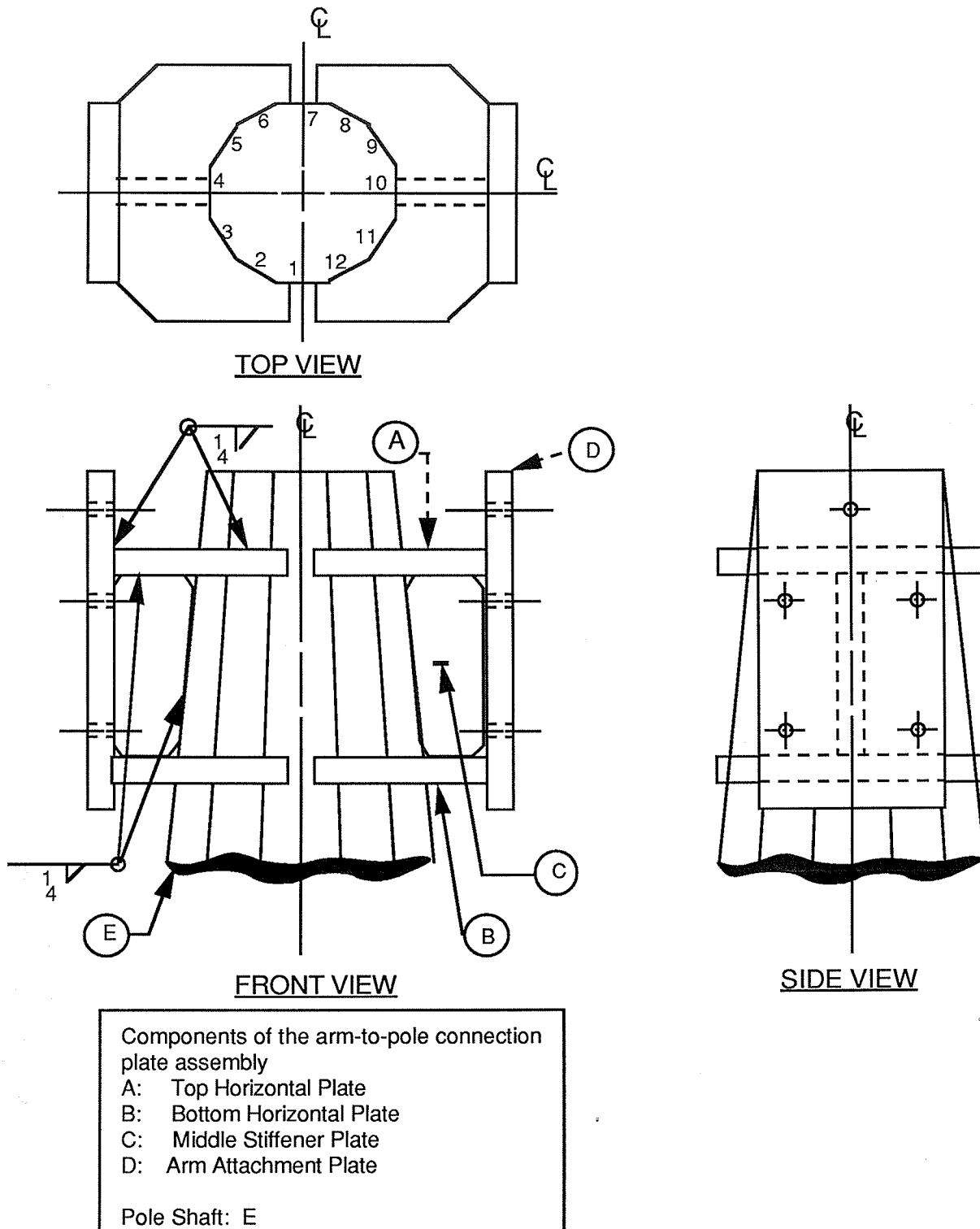


FIGURE 2-4: TYPICAL STATIC ARM-TO-POLE CONNECTION PLATE ASSEMBLY. The pole arms are connected to the shafts of the basic pole via plate connections welded together into complex assemblies. This figure shows a typical connection assembly of the static arm to the pole shaft.

2.1.2 Modelling the Prototype

The objective of modelling the pole prototype is to capture as much information as possible from the pole structure blueprints. The SSFDM was used as the modelling template. First, a top-down approach was used in identifying and defining the information to be captured. The captured data were arranged into eight hierarchical levels of aggregation according to the SSFDM, starting from the pole structure down to the detail level of plate connections and connection methods. Figure 2-5 shows a tree hierarchy of the pole model from Level I (the *Building Level*) to Level IV (the *Subsystems Level - II*). Figure 2-6 shows the expansion of the basic pole subsystem node in Level IV onto its subtree hierarchy from Level V (the *Structural Components Level*) to Level VIII (the *Connections Level*).

The entities defined in the SSFDM were used as the templates for modelling the pole structure. In addition, a number of subclasses of these entities were defined in order to represent the more specialized objects of the transmission steel pole. We refer to these additional entity definitions as the extension of the SSFDM to represent the pole prototype. For each entity definition in the extension, the following items were specified when applicable:

- Verbal description of what the entity represents
- Level of aggregation to which the entity belongs
- Superclass and subclass(es) of the entity
- Attributes of the entity and their constraints
- Relationships of the entity to other entities in the prototype model and their mapping constraints
- Unique identifier of the entity, which is an attribute or combination of attributes, analogous to primary key or keys in relational data bases
- Look-up references and integration points to other standard data models such as PDES, GARM, NIDDESC, etc.

Abstract data types and other entities are referenced from other data models such as PDES and NIDDESC. Examples of such referencing include the date, time, coordinate triple data types from the PDES Integrated Information Product Model; the Cartesian point, direction, line entities from the PDES Geometry Model; the NC Mark, Cross Section entities from NIDDESC Ship Structural Information Model to name a few.

A standardized notation and abbreviation schema for entity names were adopted in order to come up with interpretable entity names of reasonable character length and to assist us in managing the detailed development of the pole model. Sections 3.3.1 and 3.3.2 discuss these items in more detail.

For the interested reader, Sections 3.1 and 3.2 discuss the abstract data type and entity definitions for the prototype model. Section 3.3 presents the data dictionary of abstract data type and entity definitions for the pole prototype model. Appendix A contains the detailed data model of the steel pole prototype.

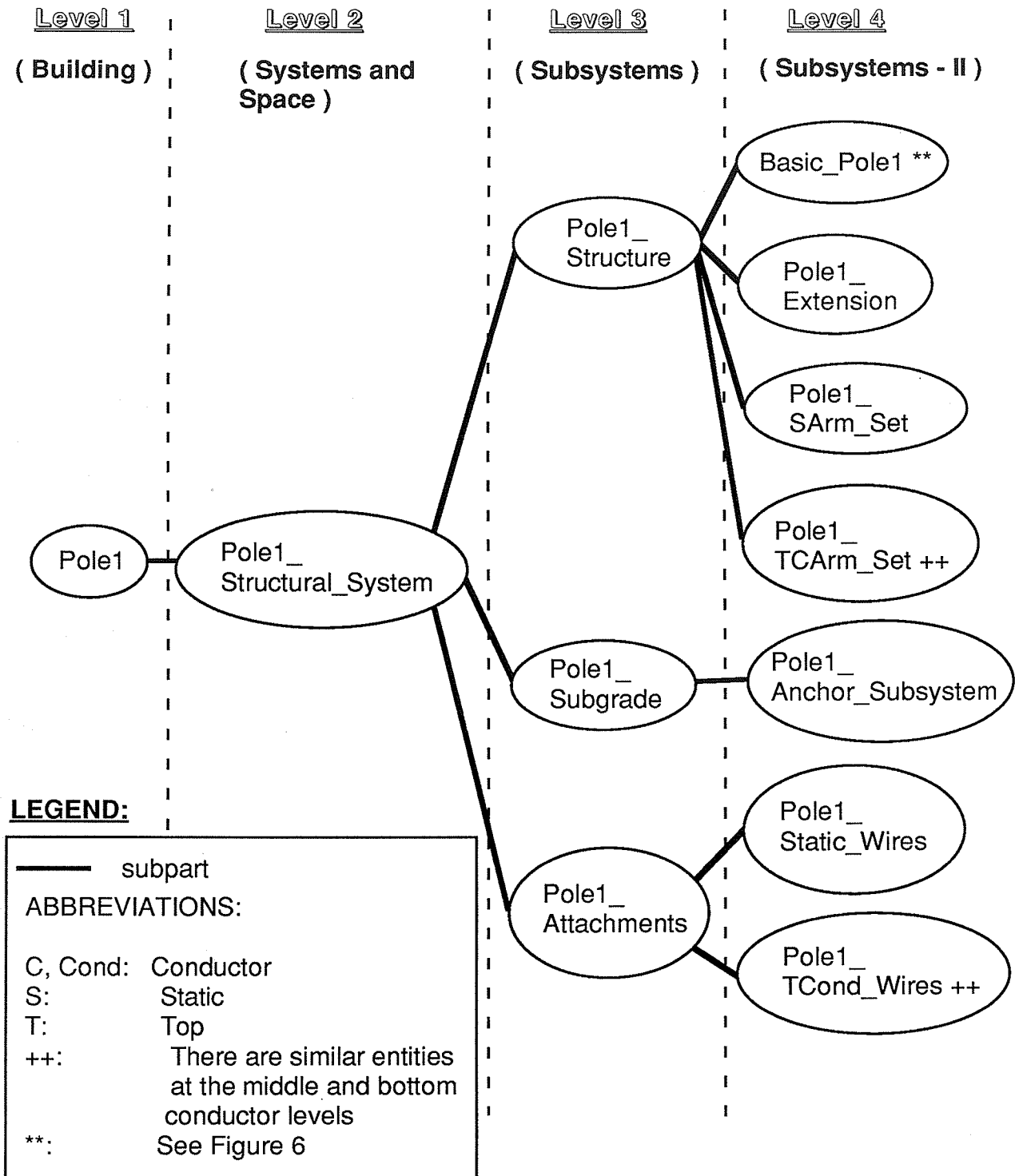


FIGURE 2-5: TREE DIAGRAM OF THE POLE PROTOTYPE MODEL. Data captured from the pole structure blueprints were arranged into eight hierarchical levels of aggregation according to the SSFDM. This figure shows a tree hierarchy of the pole model from Level I (the *Building* Level) to Level IV (the *Subsystems* Level - II).

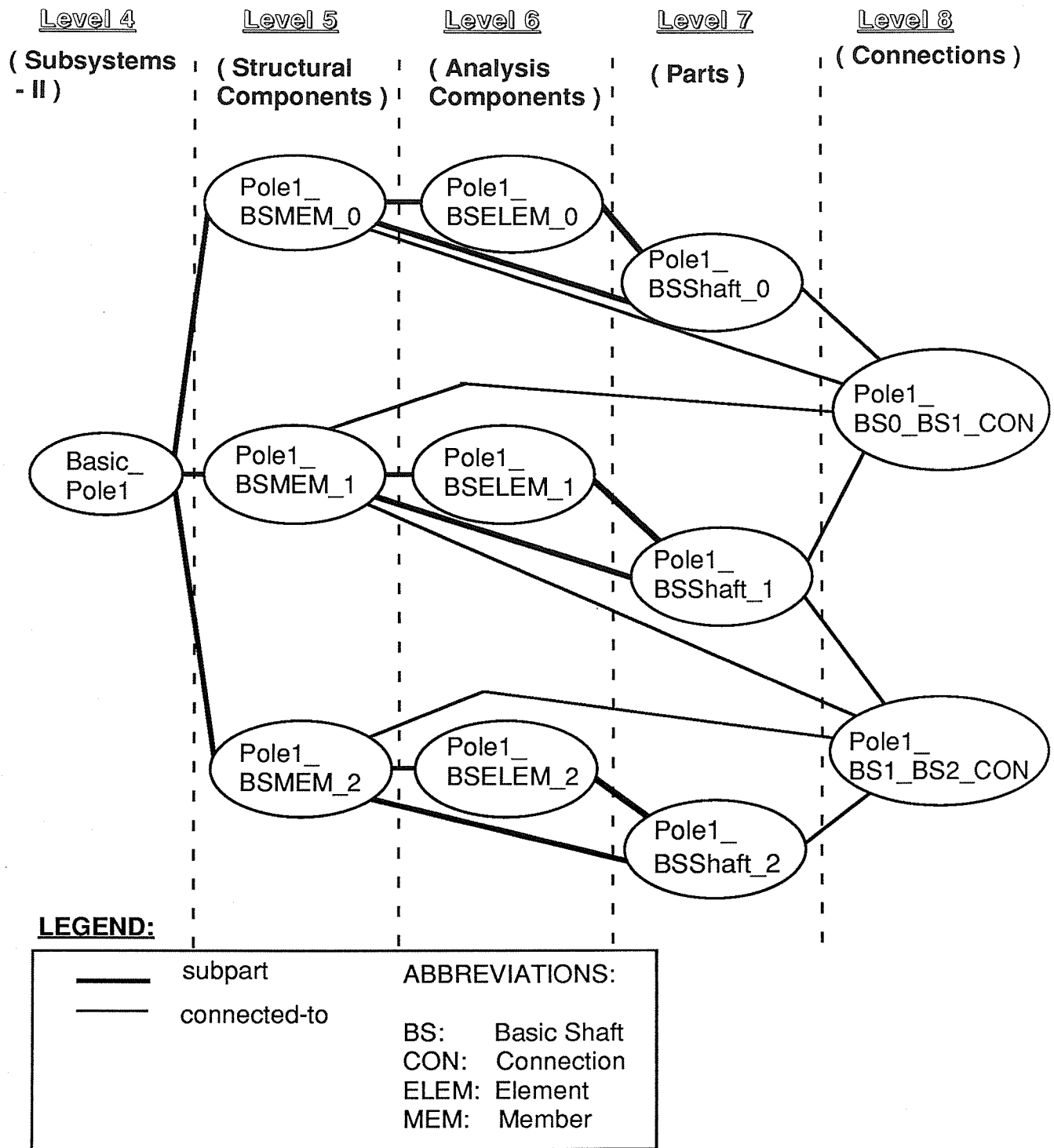


FIGURE 2-6: TREE DIAGRAM OF THE BASIC POLE OF THE PROTOTYPE MODEL. Figure 6 shows the expansion of the Basic_Pole1 subsystem node in Level IV onto its subtree hierarchy from Level V (the *Structural Components* Level) to Level VIII (the *Connections* Level).

2.2 Conclusions

2.2.1 Strengths of the Structural Steel Framing Data Model

The SSFDM offers a general framework and conceptual tools to support the modelling of steel frame structures of varying degrees of complexity:

1. The overall model is thorough. — The scope of the model broadly encompasses the high level building function definition, the functional decomposition in terms of system, subsystem and member, the description of the analysis components, down to the detail level of part, connection, subconnection, and connection method. These levels of description are comprehensive and structured according to the eight hierarchical aggregation levels of the model. The hierarchical top-down decomposition provides the user a stepwise approach to organize the information about the steel framed structure.

2. The entities in the eight aggregation levels are well defined. Attributes and slots are properly defined for each entity. Constraints on the value of the entity attributes and mapping of the entity slots are clearly identified in order to ensure data consistency within the model. Cardinality is also defined for entity relational slots when applicable. In the entity definition, integration points to other standard data models such as PDES, GARM, and NIDDESC are indicated when appropriate.

3. The taxonomy of the entity definition is orthodox and effective. — It provides a classification framework to assort the different types of entities in the model: generic, typical, and instantiated. Its underlying concept of inheritance provides a powerful mechanism for developing an object-oriented data model. The objects of a subclass inherit all the properties and behavior from its parent class, without replicating the information at the subclass level. A generic entity supplies a cognitive artifact to represent objects in the world that have common properties and behavior. A typical entity is a useful notion in representing a subset of the generic object type that has some specific commonality among its members. It provides an intermediate level in the generalization/specialization schema that captures the typical characteristics of a set of instantiated entities, and therefore eliminates the need to define these characteristics at the instantiated entity level. For instance, since the same base design is used for all three levels of conductor arms of the steel pole, we find it convenient to use typical entities to describe objects in these levels. The typical entities capture the common characteristics of the three levels; the instantiated entities have attributes that describe the unique detail information at each level. Finally, instantiated entities are used to describe specific occurrences of an object type.

4. The five relationship types are versatile. The relationship types (is-a, instance, part-of, connected-to, associated-with) can be used effectively in order capture the different semantics of the relationships among entities in the model. They delineate the three fundamental abstraction methods for developing data models: generalization/specialization, aggregation, and association.

2.2.2 Weaknesses of the Structural Steel Framing Data Model

In this section, we discuss the weaknesses of the current version of the model. They are presented in three categories: clarifications needed, problem areas, and missing elements.

2.2.2.1 Clarifications needed

1. More user-oriented documentation of the model is needed. For each entity defined in the model, a more descriptive definition is needed to explain what the entity represents and what the entity slots mean, along with an example of how the entity is used. The description of the integration points to other standard data models is not explicit enough in order to enable the user to find the reference information. The reference entity name, source of reference, nature of the integration points from the entities of the model to the reference entities must be clearly identified.

2. Suggestions of modelling strategies would be helpful to the user. The model uses the top-down approach in defining the eight hierarchical levels of aggregation. These levels appear overwhelming to the first-time user. Suggestive approaches and strategies are needed to assist the user in getting started and applying these levels effectively. The bottom line is that how these aggregation levels can be used as a template to organize the information structure in the most comprehensible and efficient manner. Other approaches are also useful for developing a model. A bottom-up approach constructs the model from the bottom detail level and working upward. The top-bottom convergence approach combines the benefits of the top-down and bottom-up approaches: use the top-down decomposition to identify the top level features and the bottom-up method to manage the detail levels, and converge in the middle [1].

3. Clarification on typical entity is needed. Questions about the definition and usage of typical entities were raised and need clarification: is a typical entity a subclass of a generic entity with some default values? Or is it an instance of a generic entity with some of the attribute values defined? When should one use a typical entity? From our experience in the prototype modelling, a typical entity is a "semi-instantiated" entity, in which some typical attribute values are defined and others to be defined in the next level of specific instances that are subclasses of the typical entity. It is useful when describing a particular type or subset of objects that have some (but not all) common attribute values. Examples of using typical entity are similar pole arm design at the three conductor levels, typical structural layout of floors in a building... One last important point is that an instantiated entity can be an instance of the typical entity, and the latter is a special kind of the generic entity. Therefore, a different type of relationship needs to be defined to associate a typical entity and its generic parent.

2.2.2.2 Problem Areas

This section presents the problem areas of the current version of the SSFDM. Although the following points are presented in separate items for clarity, we want to emphasize that the ideas they convey are very much interrelated.

1. Aggregation is over-emphasized in the model. Aggregation is the abstraction method to decompose complex objects into their ingredient objects or to construct them from these ingredients. A common pitfall in data modelling is the overuse of aggregation hierarchies. Although the importance of aggregation hierarchies can not be overlooked, hierarchical aggregation should be thought of as a conceptualization of a whole and its parts, rather than emphasized in the number of levels one can define. Moreover, for large building structures that include intricate networks of structural, electrical, HVAC systems and subsystems, the hierarchical framework does not precisely represent the relationships between these building elements. An example of such over-emphasis is the eight hierarchical aggregation levels of the SSFDM. The first five levels from *Building to Structural Components* are appropriate, but the next three levels of *Structural Components, Analysis Components, Parts* are not necessarily hierarchical nor aggregational. For

example, the pole shaft is a structural member, a beam-column element, and a physical part with fabrication features. These three descriptions portray different aspects of the same object.

In addition, the current model does not differentiate the notion of a functional grouping of components such as a system versus a physical grouping of parts such as an assembly or arrangement. Taking this notion one step further, the decomposition of the structure in terms of functional elements (e.g., systems, subsystems, and members) may not always result in the same hierarchy as the breakdown in terms of physical components (e.g., assemblies, arrangements, and parts).

2. Too many hierarchical aggregation levels present problems. First, Levels 3 and 4 are redundant for the following reasons:

- Since *System* is an entity defined in Level 2 of the model and the *part-of* entity relationship enables to relate a low level entity to a higher level entity, there is nothing to prevent using *part-of* to define the subsystems and their subsystems and so on. Level 3 of *Subsystems* and Level 4 of recursive *Subsystems* do not gain much more than creating overhead.
- For a simple structure, the data modeler may have no need to define an intermediate subsystems level between the levels of systems and components.
- A single level that encloses the *System* entity definition in contrast to the *Building* level and the next lower level of *Structural Components* is sufficient to support the idea of functional grouping.

Second, Levels 5, 6, 7 are different views of what supposes to be a single level of structural components. A member entity (e.g., *Beam*, *Column*, *Girder*, etc.) in Level 5 is the functional description of a component. An *Element* entity in Level 6 refers to the same component, but relates to its description for structural analysis purpose. A *Part* entity in Level 7 describes the physical aspect of that component.

This brings us to another important point. If a system is defined as a grouping of members, a similar entity can be defined for a grouping of elements (or substructure) or for a grouping of physical parts (or assembly or arrangement). In structural analysis, it is not uncommon to define a subset of the structural elements and analyze it separately as a substructure, with the applied loading and boundary conditions from the remaining structure. This is the case for the analysis of the pole conductor arms.

3. The model structure is weak in supporting different views about the data. The representation using hierarchical aggregation levels is unnatural and too rigid to capture and separate the different aspects (physical, functional, and analysis) of the structure description. This requirement is necessary in order to support different views of the model such as engineering, architecture, and construction.

To further unveil the problem, the notion of characterization as the third dimension in the representation space, as introduced in GARM [12], is absent in the current model. Characterization can be applied to the current model to describe the aspects of structural design objects. The latter have physical, functional, and behavioral characteristics which the designer reasons about at one point or another in the design process. This general taxonomy of form (or physical description), function, and behavior [15] can be further broken down into specific aspects of an entity description.

2.2.2.3 Missing Elements

This section discusses the aspects of the entity definitions that are lacking in the current model.

1. The notion of physical grouping is absent in the model. Assemblies and arrangements are two entities that represent a grouping of physical components. The difference is that an assembly is made of parts and their physical connections, an arrangement refers to a grouping of physical components and its configuration with much less emphasis on the physical part connectivity. Such entity definitions are needed in the model since in reality, assemblies are designed even before knowledge about the components exists [9].

2. Structural loading is not included in the model. Structural loading is one of the most important factors of consideration in the analysis and design of the structure. It includes a variety of load types such as gravity, live load, dead load, snow load, seismic load, wind load, etc. The general classification of environmental agents in GARM [12] is a good starting point to incorporate such entities into the model. This classification can be further expanded to include different classes of structural loading. Two important aspects of structural loading are the load and the loading condition. Loading conditions are important data to capture in the model since they relates to the designer's criteria concerning external loading effects which the structure was analyzed and designed for.

3. The definition of positioning and orientation of physical objects in the model is not clear. The orientation of a physical object can not be defined by a single unit vector. A proper framework of reference and a spatial transformation matrix need to be defined in order to locate and orientate an object in three-dimensional space. As a suggestion, the PDES Integrated Information Product Model provides some entity definitions which can provide a handle on this matter.

4. The definition of the Parts level needs more attention. First, the model does not also include the definition for plate parts. The latter are commonly used in the member connections of most steel structures. Second, the definition or reference of entities that relate to the shape and material description of the parts (e.g. cross section, material, opening, etc.) need to be clearly identified. Third, the idea of defining an entity for a design and fabrication feature of a part is very attractive. Examples of a part feature are edge cut-off, edge preparation, cut-out hole, taper, bend, etc.

2.3 Summary

In general, the current version of the SSFDM provides a strong starting point for our research in the structural data modelling area. However, certain detail aspects of the model need to be clarified or incorporated. But more importantly, the overemphasis on hierarchical aggregation and the lack of characterization in the model are the main problem areas that need to be rectified.

The most significant outcome from this evaluation task is our current development of the Primitive-Composite approach for structural data modelling [16]. The near-term objective of this development is to overcome the identified weaknesses of the current SSFDM. However, the long-term goal is two-fold: to represent the form, function, and behavior of complex structural engineering objects, and to support integration of A/E/C data assets in terms of multiple engineering views, design schema evolution and data exchange standard. In addition, we are concentrating on other potential areas of expansion of the steel model. A CIFE report regarding the recent Primitive-Composite modelling approach will be expected in the near future.

2.4 Discussion

Although only one prototype structure has been studied in this evaluation, it is noteworthy to emphasize that the motivation of this task is to better understand how well the current SSFDM can support the modelling of a real life structure, and to identify areas in which our modelling approach can be improved. The selected pole structure has provided us a sufficiently rich test case and a strong leverage in carrying out our initial objectives: perform the evaluation, draw some valuable conclusions, and promote future progresses in this project. We feel that the conclusions presented earlier are still applicable for different types of steel framed structures besides the selected pole structure.

Since the pole prototype model contains a great deal of detailed data, it can be used for a number of applications. Data from the model can be easily abstracted for an finite element analysis, except for the loading that was not incorporated in the current SSFDM. For construction applications, the model provides geometric, topological, parts fabrication and connection data. The pole model can also be used in a CAD system. We spent a lot of time recomputing the positioning coordinates and orientation axes of the pole components and meticulously encoding the geometric and fabrication data of the parts from the structure blueprints.

In terms of implementation tools, the object-oriented SSFDM can be easily implemented using an object-oriented system for applications or an object-oriented data base management system. The model can also be supported in a relational data base. We also worked on a small exercise in mutating the object-based pole data for a relational data base application.

The current SSFDM does not address object behavior, namely object methods. Nonetheless, the knowledge associated with object entities in the eight aggregation levels would relate to how data in the object entity can be processed into new useful information, and more importantly how the design object was designed, built and operates the way it is. In fact, the complete description of a structural design object should consist of its form, function, behavior and design rationale. Form is strongly delineated in the model, function and behavior were represented to a certain extent, and design rationale was not captured at all.

3. Prototype Data Model

The terms used in this section are defined in detail in Reference 1 and also disclosed in the glossary at the beginning of this report.

3.1 Abstract Data Type (ADT) Definitions

A number of abstract data types were defined for particular needs of data abstraction in the pole prototype modelling. The PDES Integrated Information Product Model was referenced in defining these abstract data types. Table 3-1 below shows a summary listing of the abstract data type definitions.

TABLE 3-1: ABSTRACT DATA TYPES DEFINED IN THE POLE PROTOTYPE MODEL.

ADT NAME	REFERENCE	DEFINITION
Cartesian_Point	Geometry Model, PDES	Data type representing a Cartesian point in three-dimensional space
Direction	Geometry Model, PDES	Data type representing a directional vector in three-dimensional space
Orientation_R	Geometry Model, PDES	Data type representing a rotational matrix R used in defining an orientation in three-dimensional space
Line	Geometry Model, PDES	Data type representing a line in three-dimensional space
End_Condition	None	Data type representing the end conditions, in terms of displacements and rotations, of a structural element in three -dimensional space
Degrees_Of_Freedom	None	Data type representing the degrees of freedom of a structural element in three-dimensional space
Date_Time	Product Model, PDES	Data type representing a date and time recording
Date	Product Model, PDES	Data type representing a date recording
Time	Product Model, PDES	Data type representing a time recording

3.2 Entity Definitions

For reference, Section 4.3.2 of [2] encloses the complete definition of the SSFDM entities. The entities defined herein are generic or typical subclasses of the ones defined in the SSFDM. They represent objects of the steel pole prototype structure. We refer to these entity definitions as the pole prototype model. Table 3-2 below shows a summary listing of these entities. Figure 3-1 illustrates the organization of the entities according to the eight hierarchical levels of aggregation defined in the SSFDM.

TABLE 3-2: ENTITY DEFINITIONS OF THE POLE PROTOTYPE MODEL.

(Notation: ^ Entity Defined in the SSFDM)

ENTITY NAME	LEVEL	SUPERCLASS	DEFINITION
TRANS_STEEL_POLE	I	BUILDING [^]	Generic entity representing a transmission steel pole
POLE_STRUC_SYSTEM	II	STRUCTURAL_SYSTEM [^]	Generic entity representing a structural system of a transmission steel pole
POLE_STRUCTURE	III	STRUC_SUBSYSTEM [^]	Generic entity representing a structural subsystem of a transmission steel pole
POLE_SUBGRADE	III	STRUC_SUBSYSTEM [^]	Generic entity representing a subgrade subsystem of a transmission steel pole, which includes the pole foundation and anchoring subsystem
POLE_SUBSTRUCTURE	IV	STRUC_SUBSYSTEM [^]	Generic entity defining a subsystem representative of the basic pole and the pole extension substructure
POLE_ARM_SET	IV	STRUC_SUBSYSTEM [^]	Generic entity representing an arm set subsystem of a transmission steel pole
POLE_SUSPENDED_WIRES	IV	SUBSYSTEM [^]	Generic entity representing an subsystem of suspended pole wires of a transmission steel pole
POLE_MEMBER	V	STRUCTURAL_MEMBER [^]	Generic entity representing an structural member of a transmission steel pole
POLE_ELEMENT	VI	ELEMENT [^]	Generic entity representing a structural element of a transmission steel pole
POLE_SHAFT_PART	VII	SHAFT_PART [^]	Generic entity representing a shaft part of a transmission steel pole. A pole shape part can be straight or tapered.
POLE_SHAFT_XSECTION	VII	None	Generic entity representing a polygonal cross-section of a hollow cylindrical shaft part of a transmission steel pole
POLE_NC_MARK	VII	None	Generic entity representing a NC Mark on a part of a transmission steel pole

Evaluation of the Structural Steel Framing Data Model

ENTITY NAME	LEVEL	SUPERCLASS	DEFINITION
POLE_PLATE_PART_EDGE	VII	None	Generic entity representing one of the ordered sequence of path segment defining the outer contour of a plate part [14].
POLE_PATH_SEGMENT	VII	None	Generic entity representing a bounded portion of a molded curve defined by two nodes with the positive direction of the path from the first node to the second node [14]
POLE_STRUC_OPENING	VII	None	Generic entity representing an opening in a part to allow penetration of another part of a transmission steel pole
POLE_ROUND_OPENING	VII	POLE_OPENING	Generic entity representing a round opening in a part (e.g. bolt hole) of a transmission steel pole
POLE_POLYGONAL_OPENING	VII	None	Generic entity representing a polygonal opening in a part of a transmission steel pole. This occurs in the base plate of the static and conductor arms base plates to allow penetration of the arm shafts.
POLE_BRACKET_PL	VII	POLE_PLATE_PART	Generic entity representing a special bracket plate used in as horizontal stiffener in the arm to pole connection of a transmission steel pole
POLE_SPLICE_CONNECTION	VIII	CONNECTION^	Generic entity representing a splice connection between two consecutive shaft parts of a transmission steel pole. A splice connection is characterized by the splice length, the radial clearance between the two shaft cross sections, the male and female connected shaft parts. Structurally, it is hold in place by the frictional forces developed in the contact area between the two shaft parts in the splice section.

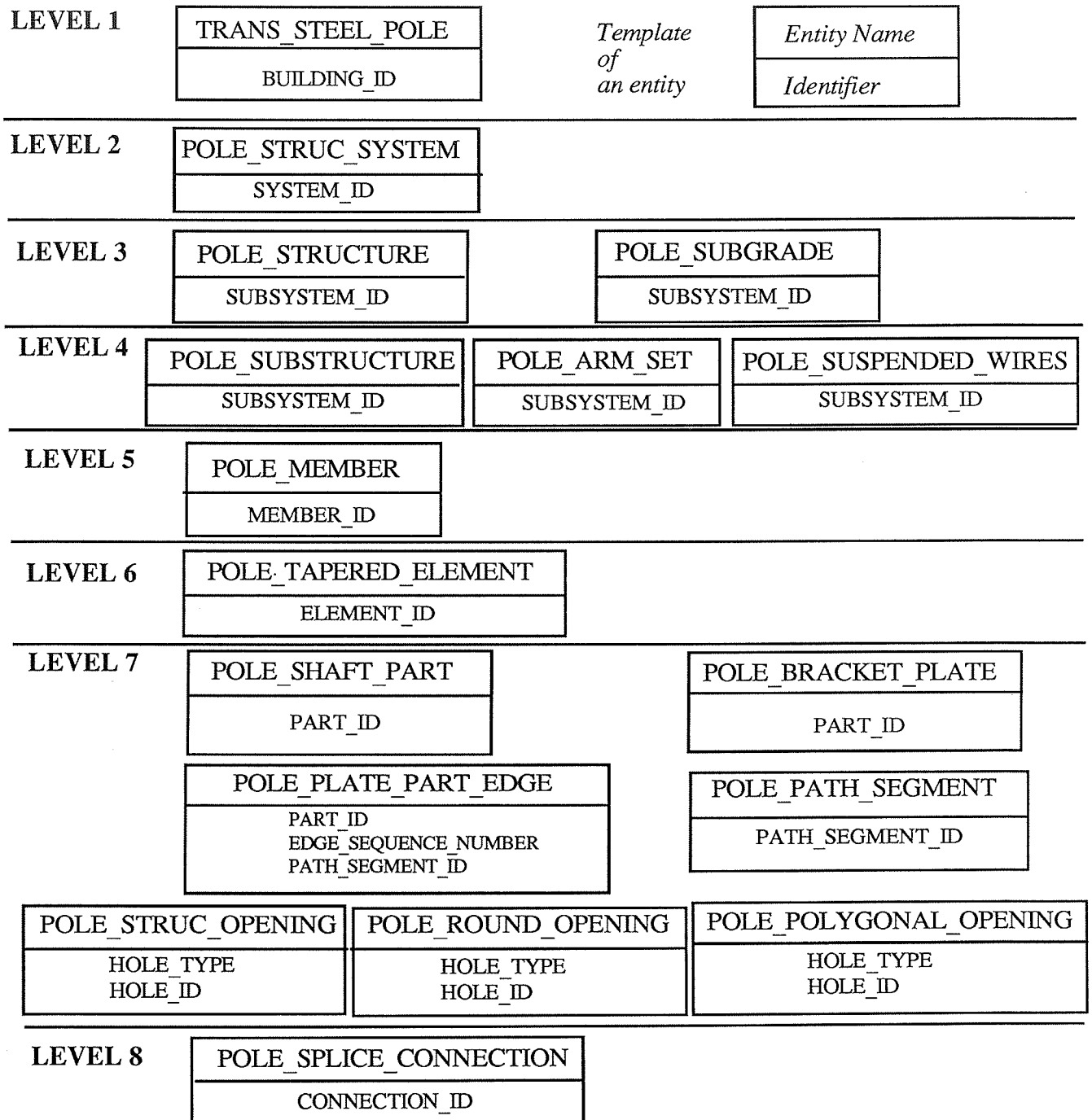


FIGURE 3-1: HIERARCHICAL AGGREGATION LEVELS IN THE POLE PROTOTYPE MODEL. The entities defined herein are generic or typical subclasses of the ones defined in the SSFDM. They represent objects of the steel pole prototype structure. This figure illustrates the organization of the entities according to the eight hierarchical levels of aggregation defined in the SSFDM.

3.3 Detailed Data Dictionary of the Prototype Model

3.3.1 Standard Notation of Entity Types and Attributes

In order to provide a visual aid to differentiate the different types of entities, generic and typical entities are denoted with names in upper case letters, instantiated entities are identified with names in upper and lower case letters. The parent entities of the SSFDM are marked with the suffix [^]. For example:

- BUILDING[^] is an entity defined in the SSFDM.
- TRANS_STEEL_POLE is a generic entity defined in this prototype and a subclass of the BUILDING[^] entity.
- TANGENT_TS_POLE is a typical entity which represents a tangent transmission steel pole.
- Pole1 is a specific instance of TANGENT_TS_POLE.

The entity slots which are inherited from the parent entities in the SSFDM are shown in *italics*. These inherited slots are only included in the definition of the subclass entity when used with a more specific interpretation than the semantics declared in the parent SSFDM. For instance, *HEIGHT* is an attribute of the entity BUILDING[^] defined in the SSFDM. When used in the context of a transmission steel pole structure, it is interpreted to be the total pole height, including the basic pole and pole extension.

Attributes with a default value are shown in bold face letters. The default values are the ones commonly used in the design of steel pole structures. For instance, a pole structural system has a default value of minimum factor of safety of 1.0, maximum extension height of 60 feet ...

3.3.2 Naming Abbreviation Schema

In naming the entities of the prototype model, particularly the instantiated entities at Level V to VIII, an abbreviation schema is adopted in order to come up with interpretable entity names of reasonable character length. It helps avoiding excessively lengthy entity names and codifying common semantics of the pole structure. The same schema is consistently used for the value of the unique identifiers of instantiated entities. This practice permits an automatic naming schema for new instantiated entities, and assists the reader in interpreting the meaning of an entity within the model. Below is an alphabetized listing of the abbreviations and their meaning.

TABLE 3-3: NAMING ABBREVIATION SCHEMA.

ABBREVIATION	MEANING
ANCH	<u>A</u> nchoring (subsystem)
ATT	<u>A</u> ttachments (subsystem or parts)
B, BOT	<u>B</u> ottom (level)
BS	<u>Ba</u> Sic Pole (subsystem)
C, COND	<u>C</u> onductor (level)
COM	<u>C</u> ONnection <u>M</u> ethod
CON	<u>C</u> ONnection
CL	<u>C</u> enter <u>L</u> ine
CP	<u>C</u> onductor to <u>P</u> ole (connection)
ED	<u>E</u> Dge
ELEM	<u>E</u> LEMent
HORZ	<u>H</u> ORiZontal (Direction - parallel with the global y direction)
LAT	<u>L</u> ATeral (Direction - parallel with the global z direction)
M, MID	<u>M</u> IDDLE (level)
MEM	<u>M</u> EMber
MK	NC <u>M</u> ar <u>K</u>
N	<u>N</u> ode
OPEN	<u>O</u> PENING (Structural)
PL	<u>P</u> Late (parts)
PNT	<u>P</u> oi <u>N</u> T
PS	<u>P</u> ath <u>S</u> egment
R	Rotational matrix <u>R</u>
S, STAT	<u>S</u> TATIC (level)
SGRAD	<u>S</u> ub <u>G</u> RA <u>D</u> e
SP	Static to Pole (connection)
STRUC	<u>S</u> TRUCtural

ABBREVIATION	MEANING
SYST	<u>S</u> Y <u>S</u> TE <u>M</u>
T	<u>T</u> op
TS	<u>T</u> ransmission <u>S</u> teel (Pole)
VERT	<u>V</u> ERT <u>I</u> cal (Direction - parallel with the global x direction)
X	e <u>X</u> tension
XSECTION	Cross (<u>X</u>) <u>S</u> EC <u>T</u> ION

Below are some examples of abbreviated entity names:

Pole1_TCArm_Set : Pole1 - Top Conductor Arm - Set

Pole1_BSMEM_0 : Pole1 - BaSic Pole MEMBer - of index 0

Pole1_XMEM_1 : Pole1 - eXtension MEMBer - of index 1

Pole1_MCP_CON_MEM : Pole1 - Middle Conductor to Pole - CONNection - MEMBer

Pole1_BSELEM0_N : Pole1 - BaSic Pole ELEMent of index 0 - Nodes

Pole1_BCArm_ATT_PL : Pole1 - Bottom Conductor Arm - ATTAchment - PLAte

Pole1_SArm_MSTIF_PS3 : Pole1 - Static Arm - Middle STIFFener - Path SegMent no. 3

Pole1_MCArm_ATT_CON : Pole1 - Middle Conductor Arm - ATTAchment CONNection

Pole1_SArm_Base_COM : Pole1 - Static Arm - Base CONNection Method

3.3.3 Data Dictionary of Abstract Data Type and Entity Definitions

In the subsequent pages, the definitions of abstract data types and entities are laid out in templates. Each template includes a descriptive statement and comments about the abstract data type or entity, and the definition of its fields or slots.

ABSTRACT DATA TYPES (ADT) :

{THIS SUBSECTION INCLUDES THE DEFINITION OF ABSTRACT DATA TYPES (ADT) USED IN THE DATA MODEL. These ADT are defined for the particular needs of data type abstraction. They are defined in reference to entities defined in the PDES Integrated Product Information Model. They can be implemented as data structures which contains 1 or more data fields.

NOTATION:

- **DEFAULT VAL** in bold face: Default value of the data field.

ADT: Cartesian Point
REFERENCE: CARTESIAN POINT (GEOMETRY MODEL, PDES)
DEFINITION: Data type representing a cartesian point in three-dimensional space.

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
X	X coordinate of the cartesian point	Real	0.0	
Y	Y coordinate of the cartesian point	Real	0.0	
Z	Z coordinate of the cartesian point	Real	0.0	

ADT: Direction
REFERENCE: DIRECTION (GEOMETRY MODEL, PDES)
DEFINITION: Data type representing a directional vector in three-dimensional space.

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
X	Directional cosine with respect to the global x axis	Real	1.0	$0.0 \leq X^2 + Y^2 + Z^2 \leq 1.0$
Y	Directional cosine with respect to the global y axis	Real	0.0	(See above)
Z	Directional cosine with respect to the global z axis	Real	0.0	(See above)

ADT: Orientation R (GEOMETRY MODEL, PDES)
REFERENCES: TRANSFORMATION COORDINATE SYSTEM

DEFINITION: Data type representing a rotational matrix R used in defining an orientation in three-dimensional space.

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
X_VECTOR	X unit vector of the orientation matrix R	Direction	{1.0,0.0,0.0}	0. <= X_VECTOR <= 1.0
Y_VECTOR	Y unit vector of the orientation matrix R	Direction	{0.0,1.0,0.0}	0. <= Y_VECTOR <= 1.0
Z_VECTOR	Z unit vector of the orientation matrix R	Direction	{0.0,0.0,1.0}	0. <= Z_VECTOR <= 1.0

ADT: Line (GEOMETRY MODEL, PDES)
REFERENCES: LINE
DEFINITION: Data type representing a line in three-dimensional space.

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
PNT	Point used to define the line	Cartesian_Point	{0.0,0.0,0.0}	PNT and DIR must both be 3D entities
DIR	Direction (vector) used to define the line	Direction	{1.0,0.0,0.0}	

ADT: End_Condition
DEFINITION: Data type representing the end conditions, in terms of displacements and rotations, of a structural element in three-dimension

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
DISPLACE_X	Translational constraint in the x direction	kConstraint	Free	Free Fixed
DISPLACE_Y	Translational constraint in the y direction	kConstraint	Free	Free Fixed
DISPLACE_Z	Translational constraint in the z direction	kConstraint	Free	Free Fixed
ROTATE_X	Rotational constraint in the x direction	kConstraint	Free	Free Fixed
ROTATE_Y	Rotational constraint in the y direction	kConstraint	Free	Free Fixed
ROTATE_Z	Rotational constraint in the z direction	kConstraint	Free	Free Fixed

ADT: Degrees_Of_Freedom
DEFINITION: Data type representing the degrees of freedom of a structural element in three-dimensional space.

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
TOTAL	Total number of degrees of freedom (at an end node of the structural element)	Integer	3	<= 6

ADT: Date Time
REFERENCE: DATE TIME (PRODUCT MODEL, PDES)
DEFINITION: Data type representing a date and time recording.

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
D	Date of the recording	Date		
T	Time of the recording	Time		

ADT: Date
REFERENCE: DATE (PRODUCT MODEL, PDES)
DEFINITION: Data type representing a date recording.

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
YEAR	Year of the date recording	Integer		YEAR > 0
MONTH	Month of the date recording	Integer		1 <= MONTH <= 12
DAY	Day of the date recording	Integer		1 <= DAY <= 31

ADT: Time
REFERENCE: TIME (PRODUCT MODEL, PDES)
DEFINITION: Data type representing a time recording.

FIELD NAME	DEFINITION	TYPE	DEFAULT VAL	CONSTRAINT
HOUR	Hour of the time recording	Integer		0 <= HOUR <= 24
MINUTE	Minute of the time recording	Integer		0 <= MINUTE <= 60
SEC	Second of the time recording	Real		0.0 <= SEC <= 60.0

ENTITY LEVEL 1: THE BUILDING LEVEL

{THIS IS THE FIRST LEVEL OF ABSTRACTION OF THE TRANSMISSION STEEL POLE PROTOTYPE. It describes the overall physical dimensions, the high level system composition, and some general functional knowledge.

NOTATION:

- Entity Name with ^: Parent entity defined in the Structural Steel Framing Data Model (SSFDM)
- Slot/Attribute Name in *italics*: Inherited from parent entities of the SSFDM, with a more specific interpretation
- Attribute Name in bold face: Attribute with default values

ENTITY: TRANS STEEL_POLE

TYPE: GENERIC

IS-A: BUILDING^

DEFINITION: Generic entity representing a transmission steel pole.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
HEIGHT	Total pole height, including basic pole and pole extension	Attribute	Numeric	Numeric
LONG_DIMENSION	Long dimension at the bottom of pole	Attribute	Numeric	Numeric
SHORT_DIMENSION	Short dimension at the bottom of pole	Attribute	Numeric	Numeric
FLOOR_AREA	Pole floor area, including base plate surface area	Attribute	Numeric	Numeric
GROUND_AREA	Pole right-of-way ground area	Attribute	Numeric	Numeric
SYSTEM	System in pole	Relational	subpart	0 or more
BUILDING_ID	Pole unique identification	Attribute	String	String
NAME	Pole title	Attribute	String	String
ADDRESS	Pole location	Attribute	String	String
FUNCTION	Pole electrical utility usage	Attribute	String	String
DESCRIPTION	Pole description (or special comments)	Attribute	String	String
PROPERTY_NUMBER	Property location identification number	Attribute	Numeric	Numeric
N_CIRCUITS	Number of circuits per pole	Attribute	Numeric	Numeric
VOLTAGE	Voltage of the pole electrical circuitry	Attribute	String	String
CIRCUIT_CONFIG	Configuration of the pole electrical circuitry	Attribute	String	String
POLE_SETTING	Setting of the pole (i.e. "bisector", etc.)	Attribute	String	String
LINE_CLASSIFICATION	Pole classification in terms of the range of the wire line angle	Attribute	String	String
MAX_LINE_ANGLE	Maximum conductor wire line angle	Attribute	Numeric	Numeric
MIN_LINE_ANGLE	Minimum conductor wire line angle	Attribute	Numeric	Numeric

ENTITY LEVEL 2: THE SYSTEM AND SPACE LEVEL

{THIS IS THE SECOND LEVEL OF ABSTRACTION OF THE TRANSMISSION STEEL POLE PROTOTYPE. This level includes the definition of the Transmission Steel Pole structural system, and the system level design constraints.

NOTATION:

- Entity Name with ^:
- Slot/Attribute Name in *italics*:
- Attribute Name in bold face:

Parent entity defined in the Structural Steel Framing Data Model (SSFDM)

Inherited from parent entities of the SSFDM, with a more specific interpretation

Attribute with default values

ENTITY: POLE_STRUC_SYSTEM

TYPE: GENERIC

IS-A: STRUCTURAL_SYSTEM^

DEFINITION: Generic entity representing a structural system of a transmission steel pole.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	DEFAULT VALUE
HEIGHT_CONSTRAINT	Type of system	Attribute	String	
	Maximum height constraint of the pole in regard to other poles on the same transmission line	Attribute	Numeric	
DESIGN_CONDITIONS	Description of the design conditions of the pole structural system	Attribute	String	
MIN_SAFETY_FACTOR	Minimum factor of safety used in the design of the overall pole	Attribute	Numeric	1.0
STATIC_SHIELD_ANGLE	Static Shield Angle for the entire pole	Attribute	Numeric	20.0 (degree)
MAX_EXTENSION	Maximum extension used with the basic pole	Attribute	Numeric	60.0 (feet)
OPT_EXTENSION	Optimum extension used in the pole design	Attribute	Numeric	10.0 (feet)

ENTITY LEVEL 3: THE SUBSYSTEM LEVEL - I

{THIS IS THE THIRD LEVEL OF ABSTRACTION OF THE TRANSMISSION STEEL POLE PROTOTYPE. This level includes definitions of the Transmission Steel Pole structural subsystem composition, and describes on a more detailed note the specific constraints imposed on the design of the pole structure.

NOTATION:

- Entity Name with ^: Parent entity defined in the Structural Steel Framing Data Model (SSFDM)
- Slot/Attribute Name in *italics*: Inherited from parent entities of the SSFDM, with a more specific interpretation
- Attribute Name in bold face: Attribute with default values

ENTITY: POLE_STRUCTURE
TYPE: GENERIC
IS-A: STRUC_SUBSYSTEM^
DEFINITION: Generic entity representing a structural subsystem of a transmission steel pole.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	DEFAULT VALUE
STAT_TO_TOP_CLEARANCE	Physical clearance between the static wire level and the top of the pole	Attribute	Numeric	
STAT_CIRC_CLEARANCE	Physical clearance between the static and circuit wire levels in the vertical direction	Attribute	Numeric	
CIRC_CIRC_CLEARANCE	Physical clearance between the consecutive circuit wire levels in the vertical direction	Attribute	Numeric	
LAT_PHASE_TO_PHASE	Physical clearance between the conductor wire phases of the same level in the lateral direction	Attribute	Numeric	
STAT_POLE_CLEARANCE	Physical clearance between the static wires and the pole in any direction	Attribute	Numeric	
CIRC_POLE_CLEARANCE	Physical clearance between the circuit wires and the pole in any direction	Attribute	Numeric	
DIAM_ROUND_OFF	Numerical fraction used to round off the diameter of a shaft for fabrication purpose	Attribute	Numeric	0.03125 (inch)
MIN_WIDTH_TO_THICK	Minimum acceptable width to thickness ratio of shaft wall	Attribute	Numeric	30.0

ENTITY: POLE SUBGRADE

TYPE: GENERIC

IS-A: STRUC_SUBSYSTEM^

DEFINITION: Generic entity representing a subgrade subsystem of a transmission steel pole, which includes the pole foundation and anchoring subsystem.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
BOT_COMPRESSION	Total compression load at the bottom of the pole substructure to be used in the foundation design	Attribute	Numeric	
BOT_SHEAR	Total shear load at the bottom of the pole substructure to be used in the foundation design	Attribute	Numeric	
BOT_MOM	Total moment at the bottom of the pole substructure to be used in the foundation design	Attribute	Numeric	

ENTITY LEVEL 4: THE SUBSYSTEM LEVEL - II

{ THIS IS THE FOURTH LEVEL OF ABSTRACTION OF THE TRANSMISSION STEEL POLE PROTOTYPE. This level represents one more level in the top down decomposition of the Transmission Steel Pole structural subsystems. The entities in this level bear much more detailed characteristics and design-related attributes.

NOTATION:

- Entity Name with *:
 - Slot/Attribute Name in *italics*:
 - Attribute Name in bold face:
- } Parent entity defined in the Structural Steel Framing Data Model (SSFDM)
 Inherited from parent entities of the SSFDM, with a more specific interpretation
 Attribute with default values

ENTITY: POLE SUBSTRUCTURE

TYPE: GENERIC

IS-A: STRUC_SUBSYSTEM^

DEFINITION: Generic entity defining a subsystem representative of the basic pole and the pole extension substructure.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	DEFAULT VALUE
MAX SHAFT LENGTH	Maximum fabricable shaft length	Attribute	Numeric	40.0 (feet)
MIN EXPOSED LENGTH	Minimum acceptable exposed shaft length	Attribute	Numeric	10.0 (feet)
MIN_RADIAL_CLEAR	Minimum acceptable radial clearance between pole shafts	Attribute	Numeric	0.125 (inch)
SPLICE_LENGTH_RATIO	Factor used in computing a splice length (i.e. 1.5 times the shaft diameter)	Attribute	Numeric	1.5
SPICE_LENGTH_INC	Additional increment used in computing a shaft splice length	Attribute	Numeric	6.0 (inch)
DEFLECT_LIMIT_RATIO	Maximum acceptable deflection ratio of the substructure in any direction	Attribute	Numeric	0.10
SHAFT_SAFETY_FACTOR	Minimum factor of safety used in the design of the pole shafts	Attribute	Numeric	1.0
HEIGHT	Height of the pole substructure	Attribute	Numeric	
TOP_OD	Outside diameter of the top of the pole substructure	Attribute	Numeric	
BOT_OD	Outside diameter of the bottom of the pole substructure	Attribute	Numeric	
WEIGHT	Total weight of the pole substructure	Attribute	Numeric	

ENTITY: POLE_ARM_SET
TYPE: GENERIC
IS-A: STRUC_SUBSYSTEM^
SUBCLASS: POLE_STATIC_SET
 POLE_COND_SET

DEFINITION: Generic entity representing an arm set subsystem of a transmission steel pole. {Pole_Static_Set and Pole_Cond_Set are typical entities which define default slot values. The latter are commonly used values for the static and conductor arms on a transmission steel pole. They are tabulated in Appendix A which includes the prototype detailed data model.}

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	DEFAULT
ARM_ANGLE	Dip angle of the arm set	Attribute	Numeric	
MAX_ARM_LENGTH	Maximum acceptable design arm length	Attribute	Numeric	
MAX_ARM_OD	Maximum acceptable arm outside diameter at the larger end that is connected to the pole	Attribute	Numeric	
MIN_ARM_OD	Minimum acceptable arm outside diameter at the tip of the arm shaft	Attribute	Numeric	
ARM_SAFETY_FACTOR	Minimum factor of safety used in the design of the pole arms	Attribute	Numeric	
ARM_TYPE	Type of arm, such as "static" or "conductor". Also used in querying and computing the number of static or conductor arm sets.	Attribute	Numeric	
INDEX	Index of the arm set, e.g. 0: top arms; 1: middle arms; 2: bottom arms. Used in querying data about a particular set of arms on the pole.	Attribute	Numeric	0

ENTITY: POLE_SUSPENDED_WIRES
TYPE: GENERIC
IS-A: SUBSYSTEM^
DEFINITION: Generic entity representing an subsystem of suspended pole wires of a transmission steel pole.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDIN.
WIND_SPAN	Suspended wire span, subject to wind loading	Attribute	Numeric	
MIN_WEIGHT_SPAN	Minimum distributed wire span, subject to gravity	Attribute	Numeric	
MAX_WEIGHT_SPAN	Maximum distributed wire span, subject to gravity	Attribute	Numeric	
RULING_SPAN	Governing suspended wire span in case of uneven wire spans on each side of the pole	Attribute	Numeric	
TYPE	Description of the type of pole wire	Attribute	String	
WIRE_PER_PHASE	Number of wires per phase	Attribute	Integer	

ENTITY LEVEL 5: THE STRUCTURAL COMPONENTS LEVEL

{THIS IS THE FIFTH LEVEL OF ABSTRACTION OF THE TRANSMISSION STEEL POLE PROTOTYPE. This level includes definitions of the specific entities of the Transmission Steel Pole structural components, namely a pole structural member.

NOTATION:

- Entity Name with *:
Parent entity defined in the Structural Steel Framing Data Model (SSFDM)
- Slot/Attribute Name in *italics*:
Inherited from parent entities of the SSFDM, with a more specific interpretation
- Attribute Name in bold face:
Attribute with default values

ENTITY: POLE MEMBER

TYPE: GENERIC

IS-A: STRUCTURAL_MEMBER^

DEFINITION: Generic entity representing an structural member of a transmission steel pole.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	DEFAULT VALUE
<i>MEMBER_ID</i>	Unique identification of the member	Attribute		
<i>DESCRIPTION</i>	Description of the member, e.g. "Basic Pole Member", "Pole Extension Member", "Arm Member".	Attribute	String	
INDEX	Index of the member in the pole subsystem to which the member belongs (e.g. 0, 1, 2, etc.). Used in querying data about a particular shaft.	Attribute	Numeric	0
QUANTITY	Quantity of the member in the set. For instance, an arm set consists of two shaft members of the same part.	Attribute	Numeric	1

ENTITY LEVEL 6: THE ANALYSIS COMPONENTS LEVEL

{THIS IS THE LEVEL OF DEFINITION OF ENTITIES (IN THE STRUCTURAL STEEL FRAMING DATA MODEL) REQUIRED FOR STRUCTURAL ANALYSIS: the ELEMENT and the NODE.

NOTATION:

- Entity Name with ^: Parent entity defined in the Structural Steel Framing Data Model (SSFDM)
- Slot/Attribute Name in *italics*: Inherited from parent entities of the SSFDM, with a more specific interpretation
- Attribute Name in bold face: Attribute with default values

ENTITY: POLE TAPERED_ELEMENT

TYPE: TYPICAL
IS-A: ELEMENT^

DEFINITION: Typical entity representing a structural element of tapered form of a transmission steel pole. The constraints on the attribute values of the cross-sectional properties of the element is that they correspond to the cross section at the bottom of the element.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
GROSS-CS_AREA	Gross cross-sectional area at the bottom of the element. The varying cross sections along the element are characterized by the properties of the related shaft parts and shaft cross-sections.	Attribute	Numeric	
NET_CS_AREA	Net cross-sectional area at the bottom of the element.	Attribute	Numeric	
XX_MOMENT_INERTIA	Moment of inertia of the cross-section at the bottom of the element about the strong axis of the element.	Attribute	Numeric	
YY_MOMENT_INERTIA	Moment of inertia of the cross section at the bottom of the element about the weak axis of the element.	Attribute	Numeric	
TORSIONAL_RIGIDITY	Torsional rigidity of the cross-section at the bottom of the element.	Attribute	Numeric	

ENTITY LEVEL 7: THE PARTS LEVEL

{THIS LEVEL INCLUDES THE DEFINITION OF THE POLE_SHAFT_PART ENTITY WHICH IS "part" OF THE POLE_SHAFT ENTITY OF LEVEL 5.

NOTATION:

- Entity Name with ^: Parent entity defined in the Structural Steel Framing Data Model (SSFDM)
- Slot/Attribute Name in *italics*: Inherited from parent entities of the SSFDM, with a more specific interpretation
- Attribute Name in bold face: Attribute with default values

ENTITY: POLE_SHAFT_PART

TYPE: GENERIC

IS-A: SHAFT_PART^

DEFINITION: Generic entity representing a shaft part of a transmission steel pole. A pole shape part can be straight or tapered.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
CROSS_SECTION	Cross section at the bottom end of the shaft part. For a tapered shaft part, the varying cross-sectional properties along the shaft can be calculated from the properties of this cross section and the shaft taper.	Relational	is-a	1 and only 1
SHAPE_FORM	Description of the shape form of the shaft part, e.g. "Straight", "Tapered", etc...	Attribute	Abstract	
TAPER	Default Value: "Straight" Taper (difference between the top and bottom diameters divided by the part length) of the shaft part. This attribute can be used to generate properties of the varying cross-sections of intermediate points along a tapered shaft part.	Attribute	Numeric	
BLACK_WEIGHT	Default Value: 0.0 (inch/inch) Net black (meaning "before galvanizing") weight of the shaft part	Attribute	Numeric	

ENTITY: POLE SHAFT_CROSS_SECTION

TYPE: GENERIC

REFERENCE: CROSS_SECTION

DEFINITION: Generic entity representing a polygonal cross-section of a hollow cylindrical shaft part of a transmission steel pole. This entity is uniquely identified by the attribute CROSS_SECTION_TYPE.

(NIDDESC SHIP STRUCTURAL INFORMATION MODEL)

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr.	TYPE	CARDINALITY
CROSS_SECTION_TYPE	Description of the type of cross section (i.e. S: Standard Cross Section, N: Non-Standard Cross Section, etc.)	Attribute		String	

N_SIDES

Number of sides for a polygonal cross section (i.e. 8: octagonal, 10: decagonal, 12: 12-sided, etc.)

Numeric

OUTER DIAMETER THICKNESS

Outer diameter of the cross-section
Plate thickness of the cross-section

Numeric
Numeric

ENTITY: POLE_NC_MARK

TYPE: GENERIC

REFERENCE: NC_MARK, NC_TEXT

DEFINITION: Generic entity representing a NC Mark on a part of a transmission steel pole. This entity is uniquely identified by the attribute NC_MARK_ID.

(NIDDESC SHIP STRUCTURAL INFORMATION MODEL)

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr.	TYPE	CARDINALITY
NC_MARK_ID	Unique identifier of the NC Mark on the part	Attribute		String	

NC_MARK_TYPE

Type of the NC Mark (i.e. "Text", "Trace Marker", etc.)

String

Default Value: "Text"

Character data to be marked by the NC Mark on the part

String

ENTITY: PLATE_PART

TYPE: GENERIC

IS-A: PART^A

REFERENCE: PLATE_PART

DEFINITION: Generic entity representing a part cut from flat material stock [3].

(NIDDESC SHIP STRUCTURAL INFORMATION MODEL)

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr.	TYPE	CARDINALITY
PLATE_PART_EDGE	Edge which belongs to this plate part	Relational		subpart	1 or more
PLATE_THICKNESS	Thickness of the plate part	Attribute		Numeric	

ENTITY:

TYPE:

IS-A :

DEFINITION:

POLE_PLATE_PART

GENERIC

PLATE_PART

Generic entity representing a plate part of a transmission steel pole. The dimensions of a pole plate part include the height, width, and thickness of the plate. These properties are encapsulated into this object module for fabrication purpose. A pole plate part has a local x axis defined in the horizontal direction in the plane of the plate, a local y axis in the vertical direction, and a local z axis in the direction perpendicular to the plane. The plate width is measured along the local x axis, the plate height along the local y axis, and the plate thickness along the local z axis. The contour of the plate part is defined as a sequence of plate part edges (see next entity). By default, the plate has a rectangular edge contour whose edge vertices can be computed from the attributes WIDTH and HEIGHT. For the default rectangular plate contour, the part plate edge and path segment entities do not need to be defined as subpart of this entity since the edge vertices can be calculated. The four edge vertices are N1, N2, N3, N4 defined as follows:

- N1: $X = -WIDTH / 2;$ $Y = HEIGHT / 2;$ $Z = 0$
- N2: $X = WIDTH / 2;$ $Y = HEIGHT / 2;$ $Z = 0$
- N3: $X = WIDTH / 2;$ $Y = -HEIGHT / 2;$ $Z = 0$
- N4: $X = -WIDTH / 2;$ $Y = -HEIGHT / 2;$ $Z = 0$

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
WIDTH	Dimension of the plate measured along the local x axis of the plate	Attribute	Numeric	
HEIGHT	Dimension of the plate measured along the local y axis of the plate	Attribute	Numeric	

ENTITY:

TYPE:

REFERENCE:

DEFINITION:

POLE_PLATE_PART_EDGE

GENERIC

PLATE_PART_EDGE

(NIDDESC SHIP STRUCTURAL INFORMATION MODEL)

Generic entity representing one of the ordered sequence of path segment defining the outer contour of a plate part of a transmission steel pole [3]. This entity is uniquely identified by a combination of the attributes EDGE_SEQUENCE_NUMBER, PATH_SEGMENT_ID, and IN_PLATE_PART_ID.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
IN_PLATE_PART	Plate part to which this edge belongs	Relational	part-of	0 or more
EDGE_SEQUENCE_NUMBER	Sequence number of the edge in the definition of the outer contour of the plate part	Attribute	Numeric	
PATH_SEGMENT	Path segment which defines the plate part edge	Relational	subpart	1 and only 1
EDGE_PREPARATION	Preparation specification of this plate	Relational	subpart	0 or 1

ENTITY: POLE_PATH_SEGMENT
TYPE: GENERIC
REFERENCE: PATH_SEGMENT
DEFINITION: Generic entity representing a bounded portion of a molded curve defined by two nodes with the positive direction of the path from the first node to the second node [3]. This entity is uniquely identified by the attribute PATH_SEGMENT_ID. (NIDDESC SHIP STRUCTURAL INFORMATION MODEL)

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
PATH_SEGMENT_ID	Unique identifier of the path segment	Attribute		
IN_PLATE_PART	Plate part to which this path segment belongs	Relational	part-of	0 or more
IN_PLATE_PART_EDGE	Plate part edge to which this path segment belongs	Relational	part-of	0 or more
START_NODE	First node of the path segment	Attribute	Abstract	
END_NODE	Second node of the path segment	Attribute	Abstract	

ENTITY: POLE_STRUC_OPENING
TYPE: GENERIC
REFERENCE: STRUCTURAL_OPENING
DEFINITION: Generic entity representing an opening in a part to allow penetration of another part of a transmission steel pole. This entity is uniquely identified by a combination of the attributes HOLE_TYPE and HOLE_ID. (NIDDESC SHIP STRUCTURAL INFORMATION MODEL)

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
HOLE_ID	Unique identifier of the opening	Attribute		
IN_PLATE_PART	Plate part to which the opening belongs	Relational	part-of	0 or more
IN_SHAPE_PART	Shape part to which the opening belongs	Relational	part-of	0 or more
HOLE_TYPE	Description of the type of opening	Attribute	String	
NODE	Nodal coordinates which locates the opening	Attribute	Abstract	
UNIT_VECTOR	Unit vector which determines the orientation of the opening	Attribute	Abstract	
CONNECTION	Connection which this opening is for	Relational	part-of	
CONN_PARTS	Parts whose connection is associated with this opening	Relational	associated-with	

ENTITY: POLE_ROUND_OPENING
IS-A: POLE_STRUC_OPENING
DEFINITION: Generic entity representing a round opening (e.g. bolt hole) in a part of a transmission steel pole.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
HOLE_DIAMETER	Diameter of the opening	Attribute		Numeric

ENTITY: POLE POLYGONAL OPENING

IS-A: POLE STRUC_OPENING

DEFINITION: Generic entity representing a polygon opening in a part of a transmission steel pole. This occurs in the base plate of the static and conductor arms base plates to allow penetration of the arm shafts.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
N_SIDES	Number of sides of the polygon opening	Attribute	Numeric	
OPENING_SIZE	Size (from the flat side to the opposite flat side of the polygon) of the opening	Attribute	Numeric	

ENTITY: POLE BRACKET_PL

IS-A: POLE PLATE_PART

DEFINITION: Generic entity representing a special bracket plate used in as horizontal stiffener in the arm to pole connection of a transmission steel pole. The edge contour of the plate are detailed by the plate dimensions A, B, C, D, F, G, H, I, J, and K. The local coordinates of the edge vertices of the plate contour can be defined as follows:

- N1 (-Width/2, Height/2, 0);
- N3 (-Width/2 - 2), (Height/2 - J), 0);
- N5 (-D/2, (Height/2 - J - I - H), 0);
- N7 ((Width/2 - 2 - B), (Height/2 - J - I), 0);
- N9 ((Width/2 - 2), Height/2, 0);
- N11 (Width/2, -(Height/2 - F), 0);
- N13 ((Width/2 - K), -Height/2, 0);
- N2 (-Width/2 - 2), Height/2, 0);
- N4 (-Width/2 - 2 - B), (Height/2 - J - I), 0);
- N6 (D/2, (Height/2 - J - I - H), 0);
- N8 ((Width/2 - 2 - B), (Height/2 - J), 0);
- N10 (Width/2, Height/2, 0);
- N12 ((Width/2 - K), -Height/2, 0);
- N14 (-Width/2, -(Height/2 - F), 0).

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
DIMENSION_A	Dimension A of the plate part	Attribute		
DIMENSION_B	Dimension B of the plate part	Attribute		
DIMENSION_C	Dimension C of the plate part	Attribute		
DIMENSION_D	Dimension D of the plate part	Attribute		
DIMENSION_F	Dimension F of the plate part	Attribute		
DIMENSION_G	Dimension G of the plate part	Attribute		
DIMENSION_H	Dimension H of the plate part	Attribute		
DIMENSION_I	Dimension I of the plate part	Attribute		
DIMENSION_J	Dimension J of the plate part	Attribute		
DIMENSION_K	Dimension K of the plate part	Attribute		

ENTITY LEVEL 8: THE CONNECTIONS LEVEL

{THIS IS THE LOWEST LEVEL OF THE TRANSMISSION STEEL POLE PROTOTYPE. The entities defined in this level are generic or typical subclasses of the CONNECTION and the SUBCONNECTION entities of the parent Structural Steel Framing Model.

NOTATION:

- Entity Name with ^: Parent entity defined in the Structural Steel Framing Data Model (SSFDM)
- Slot/Attribute Name in *italics*: Inherited from parent entities of the SSFDM, with a more specific interpretation
- Attribute Name in bold face: Attribute with default values

ENTITY: POLE SPLICE_CONNECTION
IS-A: CONNECTION^A

DEFINITION: Generic entity representing a splice connection between two consecutive shaft parts of a transmission steel pole. A splice connection is characterized by the splice length, the radial clearance between the two shaft cross sections, the male and female connected shaft parts. Structurally, it is held in place by the frictional forces developed in the contact area between the two shaft parts in the splice section.

SLOT / ATTRIBUTE NAME	DEFINITION	TYPE	Rel. /Attr. TYPE	CARDINALITY
<i>ORIGIN</i>	Point of reference for the connection. It must be the origin of the female connected shaft part.	Attribute	Abstract	
<i>SPLICE_LENGTH</i>	Length of the overlapping splice section of the two connected shaft parts	Attribute	Numeric	
<i>MALE_CON_PART</i>	Connected shaft part which locates beneath the other female connected shaft part	Relational	associated-with	0 or 1
<i>FEMALE_CON_PART</i>	Connected shaft part which locates on top of the other male connected shaft part	Relational	associated-with	0 or 1

4. Acknowledgements

The lessons learned from this evaluation task are valuable to our future research in this area. We had the chance to present this work to different audiences of faculty, students, and industry liaisons at Stanford University and are appreciative for their valuable feedback. In particular, the authors extend their thanks to William Mills who provided us the expert's input about the pole structure, Dr. Jamal Abdalla, Dr. Paul Teicholz and Ajay Lavakare, who made valuable contributions in reviewing and producing this report.

5. References

- [1] CONSTANTINE, L. L.
Object-oriented & Structured Design
Digital Consulting Inc., 1989.
- [2] LAVAKARE, AJAY and HOWARD, H.C.
Structural Steel Framing Data Model
CIFE Technical Report No. 012, Center for Integrated Facility Engineering (CIFE),
Stanford University, June 1989.
- [3] NASA SPACE STATION PROGRAM OFFICE
Space Station Program Glossary, Acronyms, and Abbreviations
Document JSC 30235, NASA, Houston, Texas, November 1986.
- [4] DATE, C. J.
An Introduction to Database Systems
Vol. I, Addison-Wesley Publishing Co., 1981.
- [5] TSICHRITZIS, D. C. and LOCHOVSKY, F. H.
Data Models
Englewood Cliffs, N.J. : Prentice-Hall, 1982.
- [6] DATE, C. J.
An Introduction to Database Systems
Vol. II, The System Programming Series, Addison-Wesley Publishing Co.,
Massachusetts, 1983.
- [7] CHEN, P. P.-S.
"The Entity-Relationship Model - Toward a Unified View of Data"
ACM Transactions on Database Systems, Vol. 1, No. 1, pp. 9-36, March 1976.
- [8] HOWARD, H.C.
Reasoning about Multiple Views of AEC Data
A proposal to the Center for Integrated Facility Engineering, Stanford University.
- [9] GEILINGH, W.
**General AEC Reference Model (GARM): an aid for the integration of
application specific product definition models**
A PDES publication, 1988.

- [10] WARTHEN, BARBARA
PDES - A CAD Standard For Data Exchange
Unix World, December 1988.

- [11] WILSON, P.R., and KENNICOTT, P.R.
PDES/STEP Integrated Product Information Model (IPIM)
ISO TC184/SC4/WG1, Doc. 4.1.2, Working Draft, September 1988.

- [12] GEILINGH, W.
General AEC Reference Model (GARM)
ISO TC184/SCA/WG1 Document 3.2.2.1, TNO Report BI-88-150, October 1988.

- [13] TURNER, J.
Architecture/Engineering/Construction (AEC) Building Systems Model
ISO TC184/SC4/WG1 Document 3.2.2.4, July 1988.

- [14] GERARDI, M., et. al.
Reference Model for Ship Structural Systems
The Navy/Industry Digital Data Exchange Standards Committee (NIDDESC), ISO TC184/SC4/WG1 Document 3.2.2.5, March 1988.

- [15] LUTH, G. P.
Representation and Reasoning for Integrated Structural Design of High-Rise Commercial Office Buildings
Unpublished PhD thesis, Department of Civil Engineering, Stanford University, 1990.

- [16] HOWARD, H. C., and ABDALLA, J. A., and PHAN, D. H.
A Primitive-Composite Approach for Structural Data Modelling
Paper submitted to the Journal of Computing in Civil Engineering, Department of Civil Engineering, Stanford University, 1990.

APPENDIX A:

DETAILED DATA MODEL OF THE STEEL POLE PROTOTYPE

Due to the length of this report, the entities and abstract data types of objects (arms, wires, etc.) in the middle and bottom conductor levels are not included herein. Yet, because of their similar base design, the three conductor levels are modeled using typical entity definitions. The typical entities of these levels are included in this section, along with the instantiated entities of the top conductor level. These entity definitions provide the reader a grasp of the modeling of these three levels without adding all the detail information.

LEVEL 1: THE BUILDING LEVEL

{NOTATION:

- Slot/Attribute Name in *italics*: Slot/Attribute inherited from parent entities
 - Attribute Name in **bold face**: Attribute with default value (also in bold face)
 - Slot Value in ||: Mapped to a class of object
- }

Entity: TANGENT_TS_POLE {Instantiated entity}

INSTANCE-OF: TRANS_STEEL_POLE

DEFINITION: Typical entity representing a tangent transmission steel pole. The latter is characterized by the vertical circuit configuration, the line angle ranging from 0 to 15 degrees, and the pole setting on the bisector of the line angle.

SLOT NAME	TYPE	VALUE	UNIT
CIRCUIT_CONFIG	String	"Vertical"	
POLE_SETTING	String	"Bisector"	
LINE_CLASSIFICATION	String	"Tangent"	
MAX_LINE_ANGLE	Integer	10.0	degree
MIN_LINE_ANGLE	Integer	0.0	degree

Entity: Pole1 {Instantiated entity}

INSTANCE-OF: TANGENT_TS_POLE

DEFINITION: Pole1, an instance of a tangent transmission steel pole.

SLOT NAME	TYPE	VALUE	UNIT
HEIGHT	Float	190.0	feet
LONG_DIMENSION	Float	90.4375	inch
SHORT_DIMENSION	Float	90.4375	inch
FLOOR_AREA	Float	214.0	square feet
GROUND_AREA	Float	1780.0	square feet
SYSTEM	Relational	Pole1_STRUC_System	
BUILDING_ID	String	"490-081-01"	
NAME	String	"Bellaire-White Oaks 345 kV Transmission Pole"	
ADDRESS	String	"Bellaire-White Oaks"	
FUNCTION	String	"345 kV, 2CKT, 800 ft span, 1-10 degrees Transmission Line"	
DESCRIPTION	String	"Pole not designed for underbuilt distribution loading"	
ORIGIN	Abstract	Zero_Origin	
PROPERTY_NUMBER	Integer	65	
N_CIRCUITS	Integer	2	
VOLTAGE	String	"345kV"	

DATA: Zero_Origin

ADT: Cartesian_Point

DEFINITION: Origin of zero x, y, z coordinates. Used in defining the origin of the pole system, the plate part origin, etc...

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	0.0	inch

LEVEL 2: THE SYSTEM AND SPACE LEVEL

{NOTATION:

- Slot/Attribute Name in *italics*: Slot/Attribute inherited from parent entities
 - Attribute Name in **bold face**: Attribute with default value (also in bold face)
 - Slot Value in | |: Mapped to a class of object
- }

Entity: Pole1_STRUC_System {Instantiated entity}
INSTANCE-OF: POLE_STRUC_SYSTEM
DEFINITION: Structural system of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN BUILDING</i>	Relational	Pole1	
<i>SUBSYSTEM</i>	Relational	Pole1_STRUCTURE, Pole1_Subgrade, Pole1_Attachments	
<i>SYSTEM ID</i>	String	"2-SYST"	
<i>IS SYSTEM</i>	Relational	{POLE_STRUC_SYSTEM}	
TYPE	String	"Structural"	
<i>DESCRIPTION</i>	String	"Loads included overload factors"	
<i>ORIGIN</i>	Abstract	Zero_Origin	
<i>ORIENTATION</i>	Abstract	Identity_R	
<i>HEIGHT CONSTRAINT</i>	Float	300.0	feet
<i>DESIGN CONDITIONS</i>	String	"ANSI 100 mph wind - NESC 1/4 inch radial ice and 4psf wind - Tension of 1 wire in normal"	

DATA: Identity_R
ADT: Orientation_R
DEFINITION: Orientation (rotational) Identity Matrix R. Also used as the global matrix R of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X_VECTOR	Direction	Unit_X	
Y_VECTOR	Direction	Unit_Y	
Z_VECTOR	Direction	Unit_Z	

DATA: Unit_X
ADT: Direction
DEFINITION: Unit Vector in the x direction.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	1.0	
Y	Float	0.0	
Z	Float	0.0	

DATA: Unit_Y
ADT: Direction
DEFINITION: Unit Vector in the y direction.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	
Y	Float	1.0	
Z	Float	0.0	

DATA: Unit_Z
ADT: Direction
DEFINITION: Unit Vector in the z direction.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	
Y	Float	0.0	
Z	Float	1.0	

LEVEL 3: THE SUBSYSTEM LEVEL - I

{NOTATION:

- Slot/Attribute Name in *italics*: Slot/Attribute inherited from parent entities
- Attribute Name in **bold face**: Attribute with default value (also in bold face)
- Slot Value in | |: Mapped to a class of object }

Entity: Pole1_Structure {Instantiated entity}

INSTANCE-OF: POLE_STRUCTURE

DEFINITION: Structural subsystem of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN_SYSTEM</i>	Relational	Pole1_STRUC_System	
<i>HAS_SUBSYSTEM</i>	Relational	Basic_Pole1, Pole1_Extension, Pole1_SArm_Set Pole1_TCArm_Set, Pole1_MCArm_Set, Pole1_BCArm_Set	
<i>CONN_TO_SUBSYSTEM</i>	Relational	Pole1_Subgrade, Pole1_Attachments	
<i>SUBSYSTEM_ID</i>	String	"3-STRUC"	
<i>IS_SUBSYSTEM</i>	Relational	POLE_STRUCTURE	
<i>DESCRIPTION</i>	String	"Basic Pole of 119 ft. - 10 in., max height of 190 ft."	
<i>ORIGIN</i>	Abstract	Zero_Origin	
<i>ORIENTATION</i>	Abstract	Identity_R	
<i>STAT_TO_TOP_CLEARANCE</i>	Float	15.75	inch
<i>STAT_CIRC_CLEARANCE</i>	Float	227.4375	inch
<i>CIRC_CIRC_CLEARANCE</i>	Float	306.0	inch
<i>LAT_PHASE_TO_PHASE</i>	Float	325.25	inch
<i>STAT_POLE_CLEARANCE</i>	Float	41.0	inch
<i>CIRC_POLE_CLEARANCE</i>	Float	120.0	inch

Entity: Pole1_Subgrade {Instantiated entity}

INSTANCE-OF: POLE_SUBGRADE

DEFINITION: Subgrade of Pole1, including the pole anchoring subsystem and foundation.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN_SYSTEM</i>	Relational	Pole1_STRUC_System	
<i>HAS_SUBSYSTEM</i>	Relational	Pole1_Anchor_Subsystem, Pole1_Foundation**	
<i>CONN_TO_SUBSYSTEM</i>	Relational	Pole1_Structure, Pole1_Attachments	
<i>SUBSYSTEM_ID</i>	String	"3-SGRAD"	
<i>IS_SUBSYSTEM</i>	Relational	POLE_SUBGRADE	
<i>DESCRIPTION</i>	String	"Pole anchoring system used base plate, base plate grouting, and high-strength anchor bolts"	
<i>ORIGIN</i>	Abstract	Zero_Origin	
<i>ORIENTATION</i>	Abstract	Identity_R	
<i>BOT_COMPRESSION</i>	Float	117.3	kip
<i>BOT_SHEAR</i>	Float	153.5	kip
<i>BOT_MOM</i>	Float	250949.0	kip in.

(** Pole1_Foundation not included in this prototype model)

Entity: Pole1_Attachments {Instantiated entity}
INSTANCE-OF: SUBSYSTEM*
DEFINITION: Pole attachments subsystem of Pole1, including the suspended wires and attachment fixed hardware.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN_SYSTEM</i>	Relational	Pole1_STRUC_System	
<i>HAS_SUBSYSTEM</i>	Relational	Pole1_Static_Wires, Pole1_Cond_Wires Pole1_Fixed_Hardware**	
<i>CONN_TO_SUBSYSTEM</i>	Relational	Pole1_Structure, Pole1_Subgrade	
<i>SUBSYSTEM_ID</i>	String	"3-ATT"	
<i>IS_SUBSYSTEM</i>	Relational	{SUBSYSTEM*}	
<i>DESCRIPTION</i>	String	"V-String insulators used as attachment fixed hardware"	
<i>ORIGIN</i>	Abstract	Pole1_BCond_Origin	
<i>ORIENTATION</i>	Abstract	Identity_R	

(** Pole1_Fixed_Hardware not included in this prototype model)

LEVEL 4: THE SUBSYSTEM LEVEL - II

{NOTATION:

- Slot/Attribute Name in *italics*: Slot/Attribute inherited from parent entities
- Attribute Name in **bold face**: Attribute with default value (also in bold face)
- Slot Value in | |: Mapped to a class of object }

Entity: **Basic_Pole1** {Instantiated entity}
 INSTANCE-OF: POLE_SUBSTRUCTURE
 DEFINITION: Basic Pole (108 ft. - 3 in.) of Pole 1.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN_SYSTEM</i>	Relational	Pole1_STRUC_System	
<i>IN_SUBSYSTEM</i>	Relational	Pole1_Structure	
<i>MEMBER</i>	Relational	Pole1_BSMEM_0, Pole1_BSMEM_1 Pole1_BSMEM_2	
<i>CONN_TO_SUBSYSTEM</i>	Relational	Pole1_Extension, Pole1_SArm_Set Pole1_TCArm_Set, Pole1_MCArm_Set Pole1_BCArm_Set	
<i>SUBSYSTEM_ID</i>	String	"4-BS"	
<i>IS_SUBSYSTEM</i>	Relational	POLE_SUBSTRUCTURE	
<i>DESCRIPTION</i>	String	"Basic Pole of 108 ft. - 3 in., with 3 shafts"	
<i>ORIGIN</i>	Abstract	Basic_Pole1_Origin	
<i>ORIENTATION</i>	Abstract	Identity_R	
<i>HEIGHT</i>	Float	1299.0	inch
<i>TOP_OD</i>	Float	20.0	inch
<i>BOT_OD</i>	Float	61.75	inch
<i>WEIGHT</i>	Float	50749.0	pounds

DATA: **Basic_Pole1_Origin**
 ADT: Cartesian_Point
 DEFINITION: Origin of the basic pole of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	981.0	inch

Entity: **Pole1_Extension** {Instantiated entity}
 INSTANCE-OF: POLE_SUBSTRUCTURE
 DEFINITION: Pole Extension (81 ft. - 9 in.) of Pole 1.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN_SYSTEM</i>	Relational	Pole1_STRUC_System	
<i>IN_SUBSYSTEM</i>	Relational	Pole1_Structure	
<i>MEMBER</i>	Relational	Pole1_XMEM_0, Pole1_XMEM_1, Pole1_XMEM_2	
<i>CONN_TO_SUBSYSTEM</i>	Relational	Basic_Pole1, Pole1_Anchor_Subsystem	
<i>SUBSYSTEM_ID</i>	String	"4-EXT"	
<i>IS_SUBSYSTEM</i>	Relational	POLE_SUBSTRUCTURE	
<i>DESCRIPTION</i>	String	"Extension of 81 ft. - 9 in. for the 190 ft. Pole"	
<i>ORIGIN</i>	Abstract	Zero_Origin	
<i>ORIENTATION</i>	Abstract	Identity_R	
<i>HEIGHT</i>	Float	981.0	inch
<i>TOP_OD</i>	Float	57.125	inch
<i>BOT_OD</i>	Float	90.4375	inch
<i>WEIGHT</i>	Float	97712.0	pounds

Entity: POLE1_STATIC_SET {Typical entity}
 IS-A : POLE_ARM_SET
 DEFINITION: Typical entity of a set of static arms of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_SYSTEM	Relational	Pole1_STRUC_System	
IN_SUBSYSTEM	Relational	Pole1_Structure	
MEMBER	Relational	Pole1_SArm	
CONN_TO_SUBSYSTEM	Relational	Basic_Pole1, Pole1_Static_Wires	
IS_SUBSYSTEM	Relational	[POLE_ARM_SET]	
ORIENTATION	Abstract	Identity_R	
ARM_ANGLE	Float	0.0	degree
MAX_ARM_LENGTH	Float	120.0	inch
MAX_ARM_OD	Float	30.0	inch
MIN_ARM_OD	Float	4.0	inch
ARM_SAFETY_FACTOR	Float	1.0	
ARM_TYPE	String	"Static"	

Entity: Pole1_SArm_Set {Instantiated entity}
 INSTANCE-OF: POLE1_STATIC_SET
 DEFINITION: Instance of a set of static arms of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
SUBSYSTEM_ID	String	"4-STAT"	
DESCRIPTION	String	"Pair of static arms"	
ORIGIN	Abstract	Pole1_SArm_Origin	

Entity: POLE1_COND_SET {Typical entity}
 IS-A : POLE_ARM_SET
 DEFINITION: Typical entity of a set of static arms of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_SYSTEM	Relational	Pole1_STRUC_System	
IN_SUBSYSTEM	Relational	Pole1_Structure	
CONN_TO_SUBSYSTEM	Relational	Basic_Pole1, Pole1_Cond_Wires	
IS_SUBSYSTEM	Relational	[POLE_ARM_SET]	
ORIENTATION	Abstract	Identity_R	
ARM_ANGLE	Float	20.0	degree
MAX_ARM_LENGTH	Float	300.0	inch
MAX_ARM_OD	Float	60.0	inch
MIN_ARM_OD	Float	6.0	inch
ARM_SAFETY_FACTOR	Float	1.5	
ARM_TYPE	String	"Conductor"	

Entity: Pole1_TCArm_Set {Instantiated entity}
 INSTANCE-OF: POLE1_COND_SET
 DEFINITION: Instance of a set of top conductor arms of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
SUBSYSTEM_ID	String	"4-T-COND"	
DESCRIPTION	String	"Pair of top conductor arms"	
MEMBER	Relational	Pole1_TCArm	
ORIGIN	Abstract	Pole1_TCSet_Origin	
INDEX	Integer	0	

DATA: Pole1_TCSet_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the top conductor arms set of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	2156.75	inch

Entity: Pole1_Anchor_Subsystem {Instantiated entity}
INSTANCE-OF: STRUC_SUBSYSTEM*
DEFINITION: Anchoring subsystem of Pole1, including pole base plate and anchor bolts.

SLOT NAME	TYPE	VALUE	UNIT
IN_SYSTEM	Relational	Pole1_STRUC_System	
IN_SUBSYSTEM	Relational	Pole1_Subgrade	
MEMBER	Relational	Pole1_Base Plate	
CONN_TO_SUBSYSTEM	Relational	Pole1_Extension	
IS_SUBSYSTEM	Relational	STRUC_SUBSYSTEM*	
SUBSYSTEM_ID	String	"4-ANCH"	
DESCRIPTION	String	"Pole Anchoring System, including base plate"	
ORIGIN	Abstract	Zero_Origin	
ORIENTATION	Abstract	Identity_R	

Entity: POLE1_STAT_WIRES {Typical entity}
IS-A: POLE_SUSPENDED_WIRES
DEFINITION: Typical entity of a subsystem of suspended conductor wires of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_SYSTEM	Relational	Pole1_STRUC_System	
IN_SUBSYSTEM	Relational	Pole1_Attachments	
MEMBER	Relational	**	
IS_SUBSYSTEM	Relational	POLE_SUSPENDED_WIRES	
ORIENTATION	Abstract	Identity_R	
WIND_SPAN	Float	800.0	feet
MIN_WEIGHT_SPAN	Float	800.0	feet
MAX_WEIGHT_SPAN	Float	800.0	feet
RULING_SPAN	Float	800.0	feet
TYPE	String	"Static"	
WIRE_PER_PHASE	Integer	2	

Entity: Pole1_Static_Wires {Instantiated entity}
INSTANCE-OF: POLE1_STAT_WIRES
DEFINITION: Subsystem of suspended static wires of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
SUBSYSTEM_ID	String	"4-S-WIRES"	
DESCRIPTION	String	"Pole1 Static Wires - 3/8 in. E.H.S."	
ORIGIN	Abstract	Pole1_Static_Origin	

DATA: Pole1_Static_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the static wire level of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	2264.25	inch

Entity: POLE1_COND_WIRES {Typical entity}
IS-A: POLE_SUSPENDED_WIRES
DEFINITION: Typical entity of a subsystem of suspended conductor wires of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_SYSTEM	Relational	Pole1_STRUC_System	
IN_SUBSYSTEM	Relational	Pole1_Attachments	
MEMBER	Relational	**	
IS_SUBSYSTEM	Relational	{POLE_SUSPENDED_WIRES}	
ORIENTATION	Abstract	Identity_R	
WIND_SPAN	Float	800.0	feet
MIN_WEIGHT_SPAN	Float	560.0	feet
MAX_WEIGHT_SPAN	Float	1040.0	feet
RULING_SPAN	Float	800.0	feet
TYPE	String	"Conductor"	
WIRE_PER_PHASE	Integer	2	

Entity: Pole1_TCond_Wires {Instantiated entity}
INSTANCE-OF: POLE_COND_WIRES
DEFINITION: Subsystem of suspended top conductor wires of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
SUBSYSTEM_ID	String	"4-T-C-WIRES"	
DESCRIPTION	String	"Pole1 Top Conductor Wires - 2167 MCM ACSR"	
ORIGIN	Abstract	Pole1_TCond_Origin	

DATA: Pole1_TCond_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the top conductor wire level of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	2036.8125	inch

LEVEL 5: THE STRUCTURAL COMPONENTS LEVEL

{NOTATION:

- Slot/Attribute Name in *italics*: Slot/Attribute inherited from parent entities
 - Attribute Name in **bold face**: Attribute with default value (also in bold face)
 - Slot Value in | |: Mapped to a class of object
- }

Entity: POLE1_BSMEM {Typical entity}
 IS-A: POLE_MEMBER
 DEFINITION: Typical entity of a structural member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN_SUBSYSTEM</i>	Relational	Basic_Pole1	
<i>MATERIAL</i>	Relational	Pole1_SHAFT_Steel	
<i>IS_MEMBER</i>	Relational	POLE_MEMBER	
<i>ORIENTATION</i>	Abstract	Identity_R	

Entity: Pole1_BSMEM_0 {Instantiated entity}
 INSTANCE-OF: POLE1_BSMEM
 DEFINITION: First shaft member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>LENGTH</i>	Float	480.0	inch
<i>PART</i>	Relational	Pole1_BSShaft_0	
<i>CONN_PART</i>	Relational	Pole1_SArm_Top_PL, Pole1_SArm_Bot_PL Pole1_SArm_MID_STIF, Pole1_TCArm_Top_PL Pole1_TCArm_Bot_PL, Pole1_TCArm_MID_STIF Pole1_TCArm_VERT_PL, Pole1_MCArm_Top_PL Pole1_MCArm_Bot_PL, Pole1_MCArm_MID_STIF Pole1_MCArm_VERT_PL	
<i>CONN_MEMBER</i>	Relational	Pole1_SArm, Pole1_TCArm Pole1_MCArm	
<i>SUPPORTING_MEMBER</i>	Relational	Pole1_BSMEM_1	
<i>SUPPORTED_MEMBER</i>	Relational	null	
<i>CONNECTION</i>	Relational	Pole1_BS0_BS1_CON, Pole1_SP_CON Pole1_TCP_CON, Pole1_MCP_CON	
<i>DESCRIPTION</i>	String	"Basic Pole Member 0"	
<i>MEMBER_ID</i>	String	"5-BS-MEM-0"	
<i>ORIGIN</i>	Abstract	Pole1_BSMEM0_Origin	
<i>END_NODES</i>	Relational	Pole1_BSMEM0_N.End_Nodes	
<i>ELEMENT</i>	Relational	Pole1_BSELEM_0	
<i>INDEX</i>	Integer	0	

DATA: Pole1_BSMEM0_Origin
 ADT: Cartesian_Point
 DEFINITION: Origin of the first member of the basic pole of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	1800.0	inch

Entity: POLE1_MEM_NODES {Typical entity}
 IS-A: MEMBER_NODES*
 DEFINITION: Typical entity representing the end nodes of a member of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>END_CONDITION_1</i>	Abstract	Free_End_Condition	
<i>END_CONDITION_2</i>	Abstract	Free_End_Condition	

Entity: Pole1_BSMEM0_N {Instantiated entity}
INSTANCE-OF: POLE1_MEM_NODES
DEFINITION: End nodes of the first member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MEMBER_ID	Relational	Pole1_BSMEM_0	
END_NODES	Relational	Pole1_BS0_N1 Pole1_BS0_N2	
END_CONDITION_1	Abstract	Fixed_End_Condition	

Entity: Pole1_BS0_N1 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: First node (bottom) of the first member / element of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_BSMEM_0	
LOCATES_ELEMENT	Relational	Pole1_BSELEM_0	
LOCATES_PART	Relational	Pole1_BSShaft_0	
COORDINATES	Abstract	Pole1_BSMEM0_Origin	
NODE_ID	String	"6-BS-0-N1"	
CONNECTION	Relational	Pole1_BS0_BS1_CON	

Entity: Pole1_BS0_N2 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: Second node (top) of the first member / element of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_BSMEM_0	
LOCATES_ELEMENT	Relational	Pole1_BSELEM_0	
LOCATES_PART	Relational	Pole1_BSShaft_0	
COORDINATES	Abstract	Pole1_BSMEM0_EndPNT	
NODE_ID	String	"6-BS-0-N2"	

DATA: Pole1_BSMEM0_EndPNT
ADT: Cartesian Point
DEFINITION: End Point of the first member of the basic pole of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	2280.0	inch

Entity: Pole1_BSMEM_1 {Instantiated entity}
INSTANCE-OF: POLE1_BSMEM
DEFINITION: Second shaft member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LENGTH	Float	479.0	inch
PART	Relational	Pole1_BSShaft_1	
CONN_PART	Relational	Pole1_BCArm_Top_PL, Pole1_BCArm_Bot_PL Pole1_BCArm_MID_STIF, Pole1_BCArm_VERT_PL	
CONN_MEMBER	Relational	Pole1_BCP_CON_MEM	
SUPPORTING_MEMBER	Relational	Pole1_BSMEM_2	
SUPPORTED_MEMBER	Relational	Pole1_BSMEM_0	
CONNECTION	Relational	Pole1_BS0_BS1_CON, Pole1_BS1_BS2_CON Pole1_BCP_CON	
DESCRIPTION	String	"Basic Pole Member 1"	

MEMBER_ID String "5-BS-MEM-1"
 ORIGIN Abstract Pole1_BSMEM1_Origin
 END_NODES Relational Pole1_BSMEM1_N.End_Nodes
 ELEMENT Relational Pole1_BSELEM_1
 INDEX Integer 1

DATA: Pole1_BSMEM1_Origin
 ADT: Cartesian_Point
 DEFINITION: Origin of the second member of the basic pole of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	1381.0	inch

Entity: Pole1_BSMEM1_N {Instantiated entity}
 INSTANCE-OF: POLE1_MEM_NODES
 DEFINITION: End nodes of the second member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MEMBER_ID	Relational	Pole1_BSMEM_1	
END_NODES	Relational	Pole1_BS1_N1 Pole1_BS1_N2	

Entity: Pole1_BS1_N1 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: First node (bottom) of the second member / element of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_BSMEM_1	
LOCATES_ELEMENT	Relational	Pole1_BSELEM_1	
LOCATES_PART	Relational	Pole1_BSShaft_1	
COORDINATES	Abstract	Pole1_BSMEM1_Origin	
NODE_ID	String	"6-BS-1-N1"	
CONNECTION	Relational	Pole1_BS1_BS2_CON	

Entity: Pole1_BS1_N2 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: Second node (top) of the second member/element of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_BSMEM_1	
LOCATES_ELEMENT	Relational	Pole1_BSELEM_1	
LOCATES_PART	Relational	Pole1_BSShaft_1	
COORDINATES	Abstract	Pole1_BSMEM1_EndPNT	
NODE_ID	String	"6-BS-1-N2"	

DATA: Pole1_BSMEM1_EndPNT
 ADT: Cartesian_Point
 DEFINITION: End Point of the second member of the basic pole of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	1860.0	inch

Entity: Pole1_BSMEM_2 {Instantiated entity}
INSTANCE-OF: POLE1_BSMEM
DEFINITION: Third shaft member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LENGTH	Float	479.0	inch
PART	Relational	Pole1_BSShaft_2	
CONN_PART	Relational	null	
CONN_MEMBER	Relational	null	
SUPPORTING_MEMBER	Relational	Pole1_XMEM_0	
SUPPORTED_MEMBER	Relational	Pole1_BSMEM_1	
CONNECTION	Relational	Pole1_BS1_BS2_CON, Pole1_BS2_X0_CON	
DESCRIPTION	String	"Basic Pole Member 2"	
MEMBER_ID	String	"5-BS-MEM-2"	
ORIGIN	Abstract	Pole1_BSMEM2_Origin	
END_NODES	Relational	Pole1_BSMEM2_N.End_Nodes	
ELEMENT	Relational	Pole1_BSELEM_2	
INDEX	Integer	2	

DATA: Pole1_BSMEM2_Origin
ADT: Cartesian Point
DEFINITION: Origin of the third member of the basic pole of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	981.0	inch

Entity: Pole1_BSMEM2_N {Instantiated entity}
INSTANCE-OF: POLE1_MEM_NODES
DEFINITION: End nodes of the second member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MEMBER_ID	Relational	Pole1_BSMEM_2	
END_NODES	Relational	Pole1_BS2_N1 Pole1_BS2_N2	

Entity: Pole1_BSELEM2_N {Instantiated entity}
INSTANCE-OF: POLE1_ELEM_NODES
DEFINITION: End nodes of the structural element of the third member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ELEMENT_ID	Relational	Pole1_BSELEM_2	
NODE_1	Relational	Pole1_BS2_N1	
NODE_2	Relational	Pole1_BS2_N2	

Entity: Pole1_BS2_N1 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: First node (bottom) of the third member / element of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_BSMEM_2	
LOCATES_ELEMENT	Relational	Pole1_BSELEM_2	
LOCATES_PART	Relational	Pole1_BSShaft_2	
COORDINATES	Abstract	Pole1_BSMEM2_Origin	
NODE_ID	String	"6-BS-2-N1"	
CONNECTION	Relational	Pole1_BS2_X0_CON	

Entity: Pole1_BS2_N2 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: Second node (top) of the third member / element of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_BSMEM_2	
LOCATES_ELEMENT	Relational	Pole1_BSELEM_2	
LOCATES_PART	Relational	Pole1_BSShaft_2	
COORDINATES	Abstract	Pole1_BSMEM2_EndPNT	
NODE_ID	String	"6-BS-2-N2"	

DATA: Pole1_BSMEM2_EndPNT
ADT: Cartesian_Point
DEFINITION: End Point of the third member of the basic pole of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	1460.0	inch

Entity: POLE1_XMEM {Typical entity}
IS-A : POLE_MEMBER
DEFINITION: Typical entity of a structural member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_SUBSYSTEM	Relational	Pole1_Extension	
MATERIAL	Relational	Pole1_SHAFT_Steel	
IS_MEMBER	Relational	{POLE_MEMBER}	
ORIENTATION	Abstract	Identity_R	

Entity: Pole1_XMEM_0 {Instantiated entity}
INSTANCE-OF: POLE1_XMEM
DEFINITION: First shaft member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LENGTH	Float	478.0	inch
PART	Relational	Pole1_XShaft_0	
CONN_PART	Relational	null	
CONN_MEMBER	Relational	null	
SUPPORTING_MEMBER	Relational	Pole1_XMEM_1	
SUPPORTED_MEMBER	Relational	Pole1_BSMEM_2	
CONNECTION	Relational	Pole1_BS2_X0_CON, Pole1_X0_X1_CON	
DESCRIPTION	String	"190 ft. Pole Ext. Member 0"	
MEMBER_ID	String	"5-X-MEM-0"	
ORIGIN	Abstract	Pole1_XMEM0_Origin	
END_NODES	Relational	Pole1_XMEM0_N.End_Nodes	
ELEMENT	Relational	Pole1_XELEM_0	
INDEX	Integer	0	

DATA: Pole1_XMEM0_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the first member of the pole extension of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	600.0	inch

Entity: Pole1_XMEM0_N {Instantiated entity}
 INSTANCE-OF: POLE1_MEM_NODES
 DEFINITION: End nodes of the first member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MEMBER_ID	Relational	Pole1_XMEM_0	
END_NODES	Relational	Pole1_X0_N1, Pole1_X0_N2	

Entity: Pole1_X0_N1 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: First node (bottom) of the first member / element of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_XMEM_0	
LOCATES_ELEMENT	Relational	Pole1_XELEM_0	
LOCATES_PART	Relational	Pole1_XShaft_0	
COORDINATES	Abstract	Pole1_XMEM0_Origin	
NODE_ID	String	"6-X-0-N1"	
CONNECTION	Relational	Pole1_X0_X1_CON	

Entity: Pole1_X0_N2 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: Second node (top) of the first member / element of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_XMEM_0	
LOCATES_ELEMENT	Relational	Pole1_XELEM_0	
LOCATES_PART	Relational	Pole1_XShaft_0	
COORDINATES	Abstract	Pole1_XMEM0_EndPNT	
NODE_ID	String	"6-X-0-N2"	

DATA: Pole1_XMEM0_EndPNT
 ADT: Cartesian_Point
 DEFINITION: End Point of the first member of the pole extension of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	1078.0	inch

Entity: Pole1_XMEM_1 {Instantiated entity}
 INSTANCE-OF: POLE1_XMEM
 DEFINITION: Second shaft member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LENGTH	Float	474.0	inch
PART	Relational	Pole1_XShaft_1	
CONN_PART	Relational	null	
CONN_MEMBER	Relational	null	
SUPPORTING_MEMBER	Relational	Pole1_XMEM_2	
SUPPORTED_MEMBER	Relational	Pole1_XMEM_0	
CONNECTION	Relational	Pole1_X0_X1_CON, Pole1_X1_X2_CON	
DESCRIPTION	String	"190 ft. Pole Ext. Member 1"	
MEMBER_ID	String	"5-X-MEM-1"	
ORIGIN	Abstract	Pole1_XMEM1_Origin	
END_NODES	Relational	Pole1_XMEM1_N.End_Nodes	
ELEMENT	Relational	Pole1_XELEM_1	
INDEX	Integer	1	

DATA: Pole1_XMEM1_Origin
 ADT: Cartesian_Point
 DEFINITION: Origin of the second member of the pole extension of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	240.0	inch

Entity: Pole1_XMEM1_N {Instantiated entity}
 INSTANCE-OF: POLE1_MEM_NODES
 DEFINITION: End nodes of the second member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MEMBER_ID	Relational	Pole1_XMEM_1	
END_NODES	Relational	Pole1_X1_N1, Pole1_X1_N2	

Entity: Pole1_X1_N1 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: First node (bottom) of the second member / element of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_XMEM_1	
LOCATES_ELEMENT	Relational	Pole1_XELEM_1	
LOCATES_PART	Relational	Pole1_XShaft_1	
COORDINATES	Abstract	Pole1_Origin	
NODE_ID	String	"6-X-1-N1"	
CONNECTION	Relational	Pole1_X1_X2_CON	

Entity: Pole1_X1_N2 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: Second node (top) of the second member / element of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_XMEM_1	
LOCATES_ELEMENT	Relational	Pole1_XELEM_1	
LOCATES_PART	Relational	Pole1_XShaft_1	
COORDINATES	Abstract	Pole1_XMEM1_EndPNT	
NODE_ID	String	"6-X-1-N2"	

DATA: Pole1_XMEM1_EndPNT
 ADT: Cartesian_Point
 DEFINITION: End Point of the third member of the pole extension of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	714.0	inch

Entity: Pole1_XMEM_2 {Instantiated entity}
 INSTANCE-OF: POLE1_XMEM
 DEFINITION: Third shaft member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LENGTH	Float	370.0	inch
PART	Relational	Pole1_XShaft_2	

CONN_PART	Relational	null
CONN_MEMBER	Relational	null
SUPPORTING_MEMBER	Relational	null
SUPPORTED_MEMBER	Relational	Pole1_XMEM_1
CONNECTION	Relational	Pole1_X1_X2_CON
DESCRIPTION	String	"190 ft. Pole Ext. Member 2"
MEMBER_ID	String	"5-X-MEM-2"
ORIGIN	Abstract	Zero_Origin
END_NODES	Relational	Pole1_XMEM2_N.End_Nodes
ELEMENT	Relational	Pole1_XELEM_2
INDEX	Integer	2

Entity: Pole1_XMEM2_N {Instantiated entity}
INSTANCE-OF: POLE1_MEM_NODES
DEFINITION: End nodes of the second member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MEMBER_ID	Relational	Pole1_XMEM_2	
END_NODES	Relational	Pole1_X2_N1, Pole1_X2_N2	

Entity: Pole1_XELEM2_N {Instantiated entity}
INSTANCE-OF: POLE1_ELEM_NODES
DEFINITION: End nodes of the structural element of the third member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ELEMENT_ID	Relational	Pole1_XELEM_2	
NODE_1	Relational	Pole1_X2_N1	
NODE_2	Relational	Pole1_X2_N2	

Entity: Pole1_X2_N1 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: First node (bottom) of the third member / element of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_XMEM_2	
LOCATES_ELEMENT	Relational	Pole1_XELEM_2	
LOCATES_PART	Relational	Pole1_XShaft_2	
COORDINATES	Abstract	Pole1_Origin	
NODE_ID	String	"6-X-2-N1"	

Entity: Pole1_X2_N2 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: Second node (top) of the third member / element of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_XMEM_2	
LOCATES_ELEMENT	Relational	Pole1_XELEM_2	
LOCATES_PART	Relational	Pole1_XShaft_2	
COORDINATES	Abstract	Pole1_XMEM2_EndPNT	
NODE_ID	String	"6-X-2-N2"	

DATA: Pole1_XMEM2_EndPNT
ADT: Cartesian_Point
DEFINITION: End Point of the third member of the pole extension of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	370.0	inch

Entity: Pole1_SArm {Instantiated entity}
INSTANCE-OF: POLE_MEMBER
DEFINITION: Static arm member of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_SUBSYSTEM	Relational	Pole1_SArm_Set	
LENGTH	Float	69.0	inch
PART	Relational	Pole1_SArm_Shaft, Pole1_SArm_Base_PL	
CONN_PART	Relational	Pole1_SArm_Att_PL	
CONN_MEMBER	Relational	Pole1_BSMEM_0	
SUPPORTING_MEMBER	Relational	null	
SUPPORTED_MEMBER	Relational	null	
CONNECTION	Relational	Pole1_SP_CON	
MATERIAL	Relational	Pole1_SHAFT_Steel	
DESCRIPTION	String	"Pole Static Arm Member"	
MEMBER_ID	String	"5-S-MEM"	
IS_MEMBER	Relational	[POLE_MEMBER]	
ORIGIN	Abstract	Pole1_SArm_Origin	
ORIENTATION	Abstract	Identity_R	
END_NODES	Relational	Pole1_SArm_N.End_Nodes	
ELEMENT	Relational	Pole1_SArm_ELEM	
QUANTITY	Integer	2	

DATA: Pole1_SArm_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the static arm members of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	2270.75	inch

Entity: Pole1_SArm_N {Instantiated entity}
INSTANCE-OF: POLE1_MEM_NODES
DEFINITION: End nodes of the static arm member of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MEMBER_ID	Relational	Pole1_SArm	
END_NODES	Relational	Pole1_SArm_N1, Pole1_SArm_N2	

Entity: Pole1_SArm_N1 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: Second node (end) of the member of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_SArm	
LOCATES_PART	Relational	Pole1_SArm_Shaft	
COORDINATES	Abstract	Pole1_SArm_N1_PNT	
NODE_ID	String	"6-S-MEM-N1"	

DATA: Pole1_SArm_N1_PNT
ADT: Cartesian_Point
DEFINITION: Point of node 1 of the member of a static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	17.593	inch
Z	Float	2270.75	inch

Entity: Pole1_SArm_N2 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: Second node (end) of the member of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_SArm	
LOCATES_PART	Relational	Pole1_SArm_Shaft	
COORDINATES	Abstract	Pole1_SArm_N2_PNT	
NODE_ID	String	"6-S-MEM-N2"	

DATA: Pole1_SArm_N2_PNT
ADT: Cartesian_Point
DEFINITION: Point of node 2 of the member of a static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	85.6911	inch
Z	Float	2270.75	inch

Entity: POLE1_CARM {Typical entity}
IS-A: POLE_MEMBER
DEFINITION: Typical entity of a conductor arm member of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LENGTH	Float	277.1875	inch
SUPPORTING_MEMBER	Relational	null	
SUPPORTED_MEMBER	Relational	null	
MATERIAL	Relational	Pole1_SHAFT_Steel	
IS_MEMBER	Relational	{POLE_MEMBER}	
ORIENTATION	Abstract	Pole1_CArm_R	
QUANTITY	Integer	2	

DATA: Pole1_CArm_R
ADT: Orientation_R
DEFINITION: Global orientation (rotational) matrix R of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X_VECTOR	Direction	Unit_X	
Y_VECTOR	Direction	Pole1_CArm_Y	
Z_VECTOR	Direction	Pole1_CArm_Z	

DATA: Pole1_CArm_Y
ADT: Direction
DEFINITION: Unit Vector in the y direction (along the center line) of the conductor arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	
Y	Float	0.9665	
Z	Float	-0.2576	

DATA: Pole1_CArm_Z
ADT: Direction
DEFINITION: Pole1. Unit Vector in the z direction (perpendicular to the center line) of the conductor arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	
Y	Float	0.2576	
Z	Float	0.9665	

Entity: Pole1_TCArm {Instantiated entity}
INSTANCE-OF: POLE1_CARM
DEFINITION: Top conductor arm member of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_SUBSYSTEM	Relational	Pole1_TCArm_Set	
PART	Relational	Pole1_TCArm_Shaft	
CONN_PART	Relational	Pole1_TCArm_Base_PL	
CONN_MEMBER	Relational	Pole1_TCArm_Att_PL	
CONNECTION	Relational	Pole1_BSMEM_0	
DESCRIPTION	String	Pole1_TCP_CON	
MEMBER_ID	String	"Pole Top Conductor Arm Member"	
END_NODES	String	"5-T-C-MEM"	
ELEMENT	Relational	Pole1_TCArm_N.End_Nodes	
ORIGIN	Relational	Pole1_TCArm_ELEM	
INDEX	Abstract	Pole1_TCArm_Origin	
	Integer	0	

DATA: Pole1_TCArm_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the top conductor arms of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	0.0	inch
Z	Float	2239.4781	inch

Entity: Pole1_TCArm_N {Instantiated entity}
INSTANCE-OF: POLE1_MEM_NODES
DEFINITION: End nodes of the top conductor arm member of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MEMBER_ID	Relational	Pole1_TCArm	
END_NODES	Relational	Pole1_TCArm_N1, Pole1_TCArm_N2	

Entity: Pole1_TCArm_N1 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: Second node (end) of the member of the top conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_TCArm	
LOCATES_PART	Relational	Pole1_TCArm_Shaft	
COORDINATES	Abstract	Pole1_TCArm_N1_PNT	
NODE_ID	String	"6-T-C-MEM-N1"	

DATA: Pole1_TCArm_N1_PNT
ADT: Cartesian_Point
DEFINITION: Point of node 1 of the member of a top conductor arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	28.9133	inch
Z	Float	2231.7980	inch

Entity: Pole1_TCArm_N2 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: Second node (end) of the member of the top conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_MEMBER	Relational	Pole1_TCArm	
LOCATES_PART	Relational	Pole1_TCArm_Shaft	
COORDINATES	Abstract	Pole1_TCArm_N2_PNT	
NODE_ID	String	"6-T-C-MEM-N2"	

DATA: Pole1_TCArm_N2_PNT
ADT: Cartesian_Point
DEFINITION: Point of node 2 of the member of a top conductor arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	294.3947	inch
Z	Float	2161.2794	inch

LEVEL 6: THE ANALYSIS COMPONENTS LEVEL

{NOTATION:

- Slot/Attribute Name in *italics*: Slot/Attribute inherited from parent entities
- Attribute Name in **bold face**: Attribute with default value (also in bold face)
- Slot Value in | |: Mapped to a class of object }

Entity: POLE1_ELEMENT {Typical entity}
 IS-A: POLE_TAPERED_ELEMENT
 DEFINITION: Typical entity representing an element of taper form of Pole1.
 An element is a basic component of the structural model used for analysis.

SLOT NAME	TYPE	VALUE	UNIT
<i>ORIENTATION</i>	Abstract	Identity_R	
<i>CENTERLINE</i>	Abstract	Pole1_CL	
<i>SECTION_DESCRIPTION</i>	String	"12-sided hollow cylindrical cross section"	
<i>IS_ELEMENT</i>	Relational	POLE_TAPERED_ELEMENT	

DATA: Pole1_CL
 ADT: Line
 DEFINITION: Center line of the shaft members of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_Origin	
DIR	Direction	Unit_Z	

Entity: POLE1_ELEM_NODES {Typical entity}
 IS-A: ELEMENT_NODES*
 DEFINITION: Typical entity representing the end nodes of an element of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>END_CONDITION_1</i>	Abstract	Free_End_Condition	
<i>END_CONDITION_2</i>	Abstract	Free_End_Condition	
<i>DEGREES_OF_FREEDOM</i>	Abstract	Pole1_DOF	

DATA: Free_End_Condition
 ADT: End_Condition
 DEFINITION: Free (displacements and rotations) end conditions of a structural member.

FIELD NAME	TYPE	VALUE	UNIT
DISPLACE_X	kConstraint	Free	
DISPLACE_Y	kConstraint	Free	
DISPLACE_Z	kConstraint	Free	
ROTATE_X	kConstraint	Free	
ROTATE_Y	kConstraint	Free	
ROTATE_Z	kConstraint	Free	

DATA: Pole1_DOF
 ADT: Degrees Of Freedom
 DEFINITION: Three-dimensional degrees of freedom (6) of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
TOTAL	Integer	6	

Entity: Pole1_BSELEM_0 {Instantiated entity}
INSTANCE-OF: POLE1_ELEMENT
DEFINITION: Structural element of the first member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_BSMEM_0	
NODE_1	Relational	Pole1_BSELEM0_N.Node_1	
NODE_2	Relational	Pole1_BSELEM0_N.Node_2	
PART	Relational	Pole1_BSShaft_0	
ORIGIN	Abstract	Pole1_BSMEM0_Origin	
LENGTH	Float	480.0	inch
GROSS_CS_AREA	Float	30.296	inch ²
NET_CS_AREA	Float	30.296	inch ²
XX_MOMENT_INERTIA	Float	4664.653	inch ⁴
YY_MOMENT_INERTIA	Float	4664.653	inch ⁴
TORSIONAL_RIGIDITY	Float	12.923	inch ⁴
ELEMENT_ID	String	"6-BS-ELEM-0"	

Entity: Pole1_BSELEM0_N {Instantiated entity}
INSTANCE-OF: POLE1_ELEM_NODES
DEFINITION: End nodes of the structural element of the first member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ELEMENT_ID	Relational	Pole1_BSELEM_0	
NODE_1	Relational	Pole1_BS0_N1	
NODE_2	Relational	Pole1_BS0_N2	
END_CONDITION_1	Abstract	Fixed_End_Condition	

DATA: Fixed_End_Condition
ADT: End Condition
DEFINITION: Fixed (displacements and rotations) end conditions of a structural member.

FIELD NAME	TYPE	VALUE	UNIT
DISPLACE_X	kConstraint	Fixed	
DISPLACE_Y	kConstraint	Fixed	
DISPLACE_Z	kConstraint	Fixed	
ROTATE_X	kConstraint	Fixed	
ROTATE_Y	kConstraint	Fixed	
ROTATE_Z	kConstraint	Fixed	

Entity: Pole1_BSELEM_1 {Instantiated entity}
INSTANCE-OF: POLE1_ELEMENT
DEFINITION: Structural element of the second member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_BSMEM_1	
NODE_1	Relational	Pole1_BSELEM1_N.Node_1	
NODE_2	Relational	Pole1_BSELEM1_N.Node_2	
PART	Relational	Pole1_BSShaft_1	
ORIGIN	Abstract	Pole1_BSMEM1_Origin	
LENGTH	Float	479.0	inch
GROSS_CS_AREA	Float	68.950	inch ²
NET_CS_AREA	Float	68.950	inch ²
XX_MOMENT_INERTIA	Float	19796.569	inch ⁴
YY_MOMENT_INERTIA	Float	19796.569	inch ⁴
TORSIONAL_RIGIDITY	Float	81.557	inch ⁴
ELEMENT_ID	String	"6-BS-ELEM-1"	

Entity: Pole1_BSELEM1_N {Instantiated entity}
INSTANCE-OF: POLE1_ELEM_NODES
DEFINITION: End nodes of the structural element of the second member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ELEMENT_ID	Relational	Pole1_BSELEM_1	
NODE_1	Relational	Pole1_BS1_N1	
NODE_2	Relational	Pole1_BS1_N2	

Entity: Pole1_BSELEM_2 {Instantiated entity}
INSTANCE-OF: POLE1_ELEMENT
DEFINITION: Structural element of the third member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_BSMEM_2	
NODE_1	Relational	Pole1_BSELEM2_N.Node_1	
NODE_2	Relational	Pole1_BSELEM2_N.Node_2	
PART	Relational	Pole1_BSShaft_2	
ORIGIN	Abstract	Pole1_BSMEM2_Origin	
LENGTH	Float	479.0	inch
GROSS_CS_AREA	Float	103.254	inch ²
NET_CS_AREA	Float	103.254	inch ²
XX_MOMENT_INERTIA	Float	46167.612	inch ⁴
YY_MOMENT_INERTIA	Float	46167.612	inch ⁴
TORSIONAL_RIGIDITY	Float	175.937	inch ⁴
ELEMENT_ID	String	"6-BS-ELEM-2"	

Entity: Pole1_XELEM_0 {Instantiated entity}
INSTANCE-OF: POLE1_ELEMENT
DEFINITION: Structural element of the first member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_XMEM_0	
NODE_1	Relational	Pole1_XELEM0_N.Node_1	
NODE_2	Relational	Pole1_XELEM0_N.Node_2	
PART	Relational	Pole1_XShaft_0	
ORIGIN	Abstract	Pole1_XMEM0_Origin	
LENGTH	Float	478.0	inch
GROSS_CS_AREA	Float	136.172	inch ²
NET_CS_AREA	Float	136.172	inch ²
XX_MOMENT_INERTIA	Float	85774.989	inch ⁴
YY_MOMENT_INERTIA	Float	85774.989	inch ⁴
TORSIONAL_RIGIDITY	Float	286.622	inch ⁴
ELEMENT_ID	String	"6-X-ELEM-0"	

Entity: Pole1_XELEM0_N {Instantiated entity}
INSTANCE-OF: POLE1_ELEM_NODES
DEFINITION: End nodes of the structural element of the first member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ELEMENT_ID	Relational	Pole1_XELEM_0	
NODE_1	Relational	Pole1_X0_N1	
NODE_2	Relational	Pole1_X0_N2	

Entity: Pole1_XELEM_1 {Instantiated entity}
INSTANCE-OF: POLE1_ELEMENT
DEFINITION: Structural element of the second member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_XMEM_1	
NODE_1	Relational	Pole1_XELEM1_N.Node_1	
NODE_2	Relational	Pole1_XELEM1_N.Node_2	
PART	Relational	Pole1_XShaft_1	
ORIGIN	Abstract	Pole1_XMEM1_Origin	
LENGTH	Float	474.0	inch
GROSS_CS_AREA	Float	163.960	inch ²
NET_CS_AREA	Float	163.960	inch ²
XX_MOMENT_INERTIA	Float	135808.84	inch ⁴
YY_MOMENT_INERTIA	Float	135808.84	inch ⁴
TORSIONAL_RIGIDITY	Float	380.764	inch ⁴
ELEMENT_ID	String	"6-X-ELEM-1"	

Entity: Pole1_XELEM1_N {Instantiated entity}
INSTANCE-OF: POLE1_ELEM_NODES
DEFINITION: End nodes of the structural element of the second member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ELEMENT_ID	Relational	Pole1_XELEM_1	
NODE_1	Relational	Pole1_X1_N1	
NODE_2	Relational	Pole1_X1_N2	

Entity: Pole1_XELEM_2 {Instantiated entity}
INSTANCE-OF: POLE1_ELEMENT
DEFINITION: Structural element of the third member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_XMEM_2	
NODE_1	Relational	Pole1_XELEM2_N.Node_1	
NODE_2	Relational	Pole1_XELEM2_N.Node_2	
PART	Relational	Pole1_XShaft_2	
ORIGIN	Abstract	Pole1_Origin	
LENGTH	Float	370.0	inch
GROSS_CS_AREA	Float	176.757	inch ²
NET_CS_AREA	Float	176.757	inch ²
XX_MOMENT_INERTIA	Float	170152.963	inch ⁴
YY_MOMENT_INERTIA	Float	170152.963	inch ⁴
TORSIONAL_RIGIDITY	Float	410.719	inch ⁴
ELEMENT_ID	String	"6-X-ELEM-2"	

Entity: Pole1_SArm_ELEM {Instantiated entity}
INSTANCE-OF: POLE1_ELEMENT
DEFINITION: Structural element of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_SArm	
NODE_1	Relational	Pole1_SArm_ELEM_N.Node_1	
NODE_2	Relational	Pole1_SArm_ELEM_N.Node_2	
PART	Relational	Pole1_SArm_Shaft	
ORIGIN	Abstract	Pole1_SArm_Origin	
LENGTH	Float	69.0	inch

GROSS_CS_AREA	Float	3.26953	inch ²
NET_CS_AREA	Float	3.26953	inch ²
XX_MOMENT_INERTIA	Float	13.20480	inch ⁴
YY_MOMENT_INERTIA	Float	13.20480	inch ⁴
TORSIONAL_RIGIDITY	Float	0.60459	inch ⁴
ELEMENT_ID	String	"6-S-ELEM"	
ORIENTATION	Abstract	Identity_R	
CENTERLINE	Abstract	Pole1_SArm_CL	
SECTION_DESCRIPTION	String	"Straight 12-sided hollow cylinder"	
END_CONDITION_1	Abstract	Fixed_End_Condition	

DATA: Pole1_SArm_CL
 ADT: Line
 DEFINITION: Center line of a static arm member of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_SArm_Origin	
DIR	Direction	Unit_Y	

Entity: Pole1_SArm_ELEM_N {Instantiated entity}
 INSTANCE-OF: POLE1_ELEM_NODES
 DEFINITION: End nodes of the structural element of the static arm of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ELEMENT_ID	Relational	Pole1_SArm_ELEM	
NODE_1	Relational	Pole1_SArm_ELEM_N1	
NODE_2	Relational	Pole1_SArm_ELEM_N2	

Entity: Pole1_SArm_ELEM_N1 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: First node (center) of the element of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_ELEMENT	Relational	Pole1_SArm_ELEM	
COORDINATES	Abstract	Pole1_SArm_Origin	
NODE_ID	String	"6-S-ELEM-N1"	

Entity: Pole1_SArm_ELEM_N2 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: First node (center) of the element of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_ELEMENT	Relational	Pole1_SArm_ELEM	
COORDINATES	Abstract	Pole1_SArm_ELEM_EndPNT	
NODE_ID	String	"6-S-ELEM-N2"	

DATA: Pole1_SArm_ELEM_EndPNT
 ADT: Cartesian_Point
 DEFINITION: End Point of the element of a static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	68.5625	inch
Z	Float	2270.75	inch

Entity: Pole1_CArm_ELEM {Typical entity}
 IS-A: POLE1_ELEMENT
 DEFINITION: Typical entity representing a structural element of the conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LENGTH	Float	275.9375	inch
GROSS_CS_AREA	Float	14.70703	inch ²
NET_CS_AREA	Float	14.70703	inch ²
XX_MOMENT_INERTIA	Float	432.388	inch ⁴
YY_MOMENT_INERTIA	Float	432.388	inch ⁴
TORSIONAL_RIGIDITY	Float	7.65071	inch ⁴
ORIENTATION	Abstract	Pole1_CArm_R	
END_CONDITION_1	Abstract	Fixed_End_Condition	

Entity: Pole1_TCArm_ELEM {Instantiated entity}
 INSTANCE-OF: POLE1_ELEMENT
 DEFINITION: Structural element of the top conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_TCArm	
NODE_1	Relational	Pole1_TCArm_ELEM_N.Node_1	
NODE_2	Relational	Pole1_TCArm_ELEM_N.Node_2	
PART	Relational	Pole1_TCArm_Shaft	
ORIGIN	Abstract	Pole1_TCArm_Origin	
ELEMENT_ID	String	"6-T-C-ELEM"	
CENTERLINE	Abstract	Pole1_TCArm_CL	

DATA: Pole1_TCArm_CL
 ADT: Line
 DEFINITION: Center line of a top conductor arm member of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_TCArm_Origin	
DIR	Direction	Pole1_CArm_Y	

Entity: Pole1_TCArm_ELEM_N {Instantiated entity}
 INSTANCE-OF: POLE1_ELEMENT_NODES
 DEFINITION: End nodes of the structural element of the top conductor arm of the pole extension.

SLOT NAME	TYPE	VALUE	UNIT
ELEMENT_ID	Relational	Pole1_TCArm_ELEM	
NODE_1	Relational	Pole1_TCArm_ELEM_N1	
NODE_2	Relational	Pole1_TCArm_ELEM_N2	

Entity: Pole1_TCArm_ELEM_N1 {Instantiated entity}
 INSTANCE-OF: NODE
 DEFINITION: First node (center) of the element of the top conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_ELEMENT	Relational	Pole1_TCArm_ELEM	
COORDINATES	Abstract	Pole1_TCArm_Origin	
NODE_ID	String	"6-T-C-ELEM-N1"	

Entity: Pole1_TCArm_ELEM_N2 {Instantiated entity}
INSTANCE-OF: NODE
DEFINITION: First node (center) of the element of the top conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
LOCATES_ELEMENT	Relational	Pole1_TCArm_ELEM	
COORDINATES	Abstract	Pole1_TCArm_ELEM_EndPNT	
NODE_ID	String	"6-T-C-ELEM-N2"	

DATA: Pole1_TCArm_ELEM_EndPNT
ADT: Cartesian_Point
DEFINITION: End Point of the element of a top conductor arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	266.6895	inch
Z	Float	2161.6386	inch

LEVEL 7: THE PARTS LEVEL

{NOTATION:

- Slot/Attribute Name in *italics*: Slot/Attribute inherited from parent entities
- Attribute Name in **bold face**: Attribute with default value (also in bold face)
- Slot Value in | |: Mapped to a class of object }

Entity: POLE1_TAPER_SHAFT_PART {Typical entity}

IS-A: POLE_SHAFT_PART

DEFINITION: Typical entity representing a shaft part of tapered form of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>CENTERLINE</i>	Abstract	Pole1_CL	
<i>ORIENTATION</i>	Abstract	Identity_R	
<i>MATERIAL</i>	Relational	Pole1_Shaft_Steel	
<i>IS_PART</i>	Relational	{POLE_SHAFT_PART}	
<i>DESCRIPTION</i>	String	"Tapered 12-sided Hollow Cylindrical shaft part"	
<i>CREATED_DATE_TIME</i>	Abstract	Pole1_Created_Date_Time	
<i>MODIFIED_DATE_TIME</i>	Abstract	Pole1_Modified_Date_Time	
<i>SHAPE_PART_TYPE</i>	String	"T12HC"	
<i>SHAPE_CLEARANCE</i>	Float	0.0	
<i>SHAPE_SURF_OFFSET</i>	Float	0.0	
TAPER	Float	0.0337	
SHAPE_FORM	String	"Tapered"	

DATA: Pole1_Created_Date_Time

ADT: Date_Time

DEFINITION: Date and time at which the parts of Pole1 are created. This is taken to be the aaa date and the time at which the drawings of Pole1 are first created.

FIELD NAME	TYPE	VALUE	UNIT
D	DATE	Pole1_Created_Date	
T	TIME	Pole1_Standard_Time	

DATA: Pole1_Created_Date

ADT: DATE

DEFINITION: Date at which the parts of Pole1 are created. This is taken to be the date on which the drawings of Pole1 are first created.

FIELD NAME	TYPE	VALUE	UNIT
YEAR	Integer	1987	
MONTH	Integer	4	
DAY	Integer	28	

DATA: Pole1_Standard_Time

ADT: TIME

DEFINITION: Time chosen to be the standard time for parts creation, revision, and approval of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
HOUR	Integer	9	hour
MINUTE	Integer	0	minute
SECOND	Integer	0.0	second

DATA: Pole1_Modified_Date_Time
ADT: Date_Time
DEFINITION: Date and time at which the parts of Pole1 are modified. This is taken to be when the drawings of Pole1 are first revised and corrected.

FIELD NAME	TYPE	VALUE	UNIT
D	DATE	Pole1_Created_Date	
T	TIME	Pole1_Standard_Time	

DATA: Pole1_Modified_Date
ADT: DATE
DEFINITION: Date at which the parts of Pole1 are modified. This is taken to be the date on which the drawings of Pole1 are first revised and corrected.

FIELD NAME	TYPE	VALUE	UNIT
YEAR	Integer	1987	
MONTH	Integer	5	
DAY	Integer	29	

Entity: Pole1_BSShaft_0 {Instantiated entity}
INSTANCE-OF: POLE1_TAPER_SHAFT_PART
DEFINITION: Shaft part of the first member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_BSMEM_0	
CONN_TO_MEMBER	Relational	Pole1_BSMEM_1, Pole1_SArm, Pole1_TCArm, Pole1_MCArm	
IN_ELEMENT	Relational	Pole1_BSELEM_0	
CONN_TO_ELEMENT	Relational	Pole1_BSELEM_1	
CONN_PARTS	Relational	Pole1_SArm_Shaft, Pole1_TCArm_Shaft, Pole1_MCArm_Shaft	
CONNECTION	Relational	Pole1_BS0_BS1_CON, Pole1_SP_CON, Pole1_TCP_CON, Pole1_MCP_CON	
CONNECTION_METHOD	Relational	Pole1_B0_B1_COM, Pole1_SArm_OUT_COM, Pole1_TCArm_OUT_COM, Pole1_MCArm_OUT_COM	
NODE	Relational	Pole1_BS0_N1, Pole1_BS0_N2	
ORIGIN	Abstract	Pole1_BSMEM0_Origin	
PART_ID	String	"7-BS-SHAFT-0"	
SHAPE_REFERENCE_PT	Abstract	Pole1_BSMEM0_Origin	
CROSS_SECTION	Relational	Pole1_BS0_Cross_Section	
NC_MARK	Relational	Pole1_BSShaft0_MK	
BLACK_WEIGHT	Float	3423.2	pounds

Entity: POLE1_SHAFT_CROSS_SECTION {Typical entity}
IS-A: POLE_SHAFT_CROSS_SECTION
DEFINITION: Typical entity representing the cross section of a 12-sided hollow cylindrical shaft part of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CROSS_SECTION_TYPE	String	"N"	
N_SIDES	Integer	12	

Entity: Pole1_BS0_Cross_Section {Instantiated entity}
INSTANCE-OF: POLE1_SHAFT_CROSS_SECTION
DEFINITION: Cross section of the shaft part of the first member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
OUTER_DIAMETER	Float	36.1875	inch
THICKNESS	Float	0.28125	inch

Entity: Pole1_BSShaft0_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the shaft part of the first member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_NC_MARK_ID	String	"7-BS-SHAFT-0-MK"	
NC_MARK_TEXT_STRING	String	"0501a"	

Entity: Pole1_BSShaft_1 {Instantiated entity}
INSTANCE-OF: POLE1_TAPER_SHAFT_PART
DEFINITION: Shaft part of the second member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_BSMEM_1	
CONN_TO_MEMBER	Relational	Pole1_BSMEM_0, Pole1_BSMEM_2	
		Pole1_BCArm	
IN_ELEMENT	Relational	Pole1_BSELEM_1	
CONN_TO_ELEMENT	Relational	Pole1_BSELEM_0, Pole1_BSELEM_2	
CONN_PARTS	Relational	Pole1_BSShaft_0, Pole1_BSShaft_2	
		Pole1_BCArm_Shaft	
CONNECTION	Relational	Pole1_BS0_BS1_GON, Pole1_BS1_BS2_CON	
		Pole1_BCP_CON	
CONNECTION_METHOD	Relational	Pole1_B0_B1_COM, Pole1_B1_B2_COM	
		Pole1_BCArm_OUT_COM	
NODE	Relational	Pole1_BS1_N1, Pole1_BS1_N2	
ORIGIN	Abstract	Pole1_BSMEM1_Origin	
PART_ID	String	"7-BS-SHAFT-1"	
SHAPE_REFERENCE_PT	Abstract	Pole1_BSMEM1_Origin	
CROSS_SECTION	Relational	Pole1_BS1_Cross_Section	
NC_MARK	Relational	Pole1_BSShaft1_MK	
BLACK_WEIGHT	Float	8386.5	pounds

Entity: Pole1_BS1_Cross_Section {Instantiated entity}
INSTANCE-OF: POLE1_SHAFT_CROSS_SECTION
DEFINITION: Cross section of the shaft part of the second member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
OUTER_DIAMETER	Float	49.5	inch
THICKNESS	Float	0.46875	inch

Entity: Pole1_BSShaft1_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the shaft part of the second member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-BS-SHAFT-1-MK"	
NC_MARK_TEXT_STRING	String	"0601a"	

Entity: Pole1_BSShaft_2 {Instantiated entity}
INSTANCE-OF: POLE1_TAPER_SHAFT_PART
DEFINITION: Shaft part of the third member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_BSMEM_2	
CONN_TO_MEMBER	Relational	Pole1_BSMEM_1, Pole1_XMEM_0	
IN_ELEMENT	Relational	Pole1_BSELEM_2	
CONN_TO_ELEMENT	Relational	Pole1_BSELEM_1, Pole1_XELEM_0	

CONN PARTS	Relational	Pole1_BSShaft 1, Pole1_XShaft 0	
CONNECTION	Relational	Pole1_BS1_BS2_CON, Pole1_BS2_X0_CON	
CONNECTION_METHOD	Relational	Pole1_B1_B2_COM, Pole1_B2_X0_COM	
NODE	Relational	Pole1_BS2_N1, Pole1_BS2_N2	
ORIGIN	Abstract	Pole1_BSMEM2_Origin	
PART_ID	String	"7-BS-SHAFT-2"	
SHAPE_REFERENCE_PT	Abstract	Pole1_BSMEM2_Origin	
CROSS_SECTION	Relational	Pole1_BS2_Cross_Section	
NC_MARK	Relational	Pole1_BSShaft2_MK	
BLACK_WEIGHT	Float	13050.2	pounds

Entity: Pole1_BS2_Cross_Section {Instantiated entity}
INSTANCE-OF: POLE1_SHAFT_CROSS_SECTION
DEFINITION: Cross section of the shaft part of the third member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
OUTER DIAMETER	Float	61.75	inch
THICKNESS	Float	0.5625	inch

Entity: Pole1_BSShaft2_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the shaft part of the third member of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-BS-SHAFT-2-MK"	
NC_MARK_TEXT_STRING	String	"0801a"	

Entity: Pole1_XShaft_0 {Instantiated entity}
INSTANCE-OF: POLE1_TAPER_SHAFT_PART
DEFINITION: Shaft part of the first member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_XMEM0	
CONN_TO_MEMBER	Relational	Pole1_BSMEM2, Pole1_XMEM1	
IN_ELEMENT	Relational	Pole1_XELEM0	
CONN_TO_ELEMENT	Relational	Pole1_BSELEM2, Pole1_XELEM1	
CONN_PARTS	Relational	Pole1_BSShaft2, Pole1_XShaft1	
CONNECTION	Relational	Pole1_BS2_X0_CON, Pole1_X0_X1_CON	
CONNECTION_METHOD	Relational	Pole1_B2_X0_COM, Pole1_X0_X1_COM	
NODE	Relational	Pole1_X0_N1, Pole1_X0_N2	
ORIGIN	Abstract	Pole1_XMEM0_Origin	
PART_ID	String	"7-X-SHAFT-0"	
SHAPE_REFERENCE_PT	Abstract	Pole1_XMEM0_Origin	
CROSS_SECTION	Relational	Pole1_X0_Cross_Section	
NC_MARK	Relational	Pole1_XShaft0_MK	
BLACK_WEIGHT	Float	17854.5	pounds

Entity: Pole1_X0_Cross_Section {Instantiated entity}
INSTANCE-OF: POLE1_SHAFT_CROSS_SECTION
DEFINITION: Cross section of the shaft part of the first member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
OUTER DIAMETER	Float	73.25	inch
THICKNESS	Float	0.625	inch

Entity: Pole1_XShaft0_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the shaft part of the first member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-BS-SHAFT-0-MK"	
NC_MARK_TEXT_STRING	String	"0802a"	

Entity: Pole1_XShaft_1 {Instantiated entity}
INSTANCE-OF: POLE1_TAPER_SHAFT_PART
DEFINITION: Shaft part of the second member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_XMEM_1	
CONN_TO_MEMBER	Relational	Pole1_XMEM_0, Pole1_XMEM_2	
IN_ELEMENT	Relational	Pole1_XELEM_1	
CONN_TO_ELEMENT	Relational	Pole1_XELEM_0, Pole1_XELEM_2	
CONN_PARTS	Relational	Pole1_XShaft_0, Pole1_XShaft_2	
CONNECTION	Relational	Pole1_X0_X1_CON, Pole1_X1_X2_CON	
CONNECTION_METHOD	Relational	Pole1_X0_X1_COM, Pole1_X1_X2_COM	
NODE	Relational	Pole1_X1_N1, Pole1_X1_N2	
ORIGIN	Abstract	Pole1_XMEM1_Origin	
PART_ID	String	"7-X-SHAFT-1"	
SHAPE_REFERENCE_PT	Abstract	Pole1_XMEM1_Origin	
CROSS_SECTION	Relational	Pole1_X1_Cross_Section	
NC_MARK	Relational	Pole1_XShaft1_MK	
BLACK_WEIGHT	Float	21348.8	pounds

Entity: Pole1_X1_Cross_Section {Instantiated entity}
INSTANCE-OF: POLE1_SHAFT_CROSS_SECTION
DEFINITION: Cross section of the shaft part of the second member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
OUTER DIAMETER	Float	83.9375	inch
THICKNESS	Float	0.65625	inch

Entity: Pole1_XShaft1_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the shaft part of the second member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-X-SHAFT-1-MK"	
NC_MARK_TEXT_STRING	String	"0901a"	

Entity: Pole1_XShaft_2 {Instantiated entity}
INSTANCE-OF: POLE1_TAPER_SHAFT_PART
DEFINITION: Shaft part of the third member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_XMEM_2	
CONN_TO_MEMBER	Relational	Pole1_XMEM_1	
IN_ELEMENT	Relational	Pole1_XELEM_0	
CONN_TO_ELEMENT	Relational	Pole1_XELEM_1	
CONN_PARTS	Relational	Pole1_XShaft_1	
CONNECTION	Relational	Pole1_X1_X2_CON	
CONNECTION_METHOD	Relational	Pole1_X1_X2_COM	
NODE	Relational	Pole1_X2_N1, Pole1_X2_N2	
ORIGIN	Abstract	Pole1_Origin	

PART_ID String "7-X-SHAFT-2"
SHAPE_REFERENCE_PT Abstract Pole1_Origin
CROSS_SECTION Relational Pole1_X2_Cross_Section
NC_MARK Relational Pole1_XShaft_2_MK
BLACK_WEIGHT Float 18499.5 pounds

Entity: Pole1_X2_Cross_Section {Instantiated entity}
INSTANCE-OF: POLE1_SHAFT_CROSS_SECTION
DEFINITION: Cross section of the shaft part of the third member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
OUTER DIAMETER	Float	90.4375	inch
THICKNESS	Float	0.65625	inch

Entity: Pole1_XShaft2_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the shaft part of the third member of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-X-SHAFT-2-MK"	
NC_MARK_TEXT_STRING	String	"1202a"	

Entity: Pole1_SArm_Shaft {Instantiated entity}
INSTANCE-OF: POLE1_TAPER_SHAFT_PART
DEFINITION: Shaft part of a static arm (with no taper) of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN_MEMBER</i>	Relational	Pole1_SArm	
<i>CONN_TO_MEMBER</i>	Relational	Pole1_BSMEM_0	
<i>IN_ELEMENT</i>	Relational	Pole1_SArm_ELEM	
<i>CONN_TO_ELEMENT</i>	Relational	Pole1_BSELEM_0	
<i>CONN_PARTS</i>	Relational	Pole1_SArm_ATT_PL	
<i>CONNECTION</i>	Relational	Pole1_SP_CON	
<i>CONNECTION_METHOD</i>	Relational	Pole1_SArm_Base_COM Pole1_SArm_ATT_COM	
<i>NODE</i>	Relational	Pole1_SArm_N1, Pole1_SArm_N2	
<i>ORIGIN</i>	Abstract	Pole1_SArm_N1_PNT	
<i>PART_ID</i>	String	"7-S-SHAFT"	
<i>SHAPE_REFERENCE_PT</i>	Abstract	Pole1_SArm_N1_PNT	
<i>CROSS_SECTION</i>	Relational	Pole1_SArm_Cross_Section	
<i>SHAPE_CLEARANCE</i>	Float	17.5661	inch
<i>CENTERLINE</i>	Abstract	Pole1_SArm_CL	
<i>NC_MARK</i>	Relational	Pole1_SArm_Shaft_MK	
<i>BLACK_WEIGHT</i>	Float	70.3	pounds
<i>TAPER</i>	Float	0.0	
<i>SHAPE_FORM</i>	String	"Straight"	

Entity: Pole1_SArm_Cross_Section {Instantiated entity}
INSTANCE-OF: POLE1_SHAFT_CROSS_SECTION
DEFINITION: Cross section of the shaft part of a static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
OUTER DIAMETER	Float	6.0	inch
THICKNESS	Float	0.1875	inch

Entity: Pole1_SArm_Shaft_MK {Instantiated entity}

INSTANCE-OF: POLE_NC_MARK
 DEFINITION: NC Mark on the shaft part of a static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-S-SHAFT-MK"	
NC_MARK_TEXT_STRING	String	"0301e"	

Entity: POLE1_CARM_SHAFT {Typical entity}
 IS-A: POLE1_TAPER_SHAFT_PART
 DEFINITION: Typical entity representing a shaft part of a conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CROSS_SECTION	Relational	Pole1_CArm_Cross_Section	
ORIENTATION	Abstract	Pole1_CArm_R	
TAPER	Float	0.03624	
NC_MARK	Relational	POLE1_CARM_SHAFT_MK	
BLACK_WEIGHT	Float	865.9	pounds

Entity: Pole1_TCArm_Shaft {Instantiated entity}
 INSTANCE-OF: POLE1_CARM_SHAFT
 DEFINITION: Shaft part of a top conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_MEMBER	Relational	Pole1_TCArm	
CONN_TO_MEMBER	Relational	Pole1_BSMEM_0	
IN_ELEMENT	Relational	Pole1_TCArm_ELEM	
CONN_TO_ELEMENT	Relational	Pole1_BSELEM_0	
CONN_PARTS	Relational	Pole1_TCArm_ATT_PL	
CONNECTION	Relational	Pole1_TCP_CON	
CONNECTION_METHOD	Relational	Pole1_TCArm_Base_COM	
		Pole1_TCArm_ATT_COM	
NODE	Relational	Pole1_TCArm_N1	
		Pole1_TCArm_N2	
ORIGIN	Abstract	Pole1_TCArm_N1_PNT	
PART_ID	String	"7-T-C-SHAFT"	
SHAPE_REFERENCE_PT	Abstract	Pole1_TCArm_N1_PNT	
SHAPE_CLEARANCE	Float	28.9133	inch
CENTERLINE	Abstract	Pole1_TCArm_CL	

Entity: Pole1_CArm_Cross_Section {Instantiated entity}
 IS-A: POLE1_SHAFT_CROSS_SECTION
 DEFINITION: Cross section of the shaft part of a conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
OUTER_DIAMETER	Float	16.0	inch
THICKNESS	Float	0.3125	inch

Entity: POLE1_CARM_SHAFT_MK {Instantiated entity}
 INSTANCE-OF: POLE_NC_MARK
 DEFINITION: NC Mark on the shaft part of a conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-C-SHAFT-MK"	
NC_MARK_TEXT_STRING	String	"0401h"	

Entity: POLE1_BRACKET_PLATE {Typical entity}

INSTANCE-OF: POLE_BRACKET_PLATE
 DEFINITION: Typical entity representing a bracket plate part of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MATERIAL	Relational	Pole1_PL_Steel	
IS_PART	Relational	POLE_BRACKET_PLATE	
DESCRIPTION	String	"Bracket Plate of Pole 1"	
CREATED_DATE_TIME	Abstract	Pole1_Created_Date_Time	
MODIFIED_DATE_TIME	Abstract	Pole1_Modified_Date_Time	

Entity: POLE1_SARM_HORZ_PL {Typical entity}

INSTANCE-OF: POLE1_BRACKET_PLATE
 DEFINITION: Typical entity representing a horizontal (top or bottom) plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ORIENTATION	Abstract	Pole1_HORZ_PL_R	
CONN_TO_MEMBER	Relational	Pole1_BSMEM_0	
CONN_PARTS	Relational	Pole1_SArm_MID_STIF, Pole1_SArm_ATT_PL, Pole1_BSShaft_0	
CONNECTION	Relational	Pole1_SP_CON	
CONNECTION_METHOD	Relational	Pole1_SArm_PL_COM	
PLATE_THICKNESS	Float	0.5	inch

DATA: Pole1_HORZ_PL_R

ADT: Orientation_R
 DEFINITION: Orientation (rotational) matrix R of a horizontal plate part (parallel to the global y direction).

FIELD NAME	TYPE	VALUE	UNIT
X_VECTOR	Direction	Unit_Negative_X	
Y_VECTOR	Direction	Unit_Negative_Y	
Z_VECTOR	Direction	Unit_Z	

DATA: Unit_Negative_X

ADT: Direction
 DEFINITION: Unit Vector in the negative x direction.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-1.0	
Y	Float	0.0	
Z	Float	0.0	

DATA: Unit_Negative_Y

ADT: Direction
 DEFINITION: Unit Vector in the negative y direction.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	
Y	Float	-1.0	
Z	Float	0.0	

Entity: Pole1_SArm_Top_PL {Instantiated entity}

INSTANCE-OF: POLE1_SARM_HORZ_PL
 DEFINITION: Top plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_SArm_TPL_CL	
ORIGIN	Abstract	Pole1_SArm_TPL_Origin	
PART_ID	String	"7-S-ARM-T-PL"	
OPENING	Relational	Pole1_SArm_TPL_Hole1, Pole1_SArm_TPL_Hole2	
NC_MARK	Relational	Pole1_SArm_TPL_MK	
BLACK_WEIGHT	Float	33.5	pounds
WIDTH	Float	25.75	inch
HEIGHT	Float	14.4375	inch
DIMENSION_A	Float	20.25	inch
DIMENSION_B	Float	2.61	inch
DIMENSION_C	Float	4.082	inch
DIMENSION_D	Float	5.426	inch
DIMENSION_F	Float	4.119	inch
DIMENSION_G	Float	1.881	inch
DIMENSION_H	Float	2.5258	inch
DIMENSION_I	Float	4.802	inch
DIMENSION_J	Float	1.1098	inch
DIMENSION_K	Float	7.125	inch

DATA: Pole1_SArm_TPL_Origin
 ADT: Cartesian Point
 DEFINITION: Origin of the top plate of the static to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	8.874	inch
Z	Float	2276.75	inch

DATA: Pole1_SArm_TPL_CL
 ADT: Line
 DEFINITION: Center line of the top plate of the static to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian Point	Pole1_SArm_TPL_Origin	
DIR	Direction	Unit_Negative_Y	

Entity: Pole1_SArm_TPL_MK {Instantiated entity}
 INSTANCE-OF: POLE_NC_MARK
 DEFINITION: NC Mark on the top plate of the static to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-S-ARM-T-PL-MK"	
NC_MARK_TEXT_STRING	String	"0701"	

Entity: POLE1_BOLT_HOLE {Typical entity}
 INSTANCE-OF: POLE_ROUND_OPENING
 DEFINITION: Typical entity representing a bolt hole in a plate part of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_TYPE	String	"Bolt Hole"	
UNIT_VECTOR	Relational	Unit_Z	

Entity: POLE_SARM_TPL_HOLE {Typical entity}

INSTANCE-OF: POLE1_BOLT_HOLE
 DEFINITION: Typical bolt hole in the top plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_Top_PL	
HOLE_DIAMETER	Float	0.4375	inch

Entity: Pole1_SArm_TPL_Hole1 {Instantiated entity}
 INSTANCE-OF: POLE_SARM_TPL_HOLE
 DEFINITION: Bolt hole 1 of the top plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-T-PL-HOLE-1"	
NODE	Abstract	Pole1_SArm_TPL_Hole1_N	

DATA: Pole1_SArm_TPL_Hole1_N
 ADT: Cartesian_Point
 DEFINITION: Center node of bolt hole 1 of the top plate of the static arm to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	11.625	inch
Y	Float	2.40625	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_TPL_Hole2 {Instantiated entity}
 INSTANCE-OF: POLE_SARM_TPL_HOLE
 DEFINITION: Bolt hole 2 of the top plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-T-PL-HOLE-2"	
NODE	Abstract	Pole1_SArm_TPL_Hole2_N	

DATA: Pole1_SArm_TPL_Hole2_N
 ADT: Cartesian_Point
 DEFINITION: Center node of bolt hole 2 of the top plate of the static arm to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-11.625	inch
Y	Float	2.40625	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_BOT_PL {Instantiated entity}
 INSTANCE-OF: POLE1_SARM_HORZ_PL
 DEFINITION: BOTtom plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_SArm_BPL_CL	
ORIGIN	Abstract	Pole1_SArm_BPL_Origin	
PART_ID	String	"7-S-ARM-B-PL"	
OPENING	Relational	Pole1_SArm_BPL_Hole1 Pole1_SArm_BPL_Hole2	
NC_MARK	Relational	Pole1_SArm_BPL_MK	
BLACK_WEIGHT	Float	33.4	pounds
WIDTH	Float	26.125	inch
HEIGHT	Float	14.4375	inch
DIMENSION_A	Float	20.625	inch
DIMENSION_B	Float	2.6585	inch

DIMENSION_C	Float	4.891	inch
DIMENSION_D	Float	5.526	inch
DIMENSION_F	Float	4.228	inch
DIMENSION_G	Float	1.5845	inch
DIMENSION_H	Float	2.573	inch
DIMENSION_I	Float	4.891	inch
DIMENSION_J	Float	1.0985	inch
DIMENSION_K	Float	7.3125	inch

DATA: Pole1_SArm_BPL_CL
ADT: Line
DEFINITION: Center line of the bottom plate of the static to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_SArm_BPL_Origin	
DIR	Direction	Unit_Negative_Y	

DATA: Pole1_SArm_BPL_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the bottom plate of the static to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	8.9055	inch
Z	Float	2264.75	inch

Entity: Pole1_SArm_BPL_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the bottom plate of the static to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-S-ARM-B-PL-MK"	
NC_MARK_TEXT_STRING	String	"0702"	

Entity: POLE1_SARM_BPL_HOLE {Typical entity}
INSTANCE-OF: POLE1_BOLT_HOLE
DEFINITION: Typical bolt hole in the bottom plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_BOT_PL	
HOLE_DIAMETER	Float	0.4375	inch

Entity: Pole1_SArm_BPL_Hole1 {Instantiated entity}
INSTANCE-OF: POLE1_SARM_BPL_HOLE
DEFINITION: Bolt hole 1 of the bottom plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-B-PL-HOLE-1"	
NODE	Abstract	Pole1_SArm_BPL_Hole1_N	

DATA: Pole1_SArm_BPL_Hole1_N
ADT: Cartesian_Point
DEFINITION: Center node of bolt hole 1 of the bottom plate of the static arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-11.8125	inch
Y	Float	2.375	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_BPL_Hole2 {Instantiated entity}

INSTANCE-OF: POLE1_SARM_BPL_HOLE
 DEFINITION: Bolt hole 2 of the bottom plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-B-PL-HOLE-2"	
NODE	Abstract	Pole1_SArm_BPL_Hole2_N	

DATA: Pole1_SArm_BPL_Hole2_N
 ADT: Cartesian_Point
 DEFINITION: Center node of bolt hole 2 of the bottom plate of the static arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	11.8125	inch
Y	Float	2.375	inch
Z	Float	0.0	inch

Entity: POLE1_PLATE_PART {Typical entity}

INSTANCE-OF: POLE_PLATE_PART
 DEFINITION: Typical entity representing a plate part of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
MATERIAL	Relational	Pole1_PL_Steel	
IS_PART	Relational	{POLE_PLATE_PART}	
DESCRIPTION	String	"Plate Part of Pole 1"	
CREATED_DATE_TIME	Abstract	Pole1_Created_Date_Time	
MODIFIED_DATE_TIME	Abstract	Pole1_Modified_Date_Time	

Entity: Pole1_SArm_ATT_PL {Instantiated entity}

INSTANCE-OF: POLE1_PLATE_PART
 DEFINITION: Attachment plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_SArm_ATT_PL_CL	
ORIENTATION	Abstract	Pole1_VERT_PL_R	
CONN_TO_MEMBER	Relational	Pole1_SArm	
CONN_PARTS	Relational	Pole1_SArm_MID_STIF, Pole1_SArm_Top_PL Pole1_SArm_BOT_PL, Pole1_SArm_Base_PL	
CONNECTION	Relational	Pole1_SP_CON	
CONNECTION_METHOD	Relational	Pole1_SArm_PL_COM, Pole1_SArm_ATT_COM	
ORIGIN	Relational	Pole1_SArm_ATT_PL_Origin	
PART_ID	String	"7-S-ARM-ATT-PL"	
OPENING	Relational	Pole1_SArm_ATT_PL_Hole1 Pole1_SArm_ATT_PL_Hole2 Pole1_SArm_ATT_PL_Hole3 Pole1_SArm_ATT_PL_Hole4 Pole1_SArm_ATT_PL_CL_Hole	
NC_MARK	Relational	Pole1_SArm_ATT_PL_MK	
BLACK_WEIGHT	Float	31.1	pounds
PLATE_THICKNESS	Float	0.625	inch
WIDTH	Float	11.5	inch
HEIGHT	Float	15.75	inch

DATA: Pole1_SArm_ATT_PL_CL
 ADT: Line
 DEFINITION: Center line of the attachment plate of the static to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_SArm_ATT_PL_Origin	
DIR	Direction	Unit_Z	

DATA: Pole1_SArm_ATT_PL_Origin

ADT: Cartesian Point
 DEFINITION: Origin of the attachment plate of the static to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	16.4055	inch
Z	Float	2272.125	inch

Entity: Pole1_SArm_ATT_PL_MK {Instantiated entity}
 INSTANCE-OF: POLE_NC_MARK
 DEFINITION: NC Mark on the attachment plate of the static to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-S-ARM-ATT-PL-MK"	
NC_MARK_TEXT_STRING	String	"0704"	

DATA: Pole1_VERT_PL_R
 ADT: Orientation_R
 DEFINITION: Orientation (rotational) matrix R of a vertical plate part (parallel to the global x direction).

FIELD NAME	TYPE	VALUE	UNIT
X_VECTOR	Direction	Unit_Negative_X	
Y_VECTOR	Direction	Unit_Z	
Z_VECTOR	Direction	Unit_Y	

Entity: POLE1_SARM_ATT_PL_Hole {Typical entity}
 INSTANCE-OF: POLE1_BOLT_HOLE
 DEFINITION: Typical bolt hole in the attachment plate of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_ATT_PL	
HOLE_DIAMETER	Float	0.6875	inch

Entity: Pole1_SArm_ATT_PL_Hole1 {Instantiated entity}
 INSTANCE-OF: POLE1_SARM_ATT_PL_Hole
 DEFINITION: Bolt hole 1 of the attachment plate of the static arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-ATT-PL-HOLE-1"	
NODE	Abstract	Pole1_SArm_ATT_PL_Hole1_N	

DATA: Pole1_SArm_ATT_PL_Hole1_N
 ADT: Cartesian Point
 DEFINITION: Center node of bolt hole 1 of the attachment plate of the static arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-4.5	inch
Y	Float	3.125	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_ATT_PL_Hole2 {Instantiated entity}
 INSTANCE-OF: POLE1_SARM_ATT_PL_Hole
 DEFINITION: Bolt hole 2 of the attachment plate of the static arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-ATT-PL-HOLE-2"	
NODE	Abstract	Pole1_SArm_ATT_PL_Hole2_N	

DATA: Pole1_SArm_ATT_PL_Hole2_N

ADT: Cartesian_Point
 DEFINITION: Center node of bolt hole 2 of the attachment plate of the static arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	4.5	inch
Y	Float	3.125	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_ATT_PL_Hole3 {Instantiated entity}
 INSTANCE-OF: POLE1_SARM_ATT_PL_Hole
 DEFINITION: Bolt hole 3 of the attachment plate of the static arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-ATT-PL-HOLE-3"	
NODE	Abstract	Pole1_SArm_ATT_PL_Hole3_N	

DATA: Pole1_SArm_ATT_PL_Hole3_N
 ADT: Cartesian_Point
 DEFINITION: Center node of bolt hole 3 of the attachment plate of the static arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	4.5	inch
Y	Float	-5.875	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_ATT_PL_Hole4 {Instantiated entity}
 INSTANCE-OF: POLE1_SARM_ATT_PL_Hole
 DEFINITION: Bolt hole 4 of the attachment plate of the static arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-ATT-PL-HOLE-4"	
NODE	Abstract	Pole1_SArm_ATT_PL_Hole4_N	

DATA: Pole1_SArm_ATT_PL_Hole4_N
 ADT: Cartesian_Point
 DEFINITION: Center node of bolt hole 4 of the attachment plate of the static arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-4.5	inch
Y	Float	-5.875	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_ATT_PL_CL_Hole {Instantiated entity}
 INSTANCE-OF: POLE1_SARM_ATT_PL_Hole
 DEFINITION: Center bolt hole of the attachment plate of the static arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-ATT-PL-CL-HOLE"	
NODE	Abstract	Pole1_SArm_ATT_PL_CL_Hole_N	

DATA: Pole1_SArm_ATT_PL_CL_Hole_N
 ADT: Cartesian_Point
 DEFINITION: Center node of center bolt hole of the attachment plate of the static arm to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	6.375	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_MID_STIF {Instantiated entity}

INSTANCE-OF: POLE1_PLATE_PART
 DEFINITION: Middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_SArm_MSTIF_CL	
ORIENTATION	Abstract	Pole1_LAT_PL_R	
CONN_TO_MEMBER	Relational	Pole1_BSMEM_0	
CONN_PARTS	Relational	Pole1_SArm_Top_PL, Pole1_SArm_BOT_PL Pole1_SArm_ATT_PL, Pole1_BSShaft_0	
CONNECTION	Relational	Pole1_SP_CON	
CONNECTION_METHOD	Relational	Pole1_SArm_PL_COM	
ORIGIN	Relational	Pole1_SArm_MSTIF_Origin	
PART_ID	String	"7-S-ARM-M-STIF"	
NC_MARK	Relational	Pole1_SArm_MSTIF_MK	
BLACK_WEIGHT	Float	7.3	pounds
PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED1, Pole1_SArm_MSTIF_ED2 Pole1_SArm_MSTIF_ED3, Pole1_SArm_MSTIF_ED4 Pole1_SArm_MSTIF_ED5, Pole1_SArm_MSTIF_ED6 Pole1_SArm_MSTIF_ED7, Pole1_SArm_MSTIF_ED8	
PLATE_THICKNESS	Float	0.375	inch
WIDTH	Float	6.0	inch
HEIGHT	Float	11.5	inch

DATA: Pole1_SArm_MSTIF_CL
 ADT: Line
 DEFINITION: Center line of the middle stiffener of the static to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_SArm_MSTIF_Origin	
DIR	Direction	Unit_Z	

DATA: Pole1_SArm_MSTIF_Origin
 ADT: Cartesian_Point
 DEFINITION: Origin of the middle stiffener of the static to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	13.093	inch
Z	Float	2270.75	inch

Entity: Pole1_SArm_MSTIF_MK {Instantiated entity}
 INSTANCE-OF: POLE_NC_MARK
 DEFINITION: NC Mark on the middle stiffener of the static to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-S-ARM-M-STIF-MK"	
NC_MARK_TEXT_STRING	String	"0703"	

DATA: Pole1_LAT_PL_R
 ADT: Orientation_R
 DEFINITION: Orientation (rotational) matrix R of a lateral plate part (parallel to the global z direction of Pole1).

FIELD NAME	TYPE	VALUE	UNIT
X_VECTOR	Direction	Unit_Z	
Y_VECTOR	Direction	Unit_X	
Z_VECTOR	Direction	Unit_Negative_Y	

Entity: PLATE_EDGE_1 {Typical entity}

INSTANCE-OF: POLE_PLATE_PART_EDGE
 DEFINITION: Typical entity representing the edge no. 1 of the contour of a plate part.

SLOT NAME	TYPE	VALUE	UNIT
EDGE_SEQUENCE_NUMBER	Integer	1	

Entity: PLATE_EDGE_2 {Typical entity}

INSTANCE-OF: POLE_PLATE_PART_EDGE
 DEFINITION: Typical entity representing the edge no. 2 of the contour of a plate part.

SLOT NAME	TYPE	VALUE	UNIT
EDGE_SEQUENCE_NUMBER	Integer	2	

Entity: PLATE_EDGE_3 {Typical entity}

INSTANCE-OF: POLE_PLATE_PART_EDGE
 DEFINITION: Typical entity representing the edge no. 3 of the contour of a plate part.

SLOT NAME	TYPE	VALUE	UNIT
EDGE_SEQUENCE_NUMBER	Integer	3	

Entity: PLATE_EDGE_4 {Typical entity}

INSTANCE-OF: POLE_PLATE_PART_EDGE
 DEFINITION: Typical entity representing the edge no. 4 of the contour of a plate part.

SLOT NAME	TYPE	VALUE	UNIT
EDGE_SEQUENCE_NUMBER	Integer	4	

Entity: PLATE_EDGE_5 {Typical entity}

INSTANCE-OF: POLE_PLATE_PART_EDGE
 DEFINITION: Typical entity representing the edge no. 5 of the contour of a plate part.

SLOT NAME	TYPE	VALUE	UNIT
EDGE_SEQUENCE_NUMBER	Integer	5	

Entity: PLATE_EDGE_6 {Typical entity}

INSTANCE-OF: POLE_PLATE_PART_EDGE
 DEFINITION: Typical entity representing the edge no. 6 of the contour of a plate part.

SLOT NAME	TYPE	VALUE	UNIT
EDGE_SEQUENCE_NUMBER	Integer	6	

Entity: PLATE_EDGE_7 {Typical entity}

INSTANCE-OF: POLE_PLATE_PART_EDGE
 DEFINITION: Typical entity representing the edge no. 7 of the contour of a plate part.

SLOT NAME	TYPE	VALUE	UNIT
EDGE_SEQUENCE_NUMBER	Integer	7	

Entity: PLATE_EDGE_8 {Typical entity}

INSTANCE-OF: POLE_PLATE_PART_EDGE
 DEFINITION: Typical entity representing the edge no. 8 of the contour of a plate part.

SLOT NAME	TYPE	VALUE	UNIT
EDGE_SEQUENCE_NUMBER	Integer	8	

Entity: Pole1_SArm_MSTIF_ED1 {Instantiated entity}

INSTANCE-OF: PLATE_EDGE_1
 DEFINITION: Edge no. 1 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN PLATE PART	Relational	Pole1_SArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_SArm_MSTIF_PS1	

Entity: Pole1_SArm_MSTIF_ED2 {Instantiated entity}

INSTANCE-OF: PLATE_EDGE_2
 DEFINITION: Edge no. 2 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_SArm_MSTIF_PS2	

Entity: Pole1_SArm_MSTIF_ED3 {Instantiated entity}
 INSTANCE-OF: PLATE_EDGE_3
 DEFINITION: Edge no. 3 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_SArm_MSTIF_PS1	

Entity: Pole1_SArm_MSTIF_ED4 {Instantiated entity}
 INSTANCE-OF: PLATE_EDGE_4
 DEFINITION: Edge no. 4 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_SArm_MSTIF_PS4	

Entity: Pole1_SArm_MSTIF_ED5 {Instantiated entity}
 INSTANCE-OF: PLATE_EDGE_5
 DEFINITION: Edge no. 5 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_SArm_MSTIF_PS5	

Entity: Pole1_SArm_MSTIF_ED6 {Instantiated entity}
 INSTANCE-OF: PLATE_EDGE_6
 DEFINITION: Edge no. 6 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_SArm_MSTIF_PS6	

Entity: Pole1_SArm_MSTIF_ED7 {Instantiated entity}
 INSTANCE-OF: PLATE_EDGE_7
 DEFINITION: Edge no. 7 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_SArm_MSTIF_PS7	

Entity: Pole1_SArm_MSTIF_ED8 {Instantiated entity}
 INSTANCE-OF: PLATE_EDGE_8
 DEFINITION: Edge no. 8 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_SArm_MSTIF_PS8	

Entity: Pole1_SArm_MSTIF_PS1 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 1 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-S-ARM-M-STIF-PS-1"	
IN_PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED1	
START_NÓDE	Abstract	Pole1_SArm_MSTIF_N1	
END_NÓDE	Abstract	Pole1_SArm_MSTIF_N2	

DATA: Pole1_SArm_MSTIF_N1
 ADT: Cartesian_Point
 DEFINITION: Node 1 of the edge contour of the middle stiffener of the static to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-2.5	inch
Y	Float	5.75	inch
Z	Float	0.0	inch

DATA: Pole1_SArm_MSTIF_N2
 ADT: Cartesian_Point
 DEFINITION: Node 2 of the edge contour of the middle stiffener of the static to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	2.5	inch
Y	Float	5.75	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_MSTIF_PS2 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 2 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-S-ARM-M-STIF-PS-2"	
IN_PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED2	
START_NÓDE	Abstract	Pole1_SArm_MSTIF_N2	
END_NÓDE	Abstract	Pole1_SArm_MSTIF_N3	

DATA: Pole1_SArm_MSTIF_N3
 ADT: Cartesian_Point
 DEFINITION: Node 3 of the edge contour of the middle stiffener of the static to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	3.0	inch
Y	Float	5.25	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_MSTIF_PS3 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 3 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-S-ARM-M-STIF-PS-3"	
IN_PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED3	
START_NÓDE	Abstract	Pole1_SArm_MSTIF_N3	
END_NÓDE	Abstract	Pole1_SArm_MSTIF_N4	

DATA: Pole1_SArm_MSTIF_N4
 ADT: Cartesian_Point

DEFINITION: Node 4 of the edge contour of the middle stiffener of the static to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	3.0	inch
Y	Float	-5.25	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_MSTIF_PS4 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT

DEFINITION: Path segment no. 4 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-S-ARM-M-STIF-PS-4"	
IN_PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED4	
START_NODE	Abstract	Pole1_SArm_MSTIF_N4	
END_NODE	Abstract	Pole1_SArm_MSTIF_N5	

DATA: Pole1_SArm_MSTIF_N5

ADT: Cartesian Point

DEFINITION: Node 5 of the edge contour of the middle stiffener of the static to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	2.5	inch
Y	Float	-5.75	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_MSTIF_PS5 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT

DEFINITION: Path segment no. 5 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-S-ARM-M-STIF-PS-5"	
IN_PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED5	
START_NODE	Abstract	Pole1_SArm_MSTIF_N5	
END_NODE	Abstract	Pole1_SArm_MSTIF_N6	

DATA: Pole1_SArm_MSTIF_N6

ADT: Cartesian Point

DEFINITION: Node 6 of the edge contour of the middle stiffener of the static to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-2.32	inch
Y	Float	-5.75	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_MSTIF_PS6 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT

DEFINITION: Path segment no. 6 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-S-ARM-M-STIF-PS-6"	
IN_PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED6	
START_NODE	Abstract	Pole1_SArm_MSTIF_N6	
END_NODE	Abstract	Pole1_SArm_MSTIF_N7	

DATA: Pole1_SArm_MSTIF_N7

ADT: Cartesian Point

DEFINITION: Node 7 of the edge contour of the middle stiffener of the static to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-2.822	inch
Y	Float	-5.25	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_MSTIF_PS7 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT

DEFINITION: Path segment no. 7 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-S-ARM-M-STIF-PS-7"	
IN_PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED7	
START_NODE	Abstract	Pole1_SArm_MSTIF_N7	
END_NODE	Abstract	Pole1_SArm_MSTIF_N8	

DATA: Pole1_SArm_MSTIF_N8

ADT: Cartesian_Point

DEFINITION: Node 8 of the edge contour of the middle stiffener of the static to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-2.992	inch
Y	Float	5.25	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_MSTIF_PS8 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT

DEFINITION: Path segment no. 8 of the middle stiffener of the static arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-S-ARM-M-STIF-PS-8"	
IN_PLATE_PART_EDGE	Relational	Pole1_SArm_MSTIF_ED8	
START_NODE	Abstract	Pole1_SArm_MSTIF_N8	
END_NODE	Abstract	Pole1_SArm_MSTIF_N9	

Entity: Pole1_SArm_Base_PL {Instantiated entity}

INSTANCE-OF: POLE1_PLATE_PART

DEFINITION: Base plate of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_SArm_Base_PL_CL	
ORIENTATION	Abstract	Pole1_VERT_PL_R	
IN_MEMBER	Relational	Pole1_SArm	
CONN_TO_MEMBER	Relational	Pole1_BSMEM_0	
CONN_PARTS	Relational	Pole1_SArm_Attach_PL, Pole1_SArm_Shaft	
CONNECTION	Relational	Pole1_SPCON	
CONNECTION_METHOD	Relational	Pole1_SArm_Base_COM, Pole1_SArm_ATT_COM	
ORIGIN	Relational	Pole1_SArm_Base_PL_Origin	
PART_ID	String	"7-S-ARM-BASE-PL"	
OPENING	Relational	Pole1_SArm_Base_PL_Hole1 Pole1_SArm_Base_PL_Hole2 Pole1_SArm_Base_PL_Hole3 Pole1_SArm_Base_PL_Hole4 Pole1_SArm_Base_PL_Opening	
NC_MARK	Relational	Pole1_SArm_Base_PL_MK	
BLACK_WEIGHT	Float	25.1	pounds

PLATE THICKNESS	Float	0.875	inch
WIDTH	Float	11.5	inch
HEIGHT	Float	11.5	inch

DATA: Pole1_SArm_Base_PL_CL
ADT: Line
DEFINITION: Center line of the base plate of the static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_SArm_Base_PL_Origin	
DIR	Direction	Unit_Z	

DATA: Pole1_SArm_Base_PL_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the base plate of the static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	17.156	inch
Z	Float	2270.75	inch

Entity: Pole1_SArm_Base_PL_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the base plate of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-S-ARM-BASE-PL-MK"	
NC_MARK_TEXT_STRING	String	"0301a"	

Entity: POLE1_SARM_BASE_PL_HOLE {Typical entity}
INSTANCE-OF: POLE1_BOLT_HOLE
DEFINITION: Typical bolt hole in the base plate of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_Base_PL	
HOLE_DIAMETER	Float	1.0625	inch

Entity: Pole1_SArm_Base_PL_Hole1 {Instantiated entity}
INSTANCE-OF: POLE1_SARM_BASE_PL_HOLE
DEFINITION: Bolt hole 1 of the base plate of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-BASE-PL-HOLE-1"	
NODE	Abstract	Pole1_SArm_Base_PL_Hole1_N	

DATA: Pole1_SArm_Base_PL_Hole1_N
ADT: Cartesian_Point
DEFINITION: Center node of bolt hole 1 of the base plate of the static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-4.5	inch
Y	Float	4.5	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_Base_PL_Hole2 {Instantiated entity}
INSTANCE-OF: POLE1_SARM_BASE_PL_HOLE

DEFINITION: Bolt hole 2 of the base plate of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-BASE-PL-HOLE-2"	
NODE	Abstract	Pole1_SArm_Base_PL_Hole2_N	

DATA: Pole1_SArm_Base_PL_Hole2_N

ADT: Cartesian Point

DEFINITION: Center node of bolt hole 2 of the base plate of the static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	4.5	inch
Y	Float	4.5	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_Base_PL_Hole3 {Instantiated entity}

INSTANCE-OF: POLE1_SARM_BASE_PL_HOLE

DEFINITION: Bolt hole 3 of the base plate of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-BASE-PL-HOLE-3"	
NODE	Abstract	Pole1_SArm_Base_PL_Hole3_N	

DATA: Pole1_SArm_Base_PL_Hole3_N

ADT: Cartesian Point

DEFINITION: Center node of bolt hole 3 of the base plate of the static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	4.5	inch
Y	Float	-4.5	inch
Z	Float	0.0	inch

Entity: Pole1_SArm_Base_PL_Hole4 {Instantiated entity}

INSTANCE-OF: POLE1_SARM_BASE_PL_HOLE

DEFINITION: Bolt hole 4 of the base plate of the static arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-S-ARM-BASE-PL-HOLE-4"	
NODE	Abstract	Pole1_SArm_Base_PL_Hole4_N	

DATA: Pole1_SArm_Base_PL_Hole4_N

ADT: Cartesian Point

DEFINITION: Center node of bolt hole 4 of the base plate of the static arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-4.5	inch
Y	Float	-4.5	inch
Z	Float	0.0	inch

Entity: POLE1_OCT_OPENING {Typical entity}

INSTANCE-OF: POLE_POLYGONAL_OPENING

DEFINITION: Typical entity representing an octagonal opening in a plate part of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
UNIT_VECTOR	Abstract	Unit_Z	
NUMBER_OF_SIDES	Integer	8	
HOLE_TYPE	String	"Pole Octogonal Opening"	
NODE	Abstract	Zero Origin	

Entity: Pole1_SArm_Base_PL_Opening {Instantiated entity}

INSTANCE-OF: POLE1_OCT_OPENING

DEFINITION: Octogonal opening at the center of the base plate of the static arm of Pole1.

SLOT_NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_SArm_Base_PL	
HOLE_ID	String	"7-S-ARM-BASE-PL-OPEN"	
CONNECTION	Relational	Pole1_SArm_Base_CON	
CONN_PARTS	Relational	Pole1_SArm_Shaft	
		Pole1_SArm_Base_PL	
OPENING_SIZE	Float	6.125	inch

Entity: POLE1_CARM_HORZ_PL {Typical entity}
 IS-A: POLE1_BRACKET_PLATE
 DEFINITION: Typical entity representing a horizontal (top or bottom) plate of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ORIENTATION	Abstract	Pole1_CArm_HORZ_PL_R	
PLATE_THICKNESS	Float	0.75	inch

DATA: Pole1_CArm_HORZ_PL_R
 ADT: Orientation_R
 DEFINITION: Orientation matrix R of a horizontal (top or bottom) plate of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X_VECTOR	Direction	Unit Negative X	
Y_VECTOR	Direction	Pole1_CArm_Y'	
Z_VECTOR	Direction	Pole1_CArm_Z'	

DATA: Pole1_CArm_Y'
 ADT: Direction
 DEFINITION: Unit Vector in the y' direction of the conductor arm of Pole1, used in defining the orientation Ry of the top and bottom plates of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	
Y	Float	-0.9665	
Z	Float	-0.2576	

DATA: Pole1_CArm_Z'
 ADT: Direction
 DEFINITION: Unit Vector in the z' direction of the conductor arm of Pole1, used in defining the orientation Rz of the top and bottom plates, and Ry of the attachment plates of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	
Y	Float	-0.2576	
Z	Float	0.9665	

Entity: POLE1_TCARM_HORZ_PL {Typical entity}
 IS-A: POLE1_CARM_HORZ_PL
 DEFINITION: Typical entity representing a horizontal (top or bottom) plate of the top conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CONN_TO_MEMBER	Relational	Pole1_BSMEM_0	
CONN_PARTS	Relational	Pole1_TCArm_MID_STIF, Pole1_TCArm_ATT_PL Pole1_TCArm_VERT_PL, Pole1_BSShaft_0	
CONNECTION	Relational	Pole1_TCPCON	
CONNECTION_METHOD	Relational	Pole1_TCArm_OUT_COM, Pole1_TCArm_IN_COM Pole1_TCArm_Pole_COM	

Entity: Pole1_TCArm_Top_PL {Instantiated entity}
INSTANCE-OF: POLE1_TCARM_HORZ_PL
DEFINITION: Top plate of the top conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_TCArm_TPL_CL	
ORIGIN	Abstract	Pole1_TCArm_TPL_Origin	
PART_ID	String	"7-T-C-ARM-T-PL"	
NC_MARK	Relational	Pole1_TCArm_TPL_MK	
BLACK_WEIGHT	Float	120.9	pounds
WIDTH	Float	25.0	inch
HEIGHT	Float	29.75	inch
DIMENSION_A	Float	21.0	inch
DIMENSION_B	Float	2.8125	inch
DIMENSION_C	Float	4.875	inch
DIMENSION_D	Float	5.625	inch
DIMENSION_F	Float	1.0	inch
DIMENSION_G	Float	18.25	inch
DIMENSION_H	Float	2.9375	inch
DIMENSION_I	Float	5.0625	inch
DIMENSION_J	Float	2.5	inch
DIMENSION_K	Float	1.7927	inch

DATA: Pole1_TCArm_TPL_CL
ADT: Line
DEFINITION: Center line of the top plate of the top conductor to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_TCArm_TPL_Origin	
DIR	Direction	Pole1_CArm_Y	

DATA: Pole1_TCArm_TPL_Origin
ADT: Cartesian Point
DEFINITION: Origin of the top plate of the top conductor to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	8.6	inch
Z	Float	2253.266	inch

Entity: Pole1_TCArm_TPL_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the top plate of the top conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-T-C-ARM-T-PL-MK"	
NC_MARK_TEXT_STRING	String	"0714"	

Entity: Pole1_TCArm_BOT_PL {Instantiated entity}
INSTANCE-OF: POLE1_TCARM_HORZ_PL
DEFINITION: Bottom plate of the bottom conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_TCArm_BPL_CL	
ORIGIN	Abstract	Pole1_TCArm_BPL_Origin	
PART_ID	String	"7-T-C-ARM-B-PL"	
NC_MARK	Relational	Pole1_TCArm_BPL_MK	

BLACK_WEIGHT	Float	90.1	pounds
WIDTH	Float	25.75	inch
HEIGHT	Float	23.8125	inch
DIMENSION_A	Float	21.75	inch
DIMENSION_B	Float	2.875	inch
DIMENSION_C	Float	5.0625	inch
DIMENSION_D	Float	5.875	inch
DIMENSION_F	Float	1.125	inch
DIMENSION_G	Float	11.75	inch
DIMENSION_H	Float	3.0625	inch
DIMENSION_I	Float	5.25	inch
DIMENSION_J	Float	2.625	inch
DIMENSION_K	Float	1.9459	inch

DATA: Pole1_TCArm_BPL_CL
ADT: Line
DEFINITION: Center line of the bottom plate of the top conductor to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_TCArm_BPL_Origin	
DIR	Direction	Pole1_CArm_Y	

DATA: Pole1_TCArm_BPL_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the bottom plate of the top conductor to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	17.181	inch
Z	Float	2238.776	inch

Entity: Pole1_TCArm_BPL_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the bottom plate of the top conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-T-C-ARM-B-PL-MK"	
NC_MARK_TEXT_STRING	String	"0715"	

Entity: POLE1_CARM_ATT_PL {Instantiated entity}
INSTANCE-OF: POLE1_PLATE_PART
DEFINITION: Typical entity representing an attachment plate of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
ORIENTATION	Abstract	Pole1_CArm_ATT_PL_R	
OPENING	Relational	Pole1_CArm_ATT_PL_Hole1, Pole1_CArm_ATT_PL_Hole2 Pole1_CArm_ATT_PL_Hole3, Pole1_CArm_ATT_PL_Hole4	
NC_MARK	Relational	Pole1_TCArm_ATT_PL_MK	
BLACK_WEIGHT	Float	56.2	pounds
PLATE_THICKNESS	Float	1.375	inch
WIDTH	Float	21.5	inch
HEIGHT	Float	21.5	inch

DATA: Pole1_CArm_ATT_PL_R
ADT: Orientation R
DEFINITION: Orientation (rotational) matrix R of an attachment plate of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X_VECTOR	Direction	Unit Negative X	
Y_VECTOR	Direction	Pole_CArm_Z	
Z_VECTOR	Direction	Pole_CArm_Y	

DATA: Pole1_CArm_Y"
ADT: Direction
DEFINITION: Unit Vector in the y" direction of the conductor arm of Pole1, used in defining the orientation Rz of the attachment plate of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	
Y	Float	0.9665	
Z	Float	0.2576	

Entity: Pole1_TCArm_ATT_PL {Instantiated entity}
INSTANCE-OF: POLE1_PLATE_PART
DEFINITION: Attachment plate of the top conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_TCArm_ATT_PL_CL	
CONN_TO_MEMBER	Relational	Pole1_TCArm	
CONN_PARTS	Relational	Pole1_TCArm_MID_STIF, Pole1_TCArm_Top_PL Pole1_TCArm_BOT_PL, Pole1_TCArm_Base_PL	
CONNECTION	Relational	Pole1_TCPCON	
CONNECTION_METHOD	Relational	Pole1_TCArm_OUT_COM, Pole1_TCArm_IN_COM Pole1_TCArm_ATT_COM	
ORIGIN	Abstract	Pole1_TCArm_ATT_PL_Origin	
PART_ID	String	"7-T-C-ARM-ATT-PL"	

DATA: Pole1_TCArm_ATT_PL_CL
ADT: Line
DEFINITION: Center line of the attachment plate of the top conductor to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_TCArm_ATT_PL_Origin	
DIR	Direction	Pole_CArm_Z	

DATA: Pole1_TCArm_ATT_PL_Origin
ADT: Cartesian Point
DEFINITION: Origin of the attachment plate of the top conductor to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	25.833	inch
Z	Float	2246.332	inch

Entity: Pole1_CArm_ATT_PL_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the attachment plate of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-C-ARM-ATT-PL-MK"	
NC_MARK_TEXT_STRING	String	"0706"	

Entity: POLE1_CARM_ATT_PL_HOLE {Typical entity}
IS-A: POLE1_BOLT_HOLE
DEFINITION: Typical bolt hole in the attachment plate of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_ATT_PL	
HOLE_DIAMETER	Float	1.5625	inch

Entity: Pole1_CArm_ATT_Hole1 {Instantiated entity}
INSTANCE-OF: POLE1_CARM_ATT_PL_HOLE
DEFINITION: Bolt hole 1 of the attachment plate of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-C-ARM-ATT-PL-HOLE-1"	
NODE	Abstract	Pole1_CArm_ATT_Hole1_N	

DATA: Pole1_CArm_ATT_Hole1_N
ADT: Cartesian_Point
DEFINITION: Center node of bolt hole 1 of the attachment & base plate of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-9	inch
Y	Float	9	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_ATT_Hole2 {Instantiated entity}
INSTANCE-OF: POLE1_CARM_ATT_PL_HOLE
DEFINITION: Bolt hole 2 of the attachment plate of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-C-ARM-ATT-PL-HOLE-2"	
NODE	Abstract	Pole1_CArm_ATT_Hole2_N	

DATA: Pole1_CArm_ATT_Hole2_N
ADT: Cartesian_Point
DEFINITION: Center node of bolt hole 2 of the attachment & base plate of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	9	inch
Y	Float	9	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_ATT_PL_Hole3 {Instantiated entity}
INSTANCE-OF: POLE1_CARM_ATT_PL_HOLE
DEFINITION: Bolt hole 3 of the attachment plate of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-C-ARM-ATT-PL-HOLE-3"	
NODE	Abstract	Pole1_CArm_ATT_Hole3_N	

DATA: Pole1_CArm_ATT_Hole3_N
ADT: Cartesian_Point
DEFINITION: Center node of bolt hole 3 of the attachment & base plate of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	9	inch
Y	Float	-9	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_ATT_PL_Hole4 {Instantiated entity}
INSTANCE-OF: POLE1_CARM_ATT_PL_HOLE
DEFINITION: Bolt hole 4 of the attachment plate of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-C-ARM-ATT-PL-HOLE-4"	
NODE	Abstract	Pole1_CArm_ATT_Hole4_N	

DATA: Pole1_CArm_ATT_Hole4_N
ADT: Cartesian_Point
DEFINITION: Center node of bolt hole 4 of the attachment & base plate of the conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-9	inch
Y	Float	-9	inch
Z	Float	0.0	inch

Entity: POLE1_CARM_MID_STIF {Instantiated entity}
INSTANCE-OF: POLE1_PLATE_PART
DEFINITION: Typical entity representing a middle stiffener of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
ORIENTATION	Abstract	Pole1_CArm_MSTIF_R	
NC_MARK	Relational	Pole1_CArm_MSTIF_MK	
BLACK_WEIGHT	Float	56.2	pounds
PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED1, Pole1_CArm_MSTIF_ED2 Pole1_CArm_MSTIF_ED3, Pole1_CArm_MSTIF_ED4 Pole1_CArm_MSTIF_ED5, Pole1_CArm_MSTIF_ED6 Pole1_CArm_MSTIF_ED7, Pole1_CArm_MSTIF_ED8	
PLATE_THICKNESS	Float	0.5	inch
WIDTH	Float	18.4375	inch
HEIGHT	Float	21.5	inch

DATA: Pole1_CArm_MSTIF_R
ADT: Orientation_R
DEFINITION: Orientation (rotational) matrix R of a middle stiffener of a conductor arm to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X_VECTOR	Direction	Unit X	
Y_VECTOR	Direction	Pole1_CArm_Y	
Z_VECTOR	Direction	Pole1_CArm_Z	

INSTANCE-OF: POLE1_CARM_MID_SFIT
 DEFINITION: Middle stiffener of the top conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_TCArm_MSTIF_CL	
CONN_TO_MEMBER	Relational	Pole1_BSMEM_0	
CONN_PARTS	Relational	Pole1_TCArm_Top_PL, Pole1_TCArm_BOT_PL Pole1_TCArm_ATT_PL, Pole1_BSShaft_0	
CONNECTION	Relational	Pole1_TCP_CON	
CONNECTION_METHOD	Relational	Pole1_TCArm_Pole_COM, Pole1_TCArm_IN_COM	
ORIGIN	Abstract	Pole1_TCArm_MSTIF_Origin	
PART_ID	String	"7-T-C-ARM-M-STIF"	

DATA: Pole1_TCArm_MSTIF_CL
 ADT: Line
 DEFINITION: Center line of the middle stiffener of the top conductor to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_TCArm_MSTIF_Origin	
DIR	Direction	Pole1_CArm_Z	

DATA: Pole1_TCArm_MSTIF_Origin
 ADT: Cartesian_Point
 DEFINITION: Origin of the middle stiffener of the top conductor to pole connection of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	16.259	inch
Z	Float	2243.789	inch

Entity: Pole1_CArm_MSTIF_MK {Instantiated entity}
 INSTANCE-OF: POLE_NC_MARK
 DEFINITION: NC Mark on the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-C-ARM-M-STIF-MK"	
NC_MARK_TEXT_STRING	String	"0705"	

Entity: Pole1_CArm_MSTIF_ED1 {Instantiated entity}
 INSTANCE-OF: PLATE_EDGE_1
 DEFINITION: Edge no. 1 of the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_CArm_MSTIF_PS1	

Entity: Pole1_CArm_MSTIF_ED2 {Instantiated entity}
 INSTANCE-OF: PLATE_EDGE_2
 DEFINITION: Edge no. 2 of the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_CArm_MSTIF_PS2	

Entity: Pole1_CArm_MSTIF_ED3 {Instantiated entity}

INSTANCE-OF: PLATE_EDGE_3
 DEFINITION: Edge no. 3 of the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_CArm_MSTIF_PS1	

Entity: Pole1_CArm_MSTIF_ED4 {Instantiated entity}

INSTANCE-OF: PLATE_EDGE_4
 DEFINITION: Edge no. 1 of the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_CArm_MSTIF_PS4	

Entity: Pole1_CArm_MSTIF_ED5 {Instantiated entity}

INSTANCE-OF: PLATE_EDGE_5
 DEFINITION: Edge no. 5 of the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_CArm_MSTIF_PS5	

Entity: Pole1_CArm_MSTIF_ED6 {Instantiated entity}

INSTANCE-OF: PLATE_EDGE_6
 DEFINITION: Edge no. 6 of the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_CArm_MSTIF_PS6	

Entity: Pole1_CArm_MSTIF_ED7 {Instantiated entity}

INSTANCE-OF: PLATE_EDGE_7
 DEFINITION: Edge no. 7 of the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_CArm_MSTIF_PS7	

Entity: Pole1_CArm_MSTIF_ED8 {Instantiated entity}

INSTANCE-OF: PLATE_EDGE_8
 DEFINITION: Edge no. 8 of the middle stiffener of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_MID_STIF	
PATH_SEGMENT	Relational	Pole1_CArm_MSTIF_PS8	

Entity: Pole1_CArm_MSTIF_PS1 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 1 of the middle stiffener of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-C-ARM-M-STIF-PS-1"	
IN_PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED1	
START_NODE	Abstract	Pole1_CArm_MSTIF_N1	
END_NODE	Abstract	Pole1_CArm_MSTIF_N2	

DATA: Pole1_CArm_MSTIF_N1

ADT: Cartesian_Point
 DEFINITION: Node 1 of the edge contour of the middle stiffener of the conductor to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-8.71875	inch
Y	Float	10.75	inch
Z	Float	0.0	inch

DATA: Pole1_CArm_MSTIF_N2
 ADT: Cartesian_Point
 DEFINITION: Node 2 of the edge contour of the middle stiffener of the conductor to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	8.71875	inch
Y	Float	10.75	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_MSTIF_PS2 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 2 of the middle stiffener of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-C-ARM-M-STIF-PS-2"	
IN_PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED2	
START_NODE	Abstract	Pole1_CArm_MSTIF_N2	
END_NODE	Abstract	Pole1_CArm_MSTIF_N3	

DATA: Pole1_CArm_MSTIF_N3
 ADT: Cartesian_Point
 DEFINITION: Node 3 of the edge contour of the middle stiffener of the conductor to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	9.21875	inch
Y	Float	10.25	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_MSTIF_PS3 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 3 of the middle stiffener of the conductor arm to pole connection .

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-C-ARM-M-STIF-PS-3"	
IN_PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED3	
START_NODE	Abstract	Pole1_CArm_MSTIF_N3	
END_NODE	Abstract	Pole1_CArm_MSTIF_N4	

DATA: Pole1_CArm_MSTIF_N4
 ADT: Cartesian_Point
 DEFINITION: Node 4 of the edge contour of the middle stiffener of the conductor to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	9.21875	inch
Y	Float	-10.25	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_MSTIF_PS4 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 4 of the middle stiffener of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-C-ARM-M-STIF-PS-4"	
IN_PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED4	
START_NODE	Abstract	Pole1_CArm_MSTIF_N4	
END_NODE	Abstract	Pole1_CArm_MSTIF_N5	

DATA: Pole1_CArm_MSTIF_N5
 ADT: Cartesian_Point
 DEFINITION: Node 5 of the edge contour of the middle stiffener of the conductor to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	8.71875	inch
Y	Float	-10.75	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_MSTIF_PS5 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 5 of the middle stiffener of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-C-ARM-M-STIF-PS-5"	
IN_PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED5	
START_NODE	Abstract	Pole1_CArm_MSTIF_N5	
END_NODE	Abstract	Pole1_CArm_MSTIF_N6	

DATA: Pole1_CArm_MSTIF_N6
 ADT: Cartesian_Point
 DEFINITION: Node 6 of the edge contour of the middle stiffener of the conductor to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-2.56	inch
Y	Float	-10.75	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_MSTIF_PS6 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 6 of the middle stiffener of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-C-ARM-M-STIF-PS-6"	
IN_PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED6	
START_NODE	Abstract	Pole1_CArm_MSTIF_N6	
END_NODE	Abstract	Pole1_CArm_MSTIF_N7	

DATA: Pole1_CArm_MSTIF_N7
 ADT: Cartesian_Point
 DEFINITION: Node 7 of the edge contour of the middle stiffener of the conductor to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-3.261	inch
Y	Float	-10.05	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_MSTIF_PS7 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 7 of the middle stiffener of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-C-ARM-M-STIF-PS-7"	
IN_PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED7	
START_NODE	Abstract	Pole1_CArm_MSTIF_N7	
END_NODE	Abstract	Pole1_CArm_MSTIF_N8	

DATA: Pole1_CArm_MSTIF_N8
 ADT: Cartesian_Point
 DEFINITION: Node 8 of the edge contour of the middle stiffener of the conductor to pole connection.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	-9.10775	inch
Y	Float	10.362	inch
Z	Float	0.0	inch

Entity: Pole1_CArm_MSTIF_PS8 {Instantiated entity}

INSTANCE-OF: POLE_PATH_SEGMENT
 DEFINITION: Path segment no. 8 of the middle stiffener of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
PATH_SEGMENT_ID	String	"7-C-ARM-M-STIF-PS-8"	
IN_PLATE_PART_EDGE	Relational	Pole1_CArm_MSTIF_ED8	
START_NODE	Abstract	Pole1_CArm_MSTIF_N8	
END_NODE	Abstract	Pole1_CArm_MSTIF_N1	

Entity: POLE1_CARM_BASE_PL {Instantiated entity}

IS-A: POLE1_PLATE_PART
 DEFINITION: Typical entity representing a base plate of the conductor arm to pole connection.

SLOT NAME	TYPE	VALUE	UNIT
ORIENTATION	Abstract	Pole1_CArm_Base_PL_R	
NC_MARK	Relational	Pole1_TCArm_Base_PL_MK	
BLACK_WEIGHT	Float	175.0	pounds
PLATE_THICKNESS	Float	2.5	inch
WIDTH	Float	21.5	inch
HEIGHT	Float	21.5	inch

Entity: Pole1_TCArm_Base_PL {Instantiated entity}

INSTANCE-OF: POLE1_CARM_BASE_PL
 DEFINITION: Base plate of the top conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CENTERLINE	Abstract	Pole1_TCArm_Base_PL_CL	
IN_MEMBER	Relational	Pole1_TCArm	
CONN TO MEMBER	Relational	Pole1_BSMEM_0	
CONN PARTS	Relational	Pole1_TCArm_Attach_PL, Pole1_TCArm_Shaft	
CONNECTION	Relational	Pole1_TCP_CON	
CONNECTION_METHOD	Relational	Pole1_TCArm_Base_COM, Pole1_TCArm_ATT_COM	
ORIGIN	Abstract	Pole1_TCArm_Base_PL_Origin	
PART_ID	String	"7-T-C-ARM-BASE-PL"	

OPENING Relational Pole1_CArm_Base_PL_Hole1,
 Pole1_CArm_Base_PL_Hole2
 Pole1_CArm_Base_PL_Hole3,
 Pole1_CArm_Base_PL_Hole4,
 Pole1_TCArm_Base_PL_Opening

DATA: Pole1_TCArm_Base_PL_CL
ADT: Line
DEFINITION: Center line of the base plate of the top conductor arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
PNT	Cartesian_Point	Pole1_TCArm_Base_PL_Origin	
DIR	Direction	Pole1_CArm_Z	

DATA: Pole1_TCArm_Base_PL_Origin
ADT: Cartesian_Point
DEFINITION: Origin of the base plate of the top conductor arm of Pole1.

FIELD NAME	TYPE	VALUE	UNIT
X	Float	0.0	inch
Y	Float	27.705	inch
Z	Float	2225.727	inch

Entity: Pole1_CArm_Base_PL_MK {Instantiated entity}
INSTANCE-OF: POLE_NC_MARK
DEFINITION: NC Mark on the base plate of the conductor arm to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
NC_MARK_ID	String	"7-C-ARM-BASE-PL-MK"	
NC_MARK_TEXT_STRING	String	"0401a"	

Entity: POLE1_CARM_BASE_PL_HOLE {Typical entity}
IS-A: POLE1_BOLT_HOLE
DEFINITION: Typical bolt hole in the base plate of the conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_CArm_Base_PL	

Entity: Pole1_CArm_Base_PL_Hole1 {Instantiated entity}
INSTANCE-OF: POLE1_CARM_BASE_PL_HOLE
DEFINITION: Bolt hole 1 of the base plate of the conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-C-ARM-BASE-PL-HOLE-1"	
NODE	Abstract	Pole1_CArm_ATT_Hole1_N	

Entity: Pole1_CArm_Base_PL_Hole2 {Instantiated entity}
INSTANCE-OF: POLE1_CARM_BASE_PL_HOLE
DEFINITION: Bolt hole 2 of the base plate of the conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-C-ARM-BASE-PL-HOLE-2"	
NODE	Abstract	Pole1_CArm_ATT_Hole2_N	

Entity: Pole1_CArm_Base_PL_Hole3 {Instantiated entity}
INSTANCE-OF: POLE1_CARM_BASE_PL_HOLE
DEFINITION: Bolt hole 3 of the base plate of the conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-C-ARM-BASE-PL-HOLE-3"	
NODE	Abstract	Pole1_CArm_ATT_Hole3_N	

Entity: Pole1_CArm_Base_PL_Hole4 {Instantiated entity}
INSTANCE-OF: POLE1_CARM_BASE_PL_HOLE
DEFINITION: Bolt hole 4 of the base plate of the conductor arm of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
HOLE_ID	String	"7-C-ARM-BASE-PL-HOLE-4"	
NODE	Abstract	Pole1_CArm_ATT_Hole4_N	

Entity: POLE1_CARM_BASE_PL_OPENING {Typical entity}
INSTANCE-OF: POLE1_OCT_OPENING
DEFINITION: Typical entity representing a structural opening of octagonal shape in the center of the base plate of the conductor arm.

SLOT NAME	TYPE	VALUE	UNIT
OPENING_SIZE	Float	16.125	inch

Entity: Pole1_TCArm_Base_PL_Opening {Instantiated entity}
INSTANCE-OF: POLE1_CARM_BASE_PL_OPENING
DEFINITION: Octagonal opening at the center of the base plate of the top conductor arm.

SLOT NAME	TYPE	VALUE	UNIT
IN_PLATE_PART	Relational	Pole1_TCArm_Base_PL	
HOLE_ID	String	"7-T-C-ARM-BASE-PL-OPEN"	
CONNECTION	Relational	Pole1_TCArm_Base_CON	
CONN_PARTS	Relational	Pole1_TCArm_Shaft Pole1_TCArm_Base_PL	

LEVEL 3: THE CONNECTIONS LEVEL

{NOTATION:

- Slot/Attribute Name in *italics*: Slot/Attribute inherited from parent entities
- Attribute Name in **bold face**: Attribute with default value (also in bold face)
- Slot Value in | |: Mapped to a class of object

}

Entity: POLE1_SPLICE_CONNECTION {Typical entity}

INSTANCE OF: POLE_SPLICE_CONNECTION

DEFINITION: Typical entity representing a splice connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>IN_STRUC_SUBSYSTEM</i>	Relational	Pole1_STRUCTURE	
<i>ORIGIN</i>	Abstract	Identity_R	
<i>IS_CONNECTION</i>	Relational	[POLE_SPLICE_CONNECTION]	
<i>DEFINES_CONNECTION</i>	Relational	Pole1_BS0_BS1_CON, Pole1_BS1_BS2_CON Pole1_BS2_X0_CON, Pole1_X0_X1_CON Pole1_X1_X2_CON	
<i>DESCRIPTION</i>	String	"Splice connection between shaft parts of Pole1 structure"	

Entity: Pole1_BS0_BS1_CON {Instantiated entity}

INSTANCE OF: POLE1_SPLICE_CONNECTION

DEFINITION: Splice connection between the members of indices 0 and 1 of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>CONNECTS_MEMBERS</i>	Relational	Pole1_BSMEM_0, Pole1_BSMEM_1	
<i>CONNECTS_PARTS</i>	Relational	Pole1_BSShaft_0, Pole1_BSShaft_1	
<i>ORIGIN</i>	Abstract	Pole1_BSMEM0_Origin	
<i>AT_NODE</i>	Relational	Pole1_BS0_N1	
<i>CONNECTION_ID</i>	String	"8-B0-B1-CON"	
<i>SPLICE_LENGTH</i>	Float	60.0	inch
<i>MALE_CON_PART</i>	Relational	Pole1_BSMEM_0	
<i>FEMALE_CON_PART</i>	Relational	Pole1_BSMEM_1	

Entity: Pole1_BS1_BS2_CON {Instantiated entity}

INSTANCE OF: POLE1_SPLICE_CONNECTION

DEFINITION: Splice connection between the members of indices 1 and 2 of the basic pole of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>CONNECTS_MEMBERS</i>	Relational	Pole1_BSMEM_1, Pole1_BSMEM_2	
<i>CONNECTS_PARTS</i>	Relational	Pole1_BSShaft_1, Pole1_BSShaft_2	
<i>ORIGIN</i>	Abstract	Pole1_BSMEM1_Origin	
<i>AT_NODE</i>	Relational	Pole1_BS1_N1	
<i>CONNECTION_ID</i>	String	"8-B1-B2-CON"	
<i>SPLICE_LENGTH</i>	Float	79.0	inch
<i>MALE_CON_PART</i>	Relational	Pole1_BSMEM_1	
<i>FEMALE_CON_PART</i>	Relational	Pole1_BSMEM_2	

Entity: Pole1_BS2_X0_CON {Instantiated entity}
INSTANCE OF: POLE1_SPLICE_CONNECTION
DEFINITION: Splice connection between the member of index 1 of the basic pole and the member of index 0 of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CONNECTS_MEMBERS	Relational	Pole1_BSMEM_2, Pole1_XMEM_0	
CONNECTS_PARTS	Relational	Pole1_BSShaft_2, Pole1_XShaft_0	
ORIGIN	Abstract	Pole1_BSMEM2_Origin	
AT_NODE	Relational	Pole1_BS2_N1	
CONNECTION_ID	String	"8-B2-X0-CON"	
SPLICE_LENGTH	Float	97.0	inch
MALE_CON_PART	Relational	Pole1_BSMEM_2	
FEMALE_CON_PART	Relational	Pole1_XMEM_0	

Entity: Pole1_X0_X1_CON {Instantiated entity}
INSTANCE OF: POLE1_SPLICE_CONNECTION
DEFINITION: Splice connection between the members of indices 0 and 1 of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CONNECTS_MEMBERS	Relational	Pole1_XMEM_0, Pole1_XMEM_1	
CONNECTS_PARTS	Relational	Pole1_XShaft_0, Pole1_XShaft_1	
ORIGIN	Abstract	Pole1_XMEM0_Origin	
AT_NODE	Relational	Pole1_X0_N1	
CONNECTION_ID	String	"8-X0-X1-CON"	
SPLICE_LENGTH	Float	114.0	inch
MALE_CON_PART	Relational	Pole1_XMEM_0	
FEMALE_CON_PART	Relational	Pole1_XMEM_1	

Entity: Pole1_X1_X2_CON {Instantiated entity}
INSTANCE OF: POLE1_SPLICE_CONNECTION
DEFINITION: Splice connection between the members of indices 1 and 2 of the pole extension of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CONNECTS_MEMBERS	Relational	Pole1_XMEM_1, Pole1_XMEM_2	
CONNECTS_PARTS	Relational	Pole1_XShaft_1, Pole1_XShaft_2	
ORIGIN	Abstract	Pole1_XMEM1_Origin	
AT_NODE	Relational	Pole1_X1_N1	
CONNECTION_ID	String	"8-X1-X2-CON"	
SPLICE_LENGTH	Float	130.0	inch
MALE_CON_PART	Relational	Pole1_XMEM_1	
FEMALE_CON_PART	Relational	Pole1_XMEM_2	

Entity: POLE1_CONNECTION {Typical entity}
IS-A: CONNECTION^
DEFINITION: Typical entity of an arm connection assembly of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IS_CONNECTION	Relational	CONNECTION^	
DEFINES_CONNECTION	Relational	Pole1_SP_CON, Pole1_TCP_CON	
IN_STRUC_SUBSYSTEM	Relational	Basic_Pole1	

Entity: Pole1_SP_CON {Instantiated entity}
INSTANCE-OF: POLE1_CONNECTION
DEFINITION: Static to pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CONNECTION_ID	String	"5-SP-CON"	
DESCRIPTION	String	"Static Arm To Pole Connection"	
CONNECTS_MEMBERS	Relational	Pole1_BSMEM_0, Pole1_SArm	
CONNECTS_PARTS	Relational	Pole1_BSShaft_0, Pole1_SArm_Base_PL	
SUBCONNECTION	Relational	Pole1_SArm_PL_SUBCON, Pole1_SArm_ATT_SUBCON	
ORIGIN	Abstract	Pole1_SArm_Origin	
ORIENTATION	Abstract	Identity_R	

Entity: POLE1_CP_CON {Typical entity}
IS-A: POLE1_CONNECTION
DEFINITION: Typical entity of a conductor to pole connection member of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
ORIENTATION	Abstract	Pole1_CArm_R	

Entity: Pole1_TCP_CON {Instantiated entity}
INSTANCE-OF: POLE1_CONNECTION
DEFINITION: Top-conductor-arm-to-pole connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
CONNECTION_ID	String	"5-T-CP-CON"	
DESCRIPTION	String	"Top Conductor Arm To Pole Connection Member"	
CONNECTS_MEMBERS	Relational	Pole1_BSMEM_0, Pole1_TCArm	
CONNECTS_PARTS	Relational	Pole1_BSShaft_0, Pole1_TCArm_Base_PL	
SUBCONNECTION	Relational	Pole1_TCArm_OUT_SUBCON Pole1_TCArm_IN_SUBCON Pole1_TCArm_Pole_SUBCON Pole1_TCArm_ATT_SUBCON	
ORIGIN	Abstract	Pole1_TCArm_Origin	

Entity: POLE1_SUBCONNECTION {Typical entity}
IS-A : SUBCONNECTION^
DEFINITION: Typical entity of a subconnection of an arm connection assembly of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IS_SUBCONNECTION	Relational	[SUBCONNECTION^]	
DEFINES_SUBCONN	Relational	Pole1_SArm_PL_SUBCON Pole1_SArm_Base_SUBCON Pole1_SArm_ATT_SUBCON Pole1_TCArm_OUT_SUBCON Pole1_TCArm_IN_SUBCON Pole1_TCArm_Pole_SUBCON Pole1_TCArm_ATT_SUBCON	

Entity: Pole1_SArm_PL_SUBCON {Instantiated entity}
INSTANCE OF: POLE1_SUBCONNECTION
DEFINITION: Static-arm-to-pole subconnection of Pole1. It is a welded connection of steel plates.

SLOT NAME	TYPE	VALUE	UNIT
SUBCONNECTION_ID	String	"8-S-ARM-PL-SUBCON"	
DESCRIPTION	String	"Static-arm-to-pole subconnection of Pole1"	
IN_CONNECTION	Relational	Pole1_SP_CON	
CONNECTS_MEMBERS	Relational	Pole1_BSMEM_0, Pole1_SArm	
CONNECTS_PARTS	Relational	Pole1_BSShaft_0, Pole1_SArm_Top_PL Pole1_SArm_Bot_PL, Pole1_SArm_MID_STIF Pole1_SArm_ATT_PL	
METHOD	Relational	Pole1_SArm_PL_COM	

Entity: POLE1_WELDED_CONNECTION {Typical entity}
INSTANCE OF: WELDED_CONNECTION
DEFINITION: Typical entity representing a welded connection method used in Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IS_A_METHOD	Relational	[WELDED_CONNECTION*]	
DESCRIPTION	String	"Welded connection in Pole1"	

Entity: Pole1_SArm_PL_COM {Instantiated entity}
INSTANCE OF: POLE1_WELDED_CONNECTION
DEFINITION: Welded Connection method of the Static-arm-to-pole subconnection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
USED_IN_CONNECTION	Relational	Pole1_SArm_PL_SUBCON	
WELDED_PARTS	Relational	Pole1_BSShaft_0, Pole1_SArm_Top_PL Pole1_SArm_Bot_PL, Pole1_SArm_MID_STIF Pole1_SArm_ATT_PL	
METHOD_ID	String	"8-S-ARM-PL-COM-WELD"	
WELDING_PROCESS	Abstract	To be incorporated	
WELDING_PARAMETER	Relational	To be incorporated	

Entity: Pole1_SArm_Base_SUBCON {Instantiated entity}
INSTANCE OF: POLE1_SUBCONNECTION
DEFINITION: Subconnection of the static arm shaft part to the arm base plate of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
SUBCONNECTION_ID	String	"8-S-ARM-BASE-SUBCON"	
DESCRIPTION	String	"Subconnection of the static arm shaft to the arm base plate of Pole1"	
IN_CONNECTION	Relational	Pole1_SP_CON	
CONNECTS_MEMBERS	Relational	Pole1_SArm	
CONNECTS_PARTS	Relational	Pole1_SArm_Shaft, Pole1_SArm_Base_PL	
METHOD	Relational	Pole1_SArm_Base_COM	

Entity: Pole1_SArm_Base_COM {Instantiated entity}
INSTANCE OF: POLE1_WELDED_CONNECTION
DEFINITION: Welded connection method used to connect the static arm shaft part to the arm base plate of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
USED_IN_CONNECTION	Relational	Pole1_SArm_Base_SUBCON	
WELDED_PARTS	Relational	Pole1_SArm_Shaft, Pole1_SArm_Base_PL	
METHOD_ID	String	"8-S-ARM-BASE-COM-WELD"	
WELDING_PROCESS	Abstract	To be incorporated	
WELDING_PARAMETER	Relational	To be incorporated	

Entity: Pole1_SArm_ATT_SUBCON {Instantiated entity}
INSTANCE OF: POLE1_SUBCONNECTION
DEFINITION: Subconnection of the static arm base plate to the attachment plate in the static to pole connection assembly of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
SUBCONNECTION_ID	String	"8-S-ARM-ATT-SUBCON"	
DESCRIPTION	String	"Subconnection of the static arm base plate to the attachment plate of Pole 1"	
IN_CONNECTION	Relational	Pole1_SP_CON	
CONNECTS_MEMBERS	Relational	Pole1_SArm	
CONNECTS_PARTS	Relational	Pole1_SArm_Base_PL, Pole1_SArm_ATT_PL	
METHOD	Relational	Pole1_SArm_ATT_COM	

Entity: POLE1_BOLTED_CONNECTION {Typical entity}
INSTANCE OF: BOLTED_CONNECTION
DEFINITION: Typical entity representing a bolted connection method used in Pole1.

SLOT NAME	TYPE	VALUE	UNIT
IS_A_METHOD	Relational	[BOLTED_CONNECTION*]	
DESCRIPTION	String	"Bolted connection in Pole1"	
BOLT_PROCESS	Abstract	To be incorporated	

Entity: Pole1_SArm_ATT_COM {Instantiated entity}
INSTANCE OF: POLE1_BOLTED_CONNECTION
DEFINITION: Bolted connection method used to connect the static arm base plate to the attachment plate in the static to pole connection assembly of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
USED_IN_CONNECTION	Relational	Pole1_SArm_ATT_SUBCON	
BOLTED_PARTS	Relational	Pole1_SArm_Shaft, Pole1_SArm_Base_PL	
METHOD_ID	String	"8-S-ARM-ATT-COM-BOLT"	
BOLT_PARAMETER	Relational	To be incorporated	

Entity: Pole1_TCArm_IN_SUBCON {Instantiated entity}
INSTANCE OF: POLE1_SUBCONNECTION
DEFINITION: Inner subconnection of the top conductor arm to pole connection of Pole1. It is a welded connection.

SLOT NAME	TYPE	VALUE	UNIT
SUBCONNECTION_ID	String	"8-T-C-ARM-IN-SUBCON"	
DESCRIPTION	String	"Inner subconnection of the top conductor arm to pole connection of Pole 1"	
IN_CONNECTION	Relational	Pole1_TCP_CON	
CONNECTS_MEMBERS	Relational	Pole1_TCP_CON_MEM	
CONNECTS_PARTS	Relational	Pole1_TCArm_Top_PL, Pole1_TCArm_Bot_PL, Pole1_TCArm_MID_STIF	
METHOD	Relational	Pole1_TCArm_IN_COM	

Entity: POLE1_CARM_IN_COM {Typical entity}
INSTANCE OF: POLE1_WELDED_CONNECTION
DEFINITION: Typical entity representing a welded connection method of the conductor arm to pole inside plate connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
WELDING_PROCESS	Abstract	To be incorporated	
WELDING_PARAMETER	Relational	To be incorporated	

Entity: Pole1_TCArm_IN_COM {Instantiated entity}
 INSTANCE OF: POLE1_CARM_IN_COM
 DEFINITION: Welded connection method of the top conductor arm to pole inside plate connection.

SLOT NAME	TYPE	VALUE	UNIT
USED_IN_CONNECTION	Relational	Pole1_TCArm_IN_CON	
WELDED_PARTS	Relational	Pole1_TCArm_Top_PL, Pole1_TCArm_Bot_PL Pole1_TCArm_MID_STIF	
METHOD_ID	String	"8-T-C-ARM-IN-COM-WELD"	

Entity: Pole1_TCArm_OUT_SUBCON {Instantiated entity}
 INSTANCE OF: POLE1_SUBCONNECTION
 DEFINITION: Outer subconnection of the top conductor arm to pole connection of Pole1. It is a welded connection.

SLOT NAME	TYPE	VALUE	UNIT
SUBCONNECTION_ID	String	"8-T-C-ARM-OUT-SUBCON"	
DESCRIPTION	String	"Outer subconnection of the top conductor arm to pole connection of Pole 1"	
IN_CONNECTION	Relational	Pole1_TCP_CON	
CONNECTS_MEMBERS	Relational	Pole1_TCP_CON_MEM	
CONNECTS_PARTS	Relational	Pole1_TCArm_Top_PL, Pole1_TCArm_Bot_PL Pole1_TCArm_ATT_PL	
METHOD	Relational	Pole1_TCArm_OUT_COM	

Entity: POLE1_CARM_OUT_COM {Instantiated entity}
 INSTANCE OF: POLE1_WELDED_CONNECTION
 DEFINITION: Typical entity representing a welded connection method of the top conductor arm to pole outside plate connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
WELDING_PROCESS	Abstract	To be incorporated	
WELDING_PARAMETER	Relational	To be incorporated	

Entity: Pole1_TCArm_OUT_COM {Instantiated entity}
 INSTANCE OF: POLE1_CARM_OUT_COM
 DEFINITION: Welded connection method of the top conductor arm to pole outside plate connection of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
USED_IN_CONNECTION	Relational	Pole1_TCArm_OUT_CON	
WELDED_PARTS	Relational	Pole1_TCArm_Top_PL, Pole1_TCArm_Bot_PL Pole1_TCArm_ATT_PL	
METHOD_ID	String	"8-T-C-ARM-OUT-COM-WELD"	

Entity: Pole1_TCArm_Pole_SUBCON {Instantiated entity}
 INSTANCE OF: POLE1_SUBCONNECTION
 DEFINITION: Subconnection of the top conductor arm to the pole shaft part of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
SUBCONNECTION_ID	String	"8-T-C-ARM-POLE-SUBCON"	
DESCRIPTION	String	"Subconnection of the top conductor arm to the pole shaft part of Pole1"	
IN_CONNECTION	Relational	Pole1_TCP_CON	
CONNECTS_MEMBERS	Relational	Pole1_TCP_CON_MEM, Pole1_BSShaft_0	
CONNECTS_PARTS	Relational	Pole1_TCArm_Top_PL, Pole1_TCArm_Bot_PL Pole1_TCArm_MID_STIF, Pole1_BSShaft_0	
METHOD	Relational	Pole1_TCArm_Pole_COM	

Entity: POLE1_CARM_POLE_CON {Instantiated entity}
INSTANCE OF: POLE1_WELDED_CONNECTION
DEFINITION: Typical entity representing a welded connection method used to connect the top conductor arm to the pole shaft part of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
WELDING_PROCESS	Abstract	To be incorporated	
WELDING_PARAMETER	Relational	To be incorporated	

Entity: Pole1_TCArm_Pole_COM {Instantiated entity}
INSTANCE OF: POLE1_CARM_POLE_CON
DEFINITION: Welded connection method used to connect the top conductor arm to the pole shaft part.

SLOT NAME	TYPE	VALUE	UNIT
USED_IN_CONNECTION	Relational	Pole1_TCArm_Pole_CON	
WELDED_PARTS	Relational	Pole1_TCArm_Top_PL, Pole1_TCArm_Bot_PL Pole1_TCArm_MID_STIF, Pole1_BSShaft_0	
METHOD_ID	String	"8-T-C-ARM-POLE-COM-WELD"	

Entity: Pole1_TCArm_Base_SUBCON {Instantiated entity}
INSTANCE OF: POLE1_SUBCONNECTION
DEFINITION: Subconnection of the top conductor arm shaft part to the arm base plate of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
SUBCONNECTION_ID	String	"8-T-C-ARM-BASE-SUBCON"	
DESCRIPTION	String	"Subconnection of the top conductor arm shaft part to the arm base plate of Pole1"	
IN_CONNECTION	Relational	Pole1_TCP_CON	
CONNECTS_MEMBERS	Relational	Pole1_TCArm	
CONNECTS_PARTS	Relational	Pole1_TCArm_Shaft, Pole1_TCArm_Base_PL	
METHOD	Relational	Pole1_TCArm_Base_COM	

Entity: POLE1_CARM_BASE_COM {Instantiated entity}
INSTANCE OF: POLE1_WELDED_CONNECTION
DEFINITION: Welded connection method used to connect the top conductor arm shaft part to the arm base plate of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
WELDING_PROCESS	Abstract	To be incorporated	
WELDING_PARAMETER	Relational	To be incorporated	

Entity: Pole1_TCArm_Base_COM {Instantiated entity}
INSTANCE OF: POLE1_CARM_BASE_COM
DEFINITION: Welded connection method used to connect the top conductor arm shaft part to the arm base plate of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
USED_IN_CONNECTION	Relational	Pole1_TCArm_Base_CON	
WELDED_PARTS	Relational	Pole1_TCArm_Shaft, Pole1_TCArm_Base_PL	
METHOD_ID	String	"8-T-C-ARM-BASE-COM-WELD"	

Entity: Pole1_TCArm_ATT_SUBCON {Instantiated entity}
INSTANCE OF: POLE1_SUBCONNECTION
DEFINITION: Subconnection of the top conductor arm base plate to the attachment plate in the top conductor to pole connection assembly of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>SUBCONNECTION_ID</i>	String	"8-T-C-ARM-ATT-SUBCON"	
<i>DESCRIPTION</i>	String	"Subconnection of the top conductor arm base plate to the attachment plate in the top conductor to pole connection assembly of Pole1"	
<i>IN_CONNECTION</i>	Relational	Pole1_TCP_CON	
<i>CONNECTS_MEMBERS</i>	Relational	Pole1_TCArm, Pole1_TCP_CON MEM	
<i>CONNECTS_PARTS</i>	Relational	Pole1_TCArm_Base_PL, Pole1_TCArm_ATT_PL	
<i>METHOD</i>	Relational	Pole1_TCArm_ATT_COM	

Entity: POLE1_CARM_ATT_COM {Instantiated entity}
INSTANCE OF: POLE1_BOLTED_CONNECTION
DEFINITION: Typical entity representing a bolted connection method used to connect the top conductor arm base plate to the attachment plate in the top conductor to pole connection assembly.

SLOT NAME	TYPE	VALUE	UNIT
<i>BOLT_PARAMETER</i>	Relational	To be incorporated	

Entity: Pole1_TCArm_ATT_COM {Instantiated entity}
INSTANCE OF: POLE1_BOLTED_CONNECTION
DEFINITION: Bolted connection method used to connect the top conductor arm base plate to the attachment plate in the top conductor to pole connection assembly of Pole1.

SLOT NAME	TYPE	VALUE	UNIT
<i>USED_IN_CONNECTION</i>	Relational	Pole1_TCArm_ATT_CON	
<i>BOLTED_PARTS</i>	Relational	Pole1_TCArm_Base_PL, Pole1_TCArm_ATT_PL	
<i>METHOD_ID</i>	String	"8-T-C-ARM-ATT-COM-BOLT"	