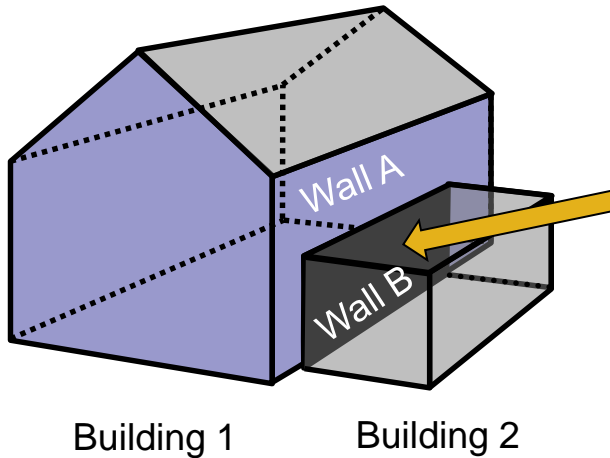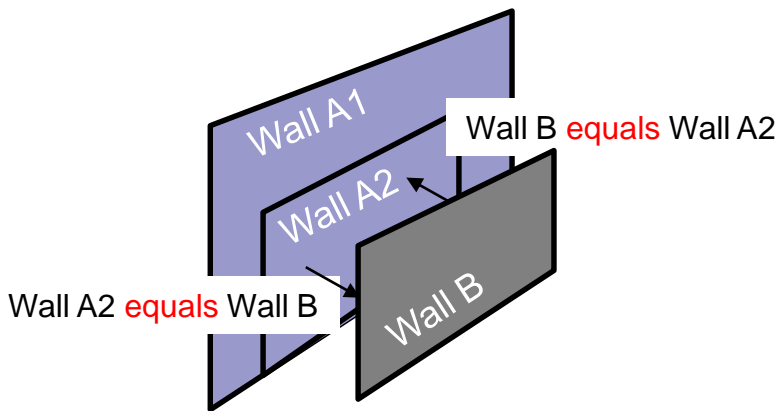# Representation of touching surfaces using relation types (I)
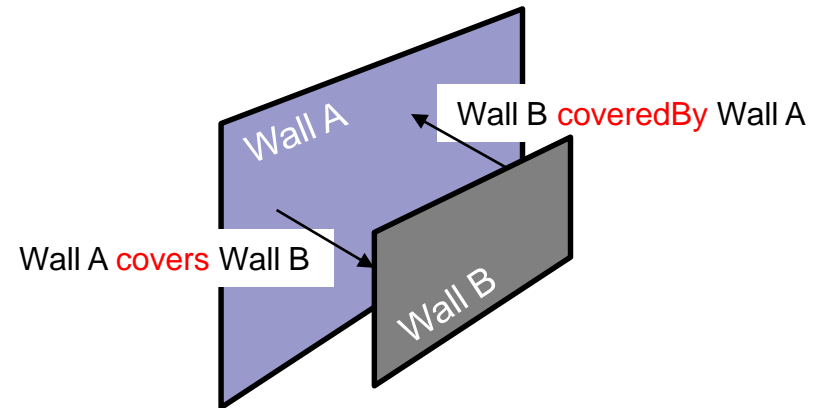

This touching surface can be represented in the following two ways using the relation types from the CityGML 3.0 Core module

1) Wall A is split up into a touching (A2) and non-touching (A1) part. The topological relation "equals" is assigned to the touching surfaces.

2) Wall A is not split up. The topological relations "covers" and "coveredBy" are assigned to the touching surfaces.

Encoding of alternative 1

Wall A1

Wall A2

Wall B equals Wall A2

Wall A2 equals Wall B

Wall B

```xml
<CityModel>

  <cityObjectMember>
    <bldg:Building gml:id="BLDG_1">
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_A1">
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_A2">
          <relatedTo>
            <CityObjectRelation>
              <relationType>equals</relationType>
              <relatedTo xlink:href="#WALL_B"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
      …
    </bldg:Building>
  </cityObjectMember>

  <cityObjectMember>
    <bldg:Building gml:id="BLDG_2">
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_B">
          <relatedTo>
            <CityObjectRelation>
              <relationType>equals</relationType>
              <relatedTo xlink:href="#WALL_A2"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
      …
    </bldg:Building>
  </cityObjectMember>

</CityModel>
```
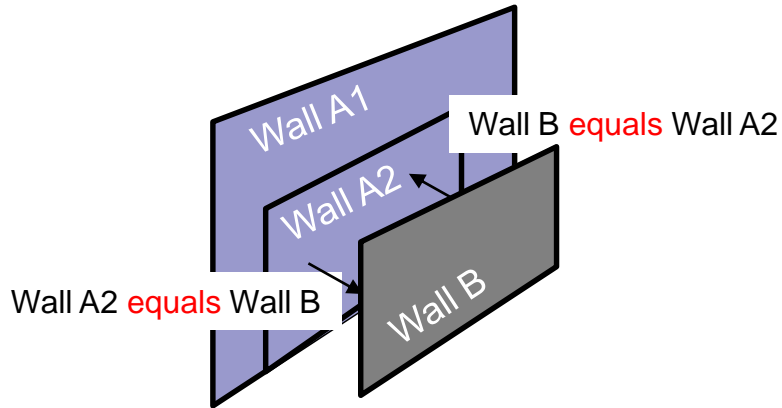
Encoding of alternative 2

Wall B coveredBy Wall A

Wall A covers Wall B

```xml
<CityModel>

  <cityObjectMember>
    <bldg:Building gml:id="BLDG_1">
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_A">
          <relatedTo>
            <CityObjectRelation>
              <relationType>covers</relationType>
              <relatedTo xlink:href="#WALL_B"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
    </bldg:Building>
  </cityObjectMember>

  <cityObjectMember>
    <bldg:Building gml:id="BLDG_2">
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_B">
          <relatedTo>
            <CityObjectRelation>
              <relationType>coveredBy</relationType>
              <relatedTo xlink:href="#WALL_A"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
    </bldg:Building>
  </cityObjectMember>

</CityModel>
```
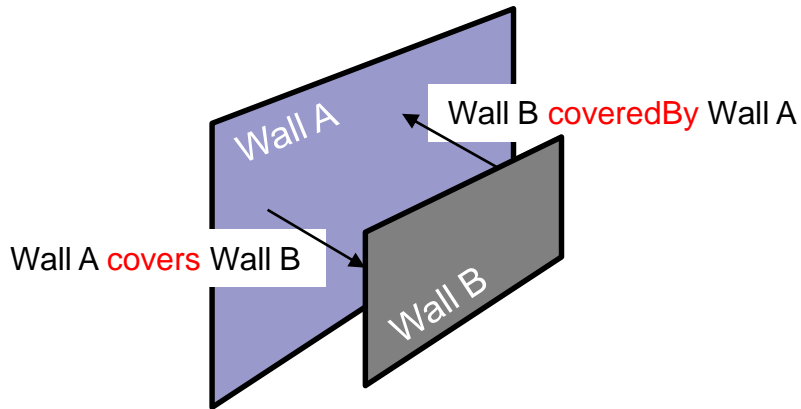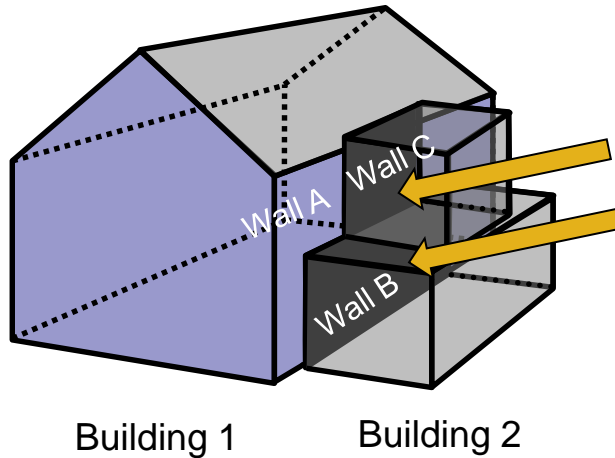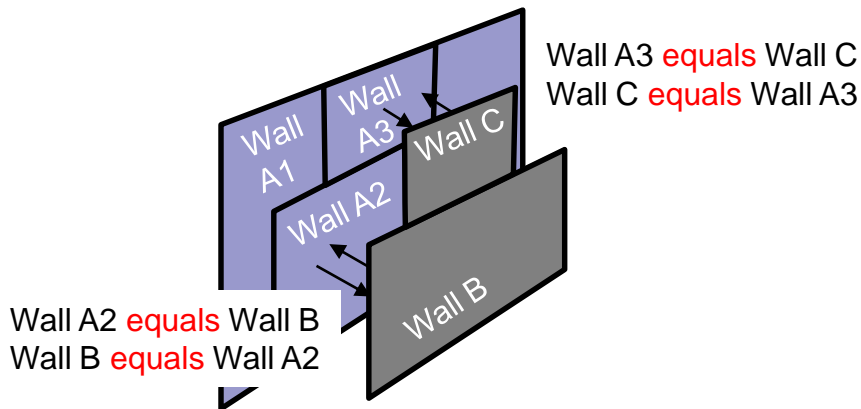
Representation of touching surfaces using relation types (II)

Building 1   Building 2

The touching surfaces can be represented in the following two ways using the relation types from the CityGML 3.0 Core module

1) Wall A is split up into touching (A2, A3) and non-touching (A1, A4) parts. The topological relation "equals" is assigned to the touching surfaces.

Wall A3 equals Wall C
Wall C equals Wall A3

Wall A2 equals Wall B
Wall B equals Wall A2

2) Wall A is not split up. The topological relations "covers" and "coveredBy" are assigned to the touching surfaces.

Wall C coveredBy Wall A

Wall A covers Wall B
Wall A covers Wall C

Wall B coveredBy Wall A

Encoding of alternative 1

Wall A3 equals Wall C
Wall C equals Wall A3

Wall A2 equals Wall B
Wall B equals Wall A2

```xml
<CityModel>

  <cityObjectMember>
    <bldg:Building gml:id="BLDG_1">
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_A1">
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_A2">
          <relatedTo>
            <CityObjectRelation>
              <relationType>equals</relationType>
              <relatedTo xlink:href="#WALL_B"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
      …
```

```xml
      …
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_A3">
          <relatedTo>
            <CityObjectRelation>
              <relationType>equals</relationType>
              <relatedTo xlink:href="#WALL_C"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_A4">
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>

      …
    </bldg:Building>
  </cityObjectMember>

  <cityObjectMember>
    <bldg:Building gml:id="BLDG_2">
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_B">
          <relatedTo>
            <CityObjectRelation>
              <relationType>equals</relationType>
              <relatedTo xlink:href="#WALL_A2"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>v
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_C">
          <relatedTo>
            <CityObjectRelation>
              <relationType>equals</relationType>
              <relatedTo xlink:href="#WALL_A3"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>

      …
    </bldg:Building>
  </cityObjectMember>

</CityModel>
```

Encoding of alternative 2

Wall C coveredBy Wall A

Wall A covers Wall B
Wall A covers Wall C

Wall B coveredBy Wall A

```xml
<CityModel>

  <cityObjectMember>
    <bldg:Building gml:id="BLDG_1">
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_A">
          <relatedTo>
            <CityObjectRelation>
              <relationType>covers</relationType>
              <relatedTo xlink:href="#WALL_B"/>
            </CityObjectRelation>
          </relatedTo>
          <relatedTo>
            <CityObjectRelation>
              <relationType>covers</relationType>
              <relatedTo xlink:href="#WALL_C"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
    </bldg:Building>
  </cityObjectMember>

…
```
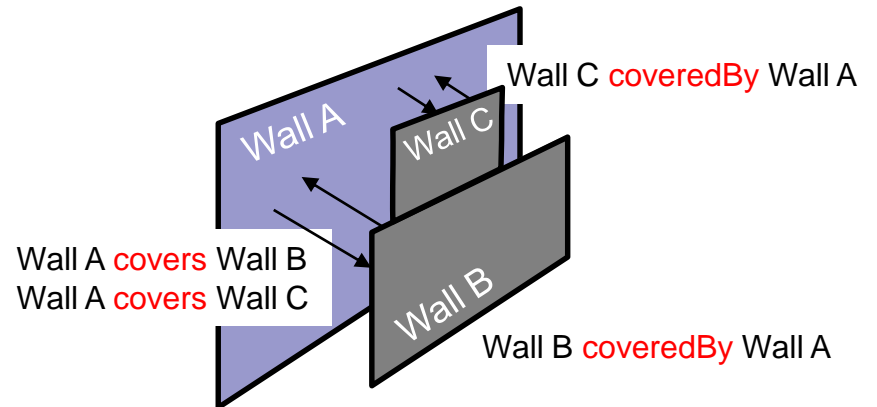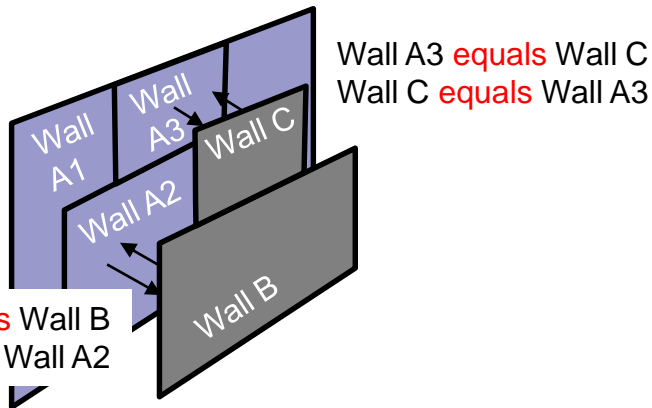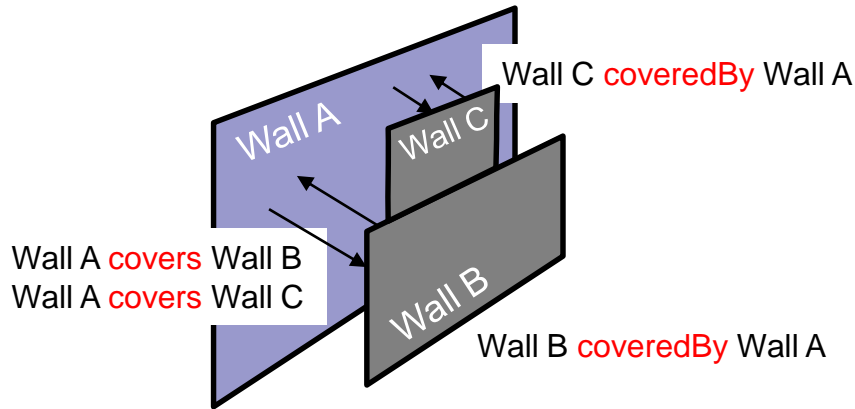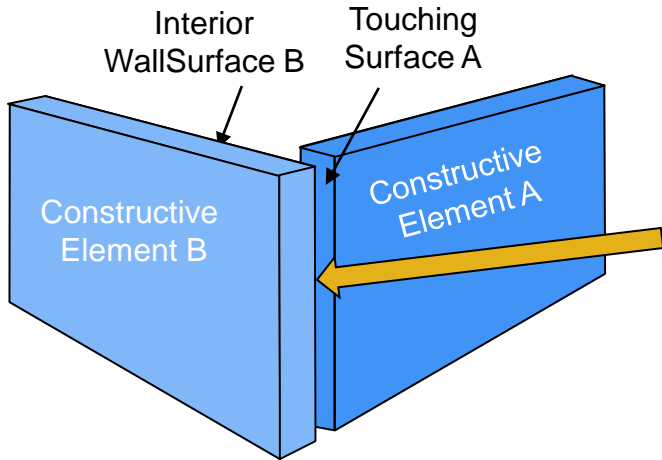
```xml
…
  <cityObjectMember>
    <bldg:Building gml:id="BLDG_2">
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_B">
          <relatedTo>
            <CityObjectRelation>
              <relationType>coveredBy</relationType>
              <relatedTo xlink:href="#WALL_A"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
      <con:constructionSurface>
        <con:WallSurface gml:id="WALL_C">
          <relatedTo>
            <CityObjectRelation>
              <relationType>coveredBy</relationType>
              <relatedTo xlink:href="#WALL_A"/>
            </CityObjectRelation>
          </relatedTo>
          <lod2MultiSurface>…</lod2MultiSurface>
        </con:WallSurface>
      </con:constructionSurface>
    </bldg:Building>
  </cityObjectMember>

</CityModel>
```

Representation of touching constructive elements using relation types

Interior
WallSurface B

Touching
Surface A

Constructive
Element A

Constructive
Element B

The touching surfaces of these constructive elements can be represented in the following two ways using the relation types from the CityGML 3.0 Core module

1) The InteriorWallSurface is split up into a touching (A1) and non-touching (A2) part. The topological relation "equals" is assigned to the touching surfaces.

TouchingSurface A

Interior
WallSurface B1

TS A equals IWS B2

IWS B2 equals TS A

InteriorWallSurface B2
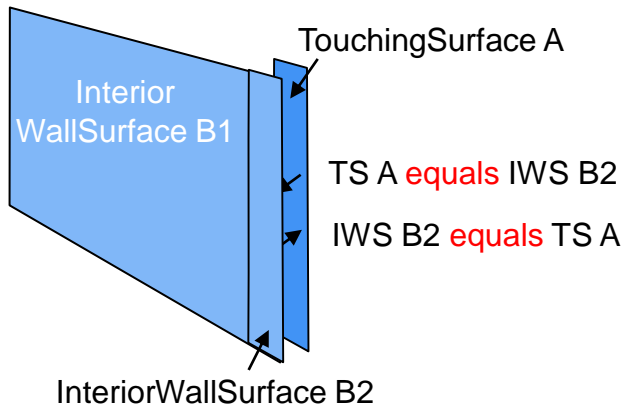
2) The InteriorWallSurface is not split up. The topological relations "covers" and "coveredBy" are assigned to the touching surfaces.

TouchingSurface A

Interior
WallSurface B

TS A isCoveredBy IWS B

IWS B covers TS A