

# Ejercicio 1.10.3

## Leer modelo STEP

# Tarea

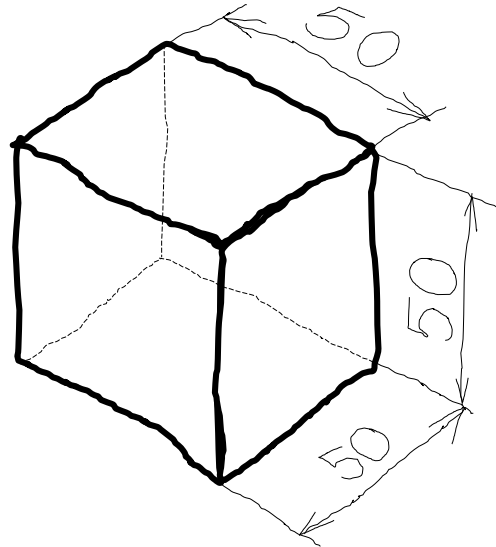
## Tarea

Estrategia

Ejecución

Conclusiones

La figura muestra el croquis de diseño de un cubo



Las tareas a realizar son:

- A** Obtenga el modelo sólido del cubo en SolidWorks
- B** Exporte el modelo en formato STEP
- C** Edite el formato STEP con un editor de textos, para agrupar las instancias por tipos

# Estrategia

Tarea

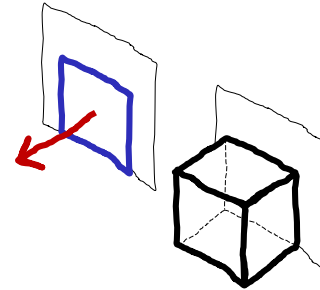
Estrategia

Ejecución

Conclusiones

La estrategia para modelar el cubo es simple:

- ✓ Obtenga el cubo por extrusión de un cuadrado dibujado en el plano del alzado



La estrategia para exportar el modelo es:

- ✓ Utilice *Guardar como* para salvar el fichero inicial en formato STEP

Puesto que hay dos tipos de formato STEP implementados en SolidWorks, seleccione el formato AP 214, que es más moderno e incluye menos información administrativa

Para exportar un modelo STEP AP 242 se necesita disponer del módulo MBD

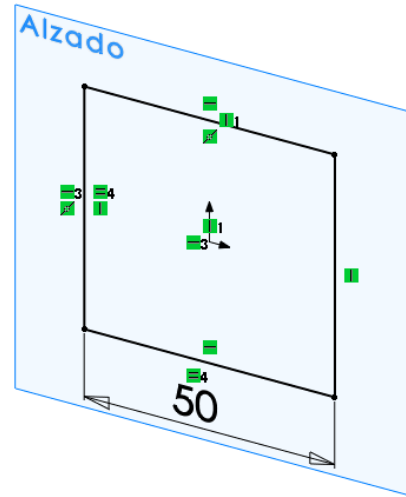
La estrategia para editar el modelo es:

- ✓ Utilice un editor de texto para abrir el fichero STEP
- ✓ Utilice las opciones de reemplazar texto para simplificar los números reales
- ✓ Utilice las opciones de cortar y pegar del editor de textos para reagrupar las instancias del bloque de datos por tipos

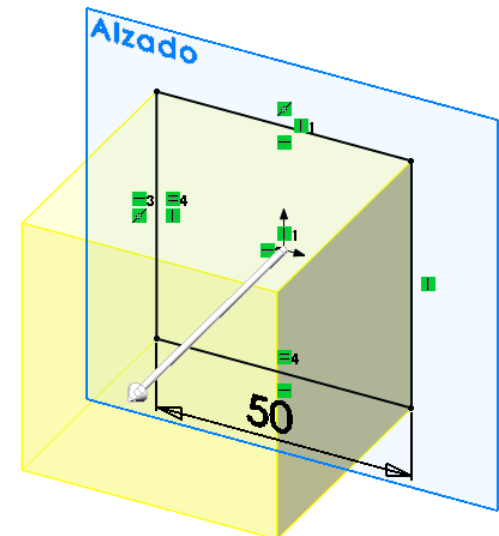
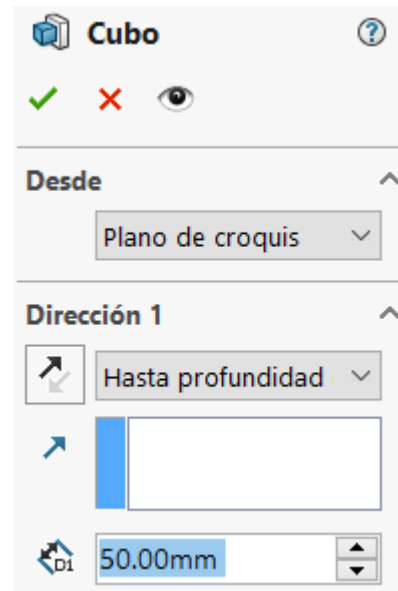
# Ejecución

Obtenga el modelo sólido de la pieza:

- ✓ Dibuje un croquis cuadrado en el alzado



- ✓ Obtenga el cubo por extrusión de un perfil cuadrado dibujado en el alzado



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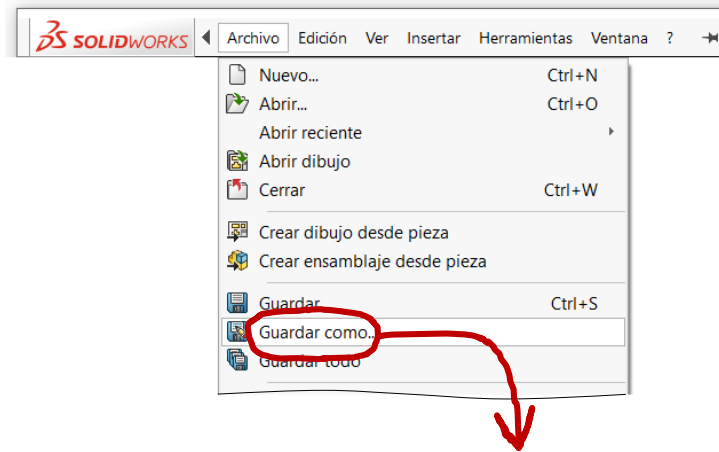
Ejecución

Conclusiones

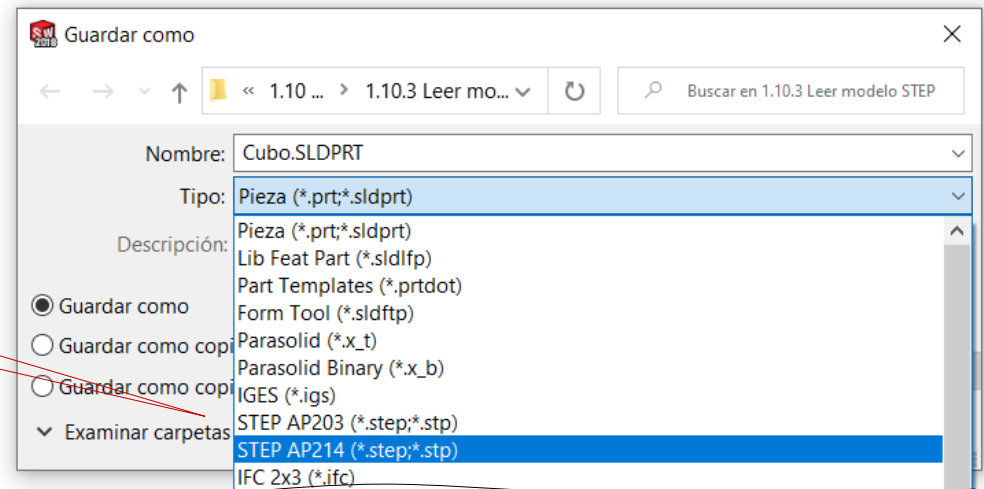
# Ejecución

## Exporte el fichero de la pieza en formato STEP

- ✓ Ejecute el comando *Guardar como*



- ✓ Seleccione el Tipo STEP AP 214



Observe que hay dos Protocolos diferentes

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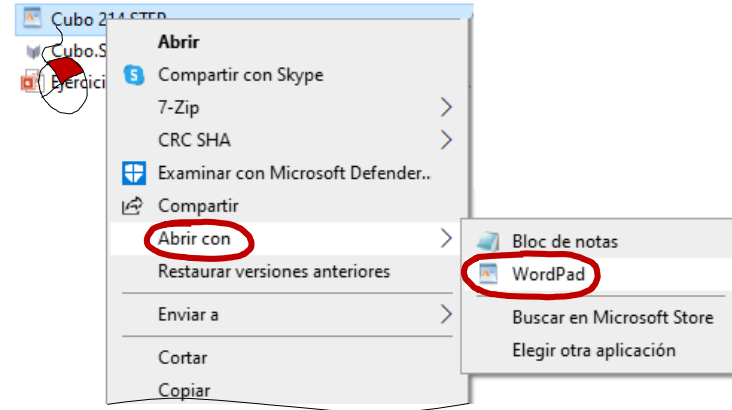
Conclusiones

# Ejecución

Abra el fichero STEP con un editor de texto:

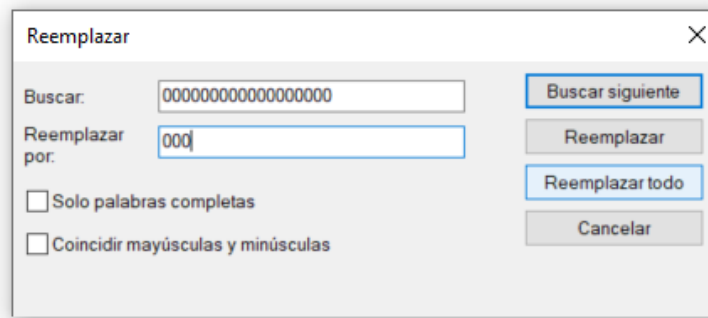
- ✓ Seleccione un editor de texto simple

Por ejemplo, WordPad ®



- ✓ Abra el fichero que contiene la versión STEP del cubo

- ✓ Para mejorar la claridad, utilice el comando *Reemplazar todo* del editor de texto para simplificar los números reales con parte decimal nula a solo tres decimales



- ✓ Redondee manualmente el resto de números decimales

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# Ejecución

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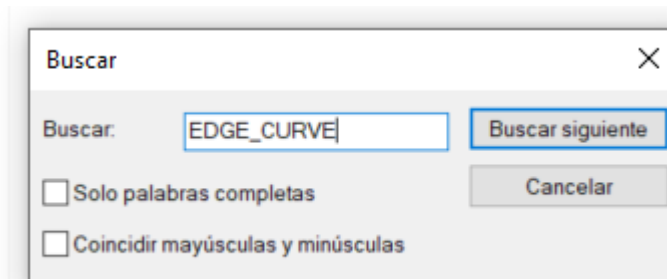
Conclusiones

- ✓ Reagrupe todas las instancias que sean igual que la primera, copiándolas y pegándolas a continuación de ella:
  - ✓ Identifique la primera instancia del bloque de datos

```
ISO-10303-21;
HEADER;
FILE_DESCRIPTION (( 'STEP AP214' ),
  '1' );
FILE_NAME ('Cubo 214.STEP',
  '2021-01-25T21:49:35',
  ( '' ),
  ( '' ),
  'SwSTEP 2.0',
  'SolidWorks 2018',
  '' );
FILE_SCHEMA (( 'AUTOMOTIVE_DESIGN' ));
ENDSEC;

DATA:
#1 = EDGE_CURVE ( 'NONE', #91, #176, #48, .T. );
#2 = ORIENTED_EDGE ( 'NONE', *, *, #10, .T. );
#3 = UNCERTAINTY_MEASURE_WITH_UNIT
(LENGTH_MEASURE( 1.000082E-05 ), #155, 'distance_accuracy_value',
'NONE');
```

- ✓ Busque instancias del mismo tipo en el resto del documento



# Ejecución

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- ✓ Corte la primera instancia igual que encuentre

```
#45 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, 1.0000 ) ) ;  
#46 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 0.0000 ) ) ;  
#47 = EDGE_CURVE ( 'NONE', #201, #15, #161, .T. ) ;  
#48 = LINE ( 'NONE', #150, #117 ) ;  
#49 = AXIS2_PLACEMENT_3D ( 'NONE', #37, #179, #80 ) ;
```

- ✓ Pegue la instancia a continuación de la primera

```
DATA;  
#1 = EDGE_CURVE ( 'NONE', #91, #176, #48, .T. ) ;  
#47 = EDGE_CURVE ( 'NONE', #201, #15, #161, .T. ) ;  
#2 = ORIENTED_EDGE ( 'NONE', *, *, #107, .T. ) ;
```

- ✓ Repita hasta que no queden más instancias iguales a la primera

```
DATA;  
#1 = EDGE_CURVE ( 'NONE', #91, #176, #48, .T. ) ;  
#47 = EDGE_CURVE ( 'NONE', #201, #15, #161, .T. ) ;  
#53 = EDGE_CURVE ( 'NONE', #176, #201, #202, .T. ) ;  
#59 = EDGE_CURVE ( 'NONE', #123, #201, #111, .T. ) ;  
#61 = EDGE_CURVE ( 'NONE', #15, #145, #144, .T. ) ;  
#74 = EDGE_CURVE ( 'NONE', #13, #145, #94, .T. ) ;  
#95 = EDGE_CURVE ( 'NONE', #123, #40, #102, .T. ) ;  
#107 = EDGE_CURVE ( 'NONE', #40, #15, #147, .T. ) ;  
#116 = EDGE_CURVE ( 'NONE', #91, #123, #108, .T. ) ;  
#127 = EDGE_CURVE ( 'NONE', #40, #13, #18, .T. ) ;  
#157 = EDGE_CURVE ( 'NONE', #13, #91, #192, .T. ) ;  
#187 = EDGE_CURVE ( 'NONE', #145, #176, #131, .T. ) ;  
#2 = ORIENTED_EDGE ( 'NONE', *, *, #107, .T. ) ;  
#3 = UNCERTAINTY_MEASURE_WITH_UNIT
```



# Ejecución

✓ Repita el procedimiento hasta tener reagrupadas todas las instancias del mismo tipo

```
ISO-10303-21;
HEADER;
FILE_DESCRIPTION (( 'STEP AP214' ),
  '1' );
FILE_NAME ('Cubo 214.STEP',
  '2021-01-25T21:49:35',
  ( '' ),
  ( '' ),
  'SwSTEP 2.0',
  'SolidWorks 2018',
  '' );
FILE_SCHEMA (( 'AUTOMOTIVE_DESIGN' ));
ENDSEC;

DATA;
#1 = EDGE_CURVE ( 'NONE', #91, #176, #48, .T. );
#47 = EDGE_CURVE ( 'NONE', #201, #15, #161, .T. );
#53 = EDGE_CURVE ( 'NONE', #176, #201, #202, .T. );
#59 = EDGE_CURVE ( 'NONE', #123, #201, #111, .T. );
#61 = EDGE_CURVE ( 'NONE', #15, #145, #144, .T. );
#74 = EDGE_CURVE ( 'NONE', #13, #145, #94, .T. );
#95 = EDGE_CURVE ( 'NONE', #123, #40, #102, .T. );
#107 = EDGE_CURVE ( 'NONE', #40, #15, #147, .T. );
#116 = EDGE_CURVE ( 'NONE', #91, #123, #108, .T. );
#127 = EDGE_CURVE ( 'NONE', #40, #13, #18, .T. );
#157 = EDGE_CURVE ( 'NONE', #13, #91, #192, .T. );
#187 = EDGE_CURVE ( 'NONE', #145, #176, #131, .T. );

#2 = ORIENTED_EDGE ( 'NONE', *, *, #107, .T. );
#7 = ORIENTED_EDGE ( 'NONE', *, *, #127, .T. );
#21 = ORIENTED_EDGE ( 'NONE', *, *, #59, .F. );
#30 = ORIENTED_EDGE ( 'NONE', *, *, #107, .F. );
#31 = ORIENTED_EDGE ( 'NONE', *, *, #95, .F. );
#33 = ORIENTED_EDGE ( 'NONE', *, *, #59, .T. );
#36 = ORIENTED_EDGE ( 'NONE', *, *, #74, .T. );
#62 = ORIENTED_EDGE ( 'NONE', *, *, #95, .T. );
#63 = ORIENTED_EDGE ( 'NONE', *, *, #157, .T. );
#67 = ORIENTED_EDGE ( 'NONE', *, *, #53, .T. );
#71 = ORIENTED_EDGE ( 'NONE', *, *, #47, .F. );
#81 = ORIENTED_EDGE ( 'NONE', *, *, #116, .T. );
#109 = ORIENTED_EDGE ( 'NONE', *, *, #187, .F. );
#112 = ORIENTED_EDGE ( 'NONE', *, *, #47, .T. );
#114 = ORIENTED_EDGE ( 'NONE', *, *, #187, .T. );
#133 = ORIENTED_EDGE ( 'NONE', *, *, #61, .F. );
#141 = ORIENTED_EDGE ( 'NONE', *, *, #1, .F. );
#160 = ORIENTED_EDGE ( 'NONE', *, *, #74, .F. );
#167 = ORIENTED_EDGE ( 'NONE', *, *, #157, .F. );
#171 = ORIENTED_EDGE ( 'NONE', *, *, #127, .F. );
#190 = ORIENTED_EDGE ( 'NONE', *, *, #53, .F. );
#191 = ORIENTED_EDGE ( 'NONE', *, *, #116, .F. );
#193 = ORIENTED_EDGE ( 'NONE', *, *, #61, .T. );
#197 = ORIENTED_EDGE ( 'NONE', *, *, #1, .T. );

#3 = UNCERTAINTY_MEASURE_WITH_UNIT
(LENGTH_MEASURE( 1.000082E-05 ), #155, 'distance_accuracy_value',
'NONE');
#58 = UNCERTAINTY_MEASURE_WITH_UNIT
(LENGTH_MEASURE( 1.000082E-05 ), #151, 'distance_accuracy_value',
'NONE');
#143 = UNCERTAINTY_MEASURE_WITH_UNIT
(LENGTH_MEASURE( 1.000E-05 ), #169, 'distance_accuracy_value',
'NONE');

#4 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 0.0000 ) );
#6 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#8 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#9 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 50.000 ) );
#11 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 0.0000 ) );
#12 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#23 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 0.0000 ) );
#25 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 0.0000 ) );
#37 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#39 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#46 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 0.0000 ) );
#69 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 50.000 ) );
#82 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 50.000 ) );
#84 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#100 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#101 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000,
50.000 ) );
#139 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000,
0.0000 ) );
#149 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000,
0.0000 ) );
#150 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#153 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 0.0000 ) );
#163 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000,
0.0000 ) );
#168 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000,
50.000 ) );
#175 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000,
50.000 ) );
#177 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000,
50.000 ) );
#180 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#182 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 0.0000 ) );
#178 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
```

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```
#5 = ADVANCED_FACE ( 'NONE', ( #44 ), #165, .F. ) ;
#34 = ADVANCED_FACE ( 'NONE', ( #125 ), #83, .T. ) ;
#96 = ADVANCED_FACE ( 'NONE', ( #16 ), #130, .F. ) ;
#128 = ADVANCED_FACE ( 'NONE', ( #115 ), #134, .F. ) ;
#173 = ADVANCED_FACE ( 'NONE', ( #189 ), #54, .F. ) ;
#194 = ADVANCED_FACE ( 'NONE', ( #32 ), #119, .F. ) ;

#16 = FACE_OUTER_BOUND ( 'NONE', #154, .T. ) ;
#32 = FACE_OUTER_BOUND ( 'NONE', #78, .T. ) ;
#44 = FACE_OUTER_BOUND ( 'NONE', #50, .T. ) ;
#115 = FACE_OUTER_BOUND ( 'NONE', #126, .T. ) ;
#125 = FACE_OUTER_BOUND ( 'NONE', #159, .T. ) ;
#189 = FACE_OUTER_BOUND ( 'NONE', #79, .T. ) ;

#10 = DIRECTION ( 'NONE', ( -1.0000, -0.0000, -0.0000 ) ) ;
#22 = DIRECTION ( 'NONE', ( 0.0000, -0.0000, -1.0000 ) ) ;
#24 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) ) ;
#41 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) ) ;
#42 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) ) ;
#45 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, 1.0000 ) ) ;
#64 = DIRECTION ( 'NONE', ( -1.0000, -0.0000, -0.0000 ) ) ;
#65 = DIRECTION ( 'NONE', ( 0.0000, -1.0000, 0.0000 ) ) ;
#68 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) ) ;
#80 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, 1.0000 ) ) ;
#85 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) ) ;
#103 = DIRECTION ( 'NONE', ( 0.0000, -0.0000, 1.0000 ) ) ;
#104 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) ) ;
#118 = DIRECTION ( 'NONE', ( -0.0000, -1.0000, -0.0000 ) ) ;
#132 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) ) ;
#135 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) ) ;
#136 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) ) ;
#137 = DIRECTION ( 'NONE', ( -0.0000, -1.0000, -0.0000 ) ) ;
#152 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, -0.0000 ) ) ;
#166 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) ) ;
#179 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, 0.0000 ) ) ;
#181 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) ) ;
#184 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) ) ;
#188 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) ) ;
#195 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) ) ;
#198 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, -0.0000 ) ) ;

#17 = ADVANCED_BREP_SHAPE_REPRESENTATION ( 'Cubo 214', ( #172, #174 ), #35 ) ;

#18 = LINE ( 'NONE', #177, #29 ) ;
#48 = LINE ( 'NONE', #150, #117 ) ;
#94 = LINE ( 'NONE', #12, #97 ) ;
#102 = LINE ( 'NONE', #178, #60 ) ;
#108 = LINE ( 'NONE', #6, #75 ) ;
#111 = LINE ( 'NONE', #69, #76 ) ;
#131 = LINE ( 'NONE', #149, #142 ) ;
#144 = LINE ( 'NONE', #139, #99 ) ;
#147 = LINE ( 'NONE', #39, #19 ) ;
#161 = LINE ( 'NONE', #153, #120 ) ;
#192 = LINE ( 'NONE', #101, #148 ) ;
#202 = LINE ( 'NONE', #25, #77 ) ;

#19 = VECTOR ( 'NONE', #41, 1000.000 ) ;
#29 = VECTOR ( 'NONE', #118, 1000.000 ) ;
#60 = VECTOR ( 'NONE', #64, 1000.000 ) ;
#75 = VECTOR ( 'NONE', #132, 1000.000 ) ;
#76 = VECTOR ( 'NONE', #184, 1000.000 ) ;
#77 = VECTOR ( 'NONE', #24, 1000.000 ) ;
#97 = VECTOR ( 'NONE', #104, 1000.000 ) ;
#99 = VECTOR ( 'NONE', #137, 1000.000 ) ;
#117 = VECTOR ( 'NONE', #42, 1000.000 ) ;
#120 = VECTOR ( 'NONE', #10, 1000.000 ) ;
#142 = VECTOR ( 'NONE', #181, 1000.000 ) ;
#148 = VECTOR ( 'NONE', #166, 1000.000 ) ;

#13 = VERTEX_POINT ( 'NONE', #175 ) ;
#15 = VERTEX_POINT ( 'NONE', #4 ) ;
#40 = VERTEX_POINT ( 'NONE', #180 ) ;
#91 = VERTEX_POINT ( 'NONE', #100 ) ;
#123 = VERTEX_POINT ( 'NONE', #82 ) ;
#145 = VERTEX_POINT ( 'NONE', #163 ) ;
#176 = VERTEX_POINT ( 'NONE', #11 ) ;
#201 = VERTEX_POINT ( 'NONE', #23 ) ;

#20 = SHAPE_DEFINITION_REPRESENTATION ( #43, #17 ) ;

#26 = PRODUCT_CONTEXT ( 'NONE', #106, 'mechanical' ) ;

#27 =( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #58 ) )
GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #151, #183, #199 ) )
REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) ) ;

#35 =( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #143 ) )
GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #169, #200, #122 ) )
REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) ) ;

#14 = AXIS2_PLACEMENT_3D ( 'NONE', #8, #195, #135 ) ;
#49 = AXIS2_PLACEMENT_3D ( 'NONE', #37, #179, #80 ) ;
#110 = AXIS2_PLACEMENT_3D ( 'NONE', #84, #65, #22 ) ;
#121 = AXIS2_PLACEMENT_3D ( 'NONE', #168, #68, #103 ) ;
#124 = AXIS2_PLACEMENT_3D ( 'NONE', #9, #85, #198 ) ;
#170 = AXIS2_PLACEMENT_3D ( 'NONE', #182, #136, #152 ) ;
#174 = AXIS2_PLACEMENT_3D ( 'NONE', #46, #45, #188 ) ;
```

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```
#28 = APPLICATION_CONTEXT ( 'automotive_design' );
#106 = APPLICATION_CONTEXT ( 'automotive_design' );

#38 = COLOUR_RGB ( '',0.792, 0.819, 0.933 );
#105 = COLOUR_RGB ( '',0.792, 0.819, 0.933 );

#43 = PRODUCT_DEFINITION_SHAPE ( 'NONE', 'NONE', #88 );

#50 = EDGE_LOOP ( 'NONE', ( #112, #30, #31, #33 ) );
#78 = EDGE_LOOP ( 'NONE', ( #7, #63, #81, #62 ) );
#79 = EDGE_LOOP ( 'NONE', ( #114, #141, #167, #36 ) );
#126 = EDGE_LOOP ( 'NONE', ( #193, #160, #171, #2 ) );
#154 = EDGE_LOOP ( 'NONE', ( #67, #21, #191, #197 ) );
#159 = EDGE_LOOP ( 'NONE', ( #133, #71, #190, #109 ) );

#51 = PRESENTATION_STYLE_ASSIGNMENT ( ( #72 ) );
#90 = PRESENTATION_STYLE_ASSIGNMENT ( ( #66 ) );

#52 = CLOSED_SHELL ( 'NONE', ( #128, #173, #96, #5, #194, #
34 ) );

#54 = PLANE ( 'NONE', #121 );
#83 = PLANE ( 'NONE', #170 );
#119 = PLANE ( 'NONE', #124 );
#130 = PLANE ( 'NONE', #49 );
#134 = PLANE ( 'NONE', #14 );
#165 = PLANE ( 'NONE', #110 );

#55 = FILL_AREA_STYLE ( '', ( #196 ) );
#73 = FILL_AREA_STYLE ( '', ( #89 ) );

#56 = PRESENTATION_LAYER_ASSIGNMENT ( '', '', ( #113 ) );
#156 = PRESENTATION_LAYER_ASSIGNMENT ( '', '', ( #162 ) );

#57 = SURFACE_SIDE_STYLE ( '', ( #129 ) );
#98 = SURFACE_SIDE_STYLE ( '', ( #164 ) );

#66 = SURFACE_STYLE_USAGE ( .BOTH. , #98 );
#72 = SURFACE_STYLE_USAGE ( .BOTH. , #57 );

#70 = PRODUCT ( 'Cubo 214', 'Cubo 214', '', ( #26 ) );
#86 = APPLICATION_PROTOCOL_DEFINITION ( 'draft international
standard', 'automotive_design', 1998, #106 );
#185 = APPLICATION_PROTOCOL_DEFINITION ( 'draft international
standard', 'automotive_design', 1998, #28 );
```

```
#87 = ( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT
( $, .RADIAN. ) );
#122 = ( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. )
SOLID_ANGLE_UNIT ( ) );
#140 = ( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. )
SOLID_ANGLE_UNIT ( ) );
#183 = ( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT
( $, .RADIAN. ) );
#199 = ( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. )
SOLID_ANGLE_UNIT ( ) );
#200 = ( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT
( $, .RADIAN. ) );

#88 = PRODUCT_DEFINITION ( 'UNKNOWN', '', #158, #93 );

#89 = FILL_AREA_STYLE_COLOUR ( '', #105 );
#196 = FILL_AREA_STYLE_COLOUR ( '', #38 );

#92 = MECHANICAL_DESIGN_GEOMETRIC_PRESENTATION_REPRESENTATION
( '', ( #162 ), #27 );

#93 = PRODUCT_DEFINITION_CONTEXT ( 'detailed design', #28,
'design' );

#113 = STYLED_ITEM ( 'NONE', ( #51 ), #17 );
#162 = STYLED_ITEM ( 'NONE', ( #90 ), #172 );

#129 = SURFACE_STYLE_FILL_AREA ( #73 );
#164 = SURFACE_STYLE_FILL_AREA ( #55 );

#138 = MECHANICAL_DESIGN_GEOMETRIC_PRESENTATION_REPRESENTATION
( '', ( #113 ), #146 );

#146 = ( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #3 ) )
GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #155, #87, #140 ) )
REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) );

#151 = ( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT
( .MILLI., .METRE. ) );
#155 = ( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT
( .MILLI., .METRE. ) );
#169 = ( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT
( .MILLI., .METRE. ) );

#158 = PRODUCT_DEFINITION_FORMATION_WITH_SPECIFIED_SOURCE
( 'ANY', '', #70, .NOT_KNOWN. );

#172 = MANIFOLD_SOLID_BREP ( 'Cubo', #52 );

#186 = PRODUCT_RELATED_PRODUCT_CATEGORY ( 'part', '', ( #70 ) );

ENDSEC;
END-ISO-10303-21;
```

# Ejecución

- ✓ Reordene los grupos de instancias por orden jerárquico, poniendo al final los menos importantes para interpretar el modelo:

- ✓ Ponga al final las instancias relacionadas con unidades, que encontrará buscando "UNIT":

```
#3 = UNCERTAINTY_MEASURE_WITH_UNIT
(LENGTH_MEASURE( 1.000082E-05 ), #155, 'distance_accuracy_value',
'NONE');
#58 = UNCERTAINTY_MEASURE_WITH_UNIT
(LENGTH_MEASURE( 1.000082E-05 ), #151, 'distance_accuracy_value',
'NONE');
#143 = UNCERTAINTY_MEASURE_WITH_UNIT
(LENGTH_MEASURE( 1.000E-05 ), #169, 'distance_accuracy_value',
'NONE');

#87 =( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT
( $, .RADIAN. ) );
#122 =( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. )
SOLID_ANGLE_UNIT ( ) );
#140 =( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. )
SOLID_ANGLE_UNIT ( ) );
#183 =( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT
( $, .RADIAN. ) );
#199 =( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. )
SOLID_ANGLE_UNIT ( ) );
#200 =( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT
( $, .RADIAN. ) );

#151 =( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT
( .MILLI., .METRE. ) );
#155 =( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT
( .MILLI., .METRE. ) );
#169 =( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT
( .MILLI., .METRE. ) );

ENDSEC;
END-ISO-10303-21;
```

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# Ejecución

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**Ejecución**

Conclusiones

√ Ponga delante de las instancias de unidades las instancias de color:

√ Busque las instancias de COLOUR

√ Busque las instancias que utilizan a las instancias de COLOUR En el ejemplo son #38 y #105

√ Repita el procedimiento hasta encontrar todas las instancias de las que dependen las instancias de color

```
#56 = PRESENTATION_LAYER_ASSIGNMENT ( '', '', ( #113 ) ) ;  
#156 = PRESENTATION_LAYER_ASSIGNMENT ( '', '', ( #162 ) ) ;
```

```
#113 = STYLED_ITEM ( 'NONE', ( #51 ), #17 ) ;  
#162 = STYLED_ITEM ( 'NONE', ( #90 ), #172 ) ;
```

```
#51 = PRESENTATION_STYLE_ASSIGNMENT ( ( #72 ) ) ;  
#90 = PRESENTATION_STYLE_ASSIGNMENT ( ( #66 ) ) ;
```

```
#66 = SURFACE_STYLE_USAGE ( .BOTH. , #98 ) ;  
#72 = SURFACE_STYLE_USAGE ( .BOTH. , #57 ) ;
```

```
#57 = SURFACE_SIDE_STYLE ( '', ( #129 ) ) ;  
#98 = SURFACE_SIDE_STYLE ( '', ( #164 ) ) ;
```

```
#129 = SURFACE_STYLE_FILL_AREA ( #73 ) ;  
#164 = SURFACE_STYLE_FILL_AREA ( #55 ) ;
```

```
#55 = FILL_AREA_STYLE ( '', ( #196 ) ) ;  
#73 = FILL_AREA_STYLE ( '', ( #89 ) ) ;
```

```
#89 = FILL_AREA_STYLE_COLOUR ( '', #105 ) ;  
#196 = FILL_AREA_STYLE_COLOUR ( '', #38 ) ;
```

```
#38 = COLOUR_RGB ( '', 0.792, 0.819, 0.933 ) ;  
#105 = COLOUR_RGB ( '', 0.792, 0.819, 0.933 ) ;
```

# Ejecución

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**Ejecución**

Conclusiones

√ Ponga delante de la información de color, la información geométrica del modelo:

√ Ponga los puntos cartesianos (CARTESIAN\_POINT) delante de las instancias de color:

```
#4 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 0.0000 ) );
#6 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#8 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#9 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 50.000 ) );
#11 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 0.0000 ) );
#12 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#23 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 0.0000 ) );
#25 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 0.0000 ) );
#37 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#39 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#46 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 0.0000 ) );
#69 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 50.000 ) );
#82 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 50.000 ) );
#84 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#100 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#101 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#139 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 0.0000 ) );
#149 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 0.0000 ) );
#150 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#153 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 0.0000 ) );
#163 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 0.0000 ) );
#168 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#175 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#177 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#180 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#182 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 0.0000 ) );
#178 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
```

```
#51 = PRESENTATION_STYLE_ASSIGNMENT ( ( #72 ) );
#90 = PRESENTATION_STYLE_ASSIGNMENT ( ( #66 ) );
```

```
#66 = SURFACE_STYLE_USAGE ( .BOTH. , #98 );
#72 = SURFACE_STYLE_USAGE ( .BOTH. , #57 );
```

```
#57 = SURFACE_SIDE_STYLE ( '', ( #129 ) );
#98 = SURFACE_SIDE_STYLE ( '', ( #164 ) );
```

# Ejecución

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**Ejecución**

Conclusiones

✓ Agrupe los vectores y sus direcciones delante de los puntos cartesianos:

```
#19 = VECTOR ( 'NONE', #41, 1000.000 ) ;
#29 = VECTOR ( 'NONE', #118, 1000.000 ) ;
#60 = VECTOR ( 'NONE', #64, 1000.000 ) ;
#75 = VECTOR ( 'NONE', #132, 1000.000 ) ;
#76 = VECTOR ( 'NONE', #184, 1000.000 ) ;
#77 = VECTOR ( 'NONE', #24, 1000.000 ) ;
#97 = VECTOR ( 'NONE', #104, 1000.000 ) ;
#99 = VECTOR ( 'NONE', #137, 1000.000 ) ;
#117 = VECTOR ( 'NONE', #42, 1000.000 ) ;
#120 = VECTOR ( 'NONE', #10, 1000.000 ) ;
#142 = VECTOR ( 'NONE', #181, 1000.000 ) ;
#148 = VECTOR ( 'NONE', #166, 1000.000 ) ;

#10 = DIRECTION ( 'NONE', ( -1.0000, -0.0000, -0.0000 ) ) ;
#22 = DIRECTION ( 'NONE', ( 0.0000, -0.0000, -1.0000 ) ) ;
#24 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) ) ;
#41 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) ) ;
#42 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) ) ;
#45 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, 1.0000 ) ) ;
#64 = DIRECTION ( 'NONE', ( -1.0000, -0.0000, -0.0000 ) ) ;
#65 = DIRECTION ( 'NONE', ( 0.0000, -1.0000, 0.0000 ) ) ;
#68 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) ) ;
#80 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, 1.0000 ) ) ;
#85 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) ) ;
#103 = DIRECTION ( 'NONE', ( 0.0000, -0.0000, 1.0000 ) ) ;
#104 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) ) ;
#118 = DIRECTION ( 'NONE', ( -0.0000, -1.0000, -0.0000 ) ) ;
#132 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) ) ;
#135 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) ) ;
#136 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) ) ;
#137 = DIRECTION ( 'NONE', ( -0.0000, -1.0000, -0.0000 ) ) ;
#152 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, -0.0000 ) ) ;
#166 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) ) ;
#179 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, 0.0000 ) ) ;
#181 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) ) ;
#184 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) ) ;
#188 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) ) ;
#195 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) ) ;
#198 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, -0.0000 ) ) ;
```

# Ejecución

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**Ejecución**

Conclusiones

- √ Mueva delante de los vectores, las definiciones de los sistemas de coordenadas (AXIS2\_PLACEMENT\_3D):

```
#14 = AXIS2_PLACEMENT_3D ( 'NONE', #8, #195, #135 ) ;  
#49 = AXIS2_PLACEMENT_3D ( 'NONE', #37, #179, #80 ) ;  
#110 = AXIS2_PLACEMENT_3D ( 'NONE', #84, #65, #22 ) ;  
#121 = AXIS2_PLACEMENT_3D ( 'NONE', #168, #68, #103 ) ;  
#124 = AXIS2_PLACEMENT_3D ( 'NONE', #9, #85, #198 ) ;  
#170 = AXIS2_PLACEMENT_3D ( 'NONE', #182, #136, #152 ) ;  
#174 = AXIS2_PLACEMENT_3D ( 'NONE', #46, #45, #188 ) ;
```

- √ Mueva las líneas delante de los sistemas de coordenadas:

```
#18 = LINE ( 'NONE', #177, #29 ) ;  
#48 = LINE ( 'NONE', #150, #117 ) ;  
#94 = LINE ( 'NONE', #12, #97 ) ;  
#102 = LINE ( 'NONE', #178, #60 ) ;  
#108 = LINE ( 'NONE', #6, #75 ) ;  
#111 = LINE ( 'NONE', #69, #76 ) ;  
#131 = LINE ( 'NONE', #149, #142 ) ;  
#144 = LINE ( 'NONE', #139, #99 ) ;  
#147 = LINE ( 'NONE', #39, #19 ) ;  
#161 = LINE ( 'NONE', #153, #120 ) ;  
#192 = LINE ( 'NONE', #101, #148 ) ;  
#202 = LINE ( 'NONE', #25, #77 ) ;
```

- √ Mueva los planos delante de las líneas:

```
#54 = PLANE ( 'NONE', #121 ) ;  
#83 = PLANE ( 'NONE', #170 ) ;  
#119 = PLANE ( 'NONE', #124 ) ;  
#130 = PLANE ( 'NONE', #49 ) ;  
#134 = PLANE ( 'NONE', #14 ) ;  
#165 = PLANE ( 'NONE', #110 ) ;
```



# Ejecución

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**Ejecución**

Conclusiones

√ Mueva delante de la información geométrica del modelo, la información topológica:

√ Mueva delante de los planos los vértices:

```
#13 = VERTEX_POINT ( 'NONE', #175 ) ;  
#15 = VERTEX_POINT ( 'NONE', #4 ) ;  
#40 = VERTEX_POINT ( 'NONE', #180 ) ;  
#91 = VERTEX_POINT ( 'NONE', #100 ) ;  
#123 = VERTEX_POINT ( 'NONE', #82 ) ;  
#145 = VERTEX_POINT ( 'NONE', #163 ) ;  
#176 = VERTEX_POINT ( 'NONE', #11 ) ;  
#201 = VERTEX_POINT ( 'NONE', #23 ) ;
```

√ Mueva delante de los vértices las aristas curvas:

```
#1 = EDGE_CURVE ( 'NONE', #91, #176, #48, .T. ) ;  
#47 = EDGE_CURVE ( 'NONE', #201, #15, #161, .T. ) ;  
#53 = EDGE_CURVE ( 'NONE', #176, #201, #202, .T. ) ;  
#59 = EDGE_CURVE ( 'NONE', #123, #201, #111, .T. ) ;  
#61 = EDGE_CURVE ( 'NONE', #15, #145, #144, .T. ) ;  
#74 = EDGE_CURVE ( 'NONE', #13, #145, #94, .T. ) ;  
#95 = EDGE_CURVE ( 'NONE', #123, #40, #102, .T. ) ;  
#107 = EDGE_CURVE ( 'NONE', #40, #15, #147, .T. ) ;  
#116 = EDGE_CURVE ( 'NONE', #91, #123, #108, .T. ) ;  
#127 = EDGE_CURVE ( 'NONE', #40, #13, #18, .T. ) ;  
#157 = EDGE_CURVE ( 'NONE', #13, #91, #192, .T. ) ;  
#187 = EDGE_CURVE ( 'NONE', #145, #176, #131, .T. ) ;
```

# Ejecución

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**Ejecución**

Conclusiones

√ Mueva las aristas orientadas delante de las aristas curvas:

```
#2 = ORIENTED_EDGE ( 'NONE', *, *, #107, .T. ) ;
#7 = ORIENTED_EDGE ( 'NONE', *, *, #127, .T. ) ;
#21 = ORIENTED_EDGE ( 'NONE', *, *, #59, .F. ) ;
#30 = ORIENTED_EDGE ( 'NONE', *, *, #107, .F. ) ;
#31 = ORIENTED_EDGE ( 'NONE', *, *, #95, .F. ) ;
#33 = ORIENTED_EDGE ( 'NONE', *, *, #59, .T. ) ;
#36 = ORIENTED_EDGE ( 'NONE', *, *, #74, .T. ) ;
#62 = ORIENTED_EDGE ( 'NONE', *, *, #95, .T. ) ;
#63 = ORIENTED_EDGE ( 'NONE', *, *, #157, .T. ) ;
#67 = ORIENTED_EDGE ( 'NONE', *, *, #53, .T. ) ;
#71 = ORIENTED_EDGE ( 'NONE', *, *, #47, .F. ) ;
#81 = ORIENTED_EDGE ( 'NONE', *, *, #116, .T. ) ;
#109 = ORIENTED_EDGE ( 'NONE', *, *, #187, .F. ) ;
#112 = ORIENTED_EDGE ( 'NONE', *, *, #47, .T. ) ;
#114 = ORIENTED_EDGE ( 'NONE', *, *, #187, .T. ) ;
#133 = ORIENTED_EDGE ( 'NONE', *, *, #61, .F. ) ;
#141 = ORIENTED_EDGE ( 'NONE', *, *, #1, .F. ) ;
#160 = ORIENTED_EDGE ( 'NONE', *, *, #74, .F. ) ;
#167 = ORIENTED_EDGE ( 'NONE', *, *, #157, .F. ) ;
#171 = ORIENTED_EDGE ( 'NONE', *, *, #127, .F. ) ;
#190 = ORIENTED_EDGE ( 'NONE', *, *, #53, .F. ) ;
#191 = ORIENTED_EDGE ( 'NONE', *, *, #116, .F. ) ;
#193 = ORIENTED_EDGE ( 'NONE', *, *, #61, .T. ) ;
#197 = ORIENTED_EDGE ( 'NONE', *, *, #1, .T. ) ;
```

√ Mueva los bucles de aristas delante de las aristas orientadas:

```
#50 = EDGE_LOOP ( 'NONE', ( #112, #30, #31, #33 ) ) ;
#78 = EDGE_LOOP ( 'NONE', ( #7, #63, #81, #62 ) ) ;
#79 = EDGE_LOOP ( 'NONE', ( #114, #141, #167, #36 ) ) ;
#126 = EDGE_LOOP ( 'NONE', ( #193, #160, #171, #2 ) ) ;
#154 = EDGE_LOOP ( 'NONE', ( #67, #21, #191, #197 ) ) ;
#159 = EDGE_LOOP ( 'NONE', ( #133, #71, #190, #109 ) ) ;
```

# Ejecución

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**Ejecución**

Conclusiones

- ✓ Mueva los contornos de caras delante de los bucles de aristas:

```
#16 = FACE_OUTER_BOUND ( 'NONE', #154, .T. ) ;  
#32 = FACE_OUTER_BOUND ( 'NONE', #78, .T. ) ;  
#44 = FACE_OUTER_BOUND ( 'NONE', #50, .T. ) ;  
#115 = FACE_OUTER_BOUND ( 'NONE', #126, .T. ) ;  
#125 = FACE_OUTER_BOUND ( 'NONE', #159, .T. ) ;  
#189 = FACE_OUTER_BOUND ( 'NONE', #79, .T. ) ;
```

- ✓ Mueva las caras delante de los contornos de caras:

```
#5 = ADVANCED_FACE ( 'NONE', ( #44 ), #165, .F. ) ;  
#34 = ADVANCED_FACE ( 'NONE', ( #125 ), #83, .T. ) ;  
#96 = ADVANCED_FACE ( 'NONE', ( #16 ), #130, .F. ) ;  
#128 = ADVANCED_FACE ( 'NONE', ( #115 ), #134, .F. ) ;  
#173 = ADVANCED_FACE ( 'NONE', ( #189 ), #54, .F. ) ;  
#194 = ADVANCED_FACE ( 'NONE', ( #32 ), #119, .F. ) ;
```

- ✓ Complete la definición del modelo moviendo delante de las caras las instancias de encabezamiento del modelo B-Rep:

```
#172 = MANIFOLD_SOLID_BREP ( 'Cubo', #52 ) ;  
  
#52 = CLOSED_SHELL ( 'NONE', ( #128, #173, #96, #5, #194, #34 ) ) ;
```

# Ejecución

- √ Reagrupe, al principio del bloque de datos, las instancias que describen las características generales del modelo CAD del producto y su representación B-Rep:

```
DATA;
#186 = PRODUCT_RELATED_PRODUCT_CATEGORY ( 'part', '', ( #70 ) );

#70 = PRODUCT ( 'Cubo 214', 'Cubo 214', '', ( #26 ) );
#26 = PRODUCT_CONTEXT ( 'NONE', #106, 'mechanical' );
#106 = APPLICATION_CONTEXT ( 'automotive_design' );
#93 = PRODUCT_DEFINITION_CONTEXT ( 'detailed design', #28, 'design' );
#28 = APPLICATION_CONTEXT ( 'automotive_design' );

#20 = SHAPE_DEFINITION_REPRESENTATION ( #43, #17 );

#43 = PRODUCT_DEFINITION_SHAPE ( 'NONE', 'NONE', #88 );
#88 = PRODUCT_DEFINITION ( 'UNKNOWN', '', #158, #93 );
#158 = PRODUCT_DEFINITION_FORMATION_WITH_SPECIFIED_SOURCE (
  'ANY', '', #70, .NOT_KNOWN. );

#17 = ADVANCED_BREP_SHAPE_REPRESENTATION ( 'Cubo 214', ( #172, #174 ), #35 );
#35 =( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
  GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #143 ) )
  GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #169, #200, #122 ) )
  REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) );

#92 = MECHANICAL_DESIGN_GEOMETRIC_PRESENTATION_REPRESENTATION
( '', ( #162 ), #27 );
#27 =( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
  GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #58 ) )
  GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #151, #183, #199 ) )
  REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) );

#86 = APPLICATION_PROTOCOL_DEFINITION
( 'draft international standard', 'automotive_design', 1998, #106 );

#185 = APPLICATION_PROTOCOL_DEFINITION
| ( 'draft international standard', 'automotive_design', 1998, #28 );

#138 = MECHANICAL_DESIGN_GEOMETRIC_PRESENTATION_REPRESENTATION
( '', ( #113 ), #146 );
#146 =( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
  GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #3 ) )
  GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #155, #87, #140 ) )
  REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) );

#172 = MANIFOLD_SOLID_BREP ( 'Cubo', #52 );
```

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# Ejecución

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El resultado final es un fichero físico no legible por las aplicaciones CAD (porque está desordenado), pero más legible para los humanos:

```
ISO-10303-21;
HEADER;
FILE_DESCRIPTION (( 'STEP AP214' ),
  '1' );
FILE_NAME ('Cubo 214.STEP',
  '2021-01-25T21:49:35',
  ( '' ),
  ( '' ),
  'SwSTEP 2.0',
  'SolidWorks 2018',
  '' );
FILE_SCHEMA (( 'AUTOMOTIVE_DESIGN' ));
ENDSEC;

DATA;
#186 = PRODUCT_RELATED_PRODUCT_CATEGORY ( 'part', '', ( #70 ) );

#70 = PRODUCT ( 'Cubo 214', 'Cubo 214', '', ( #26 ) );
#26 = PRODUCT_CONTEXT ( 'NONE', #106, 'mechanical' );
#106 = APPLICATION_CONTEXT ( 'automotive_design' );
#93 = PRODUCT_DEFINITION_CONTEXT ( 'detailed design', #28, 'design' );
#28 = APPLICATION_CONTEXT ( 'automotive_design' );

#20 = SHAPE_DEFINITION_REPRESENTATION ( #43, #17 );

#43 = PRODUCT_DEFINITION_SHAPE ( 'NONE', 'NONE', #88 );
#88 = PRODUCT_DEFINITION ( 'UNKNOWN', '', #158, #93 );
#158 = PRODUCT_DEFINITION_FORMATION_WITH_SPECIFIED_SOURCE (
  'ANY', '', #70, .NOT_KNOWN. );

#17 = ADVANCED_BREP_SHAPE_REPRESENTATION ( 'Cubo 214', ( #172, #174 ), #35 );
#35 = ( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
  GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #143 ) )
  GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #169, #200, #122 ) )
  REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) );

#92 = MECHANICAL_DESIGN_GEOMETRIC_PRESENTATION_REPRESENTATION
( '', ( #162 ), #27 );
#27 = ( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
  GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #58 ) )
  GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #151, #183, #199 ) )
  REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) );

#86 = APPLICATION_PROTOCOL_DEFINITION
( 'draft international standard', 'automotive_design', 1998, #106 );

#185 = APPLICATION_PROTOCOL_DEFINITION
( 'draft international standard', 'automotive_design', 1998, #28 );

#138 = MECHANICAL_DESIGN_GEOMETRIC_PRESENTATION_REPRESENTATION
( '', ( #113 ), #146 );
#146 = ( GEOMETRIC_REPRESENTATION_CONTEXT ( 3 )
  GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT ( ( #3 ) )
  GLOBAL_UNIT_ASSIGNED_CONTEXT ( ( #155, #87, #140 ) )
  REPRESENTATION_CONTEXT ( 'NONE', 'WORKSPACE' ) );
```

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```
#172 = MANIFOLD_SOLID_BREP ( 'Cubo', #52 ) ;

#52 = CLOSED_SHELL ( 'NONE', ( #128, #173, #96, #5, #194, #34 ) ) ;

#5 = ADVANCED_FACE ( 'NONE', ( #44 ), #165, .F. ) ;
#34 = ADVANCED_FACE ( 'NONE', ( #125 ), #83, .T. ) ;
#96 = ADVANCED_FACE ( 'NONE', ( #16 ), #130, .F. ) ;
#128 = ADVANCED_FACE ( 'NONE', ( #115 ), #134, .F. ) ;
#173 = ADVANCED_FACE ( 'NONE', ( #189 ), #54, .F. ) ;
#194 = ADVANCED_FACE ( 'NONE', ( #32 ), #119, .F. ) ;

#16 = FACE_OUTER_BOUND ( 'NONE', #154, .T. ) ;
#32 = FACE_OUTER_BOUND ( 'NONE', #78, .T. ) ;
#44 = FACE_OUTER_BOUND ( 'NONE', #50, .T. ) ;
#115 = FACE_OUTER_BOUND ( 'NONE', #126, .T. ) ;
#125 = FACE_OUTER_BOUND ( 'NONE', #159, .T. ) ;
#189 = FACE_OUTER_BOUND ( 'NONE', #79, .T. ) ;

#50 = EDGE_LOOP ( 'NONE', ( #112, #30, #31, #33 ) ) ;
#78 = EDGE_LOOP ( 'NONE', ( #7, #63, #81, #62 ) ) ;
#79 = EDGE_LOOP ( 'NONE', ( #114, #141, #167, #36 ) ) ;
#126 = EDGE_LOOP ( 'NONE', ( #193, #160, #171, #2 ) ) ;
#154 = EDGE_LOOP ( 'NONE', ( #67, #21, #191, #197 ) ) ;
#159 = EDGE_LOOP ( 'NONE', ( #133, #71, #190, #109 ) ) ;

#2 = ORIENTED_EDGE ( 'NONE', *, *, #107, .T. ) ;
#7 = ORIENTED_EDGE ( 'NONE', *, *, #127, .T. ) ;
#21 = ORIENTED_EDGE ( 'NONE', *, *, #59, .F. ) ;
#30 = ORIENTED_EDGE ( 'NONE', *, *, #107, .F. ) ;
#31 = ORIENTED_EDGE ( 'NONE', *, *, #95, .F. ) ;
#33 = ORIENTED_EDGE ( 'NONE', *, *, #59, .T. ) ;
#36 = ORIENTED_EDGE ( 'NONE', *, *, #74, .T. ) ;
#62 = ORIENTED_EDGE ( 'NONE', *, *, #95, .T. ) ;
#63 = ORIENTED_EDGE ( 'NONE', *, *, #157, .T. ) ;
#67 = ORIENTED_EDGE ( 'NONE', *, *, #53, .T. ) ;
#71 = ORIENTED_EDGE ( 'NONE', *, *, #47, .F. ) ;
#91 = ORIENTED_EDGE ( 'NONE', *, *, #116, .T. ) ;
#109 = ORIENTED_EDGE ( 'NONE', *, *, #187, .F. ) ;
#112 = ORIENTED_EDGE ( 'NONE', *, *, #47, .T. ) ;
#114 = ORIENTED_EDGE ( 'NONE', *, *, #187, .T. ) ;
#133 = ORIENTED_EDGE ( 'NONE', *, *, #61, .F. ) ;
#141 = ORIENTED_EDGE ( 'NONE', *, *, #1, .F. ) ;
#160 = ORIENTED_EDGE ( 'NONE', *, *, #74, .F. ) ;
#167 = ORIENTED_EDGE ( 'NONE', *, *, #157, .F. ) ;
#171 = ORIENTED_EDGE ( 'NONE', *, *, #127, .F. ) ;
#190 = ORIENTED_EDGE ( 'NONE', *, *, #53, .F. ) ;
#191 = ORIENTED_EDGE ( 'NONE', *, *, #116, .F. ) ;
#193 = ORIENTED_EDGE ( 'NONE', *, *, #61, .T. ) ;
#197 = ORIENTED_EDGE ( 'NONE', *, *, #1, .T. ) ;

#1 = EDGE_CURVE ( 'NONE', #91, #176, #48, .T. ) ;
#47 = EDGE_CURVE ( 'NONE', #201, #15, #161, .T. ) ;
#53 = EDGE_CURVE ( 'NONE', #176, #201, #202, .T. ) ;
#59 = EDGE_CURVE ( 'NONE', #123, #201, #111, .T. ) ;
#61 = EDGE_CURVE ( 'NONE', #15, #145, #144, .T. ) ;
#74 = EDGE_CURVE ( 'NONE', #13, #145, #94, .T. ) ;
#95 = EDGE_CURVE ( 'NONE', #123, #40, #102, .T. ) ;
#107 = EDGE_CURVE ( 'NONE', #40, #15, #147, .T. ) ;
#116 = EDGE_CURVE ( 'NONE', #91, #123, #108, .T. ) ;
#127 = EDGE_CURVE ( 'NONE', #40, #13, #18, .T. ) ;
#157 = EDGE_CURVE ( 'NONE', #13, #91, #192, .T. ) ;
#187 = EDGE_CURVE ( 'NONE', #145, #176, #131, .T. ) ;
```

```
#13 = VERTEX_POINT ( 'NONE', #175 ) ;
#15 = VERTEX_POINT ( 'NONE', #4 ) ;
#40 = VERTEX_POINT ( 'NONE', #180 ) ;
#91 = VERTEX_POINT ( 'NONE', #100 ) ;
#123 = VERTEX_POINT ( 'NONE', #82 ) ;
#145 = VERTEX_POINT ( 'NONE', #163 ) ;
#176 = VERTEX_POINT ( 'NONE', #11 ) ;
#201 = VERTEX_POINT ( 'NONE', #23 ) ;

#54 = PLANE ( 'NONE', #121 ) ;
#83 = PLANE ( 'NONE', #170 ) ;
#119 = PLANE ( 'NONE', #124 ) ;
#130 = PLANE ( 'NONE', #49 ) ;
#134 = PLANE ( 'NONE', #14 ) ;
#165 = PLANE ( 'NONE', #110 ) ;

#18 = LINE ( 'NONE', #177, #29 ) ;
#48 = LINE ( 'NONE', #150, #117 ) ;
#94 = LINE ( 'NONE', #12, #97 ) ;
#102 = LINE ( 'NONE', #178, #60 ) ;
#108 = LINE ( 'NONE', #6, #75 ) ;
#111 = LINE ( 'NONE', #69, #76 ) ;
#131 = LINE ( 'NONE', #149, #142 ) ;
#144 = LINE ( 'NONE', #139, #99 ) ;
#147 = LINE ( 'NONE', #39, #19 ) ;
#161 = LINE ( 'NONE', #153, #120 ) ;
#192 = LINE ( 'NONE', #101, #148 ) ;
#202 = LINE ( 'NONE', #25, #77 ) ;

#14 = AXIS2_PLACEMENT_3D ( 'NONE', #8, #195, #135 ) ;
#49 = AXIS2_PLACEMENT_3D ( 'NONE', #37, #179, #80 ) ;
#110 = AXIS2_PLACEMENT_3D ( 'NONE', #84, #65, #22 ) ;
#121 = AXIS2_PLACEMENT_3D ( 'NONE', #168, #68, #103 ) ;
#124 = AXIS2_PLACEMENT_3D ( 'NONE', #9, #85, #198 ) ;
#170 = AXIS2_PLACEMENT_3D ( 'NONE', #182, #136, #152 ) ;
#174 = AXIS2_PLACEMENT_3D ( 'NONE', #46, #45, #188 ) ;

#19 = VECTOR ( 'NONE', #41, 1000.000 ) ;
#29 = VECTOR ( 'NONE', #118, 1000.000 ) ;
#60 = VECTOR ( 'NONE', #64, 1000.000 ) ;
#75 = VECTOR ( 'NONE', #132, 1000.000 ) ;
#76 = VECTOR ( 'NONE', #184, 1000.000 ) ;
#77 = VECTOR ( 'NONE', #24, 1000.000 ) ;
#97 = VECTOR ( 'NONE', #104, 1000.000 ) ;
#99 = VECTOR ( 'NONE', #137, 1000.000 ) ;
#117 = VECTOR ( 'NONE', #42, 1000.000 ) ;
#120 = VECTOR ( 'NONE', #10, 1000.000 ) ;
#142 = VECTOR ( 'NONE', #181, 1000.000 ) ;
#148 = VECTOR ( 'NONE', #166, 1000.000 ) ;
```

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```
#10 = DIRECTION ( 'NONE', ( -1.0000, -0.0000, -0.0000 ) );
#22 = DIRECTION ( 'NONE', ( 0.0000, -0.0000, -1.0000 ) );
#24 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) );
#41 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) );
#42 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) );
#45 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, 1.0000 ) );
#64 = DIRECTION ( 'NONE', ( -1.0000, -0.0000, -0.0000 ) );
#65 = DIRECTION ( 'NONE', ( 0.0000, -1.0000, 0.0000 ) );
#68 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) );
#80 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, 1.0000 ) );
#85 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) );
#103 = DIRECTION ( 'NONE', ( 0.0000, -0.0000, 1.0000 ) );
#104 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) );
#118 = DIRECTION ( 'NONE', ( -0.0000, -1.0000, -0.0000 ) );
#132 = DIRECTION ( 'NONE', ( 0.0000, 1.0000, 0.0000 ) );
#135 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) );
#136 = DIRECTION ( 'NONE', ( 0.0000, 0.0000, -1.0000 ) );
#137 = DIRECTION ( 'NONE', ( -0.0000, -1.0000, -0.0000 ) );
#152 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, -0.0000 ) );
#166 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) );
#179 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, 0.0000 ) );
#181 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) );
#184 = DIRECTION ( 'NONE', ( -0.0000, -0.0000, -1.0000 ) );
#188 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) );
#195 = DIRECTION ( 'NONE', ( 1.0000, 0.0000, 0.0000 ) );
#198 = DIRECTION ( 'NONE', ( -1.0000, 0.0000, -0.0000 ) );

#4 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 0.000 ) );
#6 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#8 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#9 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 50.000 ) );
#11 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 0.000 ) );
#12 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#23 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 0.000 ) );
#25 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 0.000 ) );
#37 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#39 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#46 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 0.0000 ) );
#69 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 50.000 ) );
#82 = CARTESIAN_POINT ( 'NONE', ( 25.000, 25.000, 50.000 ) );
#84 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#100 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#101 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#139 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 0.000 ) );
#149 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 0.000 ) );
#150 = CARTESIAN_POINT ( 'NONE', ( 25.000, -25.000, 50.000 ) );
#153 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 0.000 ) );
#163 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 0.000 ) );
#168 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#175 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#177 = CARTESIAN_POINT ( 'NONE', ( -25.000, -25.000, 50.000 ) );
#180 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
#182 = CARTESIAN_POINT ( 'NONE', ( 0.0000, 0.0000, 0.0000 ) );
#178 = CARTESIAN_POINT ( 'NONE', ( -25.000, 25.000, 50.000 ) );
```

```
#56 = PRESENTATION_LAYER_ASSIGNMENT ( '', '', ( #113 ) );
#156 = PRESENTATION_LAYER_ASSIGNMENT ( '', '', ( #162 ) );

#113 = STYLED_ITEM ( 'NONE', ( #51 ), #17 );
#162 = STYLED_ITEM ( 'NONE', ( #90 ), #172 );

#51 = PRESENTATION_STYLE_ASSIGNMENT ( ( #72 ) );
#90 = PRESENTATION_STYLE_ASSIGNMENT ( ( #66 ) );

#66 = SURFACE_STYLE_USAGE ( .BOTH., #98 );
#72 = SURFACE_STYLE_USAGE ( .BOTH., #57 );

#57 = SURFACE_SIDE_STYLE ( '', ( #129 ) );
#98 = SURFACE_SIDE_STYLE ( '', ( #164 ) );

#129 = SURFACE_STYLE_FILL_AREA ( #73 );
#164 = SURFACE_STYLE_FILL_AREA ( #55 );

#55 = FILL_AREA_STYLE ( '', ( #196 ) );
#73 = FILL_AREA_STYLE ( '', ( #89 ) );

#89 = FILL_AREA_STYLE_COLOUR ( '', #105 );
#196 = FILL_AREA_STYLE_COLOUR ( '', #38 );

#38 = COLOUR_RGB ( '', 0.792, 0.819, 0.933 );
#105 = COLOUR_RGB ( '', 0.792, 0.819, 0.933 );

#3 = UNCERTAINTY_MEASURE_WITH_UNIT ( LENGTH_MEASURE( 1.000082E-05 ), #155,
'distance_accuracy_value', 'NONE' );
#58 = UNCERTAINTY_MEASURE_WITH_UNIT ( LENGTH_MEASURE( 1.000082E-05 ), #151,
'distance_accuracy_value', 'NONE' );
#143 = UNCERTAINTY_MEASURE_WITH_UNIT ( LENGTH_MEASURE( 1.000E-05 ), #169,
'distance_accuracy_value', 'NONE' );

#87 = ( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT ( $, .RADIAN. ) );
#122 = ( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. ) SOLID_ANGLE_UNIT ( ) );
#140 = ( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. ) SOLID_ANGLE_UNIT ( ) );
#183 = ( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT ( $, .RADIAN. ) );
#199 = ( NAMED_UNIT ( * ) SI_UNIT ( $, .STERADIAN. ) SOLID_ANGLE_UNIT ( ) );
#200 = ( NAMED_UNIT ( * ) PLANE_ANGLE_UNIT ( ) SI_UNIT ( $, .RADIAN. ) );

#151 = ( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT ( .MILLI., .METRE. ) );
#155 = ( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT ( .MILLI., .METRE. ) );
#169 = ( LENGTH_UNIT ( ) NAMED_UNIT ( * ) SI_UNIT ( .MILLI., .METRE. ) );

ENDSEC;
END-ISO-10303-21;
```

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- 1 Exportar a formatos neutros implementados en la aplicación nativa es un proceso sencillo y rápido

Pero algunos formatos neutros tienen diferentes “versiones”

- 2 Los formatos neutros representados en texto legible se pueden editar con editores de texto sencillos

- 3 Los formatos cuya secuencia se basa en etiquetas (como STEP), resultan difíciles de leer, a pesar de estar contenidos en documentos de texto plano

- 4 Editar el formato para romper la secuencia de las etiquetas y agrupar las instancias por tipos simplifica la lectura de los ficheros físicos de STEP

Aunque el resultado puede ser un fichero no legible para las aplicaciones CAD, y el proceso manual consume mucho tiempo



# Conclusiones



Existen aplicaciones que automatizan parte del trabajo necesario para analizar los ficheros físicos de STEP:

NIST STEP File Analyzer and Viewer 4.34

Robert Lipman

<https://www.nist.gov/services-resources/software/step-file-analyzer-and-viewer>



Entity	Count
colour_rgb	2
fill_area_style	2
fill_area_style_colour	2
presentation_layer_assignment	2
presentation_style_assignment	2
styled_item	2
surface_side_style	2
surface_style_fill_area	2
surface_style_usage	2
advanced_brep_shape_representation (geometric_representation_context)	1
(global_uncertainty_assigned_context)	3
(global_unit_assigned_context)	1
mechanical_design_geometric_representation	2
shape_definition_representation	1
application_context	2
application_protocol_definition	2
product	1
product_context	1
product_definition	1
product_definition_context	1
product_definition_formation_with_specified_source	1
product_definition_shape	1
product_related_product_category	1
advanced_face	6
axis2_placement_3d	7
cartesian_point	27
closed_shell	1
direction	26
edge_sweep	12
edge_loop	6
face_swept_bound	6
line	12
shell_of_solid_brep	1
oriented_edge	24
plane	6
vector	12
vertex_point	8
(length_unit)	3
(si_unit)	3
(plane_angle_unit)	3
(si_unit)	3
(solid_angle_unit)	3
uncertainty_measure_with_unit	3
Entity types not processed (0)	

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