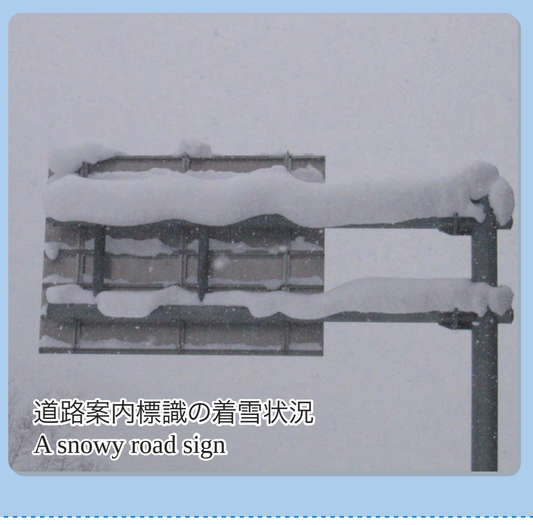
道路施設の着氷雪対策に関する研究

Measures for Controlling Snow and Ice Accretion on Road Facilities

冬期間、道路案内標識等の道路施設に付着した雪や氷が落下して、通行車両に被害を及ぼす事例が起きています。この対策として、人力による着雪処理を主に行っていますが、作業に手間がかかり通行車両との接触などの危険が伴います。このため、寒地土木研究所では、道路施設の着氷雪対策に関する研究に取り組んでいます。

When the snow and ice that accrete to road signs and other road accessories fall, they sometimes damage traveling vehicles. To prevent this, snow is removed manually. However, such removal is time and labor intensive, and potentially dangerous to road maintenance personnel from possible contact with passing vehicles. The Civil Engineering Research Institute for Cold Region has been investigating measures against snow and ice accretion on road accessories.


道路案内標識の着雪状況
A snowy road sign


人力による着雪処理作業
Manual snow removal

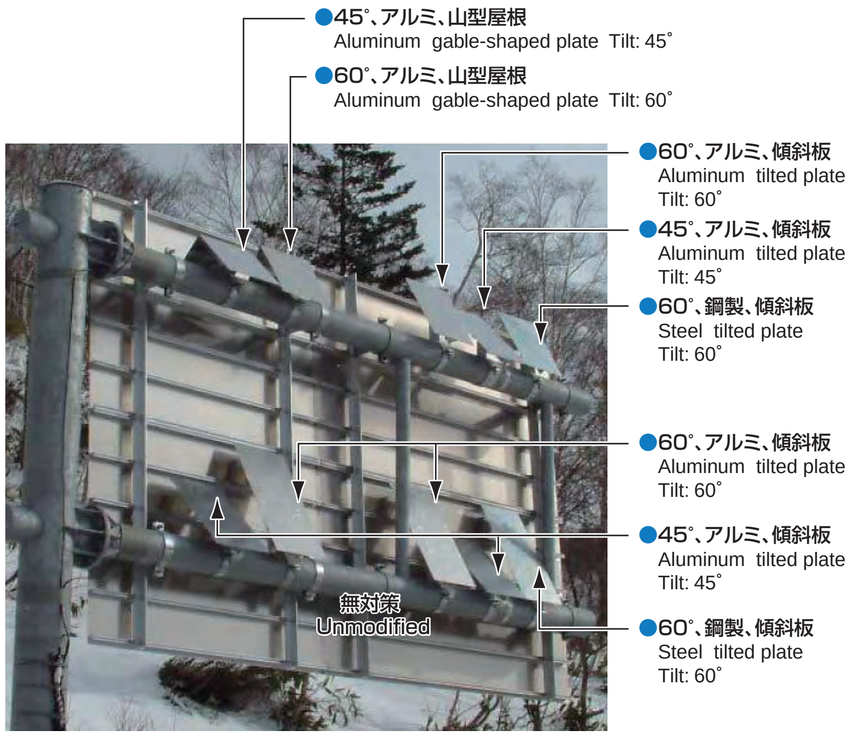
道路案内標識の対策工の調査

Investigation of measures of road sign designs

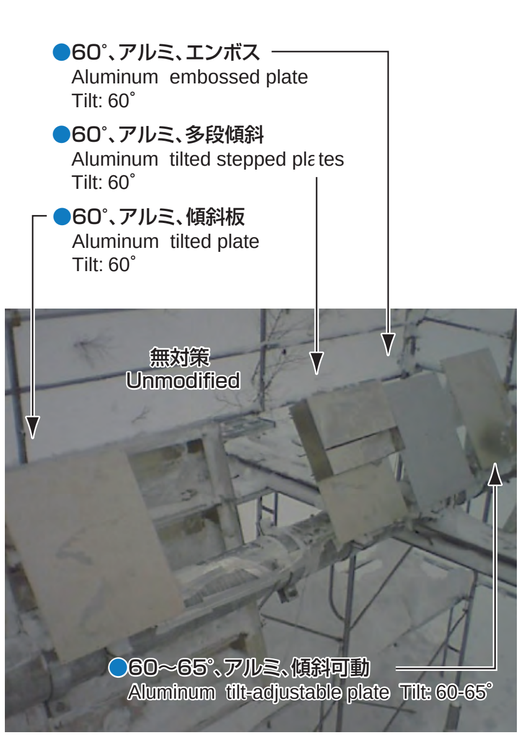
簡易な着雪対策として、形状、材質および角度を変えた傾斜板を、試験用の道路案内標識に設置して、着雪・落雪状況の調査を行っています。さらに新しい対策工として、多段傾斜（傾斜板を50mm間隔で階段状に３枚配置したもの）、エンボス（傾斜板表面にΦ10mm、間隔20mmで1210個配列したもの）、傾斜可動（傾斜板の角度が60°～65°で可動するもの）を考案・試作し、着雪・落雪状況を観測しました。

傾斜板、多段傾斜、エンボス、傾斜可動では、無対策より落雪回数が多く、着雪量も少ない傾向がありました。特に多段傾斜では傾斜板より落雪回数が多い傾向があり、落雪を促進する効果が期待されます。

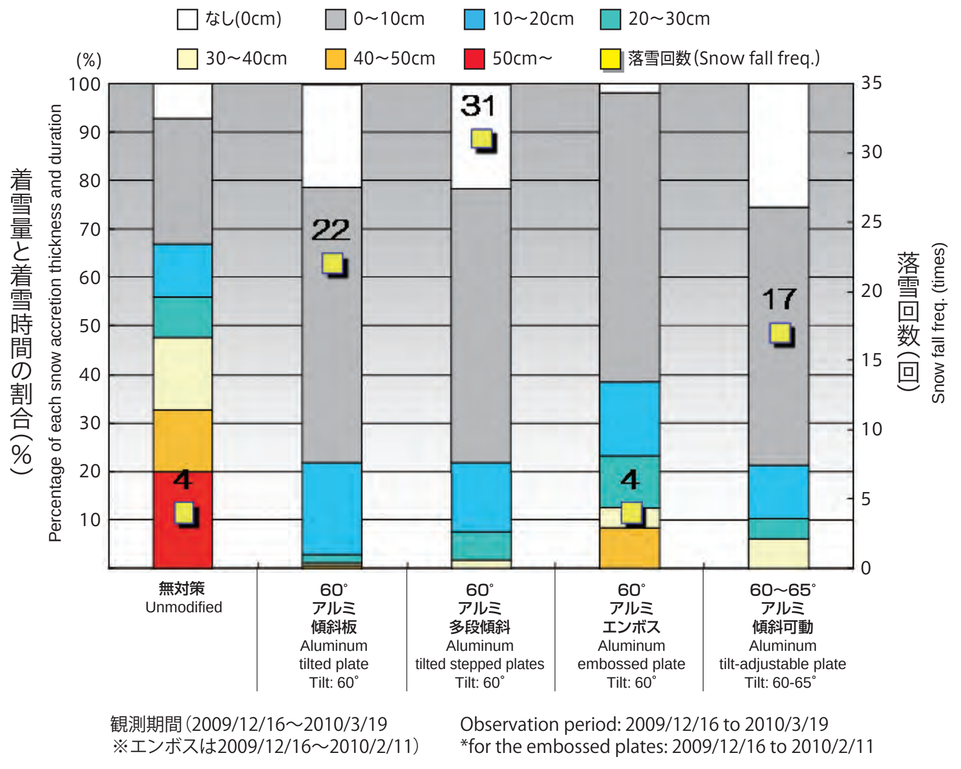
To determine the effectiveness of simple snow accretion prevention devices, investigations on snow accretion on road facilities and the resulting falls of accreted snow have been conducted by installing tilted plates of various shapes, materials, and angles on a test road sign. Newly devised and added test devices are tilted stepped plates (three tilted plates set as steps with 50 mm between them), embossed plates (tilted plates with 1210 dents of 10 mm in diameter at 20-mm intervals on the surface), and tilt-adjustable plates (the tilt can be varied between the angles of 60 and 65 degrees). Less snow accretion and more frequent snow falls were observed on the tilted plates, tilted stepped plates, embossed plates and tilt-adjustable plates than on the unmodified road sign. The tilted stepped plates, in particular, tended to have more frequent snow falls than the tilted plate, which shows the device to be promising as a snow accretion countermeasure.



▲難着雪対策工の試験状況
Test installation of devices to prevent snow accretion



▲試作した新しい着雪対策工の試験状況
Newly devised plates under investigation



観測期間（2009/12/16～2010/3/19
※エンボスは2009/12/16～2010/2/11）
Observation period: 2009/12/16 to 2010/3/19
*for the embossed plates: 2009/12/16 to 2010/2/11
▲各着雪対策工の着雪量と着雪時間の割合
Percentage of each snow accretion thickness and duration

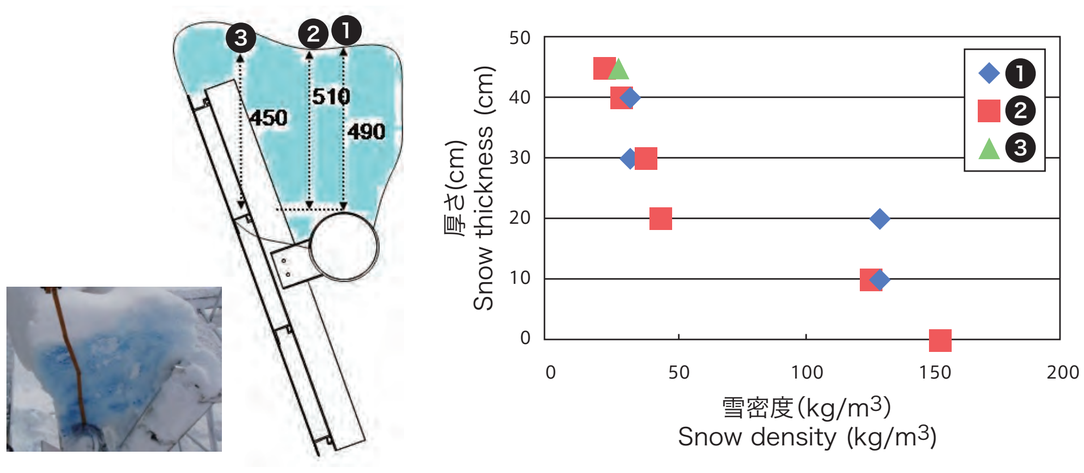
被害に至る着氷雪性状の解明

Determining which snow and ice accretion conditions lead to damages

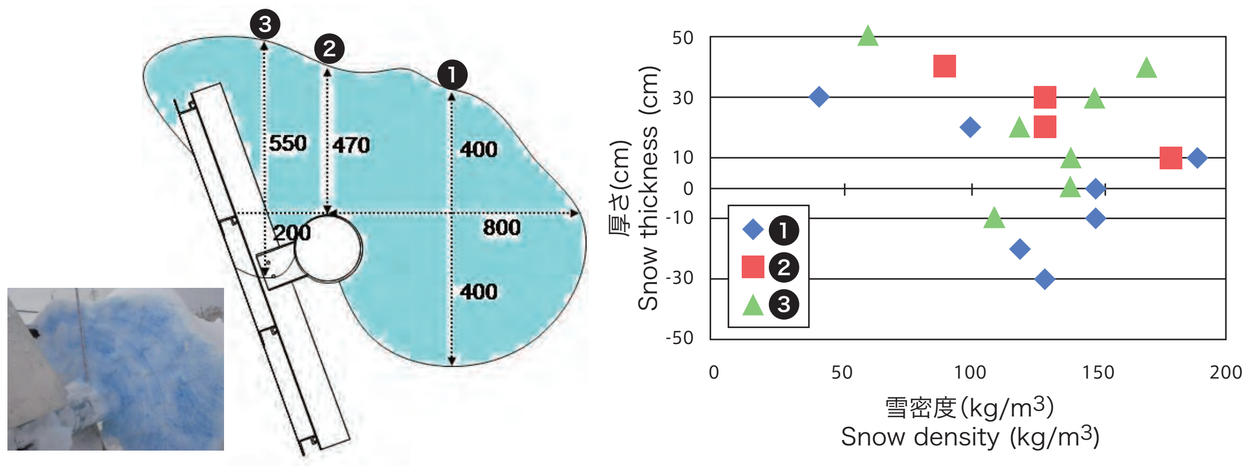
落雪による被害を調査するため、対策を行っていない道路案内標識を設置して着雪状況の観測を行い、着雪後の経過日数の違いによる、雪密度の違いについて調査を行いました。

１６日経過した着雪の平均密度は６０ｋｇ/m³、３１日経過した着雪の平均密度は１３０ｋｇ/m³で、雪密度が約２．２倍に増加する結果が得られました。

To clarify the relationship between the conditions of snow that has accreted to the road sign and the damages caused by falling accreted snow, we installed an unmodified road sign and investigated the density of accreted snow 16 days and 31 days after accretion started. The average density of the latter (130 kg/m^3) was about 2.2 times that of the former (60 kg/m^3).



▲着雪から１６日間経過した雪密度の分布（中山峠）（2009/12/27　～　2010/1/11）
Snow thickness and density of accreted snow 16 days after accretion started (Nakayama Pass)
(Observed from 2009/12/27 to 2010/1/11)



▲着雪から３１日間経過した雪密度の分布（中山峠）（2010/1/11　～　2010/2/11）
Snow thickness and density of accreted snow 31 days after accretion started (Nakayama Pass)
(Observed from 2010/1/11 to 2010/2/11)