

December 10, 2025

ISO/IEC JTC1/SC32/WG3 ANSI INCITS DM32 Database

Title: Incorrect outer reference prevention in <from clause>
Author: Gerald Venzl
Project: SQL: 202X-CD
Status: Proposal

Revision	Date	ISO/IEC JTC1/SC32/WG3	ANSI/INCITS DM32
Original	2025-11-07	W30-019	DM32-2025-00209
Revision 1	2025-12-09	W30-019r1	DM32-2025-00209r1

References:

[Foundation CD] WG3:W30-013 (DM32-2025-00207) (ISO Committee Draft) Database Language SQL
– Part 2: Foundation (SQL/Foundation), Jim Melton, Joern Bartels (editors), October 2025

[Foundation:2023] “ISO International Standard (IS) Information technology — Database Language SQL — Part 2: SQL/Foundation”, ISO/IEC 9075-2:2023

[CD comments] “SC32/WG3 CD 9075 Consolidated Comments”, ISO/IEC JTC1/SC32 (not yet available)

Abstract:

This paper proposes a bug fix to a syntax rule in 7.5 <from clause>.

1 Introduction

This proposal addresses the following ballot comments in [CD comments]:

- SEQ# ??, P02-USA-??? 2-Minor Technical P02-07.05, <from clause>

In SQL:2023 and earlier versions the following SQL query was valid:

```
SELECT ...  
FROM t1, LATERAL (SELECT id FROM t2 WHERE t1.c1=t2.c2) tv;
```

In CD SQL:202X this query is no longer valid due to changes in subclause 7.5 <from clause>, SR2)

In SQL:2023 the SR stated:

2) No element TR_i in TRL shall contain an outer reference to an element TR_j , where $i \leq j$.

In CD SQL:202X the SR states:

2) No element in TRL shall contain an outer reference to any other element in TRL.

The intent of the original SR was to prevent outer references to succeeding table references and allowing outer references to preceding table references. The new SR prevents any outer references in either direction.

The semantics of SQL:2023 need to be reinstated.

The ballot comment is correct.

In SQL:2023 and earlier versions the following SQL query containing an outer reference in table reference *tv* to the preceding table reference *t1* is valid:

```
SELECT ...  
FROM t1, LATERAL (SELECT id FROM t2 WHERE t1.c1=t2.c2) tv;
```

Conversely, an outer reference to a succeeding table reference is not valid:

```
SELECT ...  
FROM LATERAL (SELECT id FROM t2 WHERE t1.c1=t2.c2) tv, t1;
```

This rule was enforced by 7.5 <from clause> SR2), which stated:

2) No element TR_i in TRL shall contain an outer reference to an element TR_j , where $i \leq j$.

The recently applied change to 7.5 <from clause> SR 2) breaks the intended syntax rule logic and inadvertently prevents any outer references altogether:

2) No element in TRL shall contain an outer reference to any other element in TRL.

To reinstate the semantics of the syntax rule, symbols need to be defined to help iterate through the table references and a check needs to be in place to verify that a given table reference has no reference to another table reference to its right side.

For that, the number of total table references need to be acquired. This is already done by SR 6):

6) Let NT be the number of <table reference>s immediately contained in TRL. Let NR_0 be 0 (zero).

During the presentation of the original proposal, it was stated that a new syntax rule was preferred rather than attaching it to SR 6) a) as the check of the previous SR 2) checks for different restrictions than SR 6) a). The author agrees that attaching it to SR 6) a) might make it harder for the reader to understand the implication of this particular syntax rule and the other rules and concluded that making this syntax rule the very first subrule of SR 6) is the best course of action.

During the presentation of the original proposal, it was also stated that the definition of “outer reference” is not clear and should be specified. The term outer reference is defined in 6.7 <column reference> SR 4) as:

4) If a <column reference> CR is contained in a <table expression> TE and the qualifying scope of CR contains TE , then CR is an outer reference to the qualifying table of CR .

However, the author too has found that the underlying definition of outer reference traverses through several layers of the standard and gets convoluted and could use improvement. Yet, this is out of scope of this paper, as this paper is just trying to establish previously existing semantics that already used outer reference.

Instead, the author recommends submitting a CD comment for outer reference that can address this concern separately.

After review of the syntax rule and outer reference, the author concluded to add a new subrule rule to SR 6). Because the original syntax rule was checked prior to SR 6), the author recommends adding this new rule as the first subrule a) to SR 6):

a.0) For all i , $1 \text{ (one)} \leq i < NT$ and for all n , $i < n \leq NT$, TR_i shall not contain an outer reference to TR_n .

Additional changes are required to define TR for the syntax rule while NT is defined by SR 6) itself.

This new syntax rule runs a loop through all table references. For each table reference, a new loop is instantiated checking for all remaining elements after i that no following table reference has an outer reference to current table reference at position i , hence preventing an outer reference to occur before the table reference itself is defined.

In other words, the syntax rule established that:

- i ranges from 1 to $NT-1$ (number of table references), last table reference cannot have a right-side outer reference anymore
- n ranges from current position $i+1$ ($i < n$) to NT (number of table references), including the last table reference
- TR_i (current table reference on position i) shall not container an outer reference to TR_n (table reference at position n following i)

Reiterating the rule:

- a.0) For all i , $1 \leq i < NT$ and for all n , $i < n \leq NT$, TR_i shall not contain an outer reference to TR_n .

Example with a **to be prevented** statement that references t3 inside of t2 before t3 occurs:

```
SELECT ...  
FROM t1, LATERAL (SELECT id FROM t2 WHERE t3.c1=t2.c2) t2, t3;
```

1. Counter i starts at 1 and ranges from 1 – 2 (t1, t2)
2. For counter at position i , currently 1
 - a. Counter n starts at 2 ($i < n$) and ranges from 2 – 3 (t2, t3)
 - i. Table reference TR_i (currently t1) shall not contain an outer reference to table reference TR_n (currently t2), correct
 - b. Counter n is incremented to 3
 - i. Table reference TR_i (currently t1) shall not contain an outer reference to table reference TR_n (currently t3), correct
 - c. Counter n is exhausted
3. Counter i is incremented to 2
 - a. Counter n starts at 3 ($i < n$) and ranges from 3 – 3 (t3)
 - i. Table reference TR_i (currently t2) shall not contain an outer reference to table reference TR_n (currently t3), **violation**, t2 does have a reference to t3.
 - b. Counter n is exhausted
4. Counter i is exhausted

Example with an allowed statement that references t1 inside of t2 after t1 occurs:

```
SELECT ...  
FROM t1, LATERAL (SELECT id FROM t2 WHERE t1.c1=t2.c2) t2, t3;
```

1. Counter i starts at 1 and ranges from 1 – 2 (t1, t2)
2. For counter at position i , currently 1
 - a. Counter n starts at 2 ($i < n$) and ranges from 2 – 3 (t2, t3)
 - i. Table reference TR_i (currently t1) shall not contain an outer reference to table reference TR_n (currently t2), correct
 - b. Counter n is incremented to 3
 - i. Table reference TR_i (currently t1) shall not contain an outer reference to table reference TR_n (currently t3), correct
 - c. Counter n is exhausted
3. Counter i is incremented to 2
 - a. Counter n starts at 3 ($i < n$) and ranges from 3 – 3 (t3)
 - i. Table reference TR_i (currently t2) shall not contain an outer reference to table reference TR_n (currently t3), correct
 - b. Counter n is exhausted
4. Counter i is exhausted

2 Proposal

2.1 Proposal conventions

SMALLCAPS	denote numbered editorial instructions.	RGB: #000000
New Text	new text is identified by using a red bold font.	RGB: #FF0000
Deleted Text	deleted text is identified by using a blue strikethrough font.	RGB: #0000FF
Plain	denotes existing text to be retained.	RGB: #000000
[Note]	denotes notes to the editor.	RGB: #00B050
New Symbol	denotes the usage of a new symbol.	RGB: #A000A0
Existing Symbol	denotes the usage of an existing symbol.	RGB: #A000A0

2.2 Changes proposed to [Foundation CD]

2.2.1 Changes to 7.5 <from clause>

1. DELETE SYNTAX RULE SR2

~~2) No element in TRL shall contain an outer reference to any other element in TRL.~~

2. MODIFY SYNTAX RULE 6) AS SHOWN HERE:

6) Let NT be the number of <table reference>s immediately contained in TRL . Let NR_0 be 0 (zero). **Let TR_i , $1 \text{ (one)} \leq i \leq NT$, be the i -th <table reference> in TRL .**

a.0) For all i , $1 \text{ (one)} \leq i < NT$ and for all n , $i < n \leq NT$, TR_i shall not contain an outer reference to TR_n .

a) For i ranging from 1 (one) to NT :

- i) ~~Let TR_i be the i -th <table reference> in TRL .~~ Let NTR_i be the number of range variables of TR_i .

3 Ballot comments addressed

The following ballot comments in [CD comments] are fully addressed:

- SEQ# ?? (P02-USA-???)

4 Checklist

1	Interactions with other concurrent proposals identified and editorial assistance given.	N/A
2	Concepts.	N/A
3	Access Rules.	N/A
4	Conformance Rules, including the Annex A for rules not in a Conformance Rules section and the “Implied feature relationships” table.	N/A
5	Check that any removed non-terminals, subclauses, defined terms, and the like are no longer referenced.	N/A
6	BNF production split affecting immediate containment.	N/A
7	Lists of statements by category.	N/A
8	Collation coercibility determination for changes related to character strings.	N/A
9	Closing Possible Problems or Language Opportunity when a proposal resolves them.	N/A
10	Any new Possible Problems clearly identified.	N/A
11	Reserved and non-reserved keywords.	N/A
12	Implementation-defined and –dependent features clearly identified, and descriptions provided.	N/A
13	Information and Definition Schemata.	N/A
14	Incompatibilities Annex (for 2 nd and subsequent editions of the document)	N/A
15	Table of identifiers used by diagnostics statements.	N/A
16	Embedded SQL bindings and host language implications.	N/A
17	Dynamic SQL issues: including Dynamic descriptor areas.	N/A
18	CLI impact.	N/A
19	PSM impact.	N/A
20	MED impact.	N/A
21	OLB impact.	N/A
22	Schemata impact.	N/A
23	JRT impact.	N/A
24	XML impact.	N/A
25	MDA impact.	N/A
26	PGQ impact.	N/A
27	Impact on GQL for PGQ changes.	N/A

- End of paper -