Submit a comment

Proposed Change 1823

Code Reference(s):	**NBC20 Div.B 9.36.2.7. (first printing)** **NBC20 Div.B 9.36.5.3. (first printing)** **NBC20 Div.B 9.36.7.3. (first printing)**
Subject:	Fenestration
Title:	Thermal Characteristics of Fenestration and Doors
Description:	This proposed change places a limit on the maximum solar heat gain coefficient for fenestration and doors based on the fenestration and door area to gross wall area ratio.

This change could potentially affect the following topic areas:

- [ ] Division A
- [ ] Division C
- [ ] Building operations
- [x] Small Buildings
- [x] Fire Protection
- [ ] Accessibility
- [x] Building Envelope
- [ ] Heating, Ventilating and Air Conditioning
- [x] Division B
- [x] Design and Construction
- [x] Housing
- [ ] Large Buildings
- [x] Occupant safety in use
- [ ] Structural Requirements
- [x] Energy Efficiency
- [ ] Plumbing
- [ ] Construction and Demolition Sites

Problem

Currently, Article 9.36.2.7. of Division B of the National Building Code of Canada (NBC) 2020 allows Code users to choose either the overall thermal transmittance (U-value) or Energy Rating (ER) path to comply with the Code requirements on the thermal characteristics of fenestration and doors.

The Code does not adequately address the risk of the overheating of buildings due to the relationship between the solar heat gain coefficient (SHGC) of glazing and the fenestration and door area to gross wall area ratio (FDWR). Buildings that have large areas of high solar heat gain from fenestration on orientations with significant solar exposure are the most susceptible to overheating. East-west orientations in particular may cause higher peak cooling loads and overheating potential. In homes using the prescriptive path for compliance that have mechanical cooling, this situation can result in higher energy use; and, in homes that do not have mechanical cooling, this situation can result in overheating, leading to a higher likelihood of homeowners installing mechanical cooling systems in future that are not included in the energy model used at the time of construction. These risks may be further amplified when solar heat gain energy is beneficial to modeling for compliance with energy-efficiency requirements.

Conversely, in the NBC 2020, Sentence 9.36.7.3.(2) requires that peak cooling in the proposed house be lower than that of the reference house. The reference house is always modeled with an SHGC of 0.26 for all fenestration, which is considered a very low solar gain coefficient. Use of this SHGC can cause non-compliance in homes that otherwise appear to meet the intent of the Code and may be overly restrictive to Code users.

Justification

An ongoing concern about the potential overheating of homes and the related impact on energy use was identified. While Sentence 9.36.8.6.(4) in the prescriptive compliance path attempts to address the potential for overheating by restricting ER compliance to orientations with less than 17% FDWR, there are no explicit limitations on high solar heat gain from fenestration, which can allow for the selection of high solar heat gain fenestration that is compliant with the current requirement. This situation can result in homes that use the prescriptive path for compliance having high energy usage for cooling, causing discomfort to occupants, and increasingly causing their owners to install mechanical cooling after occupancy that is not accounted for in the energy compliance models of the Code.

A study completed by NRC titled, "Climate Resilience Buildings: Guideline for management of overheating risk in residential buildings," [1] in 2021 (updated in 2022) in section 10.1 identifies 0.40 SHGC or lower as a notional threshold for low solar gain and shows that the selection of low solar gain fenestration correlates with a reduced risk of overheating in homes.

This proposed change restricts the SHGC to 0.45 in the prescriptive path in cases where the FDWR is not more than 17%, and to 0.40 in cases where the FDWR is between 17% and 22%. In cases where the FDWR exceeds 22% or when homeowners choose fenestration with a higher SHGC than prescribed, homeowners will be required to use the performance path for compliance.

Using the performance path, NBC Sentence 9.36.7.3.(2) requires that the Code user demonstrate compliance in the proposed house by achieving a peak cooling load that is lower than that of the reference house. While this approach is intended to limit the risk of houses overheating, in application it can cause houses that appear to comply with the intent of the Code to fail the compliance metric, causing undue hardship for Code users. This situation is due in part to the use of an SHGC of 0.26 for all fenestration in the reference house (Clause 9.36.5.14.(2)(c)). Combined with the procedure for redistribution of windows in the reference house (Sentence 9.36.5.14.(5)), a peak cooling value that is unduly restrictive can be established.

Examples of types of houses that may be affected include low-load houses with small volumes, houses with overall small cooling loads, and houses with mechanical cooling installed that is already accounted for in the energy model.

It was determined that revising the SHGC used in the reference house to a higher value would trigger substantial changes to the already established tables of prescriptive points (Subsection 9.36.8.), as well as making compliance with the energy performance tiers more difficult by reducing the heating energy required by the reference house. An alternative approach was proposed that introduces an additional 10% allowance when comparing the peak cooling loads of the proposed and reference homes.

The Natural Resources Canada (NRCan)-funded Canadian Home Builders' Association (CHBA) Net Zero Home Labelling Program was considered to assess the impact of the additional 10% allowance. It was determined that a complete solution would require the following three changes to the compliance requirements to prevent overheating in NBC Article 9.36.7.3.:

1. A relaxation of the proposed-to-reference-house comparison, allowing for the proposed house to achieve compliance with a design cooling load of 110% that of the reference house.
2. The introduction of a cooling intensity metric that limits the design cooling intensity of the proposed house to 4.5 W/m^3.
3. The installation of a mechanical cooling system in the proposed house that has the capacity to meet the peak cooling load, and that is included in the energy model calculation for compliance with NBC Article 9.36.7.2.

Taken together, the above-mentioned changes would provide relief to the owners of houses at the margins of compliance with the current requirements that meet the intent of the overheating requirements. The above-mentioned changes would also reduce the risk of overheating in houses that comply with the requirements using the prescriptive path.

The narrow scope of the work related to the above-mentioned changes limits the solutions in this proposed change to addressing concerns about overheating as they relate to energy use in houses. Overheating due to extreme climate events was deemed to be outside of scope and is not directly addressed. While this proposed change may form part of a broader solution to the overheating issue, it should not be construed as having that goal.

PROPOSED CHANGE

NBC20 Div.B 9.36.2.7. (first printing)

[9.36.2.7.] 9.36.2.7. Thermal Characteristics of Fenestration, Doors and Skylights

[1] 1) Except as provided in ~~Sentences (2) to (8)~~Sentences (3)-2025 to (9)-2025 and Article 9.36.2.11., fenestration and doors shall have an overall thermal transmittance (U-value) not greater than, or an Energy Rating not less than, the values listed in Table 9.36.2.7.-A for the applicable heating-degree day category. (See Note A-9.36.2.7.(1) and (3)~~Note A-9.36.2.7.(1) and (2)~~.)

Table [9.36.2.7.-A] 9.36.2.7.-A
Required Thermal Characteristics of Fenestration and Doors
Forming Part of Sentence [9.36.2.7.] 9.36.2.7.([1] 1)

Components	Thermal Characteristics (1)	Heating Degree-Days of *Building* Location, (2) in Celsius Degree-Days					
		Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
Fenestration (3) and doors	Max. U-value, W/(m^2×K)	1.84	1.84	1.61	1.61	1.44	1.44
	Min. Energy Rating	21	21	25	25	29	29

Notes to Table [9.36.2.7.-A] 9.36.2.7.-A:

(1) See Note A-Table 9.36.2.7.-A.

(2) See Article 1.1.3.1.

(3) Except skylights (see Sentence (3)-2025~~Sentence (2)~~) and glass block assemblies (see Sentence (5)-2025~~Sentence (4)~~).

[2] --) The solar heat gain coefficient of fenestration and doors in a given orientation shall not be greater than the value listed in Table 9.36.2.7.-B-2025 for the fenestration and door area to gross wall area ratio (FDWR) in that orientation.

Table [9.36.2.7.-B]
Solar Heat Gain Coefficient of Fenestration and Doors
Forming Part of Sentence [9.36.2.7.] 9.36.2.7.([3] 2)

Fenestration and door area to gross wall area ratio (FDWR)	Maximum solar heat gain coefficient of fenestration and doors
FDWR < 17%	0.45
17% < FDWR < 22%	0.40
FDWR > 22%	0.26

[3] 2) Skylights shall have an overall thermal transmittance not greater than the values listed in ~~Table 9.36.2.7.-B~~Table 9.36.2.7-C-2025 for the applicable heating-degree day category. (See Note A-9.36.2.7.(1) and (3)~~Note A-9.36.2.7.(1) and (2)~~.)

Table [9.36.2.7.-C] 9.36.2.7.-B
Overall Thermal Transmittance of Skylights
Forming Part of Sentence [9.36.2.7.] 9.36.2.7.([3] 2)

	Heating Degree-Days of *Building* Location,[(1)] in Celsius Degree-Days					
	Zone 4 < 3000	Zone 5 3000 to 3999	Zone 6 4000 to 4999	Zone 7A 5000 to 5999	Zone 7B 6000 to 6999	Zone 8 ≥ 7000
Component	Maximum Overall Thermal Transmittance, $W/(m^2 \times K)$					
Skylights	2.92	2.92	2.75	2.75	2.41	2.41

Note to Table [9.36.2.7.-C] 9.36.2.7.-B:

(1) See Article 1.1.3.1.

[4] 3) Except for site-assembled or site-glazed factory-made fenestration products, curtain wall construction, and site-built windows and glazed doors that are tested in accordance with Sentence 9.36.2.2.(3), site-built windows and glazed doors need not comply with Sentence (1), provided they are constructed in accordance with one of the options presented in ~~Table 9.36.2.7.-C~~Table 9.36.2.7.-D for the applicable climate zone. (See Note A-9.36.2.7.(4)~~Note A-9.36.2.7.(3)~~.)

Table [9.36.2.7.-D] 9.36.2.7.-C
Compliance Options for Site-built Windows and Glazed Portion of Doors
Forming Part of Sentence [9.36.2.7.] 9.36.2.7.([4] 3)

Component	Description of Component	Compliance Options							
		Climate Zones 4 and 5			Climate Zones 6 and 7A			Climate Zones 7B and 8	
		≤ 3999 HDD			4000 to 5999 HDD			≥ 6000 HDD	
		1	2	3	1	2	3	1	2
Frame	non-metallic	Ö	Ö	—	Ö	Ö	—	Ö	Ö
	thermally broken metallic	—	—	Ö	—	—	Ö	—	—
Glazing	double	—	Ö	—	—	—	—	—	—
	triple	Ö	—	Ö	Ö	Ö	Ö	Ö	Ö
	argon-filled	—	Ö	—	Ö	—	Ö	—	Ö
Low-e coating	none	Ö	—	—	—	—	—	—	—
	number of panes with ≤ 0.10	—	≥ 1	—	—	—	—	≥ 2	—
	number of panes with ≤ 0.20	—	—	2	≥ 1	2	≥ 2	—	≥ 2
Spacer	size, mm	12.7	—	12.7	≥ 12.7	12.7	≥ 12.7	≥ 12.7	≥ 12.7
	non-metallic	—	Ö	—	—	—	—	—	—

[5] **4)** Glass block assemblies separating *conditioned space* from unconditioned space or the exterior shall have
[a] a) an overall thermal transmittance of not more than 2.9 W/(m^2×K), and
[b] b) a total aggregate area of not more than 1.85 m^2.

[6] **5)** One door separating a *conditioned space* from an unconditioned space or the exterior is permitted to have an overall thermal transmittance up to 2.6 W/(m^2×K).

[7] **6)** Storm windows and doors need not comply with Sentence (1).

[8] **7)** Vehicular access doors separating a *conditioned space* from an unconditioned space or the exterior shall have a nominal thermal resistance of not less than 1.1 (m^2×K)/W.

[9] **8)** Access hatches separating a *conditioned space* from an unconditioned space shall be insulated to a nominal thermal resistance of not less than 2.6 (m^2×K)/W.

NBC20 Div.B 9.36.5.3. (first printing)
[9.36.5.3.] **9.36.5.3. Compliance**
(See Note A-9.36.5.3.)

[1] **1)** The performance compliance calculations shall determine the annual energy

consumption of the proposed house and the house energy target of a reference house in accordance with

[a] a) this Subsection, or

[b] b) the EnerGuide Rating System, version 15, and Sentence (2).

(See Note A-9.36.5.3.(1).)

[2] **2)** The annual energy consumption of the proposed house shall not exceed the house energy target of the reference house. (See Note A-9.36.5.3.(2).)

[3] **3)** In establishing the house energy target, *building* components, systems and assemblies shall be accounted for in accordance with the prescriptive requirements of Subsections 9.36.2. to 9.36.4. for the climate zone under consideration.

[4] **4)** In establishing the annual energy consumption, *building* components, systems and assemblies that are addressed in the scope of the prescriptive requirements of Subsections 9.36.2. to 9.36.4. shall be accounted for for the climate zone under consideration.

[5] **5)** Where the construction techniques or *building* components, systems or assemblies used are more energy-efficient than those prescribed by the prescriptive requirements, the performance compliance calculations are permitted to take this increased performance level into account in the determination of the annual energy consumption, provided it can be quantified and is not dependent on occupant interaction.

[6] **6)** Both the proposed and reference houses shall be modeled using the same climatic data, *soil* conditions, operating schedules in Article 9.36.5.4. and temperature set-points.

[7] **--)** Where a cooling system is not installed in the proposed house, the peak cooling load shall be modeled for both the proposed and reference houses by using additional models with appropriately sized space-cooling equipment serving all *conditioned spaces*. (See Note A-9.36.5.3.(7).)

[8] **--)** The proposed house described in Sentence (7) shall have

[a] --) a peak cooling load not greater than 110% of the peak cooling load for the reference house, or

[b] --) a design cooling intensity not greater than 4.5 W/m^3.

Note A-9.36.5.3.(7). Peak Cooling Load.

The term “peak cooling load” refers to the highest hourly-averaged rate of mechanical cooling required to maintain the building or house at the cooling set-point temperature over the course of the year. The peak cooling load must reflect the rate at which heat is extracted from the conditioned space and not the rate of energy consumption of any cooling equipment. Some modeling software only reports peak cooling loads when the building or house model is configured with an air conditioner; in such cases, the model should include air-conditioning for the purpose of computing the peak cooling load. If the modeling software does not report peak hourly loads, the design cooling load may be used instead.

The peak cooling load criterion is intended to reduce the risk that houses will overheat in the summer as a consequence of the energy reduction measures required by the Code. To meet this goal, in houses without cooling systems, the proposed house must achieve a peak cooling load that is no more than 110% that of the reference house or a design cooling intensity of not more than 4.5 W/m^3. Even so, this modeling requirement does not guarantee that a house will not overheat, as a reference house complying with Subsection 9.36.5. may nevertheless be prone to overheating in some circumstances. This requirement does not prescribe the installation of cooling systems in new construction.

NBC20 Div.B 9.36.7.3. (first printing)

[9.36.7.3.] 9.36.7.3. Energy Performance Improvement Compliance Calculations

[1] 1) Except where otherwise stated in this Article, the proposed and reference houses shall be modeled in accordance with Subsection 9.36.5. to determine

[a] a) the annual energy consumption of the proposed house and the house energy target of the reference house,

[b] b) the annual gross space heat loss of the proposed and reference houses calculated in accordance with Sentence (5), and

[c] c) the peak cooling load of the proposed and reference houses ~~(see Sentence (4))~~.

(See Note A-9.36.7.3.(1).)

~~**[2] 2)** The peak cooling load for the proposed house shall not be greater than the peak cooling load for the reference house. (See Sentence (4).)~~

[3] 3) Except for energy performance tier 1, where space heating is provided by a heat pump in the proposed house, the reference house shall be modeled using

[a] a) equipment of the same type as the secondary or back-up system in the proposed house, but made to comply with the energy efficiency requirements of Article 9.36.3.10., or

[b] b) electric resistance heaters, where no back-up is provided in the proposed house.

~~**[4] 4)** Where cooling systems are not installed in the proposed house, both the proposed and reference houses shall have additional models using appropriately sized space-cooling equipment serving all *conditioned spaces* to determine the peak cooling load. (See Note A-9.36.7.3.(4).)~~

[5] 5) The annual gross space heat loss shall be calculated as the sum of the cumulative heat loss from

[a] a) conduction across opaque and transparent elements of the *building* envelope,

[b] b) air infiltration and exfiltration, and

[c] c) mechanical ventilation.

(See Note A-9.36.7.3.(5).)

[6] 6) The percent heat loss reduction shall be calculated by subtracting the annual gross space heat loss of the proposed house from the annual gross space heat loss of the reference house and dividing the result by the annual gross space heat loss of the reference house.

[7] 7) The percent improvement shall be calculated by subtracting the annual energy consumption of the proposed house from the house energy target of the reference house and dividing the result by the house energy target of the reference house.

[8] 8) The percent house energy target shall be calculated by dividing the annual energy consumption of the proposed house by the house energy target of the reference house.

[9] 9) The airtightness value used in the energy model for the proposed house shall be

[a] a) the airtightness value set out in Clause 9.36.5.10.(9)(a), or

[b] b) where an airtightness test is to be conducted, a design airtightness, until the airtightness has been measured in accordance with Sentence 9.36.6.3.(1) and the appropriate airtightness value set out in Sentence 9.36.5.10.(9) can be selected.

(See Note A-9.36.7.3.(9).)

~~**Note A-9.36.7.3.(4) Peak Cooling Load.**~~

~~The term “peak cooling load” refers to the highest hourly-averaged rate of mechanical cooling required to maintain the building or house at the cooling set-point temperature over the course of the year. The peak cooling load must reflect the rate at which heat is extracted from the conditioned space, and not the rate of energy consumption of any cooling equipment.~~

~~Some modeling software only report peak cooling loads when the building or house model is configured with an air conditioner; in such cases, the model should include air-conditioning for the purpose of computing the peak cooling load. If the modeling software does not report peak hourly loads, the design cooling load may be used instead.~~

~~The peak cooling load criteria is intended to reduce the risk that houses built under the tiered energy performance compliance path will overheat in the summer. To meet this goal, the proposed house must achieve a peak cooling load that is no more than that of the reference house. Even so, this modeling requirement does not guarantee that a house will not overheat, as a reference house complying with Subsection 9.36.5. may nevertheless be prone to overheating in some circumstances. Instead, houses complying with this modeling requirement should be no more prone to overheating than houses constructed under other energy efficiency compliance paths in the Code. This requirement does not prescribe the installation of cooling systems in new construction nor can the installation of air-conditioning be used as an alternative compliance path for houses not meeting this requirement.~~

Impact analysis

This proposed change would restrict the use of windows with a high solar heat gain coefficient (SHGC), which may initially result in higher construction costs for some builders. High solar heat gain windows (under the Energy Rating path) generally cost less than the equivalent low SHGC windows. However, it is noted that mid- and low-SHGC glazing options are becoming increasingly available and cost-competitive as demand for this product type increases. As of June 2023, the difference in manufacturer's suggested retail unit price is $100 between low- and high-SHGC windows that are 48 in. × 48 in. in a double pane vinyl casement.

This proposed change would result in a lower operational cost to homeowners by reducing the cost of air-conditioning where cooling systems are installed and by limiting the discomfort of overheating where they are not. This proposed change has the additional benefit of reducing the likelihood of low SEER air conditioners being added or retrofitted by homeowners after closing that would not have been considered in the energy calculation at the time of construction. This situation would represent an increase in energy use in the house as a consequence of the requirements related to glazing selection, which are intended to reduce energy use, and would result in the additional energy use being omitted from the calculations. The National Research Council of Canada (NRC), Natural Resources Canada (NRCan) and Canada Mortgage and Housing Corporation (CMHC), with contributions from 37 companies, studied the impact of using glazing systems with high versus low solar heat gain in the webpage titled, "Low-Solar and High-Solar Gain Glazings" [2]. The results compiled throughout North America and the results for 10 Canadian locations indicated the following:

- High solar heat gain glazing systems offered 13% to 17% energy cost savings compared to conventional windows and offered annual energy cost savings of $117 to $354.
- Low solar heat gain glazing systems offered 8% to 10% energy cost savings compared to conventional windows and offered annual energy cost savings from $71 to $203.

Another study conducted by CanmetENERGY-Ottawa (NRCan) observed that, for a typical window-to-wall ratio, low-SHGC windows reduce the peak cooling load by 0.4 ton to 1 ton depending on the orientation. This translates into a savings of $6 to $15 for each heating period of 24 hours.

As a benefit to builders, this proposed change would help reduce customer discomfort and costly retrofits as a result of customer call-backs. Further, the additional compliance options introduced in the performance path in Article 9.36.5.3. would increase flexibility in compliance for builders by providing three options instead of only one. Anecdotal feedback indicated that the use of the performance path for compliance often results in net-cost reductions for builders, where the costs of energy modeling are offset by trade-offs in specifications that may not be available under the prescriptive path method.

References

[1] Laouadi A., Bartko M., Gaur A., Lacasse M.A., "Climate Resilience Buildings: Guideline for management of overheating risk in residential buildings," National Research Council, CRBCPI-Y4-10, April 1, 2021, including revisions released on January 10, 2022 and February 16, 2022: nrc-publications.canada.ca/eng/view/ft/?id=9c60dc19-ca18-4f4c-871f-2633f002b95c&dp=2&dsl=en

[2] Natural Resources Canada, Low-Solar and High-Solar Gain Glazings, website: https://natural-resources.canada.ca/energy/efficiency/data-research-and-insights-energy-efficiency/housing-innovation/low-solar-and-high-solar-gain-glazings/5139

Enforcement implications

This proposed change can be enforced by the existing Code enforcement infrastructure without additional resources. There are no enforcement implications beyond the practices required to enforce the existing Code provisions.

Who is affected

Designers, engineers, architects, manufacturers, builders, specification writers and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.2.7. (first printing)

[9.36.2.7.] **9.36.2.7. ([1] 1) [F92-OE1.1]**

[9.36.2.7.] -- ([2] --) [F95-OE1.1]

[9.36.2.7.] **9.36.2.7. ([3] 2) [F92-OE1.1]**

[9.36.2.7.] **9.36.2.7. ([4] 3) no attributions**

[9.36.2.7.] **9.36.2.7. ([4] 3) [F92-OE1.1]**

[9.36.2.7.] **9.36.2.7. ([5] 4) [F92-OE1.1]**

[9.36.2.7.] **9.36.2.7. ([6] 5) [F92-OE1.1]**

[9.36.2.7.] **9.36.2.7. ([7] 6) no attributions**

[9.36.2.7.] **9.36.2.7. ([8] 7) [F92-OE1.1]**

[9.36.2.7.] **9.36.2.7. ([9] 8) [F92-OE1.1]**

NBC20 Div.B 9.36.5.3. (first printing)

[9.36.5.3.] 9.36.5.3. ([1] 1) no attributions

[9.36.5.3.] 9.36.5.3. ([2] 2) [F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.5.3.] 9.36.5.3. ([3] 3) [F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.5.3.] 9.36.5.3. ([4] 4) [F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.5.3.] 9.36.5.3. ([5] 5) [F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.5.3.] 9.36.5.3. ([6] 6) [F99-OE1.1]

[9.36.5.3.] -- ([7] --) [F95,F99-OE1.1]

[9.36.5.3.] -- ([8] --) [F95,F99-OE1.1]

NBC20 Div.B 9.36.7.3. (first printing)

[9.36.7.3.] 9.36.7.3. ([1] 1) no attributions

~~[9.36.7.3.] 9.36.7.3. ([2] 2) [F95-OE1.1]~~

[9.36.7.3.] 9.36.7.3. ([3] 3) no attributions

[9.36.7.3.] 9.36.7.3. ([3] 3) [F90,F91,F92,F93,F95,F96,F98,F99,F100-OE1.1]

~~[9.36.7.3.] 9.36.7.3. ([4] 4) no attributions~~

[9.36.7.3.] 9.36.7.3. ([5] 5) [F90,F91,F92,F93,F95,F100-OE1.1]

[9.36.7.3.] 9.36.7.3. ([6] 6) no attributions

[9.36.7.3.] 9.36.7.3. ([6] 6) [F99-OE1.1]

[9.36.7.3.] 9.36.7.3. ([7] 7) [F99-OE1.1]

[9.36.7.3.] 9.36.7.3. ([8] 8) [F90,F91,F92,F93,F95,F96,F98,F99,F100-OE1.1]

[9.36.7.3.] 9.36.7.3. ([9] 9) [F90,F91,F92,F93,F95,F100-OE1.1]