

# Erratum: “Friction factor directly from transitional roughness in a turbulent pipe flow” [ASME Trans. J. Fluid Eng., 2007, 129, pp. 1255–1267]

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## Introduction

(1) Page: 1258: In friction factor relations (34), (35), (36), and (37), replace  $\delta$  by  $D$  in first location, to read as

$$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{2.51}{Re\sqrt{\lambda}} + \frac{h}{3.7D} \exp \left( -j \frac{5.66}{Re\sqrt{\lambda}} \frac{\delta}{h} \right) \right] \quad (34)$$

$$\frac{1}{\sqrt{\lambda}} = -1.93 \log_{10} \left[ \frac{1.90}{Re\sqrt{\lambda}} + \frac{h}{3.7D} \exp \left( -j \frac{5.66}{Re\sqrt{\lambda}} \frac{\delta}{h} \right) \right] \quad (35)$$

$$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{5.74}{Re^{0.9}} + \frac{h}{3.7D} \exp \left( -j \frac{12.91}{Re^{0.9}} \frac{\delta}{h} \right) \right] \quad (36)$$

$$\frac{1}{\sqrt{\lambda}} = -1.932 \log_{10} \left[ \frac{4.22}{Re^{0.9}} + \frac{h}{3.7D} \exp \left( -j \frac{9.50}{Re^{0.9}} \frac{\delta}{h} \right) \right] \quad (37)$$

(2) Page 1259: In Table 1, replace  $\delta$  by  $D$  in the second column, and its corresponding term in the third column. Also in the third column of Eqs. (3a) and (3b\*), the numerical values 0.754 and 1.724 are replaced by 0.88 and 2.02, respectively. The corrected Table 1 is given below.

**Table 1 Roughness scale and friction factors in fully rough and transitional rough pipes**

Scale	Friction factor for fully rough pipes	Friction factor for transitional rough pipes implicit and approximate explicit expressions; ( $j = 11$ ) <sup>a</sup>	Eq.
$R_q$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left( \frac{R_q}{0.7D} \right)$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{2.51}{Re\sqrt{\lambda}} + \frac{R_q}{0.7D} \exp \left( -j \frac{1.062}{Re\sqrt{\lambda}} \frac{\delta}{R_q} \right) \right]$	(1a)
$h_s = 5.333R_q$		$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{5.74}{Re^{0.9}} + \frac{R_q}{0.7D} \exp \left( -j \frac{2.58}{Re^{0.9}} \frac{\delta}{R_q} \right) \right]$	(1b*)
$R_Z$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left( \frac{R_Z}{3D} \right)$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{2.51}{Re\sqrt{\lambda}} + \frac{R_Z}{3D} \exp \left( -j \frac{4.55}{Re\sqrt{\lambda}} \frac{\delta}{R_Z} \right) \right]$	(2a)
$h_s = 1.244R_Z$		$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{5.74}{Re^{0.9}} + \frac{R_Z}{3D} \exp \left( -j \frac{10.41}{Re^{0.9}} \frac{\delta}{R_Z} \right) \right]$	(2b*)
$R_a$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left( \frac{R_a}{0.57D} \right)$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{2.51}{Re\sqrt{\lambda}} + \frac{R_a}{0.57D} \exp \left( -j \frac{0.88}{Re\sqrt{\lambda}} \frac{\delta}{R_a} \right) \right]$	(3a)
$h_s = 6.45R_a$		$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{5.74}{Re^{0.9}} + \frac{R_a}{0.57D} \exp \left( -j \frac{2.02}{Re^{0.9}} \frac{\delta}{R_a} \right) \right]$	(3b*)
$R_q/H$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left( \frac{R_q/H}{0.5D} \right)$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{2.51}{Re\sqrt{\lambda}} + \frac{R_q/H}{0.5D} \exp \left( -j \frac{0.754}{Re\sqrt{\lambda}} \frac{\delta}{R_q/H} \right) \right]$	(4a)
$h_s = 7.71R_q/H$		$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{5.74}{Re^{0.9}} + \frac{R_q/H}{0.5D} \exp \left( -j \frac{1.724}{Re^{0.9}} \frac{\delta}{R_q/H} \right) \right]$	(4b*)
$h$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left( \frac{h}{3.7D} \right)$	$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{2.51}{Re\sqrt{\lambda}} + \frac{h}{3.7D} \exp \left( -j \frac{5.66}{Re\sqrt{\lambda}} \frac{\delta}{h} \right) \right]$	(5a)
		$\frac{1}{\sqrt{\lambda}} = -2 \log_{10} \left[ \frac{5.74}{Re^{0.9}} + \frac{h}{3.7D} \exp \left( -j \frac{12.91}{Re^{0.9}} \frac{\delta}{h} \right) \right]$	(5b*)
$h$	$\frac{1}{\sqrt{\lambda}} = -1.93 \log_{10} \left( \frac{h}{3.7D} \right)$	$\frac{1}{\sqrt{\lambda}} = -1.93 \log_{10} \left[ \frac{2.51}{Re\sqrt{\lambda}} + \frac{h}{3.7D} \exp \left( -j \frac{5.66}{Re\sqrt{\lambda}} \frac{\delta}{h} \right) \right]$	(6a)
		$\frac{1}{\sqrt{\lambda}} = -1.93 \log_{10} \left[ \frac{4.22}{Re^{0.9}} + \frac{h}{3.7D} \exp \left( -j \frac{9.50}{Re^{0.9}} \frac{\delta}{h} \right) \right]$	(6b*)

Note:  $\delta = a = D/2 =$  pipe radius or semi-depth of channel.

$h =$  Equivalent sand grain roughness.

$R_q =$  Root mean square (rms) roughness,  $R_Z =$  Mean peak to valley heights roughness.

$R_a =$  Arithmetic mean roughness,  $R_q/H =$  Height-Texture (HT) roughness.

<sup>a</sup>Explicit approximate friction factor Eqs. (1b\*)–(5b\*) with  $A = 2$  based on approximate smooth pipe Eq. (38), and approximate explicit friction factor Eq. (6b\*) with  $A = 1.93$  based on Eq. (39).