# SIP No. 2021

**Subject:** SIP Fasteners

**Date:** November 2007

R-Control Wood Screws and R-Control Metal Fasteners are available from your R-Control SIP supplier for attachment of R-Control SIPs to wood or metal substrates. These screws were developed to provide an engineered fastener to meet the needs of R-Control SIP installation.

Please find attached engineering properties for the R-Control Wood Screw, Metal Fastener, and Light Duty Metal Fastener. The properties include withdrawal, shear, pull through, and tensile strength.

The values provided for the R-Control Screws and Fasteners are maximum values. As determined by the project architect/engineer, appropriate safety factors should be used in design.

**Wood Screw**

R-Control Wood Screws are used to attach R-Control SIPs to wood structural members and substrates.

**Metal Fastener**

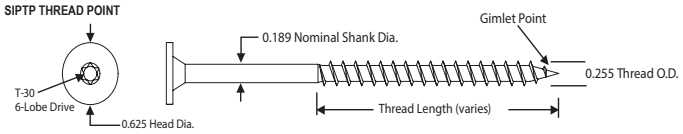
R-Control Metal Fasteners are used to attach R-Control SIPs to metal structural members and substrates. R-Control Heavy Duty Metal Fasteners can self drill into 3/16" steel without pilot hole predrilling. Installation is direct and fast - no wood nailers needed. This eliminates the need for wood nailers that would otherwise be required for the wood screw in metal building components. This results in time savings for the contractor and material savings for the building owner.

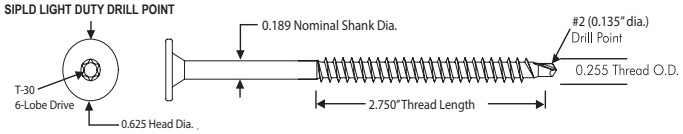
The metal fastener should be driven with a low rpm (<1500 rpm) high torque drill. Firm but not excessive pressure should be applied. This allows the drill point to engage the surface of the metal and drill through. Excessive pressure and/or rpm will dull the drill point and render the fastener ineffective.

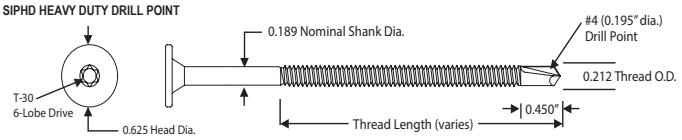
**Metal Fastener - Light Duty**

R-Control also supplies a Light Duty Metal Fastener.

R-Control Light Duty Metal Fasteners are used to attach R-Control SIPs to light duty (up to 18 gauge) metal substrates.



## Average Ultimate Values - Fastener Properties

| Fasteners | Property | | | | Avg. Ult. Pull-Thru Values (lbs) ASTM D1761 | |
|---|---|---|---|---|---|---|
| | Tensile (lbs) AISI S904 | Shear (lbs) AISI S904 | Bending Yield Strength -Fyb (psi) ASTM F1575 | Corrosion Resistance ASTM D6294, ETAG 006 | 7/16" OSB | SIP Panel (7/16" OSB) |
| Wood | 3555 | 2580 | 185,000 | <15% Red Rust after 30 cycles | 490 | 630 |
| Light Duty Metal | 3390 | 2490 | | | | |
| Heavy Duty Metal | 3855 | 2625 | | | | |

### Average Ultimate SIPLD Pullout Values in Steel Deck (lbs)

| Corrugated Steel Deck | 24 ga. | 22 ga. | | 20 ga. | 18 ga. | 16 ga. | |
|---|---|---|---|---|---|---|---|
| Yield Strength | 36 ksi | 36 ksi | 85 ksi | 36 ksi | 36 ksi | 36 ksi | 100 ksi |
| SIPLD | 250 | 381 | 435 | 449 | 694 | 896 | 1186 |

* Minimum 3/4" penetration of fastener through deck from underside of deck

### Average Ultimate SIPHD Pullout Values in Structural Steel (lbs)

| Structural Steel | 16 ga. | | 12 ga. | 1/8" | 3/16" | 1/4" |
|---|---|---|---|---|---|---|
| Yield Strength | 36 ksi | 100 ksi | 50 ksi | 36 ksi | 60 ksi | 60 ksi |
| SIPHD | 491 | 794 | 1255 | 1454 | 3098 | 3814 |

* Minimum (3) threads of penetration of fastener through deck as measured from underside of steel

### Average Ultimate Withdrawal Values in Lumber & Engineered Wood, Face Grain (lbs/in.)*

| Wood Type (Specific Gravity) | SPF/HF (0.42) | DF/SP (0.50) | LVL (0.50) | LSL (0.50) |
|---|---|---|---|---|
| SIPTP | 779 | 899 | 556 | 711 |
| SIPLD | 662 | 732 | 540 | 646 |

* Load values include fastener tip

### Average Ultimate Withdrawal Values in Lumber & Engineered Wood, Edge Grain (lbs/in.)*

| Wood Type (Specific Gravity) | SPF/HF (0.42) | DF/SP (0.50) | LVL (0.50) |
|---|---|---|---|
| SIPTP | 36 ksi | 100 ksi | 50 ksi |
| SIPLD | 491 | 794 | 1255 |

* Load values include fastener tip

## Average Ultimate Values - Fastener Properties

| Wood Type (Specific Gravity) | OSB | | | | Plywood | | |
|---|---|---|---|---|---|---|---|
| Thickness | 7/16" | 1/2" | 19/32" | 23/32" | 15/32" | 19/32" | 23/32" |
| SIPTP | 265 | 244 | 324 | 626 | 333 | 529 | 681 |
| SIPLD | 284 | 261 | 334 | 693 | 344 | 519 | 720 |

* Fastener penetrates through the full thickness of board

### Average Ultimate Tension Values in Normal Weight Concrete & CMU (lbs)[1]

| Comression Strength | 2500 psi Concrete | 5000 psi Concrete | CMU[2] |
|---|---|---|---|
| SIPTP | 682 | 859 | 713 |
| SIPLD | 476 | 648 | 553 |

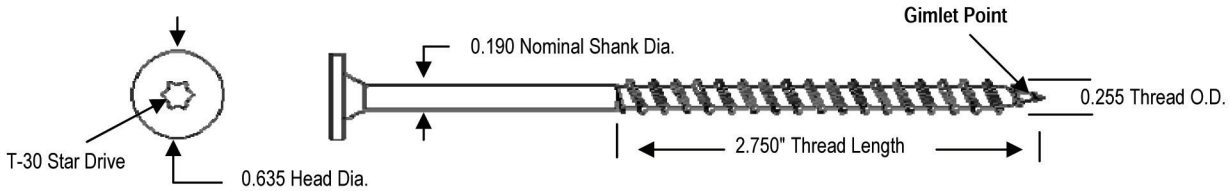
1. Fastener penetrates 1" into the concrete or CMU block, including the tip.
2. Concrete mansonry unit (CMU) conforming to ASTM C90.

### Average Ultimate Lateral Load Resistance (lbs)

| Fastener | Main Member | Side Member | Load |
|---|---|---|---|
| SIPTP | SPF[1] | 8-1/4" SIP Panel | 943 |
| SIPLD | 22 ga. Corrugated Steel Deck[2] | 7-1/4" Nailbase Panel | 411 |
| SIPLD | 7/16" OSB[3] | 7-1/4" Nailbase Panel | 112 |
| SIPHD | 1/8" Structural Steel[4] | 8-1/4" SIP Panel | 929 |

1. 1-3/4" fastener embedment into edge grain, including tip.
2. Minimum 3/4" penetration of fastener through deck as measured from underside of deck.
3. Fastener penetrates through the full thickness of board.
4. Minimum (3) threads of penetration through steel as measured from underside of steel

# R-Control Wood Screws




| Withdrawal | lbs./in. penetration | wood specific gravity |
|---|---|---|
| R-Control Wood Screw | 1429 | 0.67 |
| | 1173 | 0.55 |
| | 1067 | 0.50 |
| | 981 | 0.46 |
| | 917 | 0.43 |
| | 768 | 0.36 |
| | 661 | 0.31 |

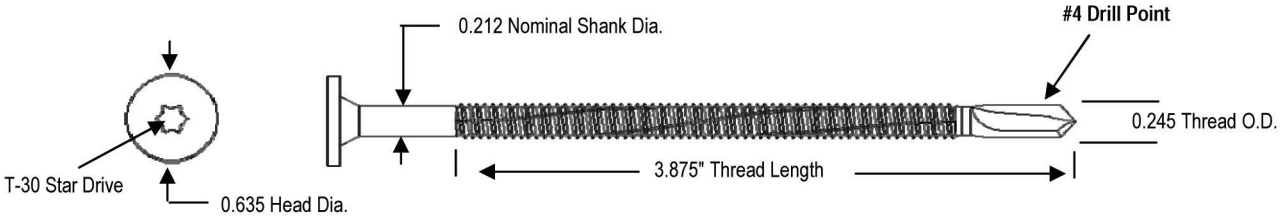
| Shear | lbs. | wood specific gravity |
|---|---|---|
| R-Control Wood Screw / R-Control SIP assembly | 790 | 0.64 |
| | 780 | 0.45 |
| | 720 | 0.38 |
| R-Control Wood Screw | 2900 | |

| Pull Through | lbs. |
|---|---|
| R-Control Wood Screw / R-Control SIP assembly | 630 |
| R-Control Wood Screw / 7/16" OSB | 545 |

| Tensile Strength | lbs. |
|---|---|
| R-Control Wood Screw | 3380 |

The values provided for the R-Control Screw Fastener are maximum values. As determined by the project architect/engineer, appropriate safety factors should be used in design.

# R-Control Metal Fasteners




| Withdrawal | lbs. | Steel |
|---|---|---|
| R-Control Metal Fastener | 770 | 16 ga. |
| | 1130 | 13 ga. |
| | 1690 | 12 ga. |
| | 3100 | 3/16" |
| | 4500 | 1/4" |

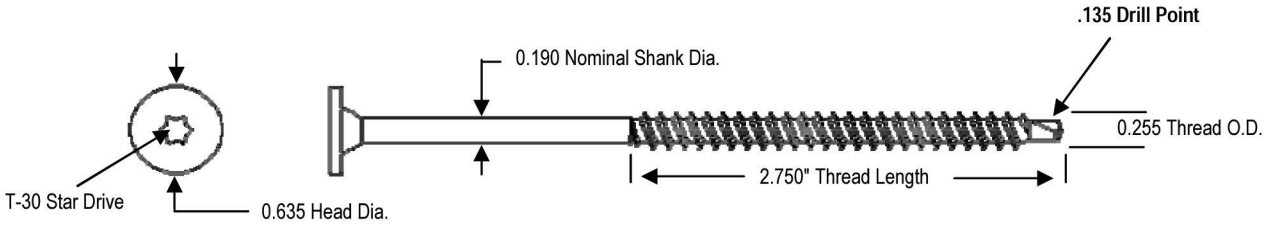
| Shear | lbs. |
|---|---|
| R-Control Metal Fastener / R-Control SIP assembly | 790 |
| R-Control Metal Fastener | 3400 |

| Pull Through | lbs. |
|---|---|
| R-Control Metal Fastener / R-Control SIP assembly | 630 |
| R-Control Metal Fastener / 7/16" OSB | 545 |

| Tensile Strength | lbs. |
|---|---|
| R-Control Metal Fastener | 6000 |

The values provided for the R-Control Metal Fastener are maximum values. As determined by the project architect/engineer, appropriate safety factors should be used in design.

# R-Control Light Duty Fasteners




| Withdrawal | lbs. | Steel |
|---|---|---|
| R-Control Light Duty Metal Fastener | 510 | 22 ga. |
| | 645 | 20 ga. |
| | 920 | 18 ga. |

| Shear | lbs. |
|---|---|
| R-Control Light Duty Metal Fastener | 2900 |

| Pull Through | lbs. |
|---|---|
| R-Control Light Duty Metal Fastener / R-Control SIP assembly | 630 |
| R-Control Light Duty Metal Fastener / 7/16" OSB | 545 |

| Tensile Strength | lbs. |
|---|---|
| R-Control Light Duty Metal Fastener | 3380 |

The values provided for the R-Control Screw Fastener are maximum values. As determined by the project architect/engineer, appropriate safety factors should be used in design.

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