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Floor Slip Resistance Consultants

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Licensed by the State of California Board of Professional Engineers And Land Surveyors

Certified by the City of Los Angeles as an official slip resistance testing laboratory for flooring

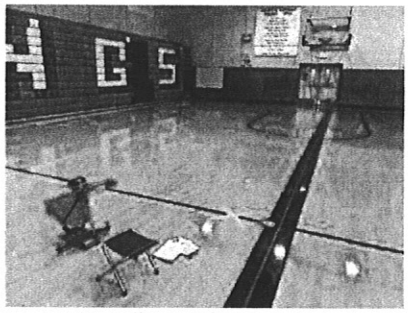
CERTIFIED

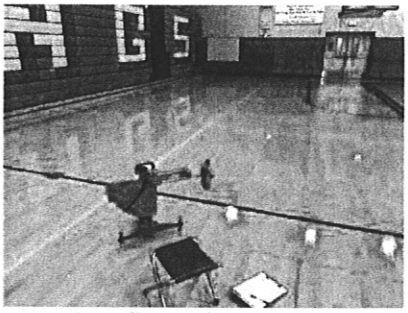
Dynamic Slip Resistance using ASTM E303-93 (2018) Pendulum Test Method per ASTM F2772-11

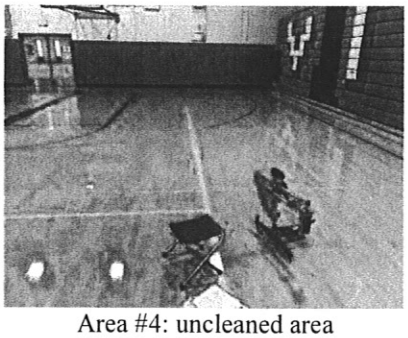
Client: **North Kitsap School District** Report date: 11/22/19
Flooring: **Wooden gym floor and concrete hallway at N. Kitsap High School Main Gym**
Page 1 of 2 Sample no.: 1911-2121 Date tested: 11/20/19
Gym surface description: coated wood, coated 2 months ago, half clean/half dirty, very smooth
Hallway flooring description: stained concrete, unknown age, dirt from normal traffic, smooth
Post-test free swing: 0 Age of TRL slider: 11 months Surface Temperature: 73°F

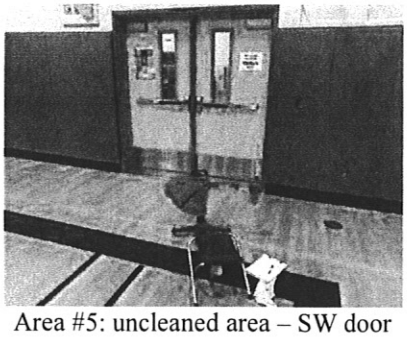
Figure 1 shows the areas tested.


Area #1: cleaned area


Area #2: uncleaned area


Area #3: uncleaned area

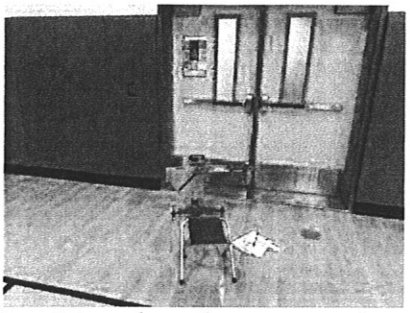

Area #4: uncleaned area


Area #5: uncleaned area – SW door

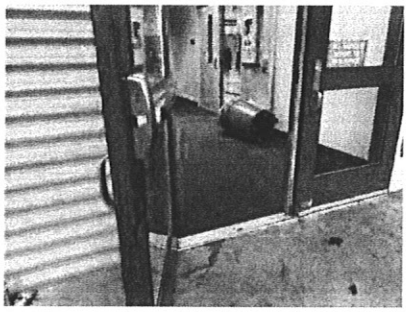

Inadequate matting outside SW door

Figure 1 – continued on next page

Flooring: **Wooden gym floor and concrete hallway at N. Kitsap High School Main Gym**



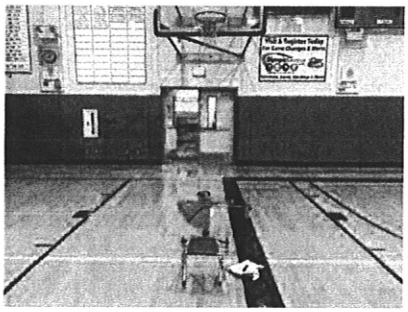
Area #6: uncleaned area – NW door



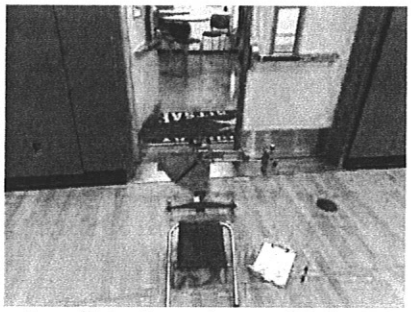
Close proximity of outdoors to NW door

Area #7: uncleaned area

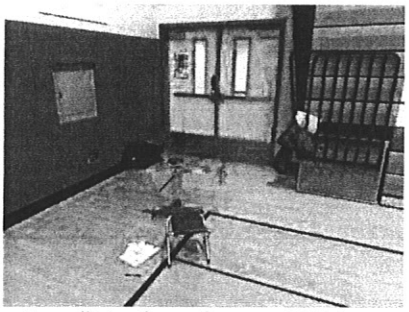
Area #8: cleaned area



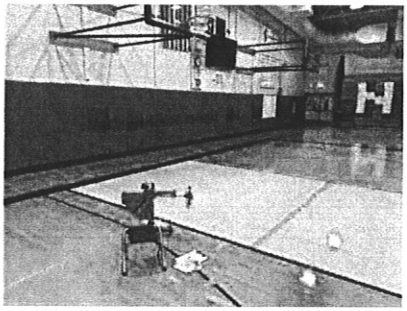
Area #9: cleaned area



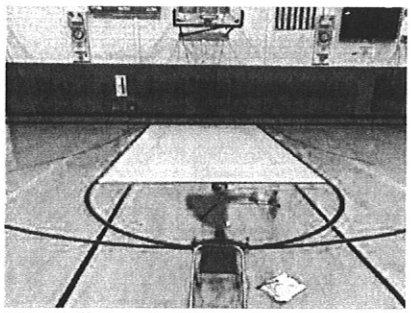
Area #10: cleaned area - SE door



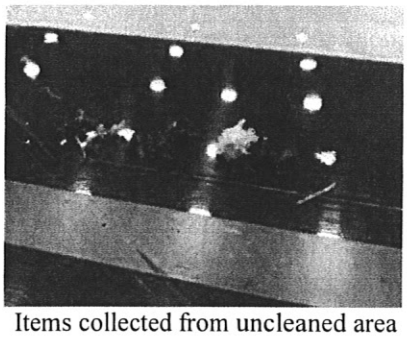
Area #11: cleaned area – NE door



Area #12: area of original slip



Area #13: where near slip occurred



Items collected from uncleaned area

Area #14: concrete hallway - NE door

Area #15: further from door

Figure 1: general areas and close-ups of polished concrete areas tested

Flooring: **Wooden gym floor and concrete hallway at N. Kitsap High School Main Gym**

American Society for Testing and Materials Method ASTM F2772-11 specifies the various test methods to be used for testing various aspects of wooden gym floors. For testing the slip resistance, it specifies using ASTM E303-93 (2018), "Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester" (astm.org) The trailing edge of a three-inch-wide spring-loaded slider, which is attached to the end of a 20-inch pendulum, contacts the tested surface when the pendulum is released from a horizontal position. The slider contact path length is pre-set to five inches. The pendulum pushes a pointer that stops and stays at the high point of the pendulum's swing. For gym testing, the slider specified is the soft TRL (Transport & Road Laboratory) rubber. Higher Pendulum Test Values (PTV) indicate increased friction. For reference only, with TRL rubber the PTV of wet #60 grade silicon carbide abrasive cloth at normal room temperature is approximately 57. For clear wet float glass it is 8. The ASTM E303 test method does not specify a numerical safety minimum for wet floors, although other pendulum test methods have a general safety criterion of 35 or 36 PTV when wet. According to ASTM F2772-11 section 4.5.1, gym floors should have a PTV between 80 and 110 when tested in the dry condition. It is well known that gym floors are typically quite slippery when wet or otherwise contaminated, and great care is usually taken to wipe sweat and fluid spills immediately off the wooden gym floors in college and professional sports.

Average PTVs with TRL (soft) rubber:

Area #1: Dry: 109; Individual PTV values: 106, 107, 109, 112
Area #1: Wet: 12; Individual PTV values: 12, 12, 11, 11
Area #2: Dry: 109; Individual PTV values: 107, 109, 109, 111
Area #3: Dry: 118; Individual PTV values: 118, 118, 117, 118
Area #4: Dry: 108; Individual PTV values: 106, 107, 108, 109
Area #5: Dry: 113; Individual PTV values: 111, 113, 114, 115
Area #6: Dry: 96; Individual PTV values: 96, 96, 95, 96
Area #7: Dry: 82; Individual PTV values: 83, 82, 82, 81
Area #8: Dry: 116; Individual PTV values: 113, 116, 117, 118
Area #9: Dry: 107; Individual PTV values: 105, 106, 108, 109
Area #10: Dry: 105; Individual PTV values: 102, 104, 107, 107
Area #10: Wet: 14; Individual PTV values: 14, 14, 14, 14
Area #11: Dry: 106; Individual PTV values: 106, 105, 105, 108
Area #12: Dry: 104; Individual PTV values: 101, 103, 105, 107
Area #13: Dry: 104; Individual PTV values: 104, 102, 105, 104
Area #14: Dry: 59; Individual PTV values: 56, 59, 59, 62
Area #14 (dusted): Dry: 92; Individual PTV values: 84, 90, 96, 100
Area #14: Wet: 20; Individual PTV values: 20, 20, 19, 19
Area #15: Dry: 67; Individual PTV values: 65, 66, 67, 69
Area #15 (dusted): Dry: 85; Individual PTV values: 81, 82, 86, 91

Discussion

All the coated wood gym floor areas tested were within the 80-110 PTV range specified by ASTM F2772-11 when tested in the dry condition, even the areas that hadn't been cleaned for many days. However, the uncleaned half of the gym had collected quite a bit of visible contamination, such as fine dust, dead flies, and what appeared to possibly be either lint from socks or tiny white pieces of the ceiling. Because coated wooden gym floors are notorious for being extremely slippery when wet or otherwise contaminated, great care needs to be taken to keep these types of floors clean

when in use. Large absorbent mats should be used outside (and inside) each door, and doors should remain closed to keep contaminants from blowing in. Mats should be cleaned regularly so that they are able to gather dust, moisture and any other contaminants from people's shoes before they spread these things onto the "slippery when wet or otherwise contaminated" flooring.

If gym classes have students running loops where they run from outside areas to the gym floor and back outside again, then we would expect the gym floor to get very dirty very quickly. These sorts of activities should be ceased, and every effort should be made to keep the gym floors clean. The ceiling material may be adding to the problem by dropping small pieces of itself onto the floor. The air ducts may also be spreading dust (or nearby construction dust) evenly over the area. The exact source of fine dust was not found during the testing, but a fine dust was found on the uncleaned half. Although it was not enough fine dust to create low pendulum test values, perhaps normal use would have generated much more dust in the area.

The temperature in the gym was found to be 73 degrees Fahrenheit. When students begin to sweat profusely with heavy physical activity, the floor will become wet with sweat, creating a very slippery condition. Lotions, creams, hair products, and other similar hygiene and beauty contaminants can be spread onto the floor by people who fall on it or do stretching exercises on it. These types of contaminants may be hard, or impossible, to remove with a simple dust mop. These types may require a degreaser and suction to completely remove the greasy contaminants.

The concrete hallway leading to the wooden gym floors were found to greatly increase in dry slip resistance when lightly dusted with a terry towel. Both areas that were tested showed this. This possibly indicates that these concrete hallways are a source of a high volume of dusty contaminants that may be getting dragged in and spread across the gym floors.

We thank you for the opportunity to be of service. Feel free to contact us with any questions or concerns. We're here to help.

Respectfully submitted,
SOTTER ENGINEERING CORPORATION

George Sotter

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