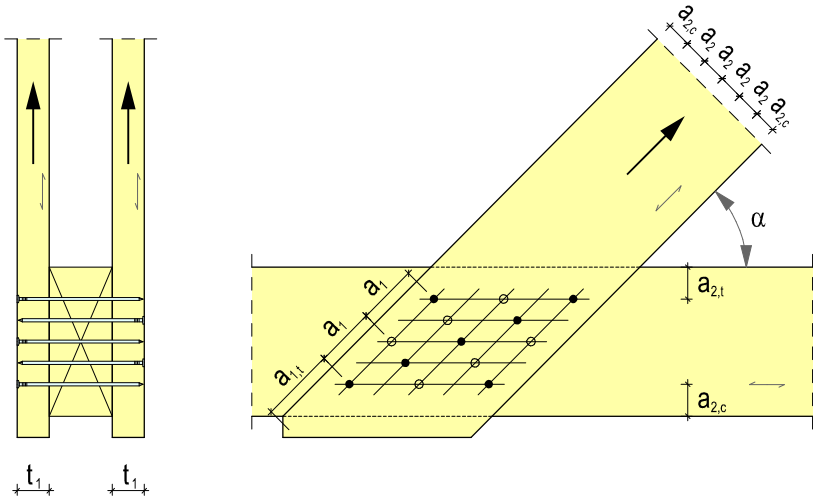
Zeichnungen zur DIN 1052



Teilprojekt II:
„Einsatz visueller Medien in der Aus-, Fort- und Weiterbildung im Zimmerer- und Holzbaugewerbe“

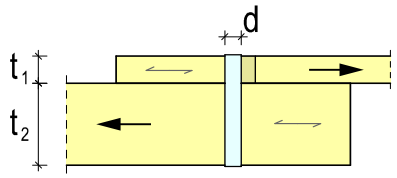
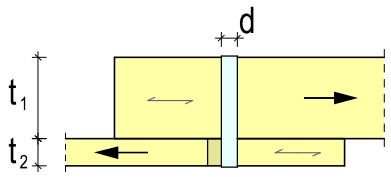
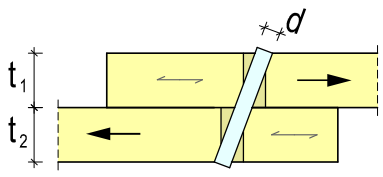
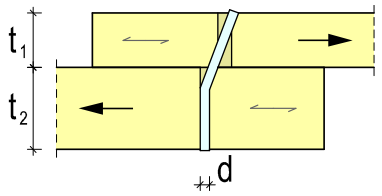
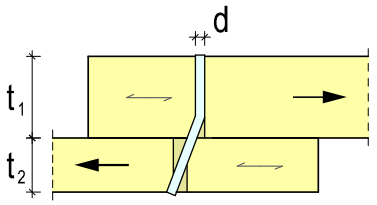
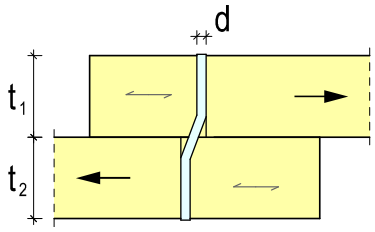
Weiterentwicklung des Zimmerer Zentrums Kassel zum Kompetenzzentrum des Zimmerer- und Ausbaugewerbes

BUNDESBILDUNGSZENTRUM DES ZIMMERER- UND AUSBAUGEWERBES bubiza.de
Berufsförderungswerk des Hessischen Zimmerhandwerks e. V.
gefördert von: BIBB BAFA

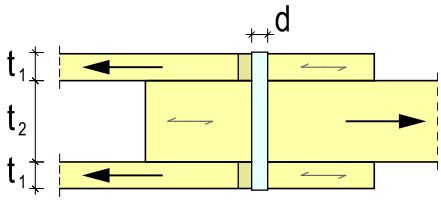
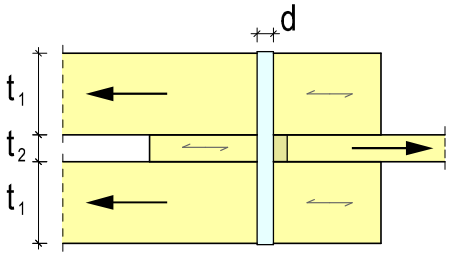
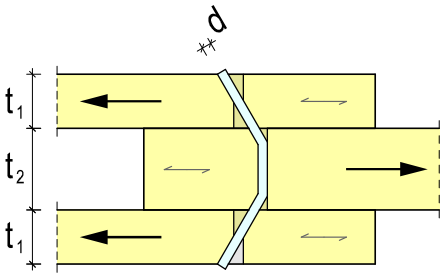
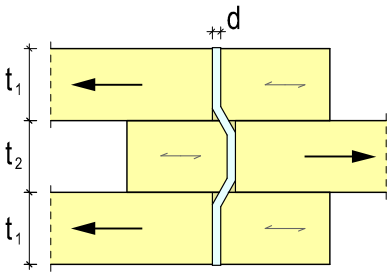
Inhaltsverzeichnis

Einschnittige Verbindungen aus Holz bzw. Holzwerkstoffen 3
Zweischnittige Verbindungen aus Holz bzw. Holzwerkstoffen 3
Einschnittige Verbindungen aus Stahlblech und Holz 4
Zweischnittige Verbindungen aus Stahlblech und Holz 4
Definitionen der Verbindungsmittelabstände 5
Verbindungsmittelabstände 6
Verbindungsmittelanordnung 7
Zugstoß mit Schlitzblech 7
Exzentrizitäten 8
Verbindungsmittel – Allgemein 8
Verbindungsmittel – Vergleich 11
Dübel besonderer Bauart 12
Nagelverbindungen 13
Zugverbindungen - Verankerungslänge 15
Schraubenverbindungen 16
Klammerverbindungen 16
Einbindelängen 16
Definition Seiten- und Mittenholz 16
Zeichnerische Darstellung von Verbindungsmitteln 17
Querschnittsschwächungen 18
Zimmermannsmäßige Verbindungen - Längsverbindungen 19
Zimmermannsmäßige Verbindungen - Eckverbindungen 21
Zimmermannsmäßige Verbindungen - Verkämmungen 23
Zimmermannsmäßige Verbindungen - Zapfenverbindungen 24
Zimmermannsmäßige Verbindungen - Versätze 26
Zugstäbe 28
Querzugproblematik 29
Bemessung 30
Gebrauchstauglichkeit 31
Klassen der Lasteinwirkungsdauer (KLED) 31
Eulerfälle 32
Belastungsfälle vereinfachter Gebrauchstauglichkeitsnachweis 32
Kragträger 33
Einfeldträger 33
Einfeldträger mit Kragarm 33
Maßgebende Lastfälle von Durchlaufträgern mit gleicher Stützweite 34
Spannungen am Biegeträger 35

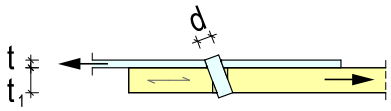
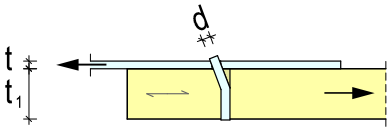
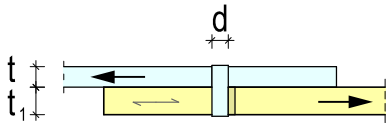
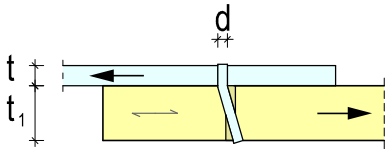
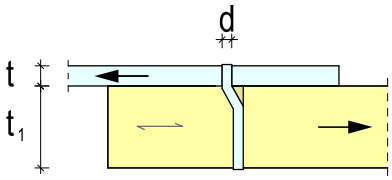
Einschnittige Verbindungen aus Holz bzw. Holzwerkstoffen

		
Versagensfall 1 (HH-ES-VF1.wmf)	Versagensfall 2 (HH-ES-VF2.wmf)	Versagensfall 3 (HH-ES-VF3.wmf)
		
Versagensfall 4 (HH-ES-VF4.wmf)	Versagensfall 5 (HH-ES-VF5.wmf)	Versagensfall 6 (HH-ES-VF6.wmf)

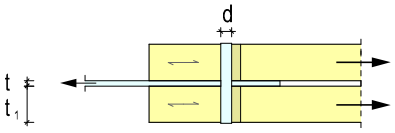
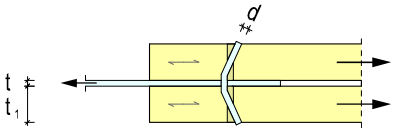
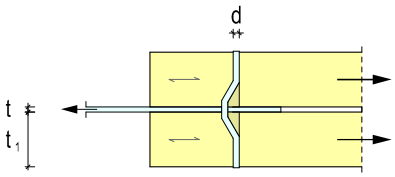
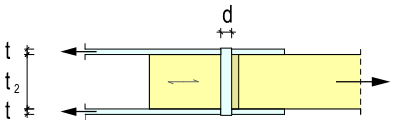
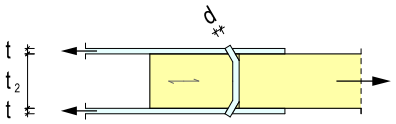
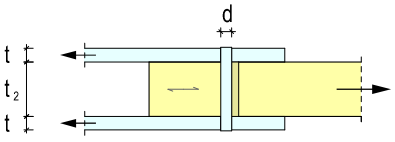
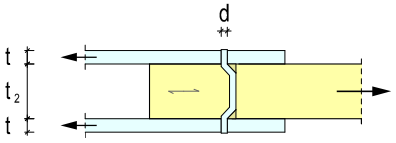
Zweischnittige Verbindungen aus Holz bzw. Holzwerkstoffen

	
Versagensfall 1 (HH-ZS-VF1.wmf)	Versagensfall 2 (HH-ZS-VF2.wmf)
	
Versagensfall 3 (HH-ZS-VF3.wmf)	Versagensfall 4 (HH-ZS-VF4.wmf)

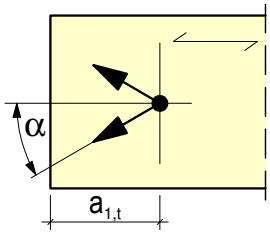
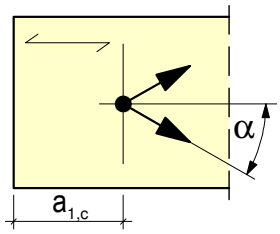
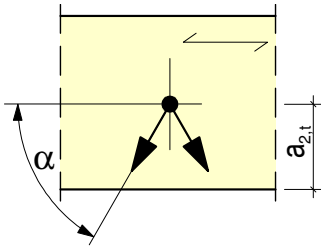
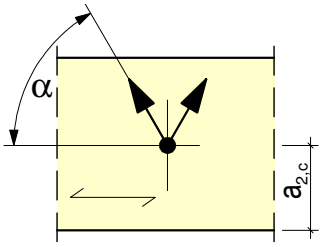
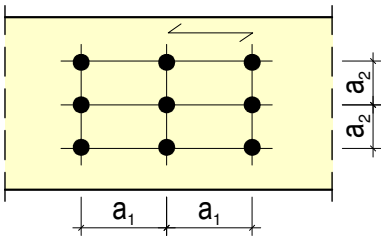
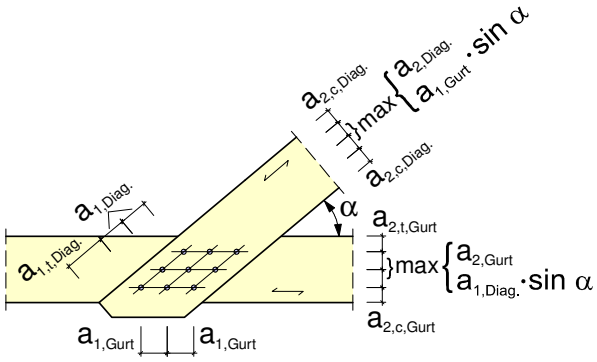
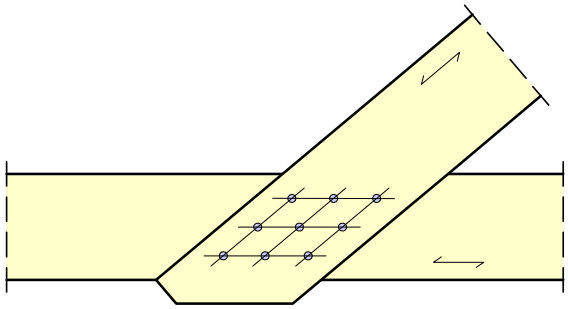
Einschnittige Verbindungen aus Stahlblech und Holz

		
Blech dünn: Versagensfall 1 (HSdü-ES-VF1.wmf)	Blech dünn: Versagensfall 2 (HSdü-ES-VF2.wmf)	
		
Blech dick: Versagensfall 1 (HSdi-ES-VF1.wmf)	Blech dick: Versagensfall 2 (HSdi-ES-VF2.wmf)	Blech dick: Versagensfall 3 (HSdi-ES-VF3.wmf)

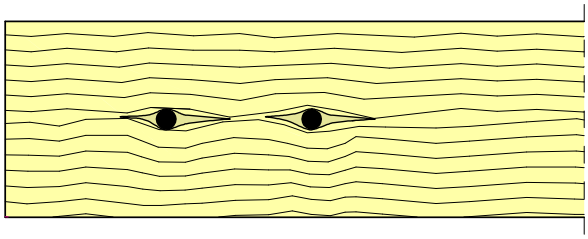
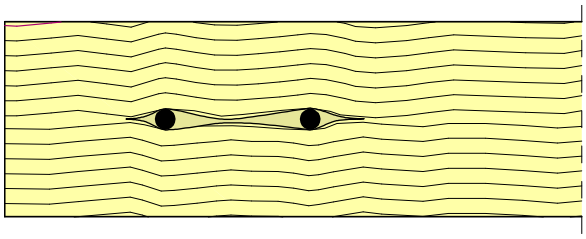
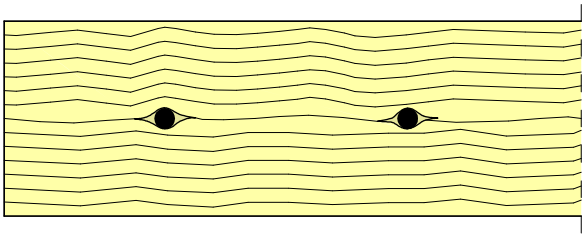
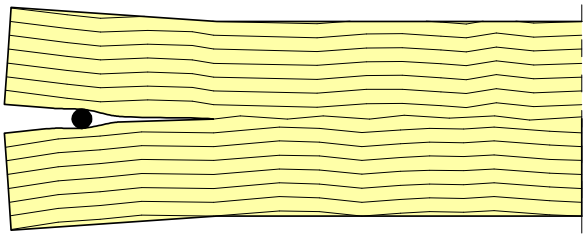
Zweischnittige Verbindungen aus Stahlblech und Holz

		
Blech innen: Versagensfall 1 (HSdüi-ZS-VF1.wmf)	Blech innen: Versagensfall 2 (HSdüi-ZS-VF2.wmf)	Blech innen: Versagensfall 3 (HSdüi-ZS-VF3.wmf)
		
Blech dünn: Versagensfall 1 (HSdüa-ZS-VF1.wmf)	Blech dünn: Versagensfall 2 (HSdüa-ZS-VF2.wmf)	
		
Blech dick: Versagensfall 1 (HSdia-ZS-VF1.wmf)	Blech dick: Versagensfall 2 (HSdia-ZS-VF2.wmf)	

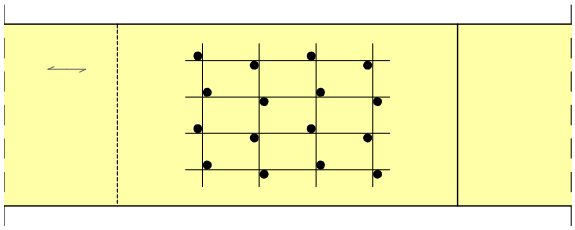
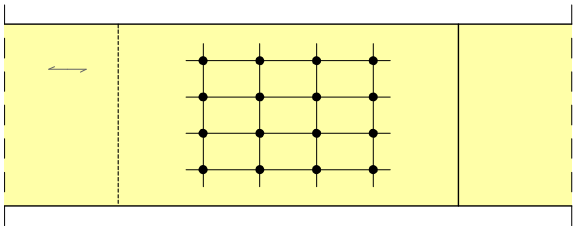
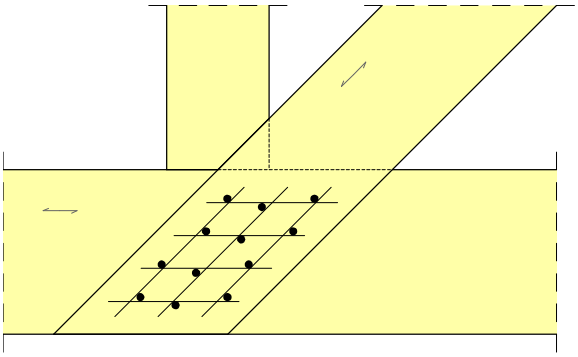
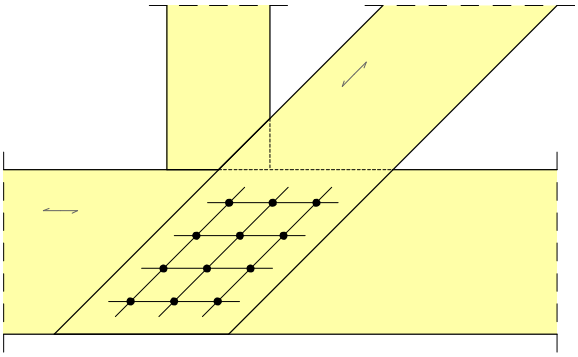
Definitionen der Verbindungsmittelabstände

	
Beanspruchtes Hirnholzende (a1t.wmf)	Unbeanspruchtes Hirnholzende (a1c.wmf)
	
Beanspruchter Rand (a2t.wmf)	Unbeanspruchter Rand (a2c.wmf)
	
In und rechtwinklig zur Faserrichtung (a1unda2.wmf)	Diagonale Anordnung (Abstände-diagonal.wmf)
	
	Diagonale Anordnung (Anordnung-diagonal.wmf)

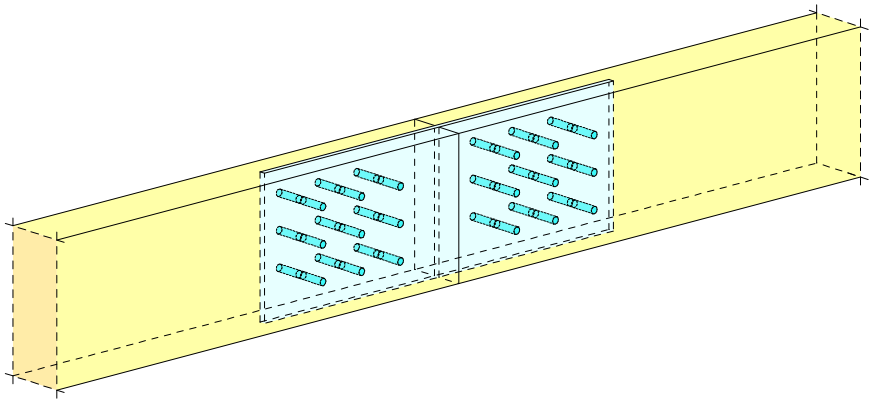
Verbindungsmittelabstände

	
Unzureichender Abstand untereinander (unzu-a1-1.wmf)	Unzureichender Abstand untereinander (unzu-a1-2.wmf)
	
Ausreichender Abstand untereinander (ausr-a1.wmf)	Unzureichender Randabstand (unzu-a1t.wmf)

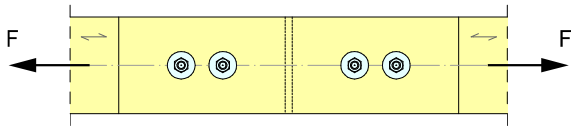
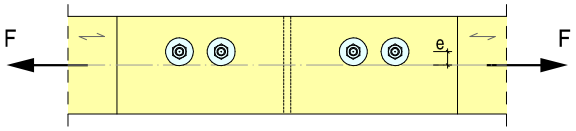
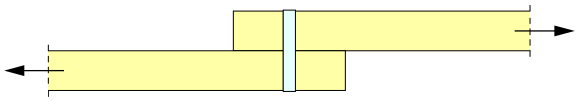
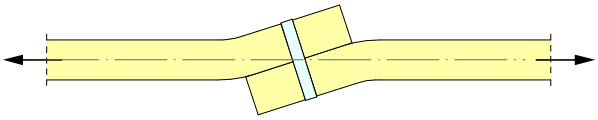
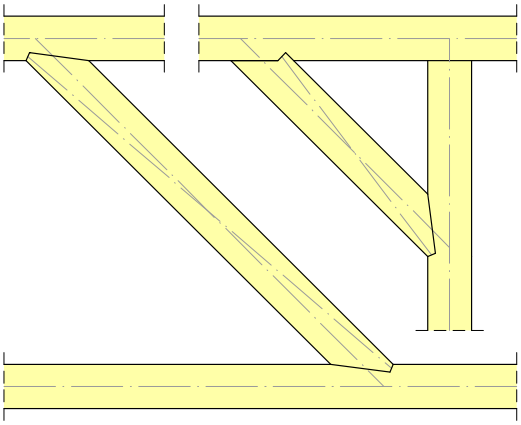
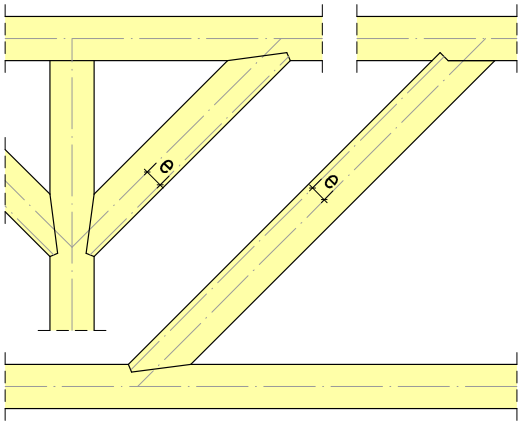
Verbindungsmittelanordnung

	
Versetzt – gerade (v-gerade.wmf)	Nicht versetzt – gerade (nv-gerade.wmf)
	
Versetzt – diagonal (v-diagonal.wmf)	Nicht versetzt – diagonal (nv-diagonal.wmf)

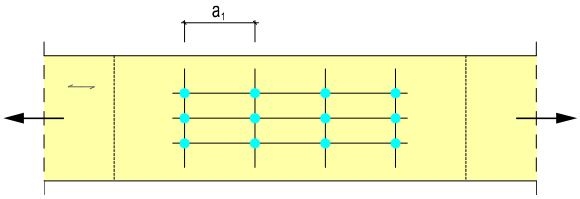
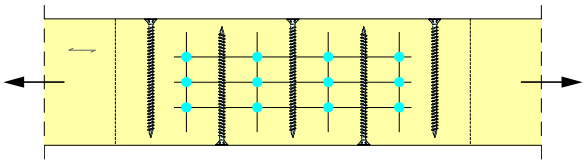
Zugstoß mit Schlitzblech


Isometrie (ZS-Isometrie.wmf)

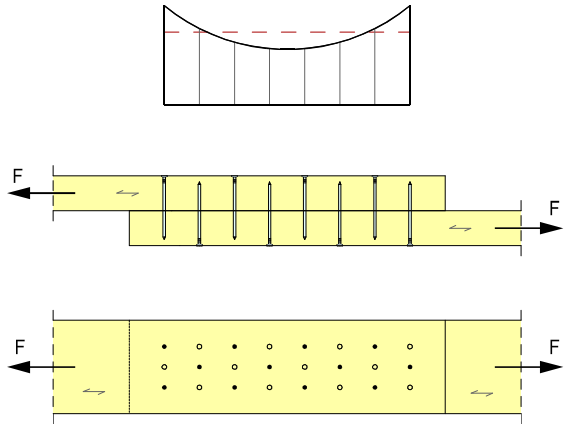
Exzentrizitäten

	
Zugstab ohne Exzentrizitäten (ZS-oEx.wmf)	Zugstab mit Exzentrizitäten (ZS-mEx.wmf)
	
Zugstab mit Exzentrizität (ZS-mEx-nv.wmf)	Zugstab mit Exzentrizität – verformt (ZS-mEx-v.wmf)
	
Strebe ohne Exzentrizitäten (St-oEx.wmf)	Strebe mit Exzentrizitäten (St-mEx.wmf)

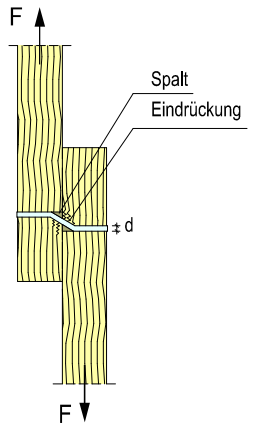
Verbindungsmittel – Allgemein

	
Effektiv wirksame Anzahl (ef-wirk.wmf)	Effektiv wirksame Anzahl (ef-wirk-ver.wmf)

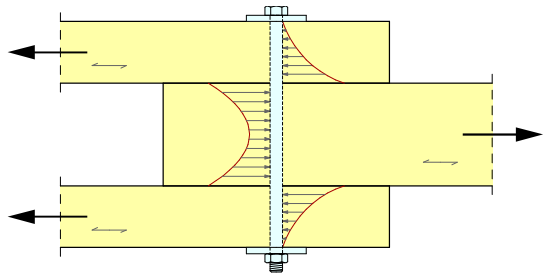
Verbindungsmittel – Allgemein



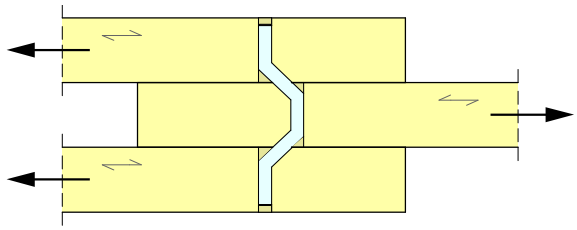
Ungleichmäßige Kraftaufteilung
(Kraftaufteilung.wmf)



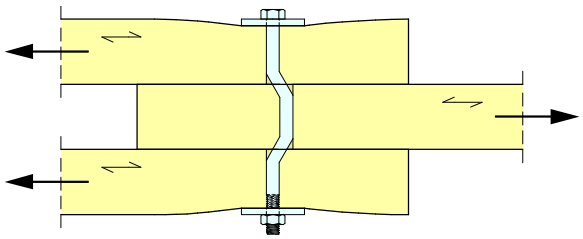
Verformungen Verbindungsmittel und Holz
(Verformungen.wmf)



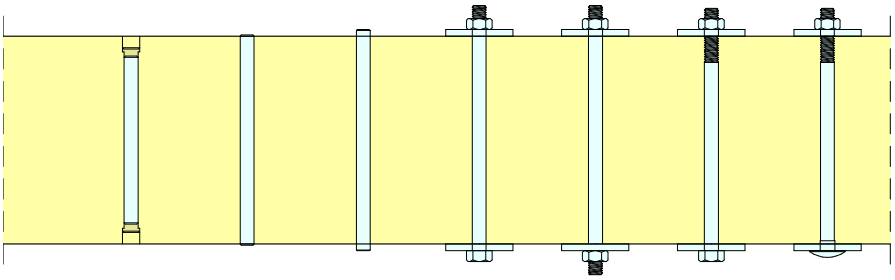
Kraftverlauf im Holz
(Kraftverlauf-Stift.wmf)



Ohne Einhängewirkung
(Seileffekt-o.wmf)

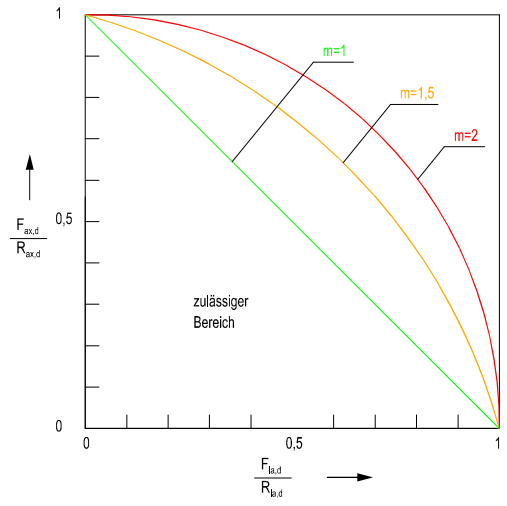


Mit Einhängewirkung
(Seileffekt-m.wmf)

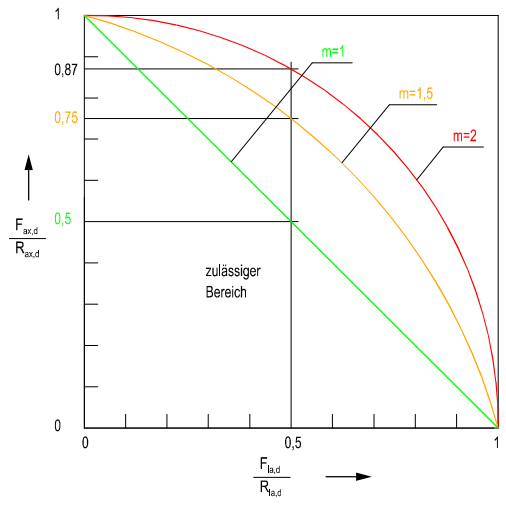


Stabdübel, Passbolzen und Bolzen im Vergleich
(StDü-PaBo-Bo.wmf)

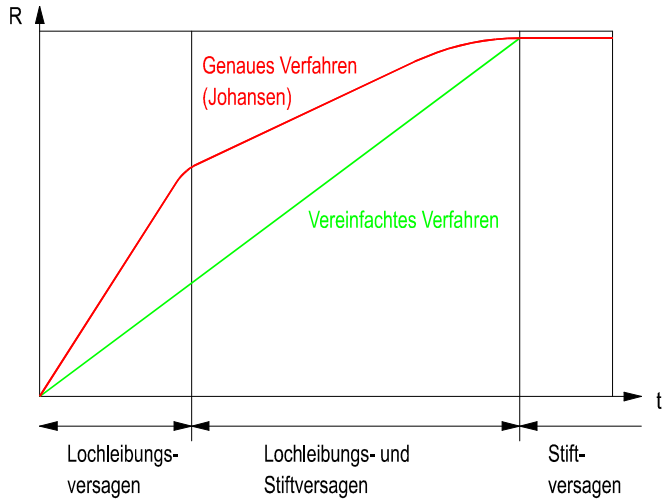
Verbindungsmittel – Allgemein



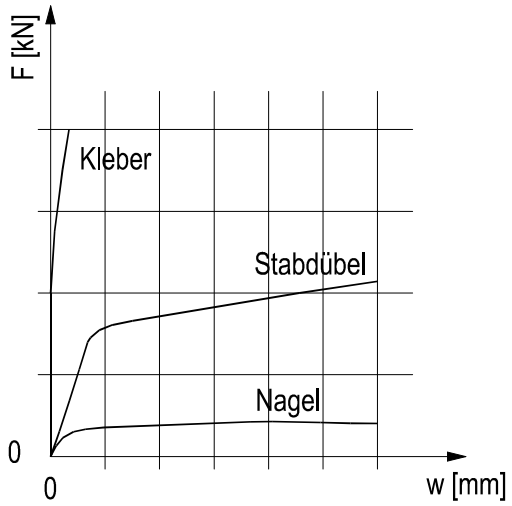
Kombinierte Beanspruchung
(Kombiniert.wmf)



Kombinierte Beanspruchung - Beispiel
(Kombiniert-Bsp.wmf)

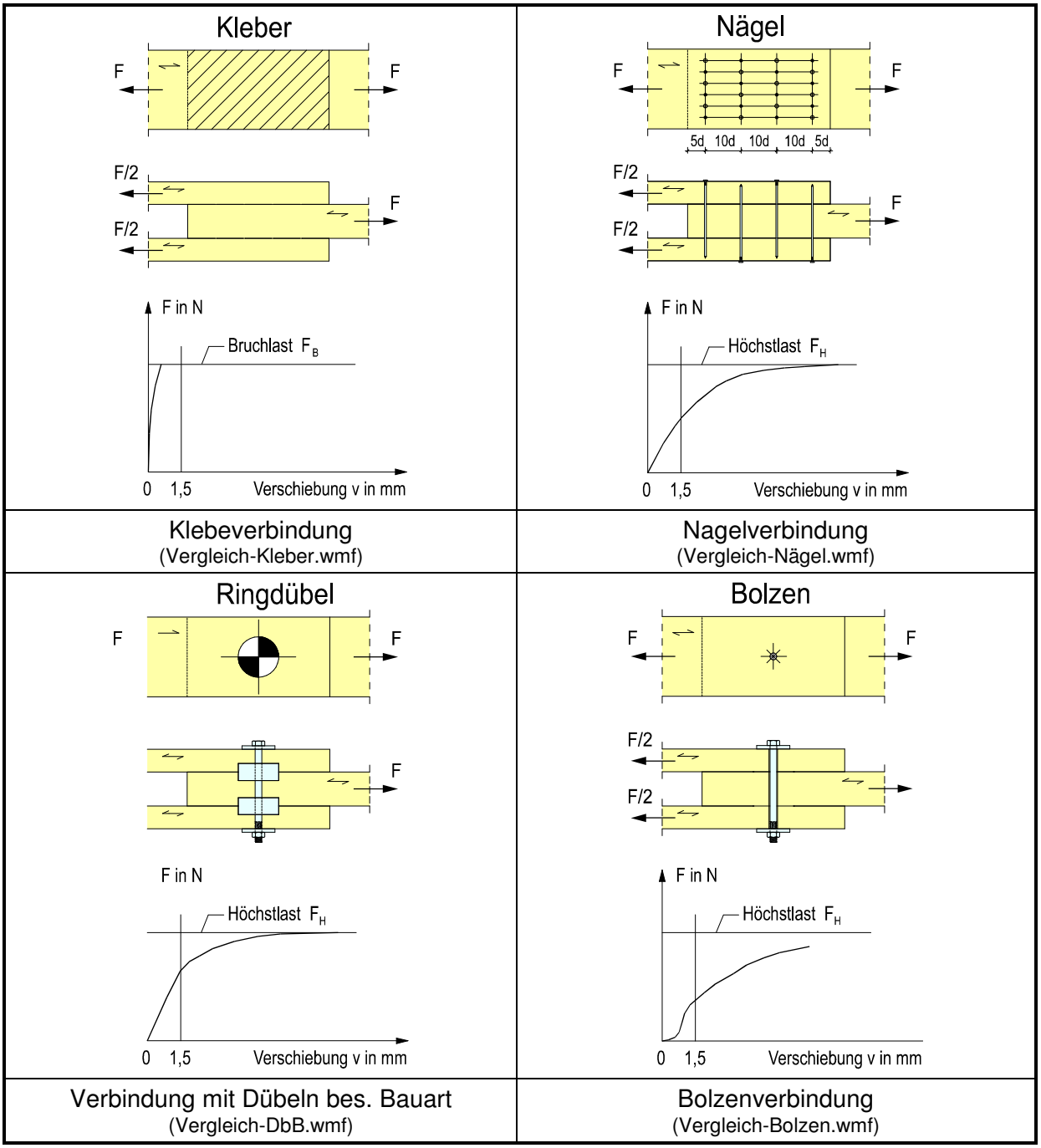


Genaues und vereinfachtes Verfahren
(Johansen.wmf)

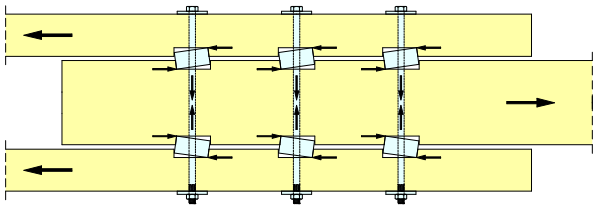


Vergleich der Tragfähigkeiten
(Vergleich.wmf)

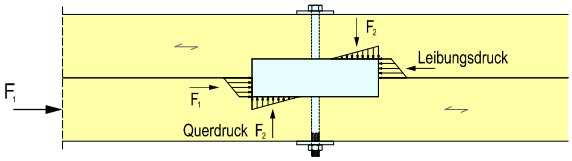
Verbindungsmittel – Vergleich



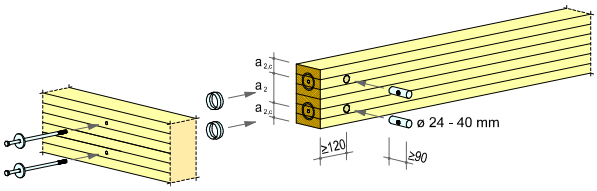
Dübel besonderer Bauart



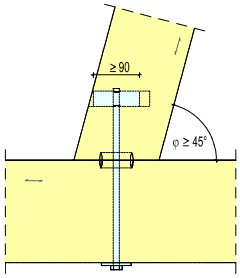
Wirkung des Bolzens
(Stift-DbB.wmf)



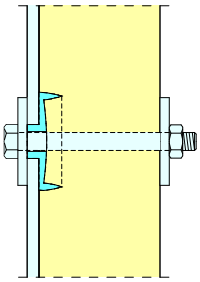
Kraftverlauf im Holz
(Kraftverlauf-DbB.wmf)



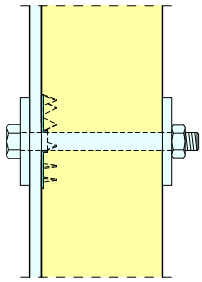
Hirnholzanschluss
(Hirnholz-Iso.wmf)



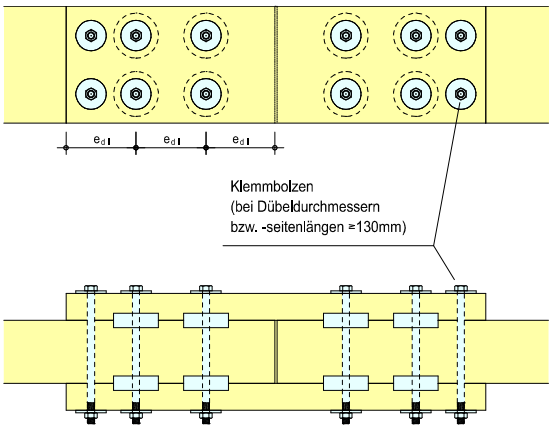
Hirnholzanschluss
(Hirnholz-D.wmf)



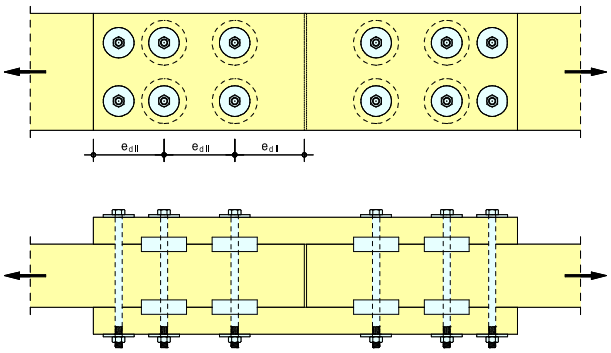
Einseitiger Scheibendübel Typ B1
(Eins-B1.wmf)



Einseitiger Scheibendübel Typ C2
(Eins-C2.wmf)

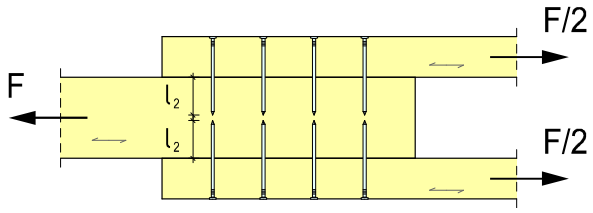


Klemmbolzen bei großen Dübeln
(DbB+Bolzen-1.wmf)

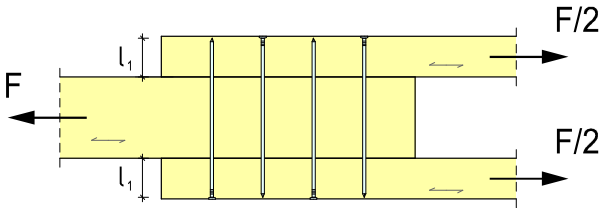


Klemmbolzen bei großen Dübeln
(DbB+Bolzen-2.wmf)

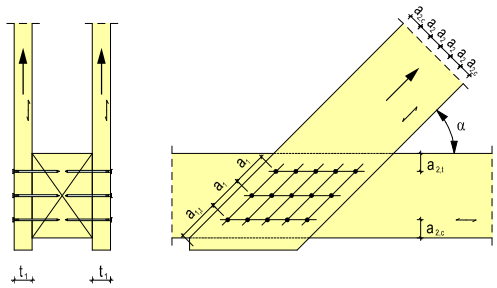
Nagelverbindungen



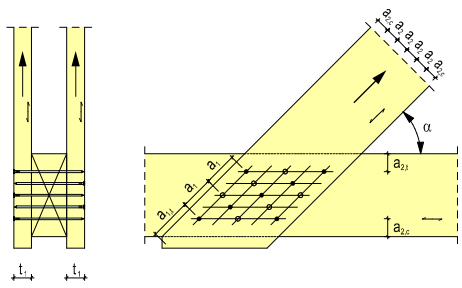
Einschnittige Verbindung
(Nagel-ES.wmf)



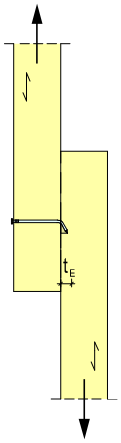
Zweischnittige Verbindung
(Nagel-ZS.wmf)



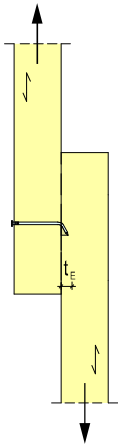
Einschnittige Verbindung
(Nagel-ES-dia.wmf)



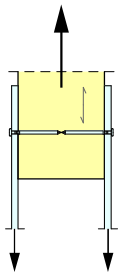
Zweischnittige Verbindung
(Nagel-ZS-dia.wmf)



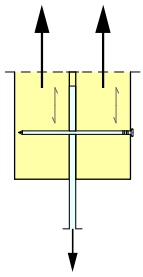
Nicht ausreichende Einschlagtiefe
(Einschlag-a.wmf)



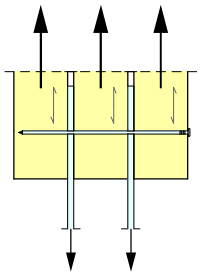
Ausreichende Einschlagtiefe
(Einschlag-na.wmf)



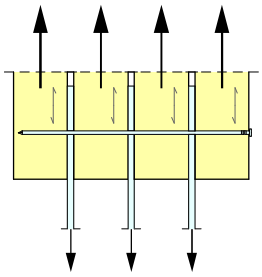
Einschnittig
(HS-ES.wmf)



Zweischnittig
(HS-ZS.wmf)

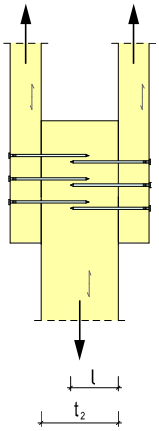


Vierschnittig
(HS-VS.wmf)

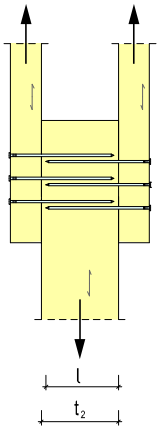


Sechsschnittig
(HS-SS.wmf)

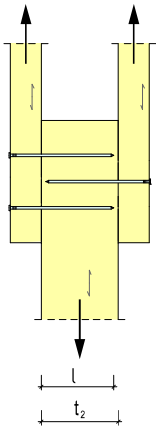
Nagelverbindungen



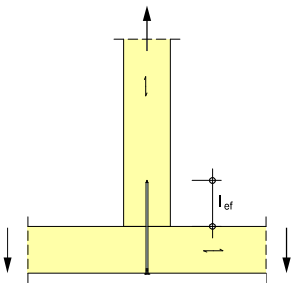
Zulässige Ausführung
(Üb-zul.wmf)



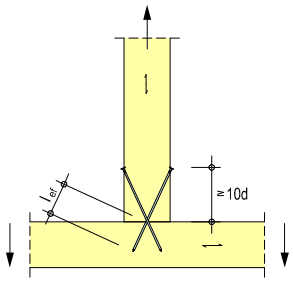
Unzulässige Ausführung
(Üb-unzul.wmf)



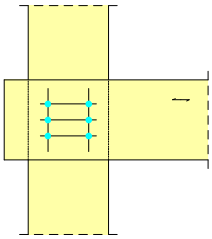
Zulässige Ausführung
(Üb-ohne.wmf)



Nagelung gerade
(Nagelung-g.wmf)

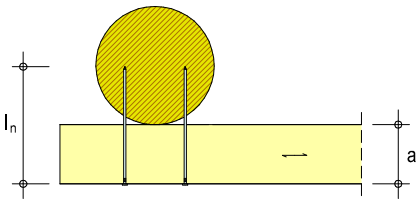


Nagelung schräg
(Nagelung-s.wmf)



Ansicht

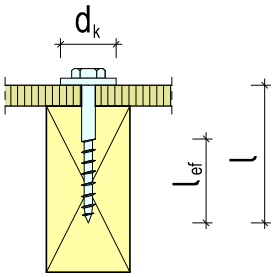
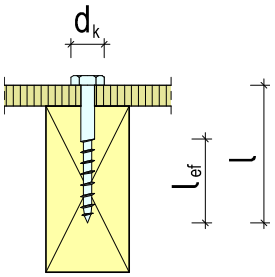
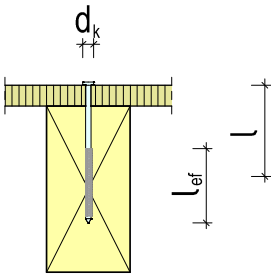
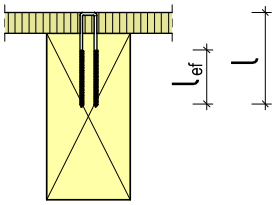
Nagelanschluss Rundholz - Ansicht
(Rundholz-A.wmf)



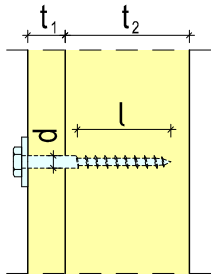
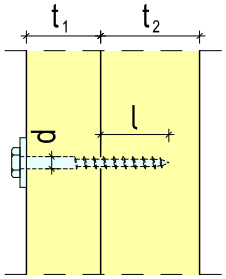
Schnitt

Nagelanschluss Rundholz - Schnitt
(Rundholz-S.wmf)

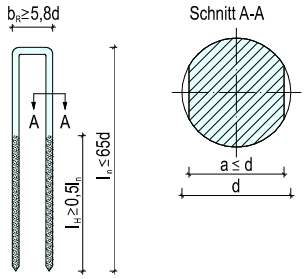
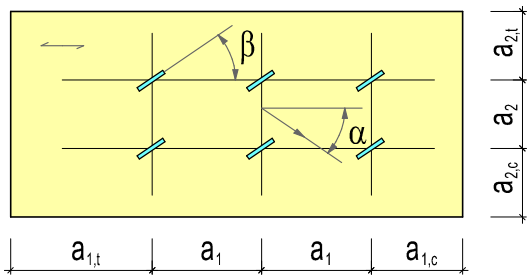
Zugverbindungen - Verankerungslänge

		
Schraube (VL-SS.wmf)	Schraube (VL-S.wmf)	Nagel (VL-N.wmf)
		
Klammer (VL-K.wmf)		

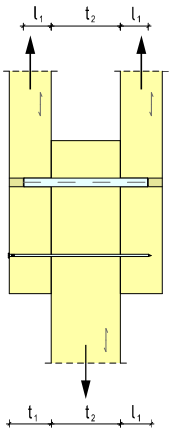
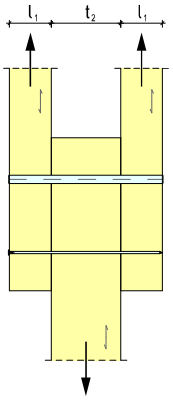
Schraubenverbindungen

	
Verankerungslänge (VL-S-teil.wmf)	Verankerungslänge (VL-S-voll.wmf)

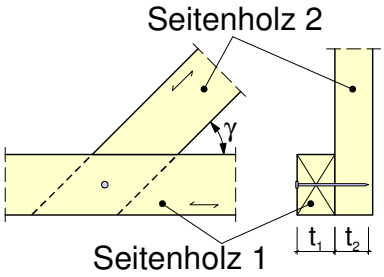
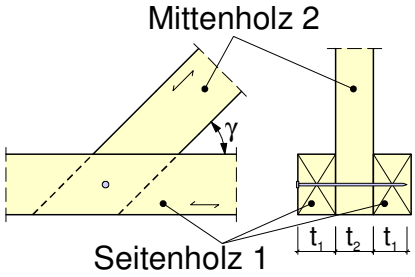
Klammerverbindungen

	
Klammerausbildung (Klammer.wmf)	Klammerabstände (Klammerabstand.wmf)

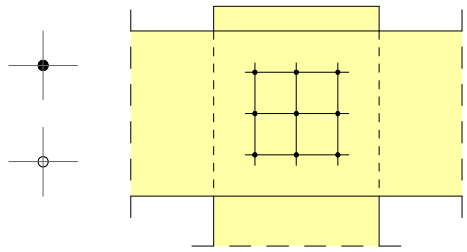
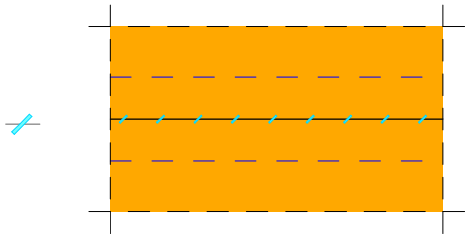
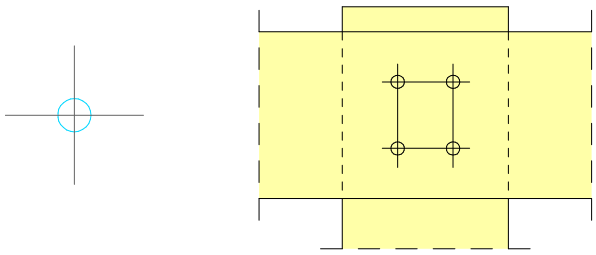
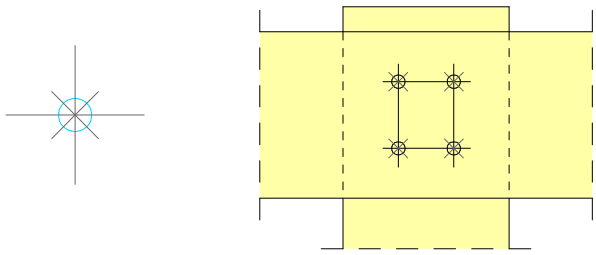
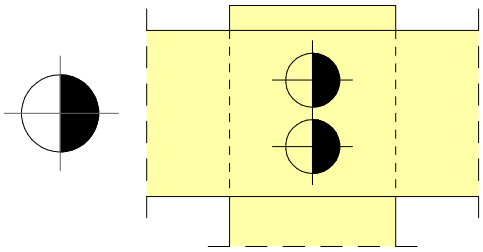
Einbindelängen

	
Ansetzbare Einbindelängen (EB-Länge1.wmf)	Ansetzbare Einbindelängen (EB-Länge2.wmf)

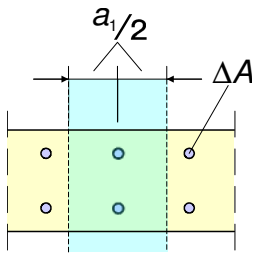
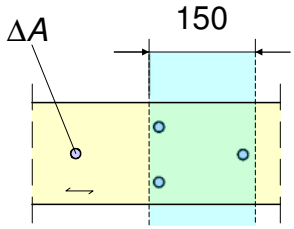
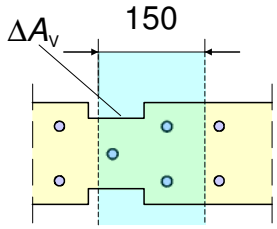
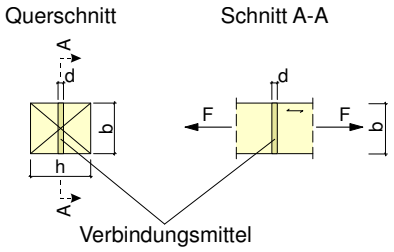
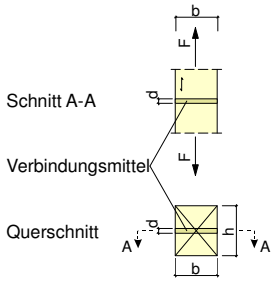
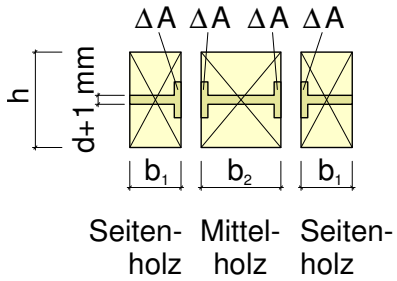
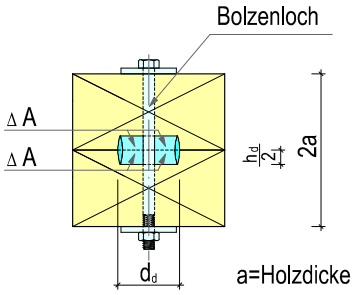
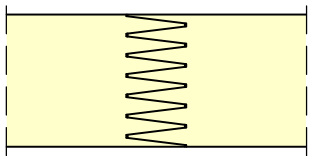
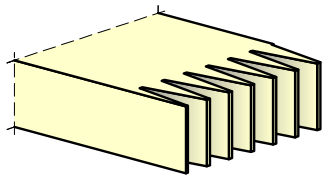
Definition Seiten- und Mittenholz

	
Einschnittige Verbindung (Def-ES.wmf)	Zweischnittige Verbindung (Def-ZS.wmf)

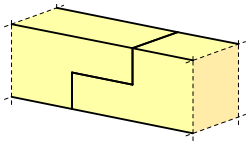
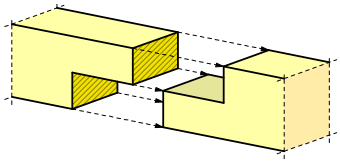
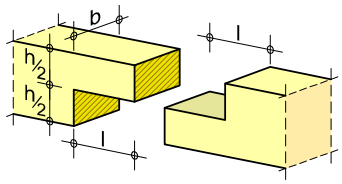
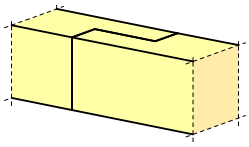
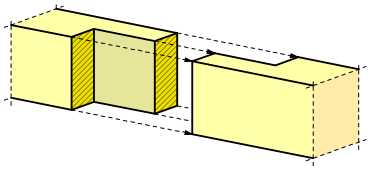
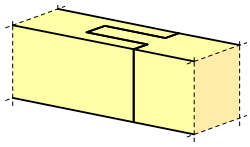
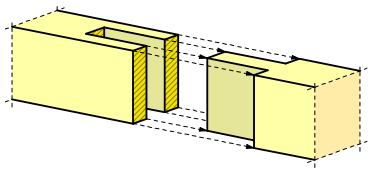
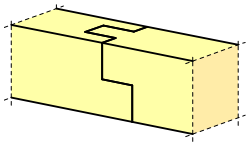
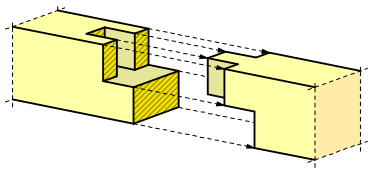
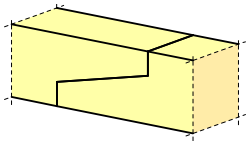
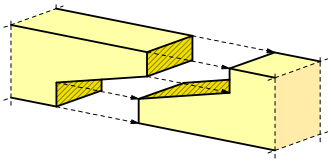
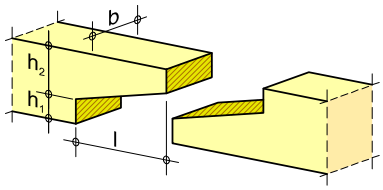
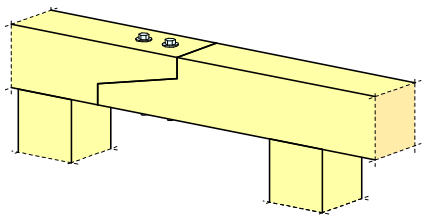
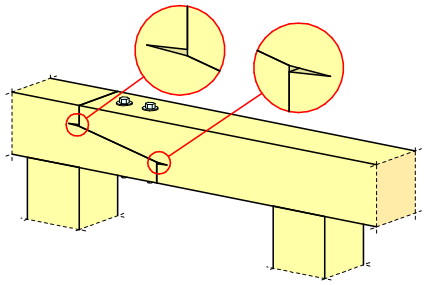
Zeichnerische Darstellung von Verbindungsmitteln

	
Nägeln (Zeich-N.wmf)	Klammern (Zeich-K.wmf)
	
Stabdübel (Zeich-St.wmf)	Bolzen (Zeich-B.wmf)
	
Dübel besonderer Bauart (Zeich-DbB.wmf)	

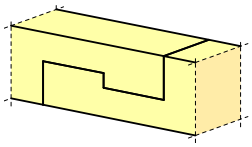
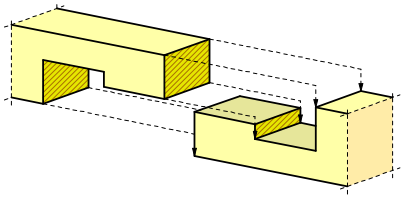
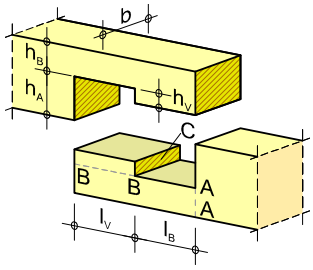
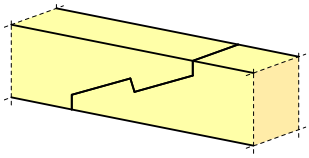
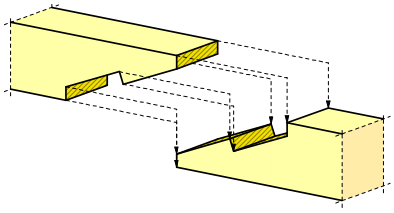
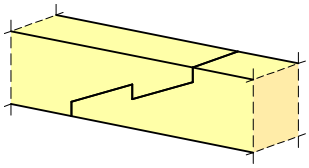
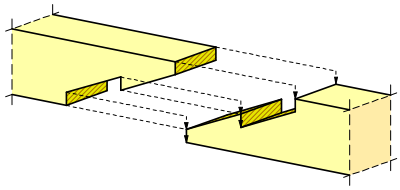
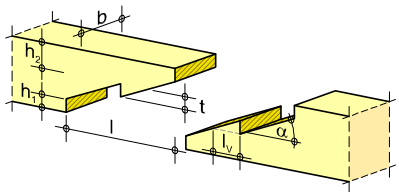
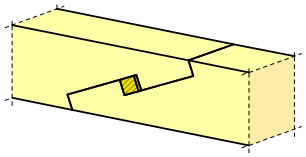
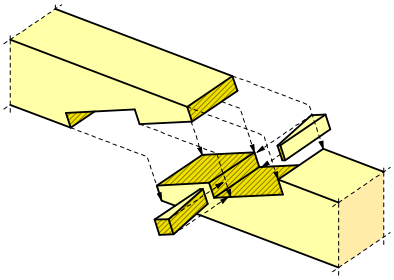
Querschnittsschwächungen

		
Schwächung 2×ΔA (Schwächung1.wmf)	Schwächung 3×ΔA (Schwächung2.wmf)	Schwächung 2×ΔA+ΔA$_V$ (Schwächung3.wmf)
		
Stiftförmige Verbindungsmittel (Schwächung-Stift-h.wmf)	Stiftförmige Verbindungsmittel (Schwächung-Stift-v.wmf)	Dübel besonderer Bauart (Schwächung-DbB1.wmf)
		
Dübel besonderer Bauart (Schwächung-DbB2.wmf)	Keilzinkenverbindung (KZ-Verb-1.wmf)	Keilzinkenverbindung (KZ-Verb-2.wmf)

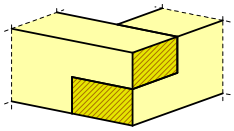
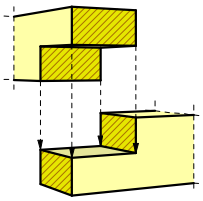
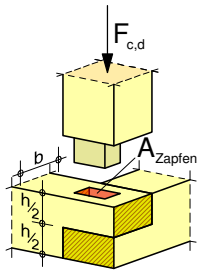
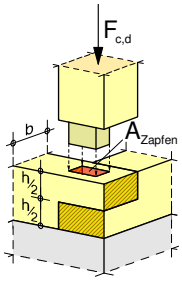
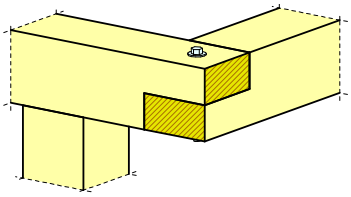
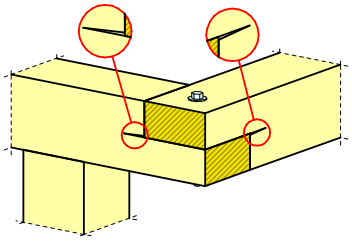
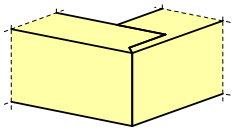
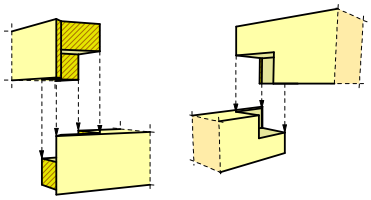
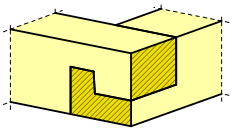
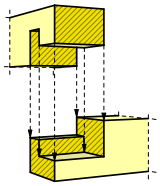
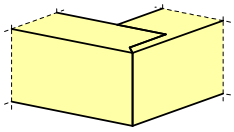
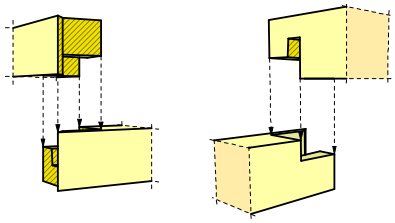
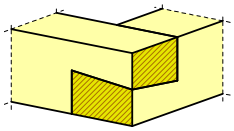
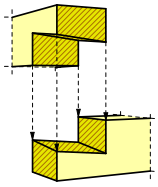
Zimmermannsmäßige Verbindungen - Längsverbindungen

		
Gerades Blatt (Blatt1.wmf)	Gerades Blatt (Blatt2.wmf)	Gerades Blatt (Blatt3.wmf)
		
Stehendes Blatt (SBlatt1.wmf)	Stehendes Blatt (SBlatt2.wmf)	Zapfenstoß (ZStoß1.wmf)
		
Zapfenstoß (ZStoß2.wmf)	Zapfenblattstoß (ZBStoß1.wmf)	Zapfenblattstoß (ZBStoß2.wmf)
		
Gerberstoß (Gerber1.wmf)	Gerberstoß (Gerber2.wmf)	Gerberstoß (Gerber3.wmf)
		
Gerberstoß (Gerber4.wmf)	Gerberstoß (Gerber5.wmf)	

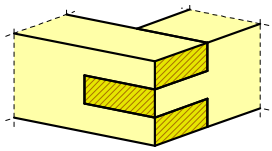
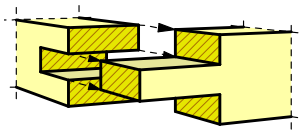
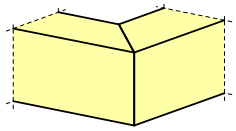
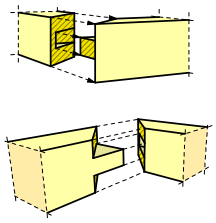
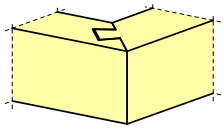
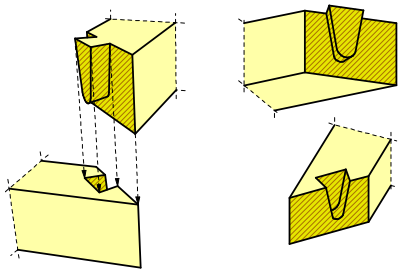
Zimmermannsmäßige Verbindungen - Längsverbindungen

		
Gerades Hakenblatt (HBlatt1.wmf)	Gerades Hakenblatt (Hblatt2.wmf)	Gerades Hakenblatt (Hblatt3.wmf)
		
Schräges Hakenblatt - rechtw. (SHBlatt1.wmf)	Schräges Hakenblatt - rechtw. (SHBlatt2.wmf)	
		
Schräges Hakenblatt - lotr. (SHBlattL1.wmf)	Schräges Hakenblatt - lotr. (SHBlattL2.wmf)	Schräges Hakenblatt - lotr. (SHBlatt-l3.wmf)
		
Schräges Hakenblatt – Keile (SHBlattK1.wmf)	Schräges Hakenblatt – Keile (SHBlattK2.wmf)	

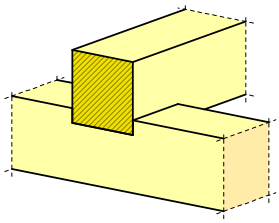
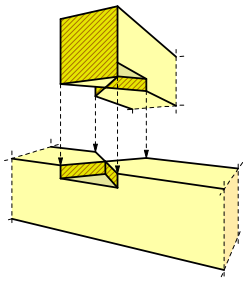
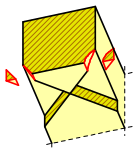
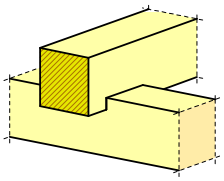
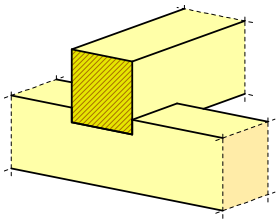
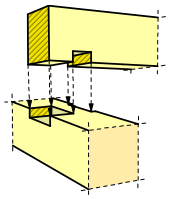
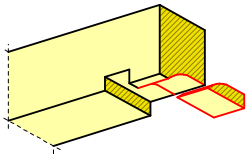
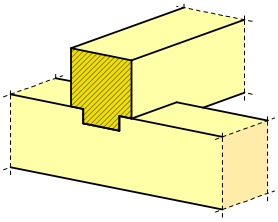
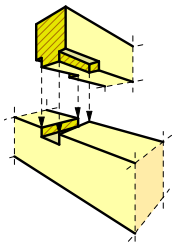
Zimmermannsmäßige Verbindungen - Eckverbindungen

		
Eckblatt (Eckblatt1.wmf)	Eckblatt (Eckblatt2.wmf)	Eckblatt (Eckblatt3.wmf)
		
Eckblatt (Eckblatt4.wmf)	Eckblatt – freitragend (Eckblatt5.wmf)	Eckblatt – freitragend (Eckblatt6.wmf)
		
Verdecktes Eckblatt (VEckblatt1.wmf)	Verdecktes Eckblatt (VEckblatt2.wmf)	Schwalbenschwanzeckblatt (SSEckblatt1.wmf)
		
Schwalbenschwanzeckblatt (SSEckblatt2.wmf)	Schwalbenschwanzeck.– verd. (VSSEckblatt1.wmf)	Schwalbenschwanzeck.– verd. (VSSEckblatt2.wmf)
		
Französisches Blatt (FBlatt1.wmf)	Französisches Blatt (FBlatt2.wmf)	

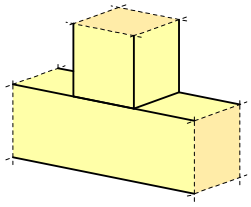
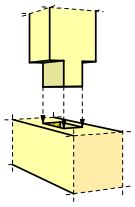
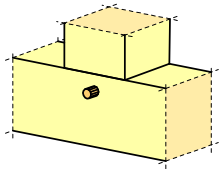
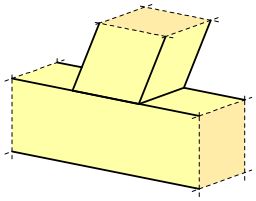
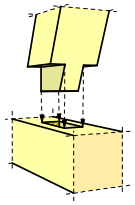
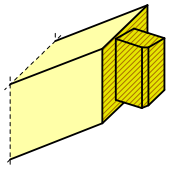
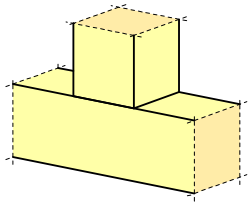
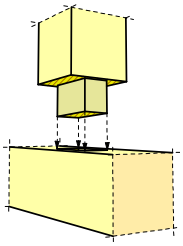
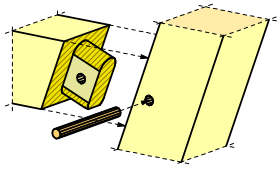
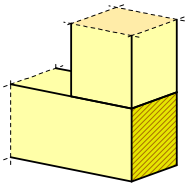
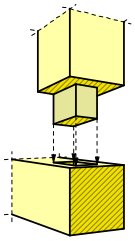
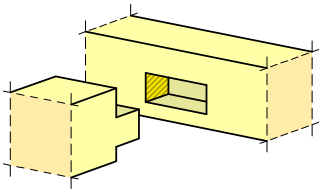
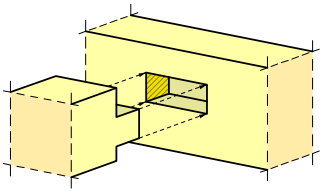
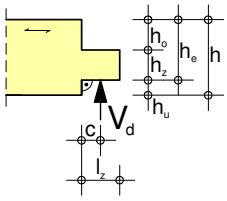
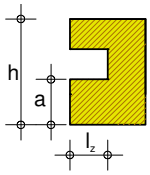
Zimmermannsmäßige Verbindungen - Eckverbindungen

		
Scherzapfen (SZapfen1.wmf)	Scherzapfen (SZapfen2.wmf)	Scherzapfen – verdeckt (VSZapfen1.wmf)
		
Scherzapfen – verdeckt (VSZapfen1.wmf)	Schwalbenschwanzgehrung (SSGehrung1.wmf)	Schwalbenschwanzgehrung (SSGehrung2.wmf)

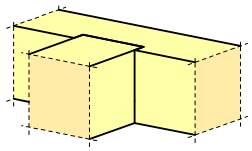
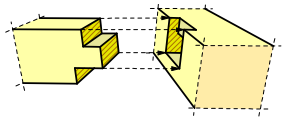
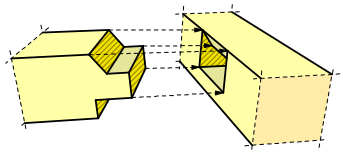
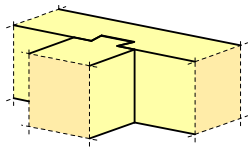
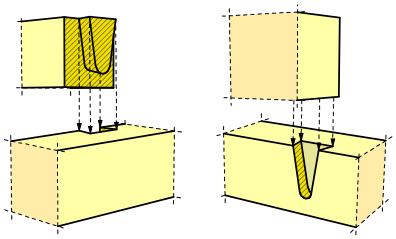
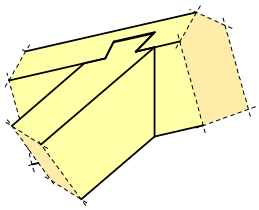
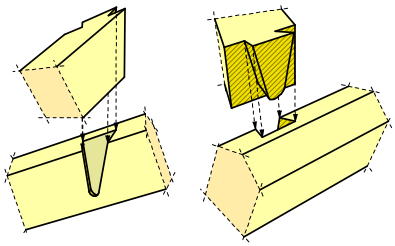
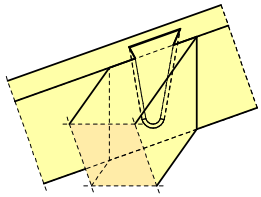
Zimmermannsmäßige Verbindungen - Verkämmungen

		
Kreuzkamm (KKamm1.wmf)	Kreuzkamm (KKamm2.wmf)	Kreuzkamm (KKamm3.wmf)
		
Kreuzkamm (KKamm4.wmf)	Doppelter Kamm (DKamm1.wmf)	Doppelter Kamm (DKamm2.wmf)
		
Doppelter Kamm (DKamm3.wmf)	Schwalbenschwanzkamm (SSKamm1.wmf)	Schwalbenschwanzkamm (SSKamm2.wmf)

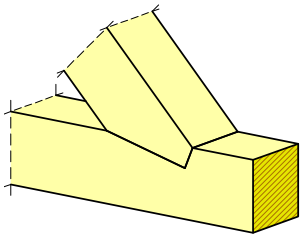
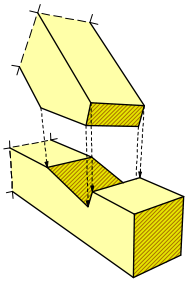
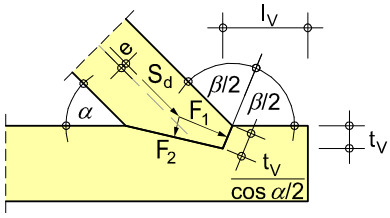
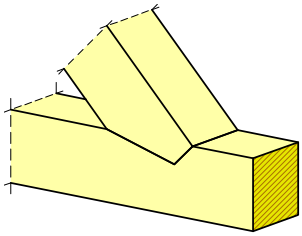
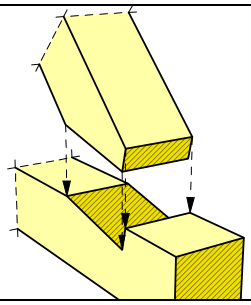
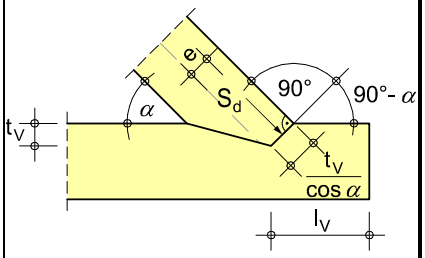
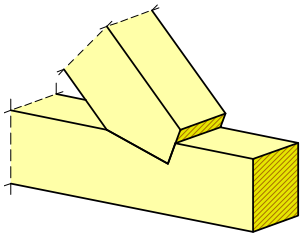
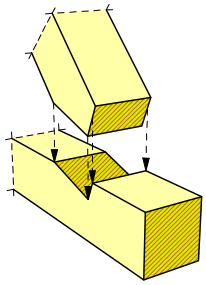
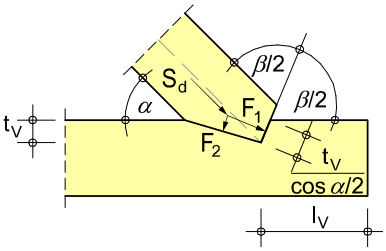
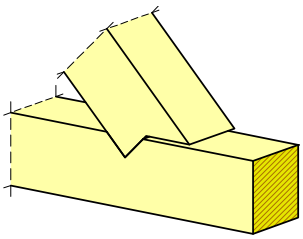
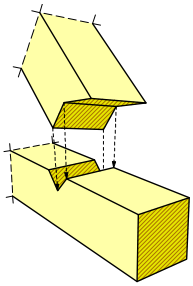
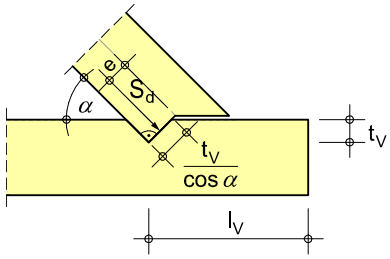
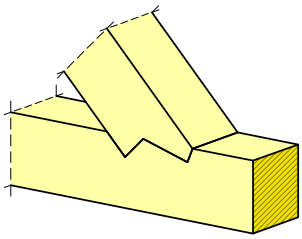
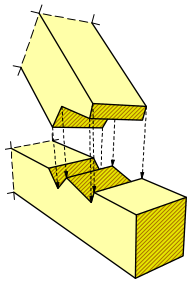
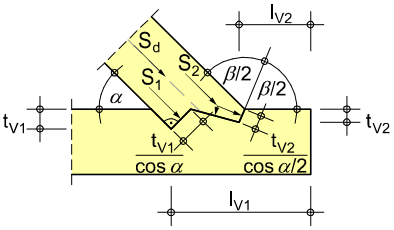
Zimmermannsmäßige Verbindungen - Zapfenverbindungen

		
Zapfen – senkrecht (Zapfen1.wmf)	Zapfen – senkrecht (Zapfen2.wmf)	Zapfen – senkrecht (Zapfen3.wmf)
		
Schräger Zapfen (SZapfen1.wmf)	Schräger Zapfen (SZapfen2.wmf)	Schräger Zapfen (SZapfen3.wmf)
		
Abgesteckter Zapfen (AZapfen1.wmf)	Abgesteckter Zapfen (AZapfen2.wmf)	Abgesteckter Zapfen (AZapfen3.wmf)
		
Zapfen mit Randabsteckung (ZapfenRA1.wmf)	Zapfen mit Randabsteckung (ZapfenRA2.wmf)	Zapfen – waagerecht (ZapfenW1.wmf)
		
Zapfen – waagerecht (ZapfenW2.wmf)	Zapfen – waagerecht (ZapfenW3.wmf)	Zapfen – waagerecht (ZapfenW4.wmf)

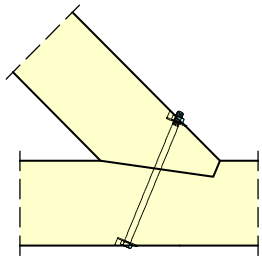
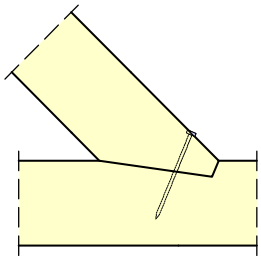
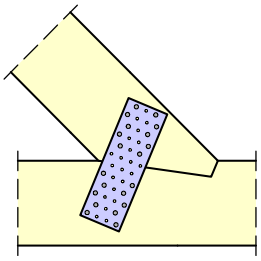
Zimmermannsmäßige Verbindungen - Zapfenverbindungen

		
Brustzapfen (BZapfen1.wmf)	Brustzapfen (BZapfen2.wmf)	Schräger Brustzapfen (SBZapfen1.wmf)
		
Schwalbenschwanzzapfen (SSZapfen1.wmf)	Schwalbenschwanzzapfen (SSZapfen2.wmf)	
		
Schwalbenschwanzz.- schräg (SSSZapfen1.wmf)	Schwalbenschwanzz.- schräg (SSSZapfen2.wmf)	Schwalbenschwanzz.- schräg (SSSZapfen3.wmf)

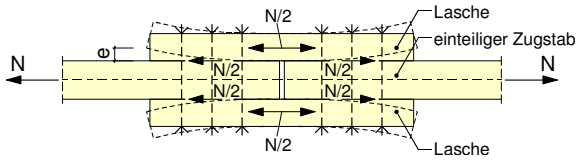
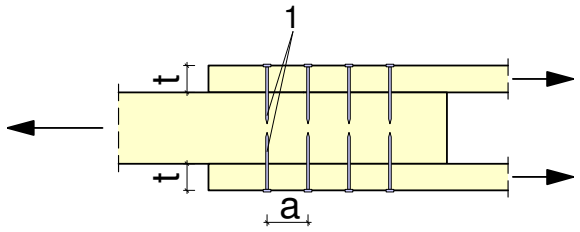
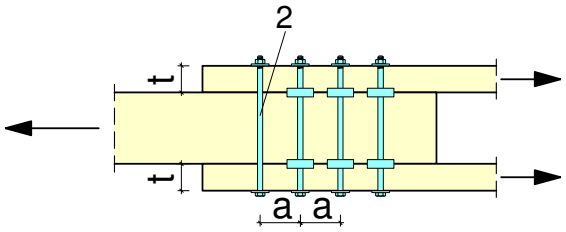
Zimmermannsmäßige Verbindungen - Versätze

		
Stirnversatz (Winkelhalb.) (StirnV-wh1.wmf)	Stirnversatz (Winkelhalb.) (StirnV-wh2.wmf)	Stirnversatz (Winkelhalb.) (StirnV-wh3.wmf)
		
Stirnversatz (rechtw.) (StirnV-rw1.wmf)	Stirnversatz (rechtw.) (StirnV-rw2.wmf)	Stirnversatz (rechtw.) (StirnV-rw3.wmf)
		
Brustversatz (BrustV1.wmf)	Brustversatz (BrustV2wmf)	Brustversatz (BrustV3wmf)
		
Fersenversatz (FersenV1.wmf)	Fersenversatz (FersenV2wmf)	Fersenversatz (FersenV3wmf)
		
Doppelter Versatz (DoppeltV1.wmf)	Doppelter Versatz (DoppeltV2.wmf)	Doppelter Versatz (DoppeltV3.wmf)

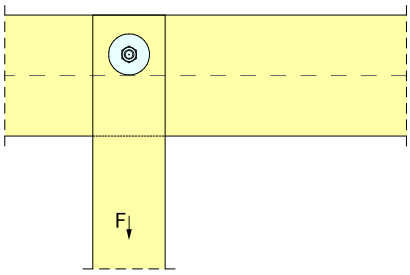
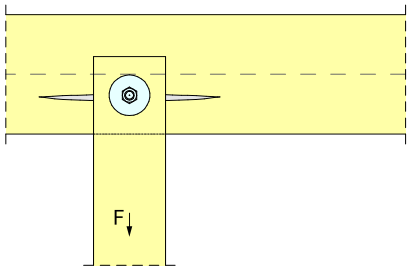
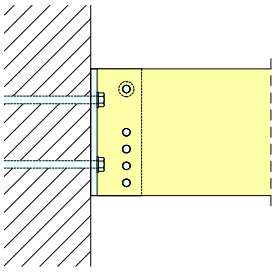
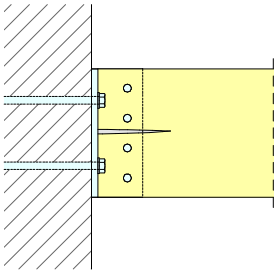
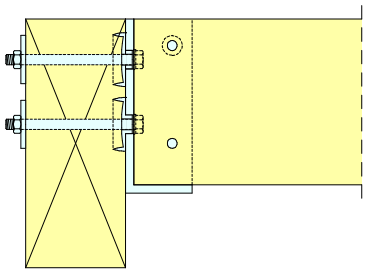
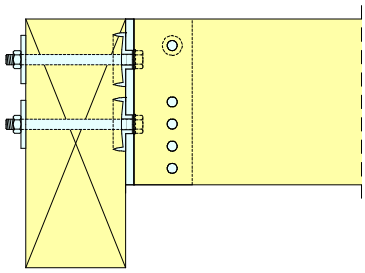
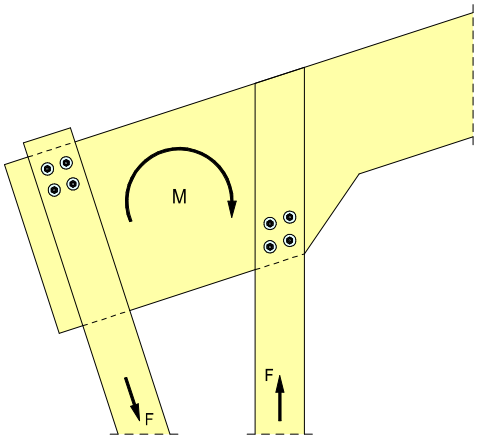
Zimmermannsmäßige Verbindungen - Versätze

		
Lagesicherung Bolzen (LS-Bolzen.wmf)	Lagesicherung Sondernagel (LS-SoNagel.wmf)	Lagesicherung Lochblech (LS-Blech.wmf)

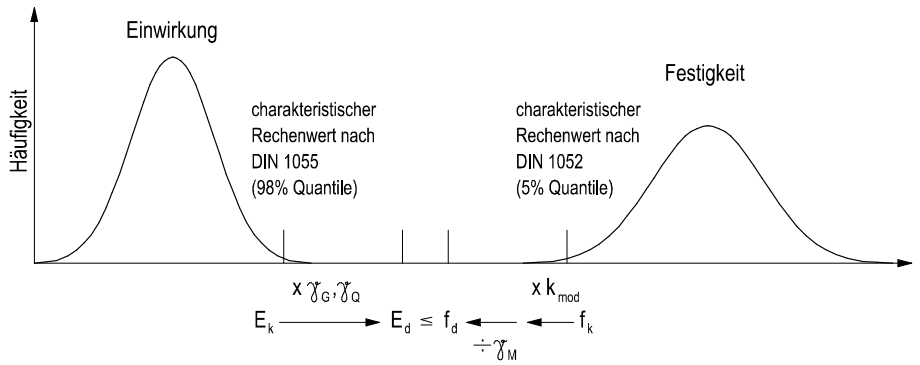
Zugstäbe

	
Laschen mit Zusatzmoment (ZS-Moment.wmf)	
	
Zusätzliche ausziehfeste Verbindungsmittel (ZS-Ausziehfest1.wmf)	Zusätzliche ausziehfeste Verbindungsmittel (ZS-Ausziehfest2.wmf)

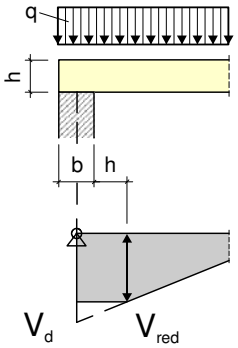
Querzugproblematik

	
Zangenanschluss (Zangen.wmf)	Zangenanschluss – Querzuggefahr (Zangen-QZ.wmf)
	
Trägeranschluss (Träger.wmf)	Trägeranschluss – Querzuggefahr (Träger-QZ.wmf)
	
Haupt-Nebenträgeranschluss (HN-Anschluss1.wmf)	Haupt-Nebenträgeranschluss (HN-Anschluss2.wmf)
	
Rahmenecke (Rahmenecke.wmf)	

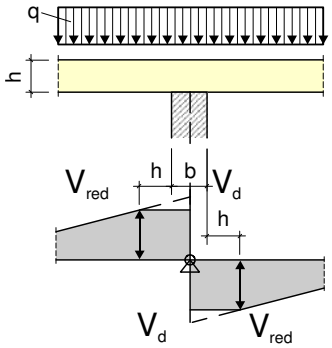
Bemessung



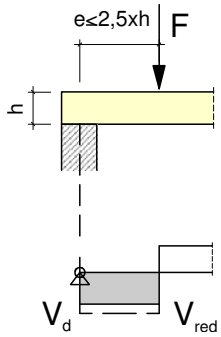
Ablauf der Bemessung
(Bemessungsablauf.wmf)



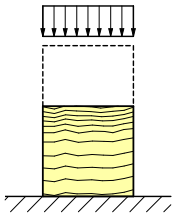
Reduzierte Querkraft
(Red-Q1.wmf)



Reduzierte Querkraft
(Red-Q2.wmf)

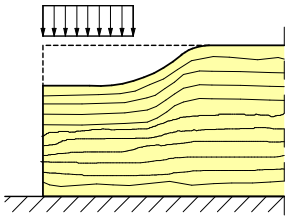


Reduzierte Querkraft
(Red-Q3.wmf)



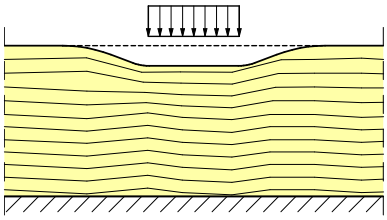
kein
Überstand

Querdruck
(Querdruck-kü.wmf)



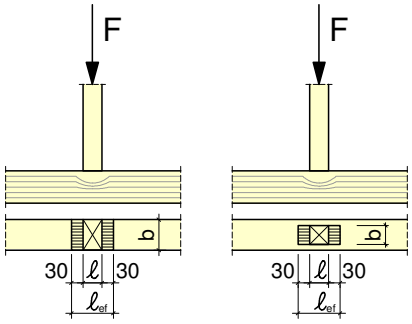
einseitiger
Überstand

Querdruck
(Querdruck-eü.wmf)

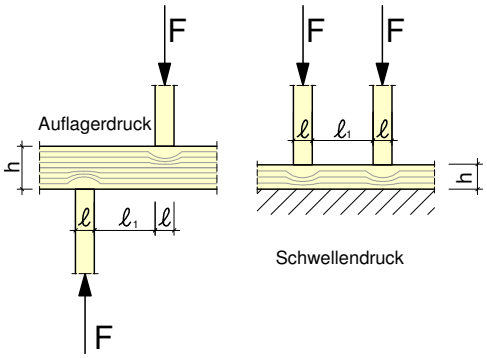


beidseitiger
Überstand

Querdruck
(Querdruck-bü.wmf)

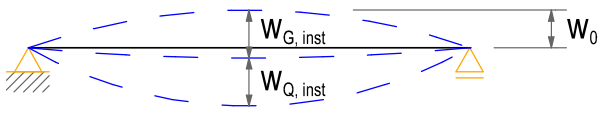


Wirksame Querdruckfläche
(Querdruckfläche1.wmf)

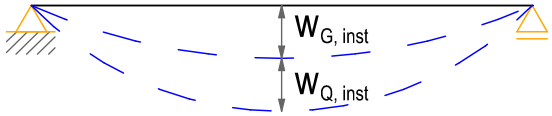


Wirksame Querdruckfläche
(Querdruckfläche2.wmf)

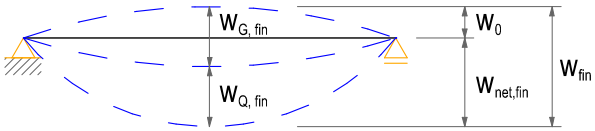
Gebrauchstauglichkeit



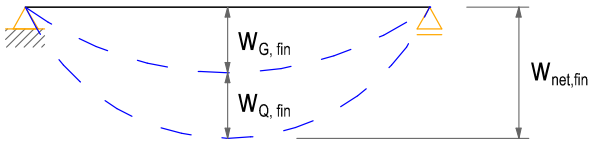
Durchbiegung mit Überhöhung
(Biegung-mÜ.wmf)



Durchbiegung ohne Überhöhung
(Biegung-oÜ.wmf)

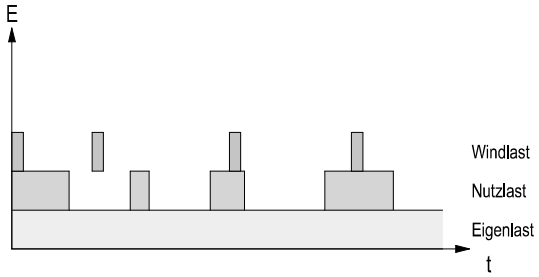


Durchbiegung mit Überhöhung, End
(Biegung-mÜ-end.wmf)

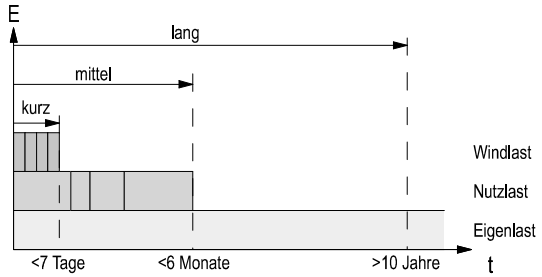


Durchbiegung ohne Überhöhung, End
(Biegung-oÜ-end.wmf)

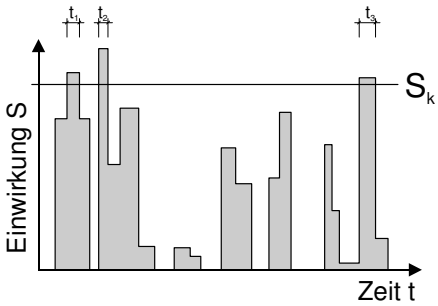
Klassen der Lasteinwirkungsdauer (KLED)



Einwirkungen
(KLED.wmf)

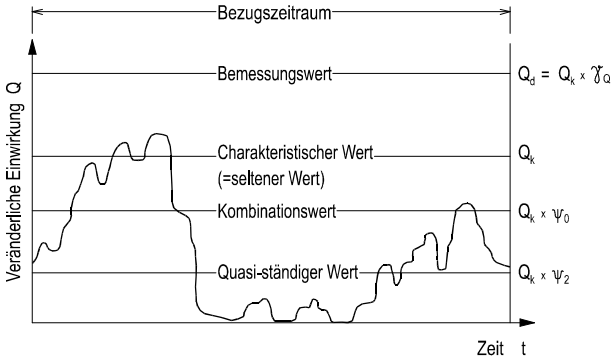


Einwirkungen - akkumuliert
(KLED-akku.wmf)



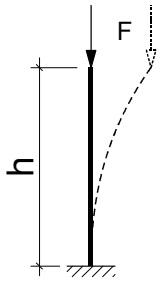
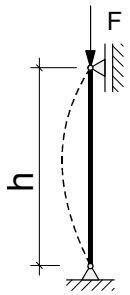
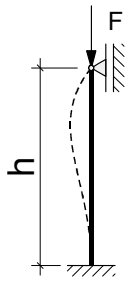
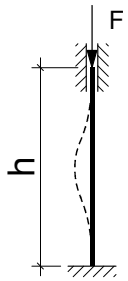
Lasteinwirkungsdauer
(S_k = charakteristische Einwirkung)

Akkumulierte Einwirkungsdauer
(Einwirkungsdauer.wmf)

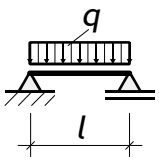
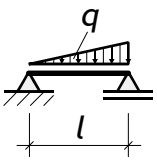
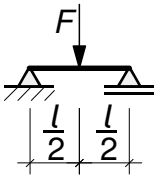
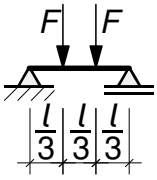


Zeitlich veränderliche Einwirkungen
(Verkehrslasten.wmf)

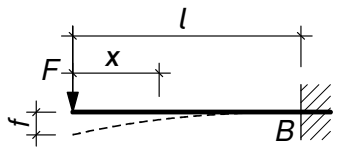
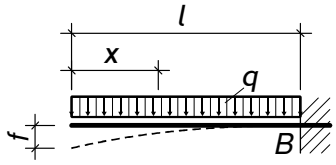
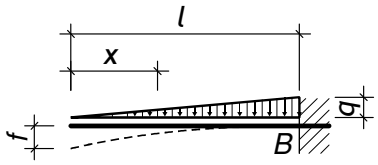
Eulerfälle

			
Eulerfall 1 (EF1.wmf)	Eulerfall 2 (EF2.wmf)	Eulerfall 3 (EF3.wmf)	Eulerfall 4 (EF4.wmf)

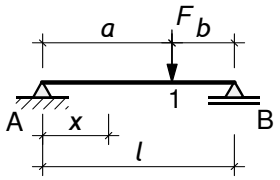
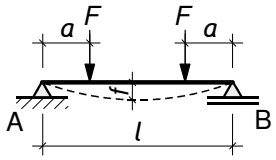
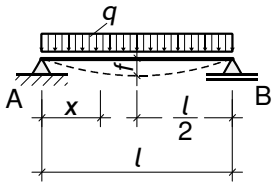
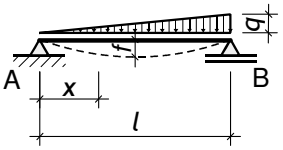
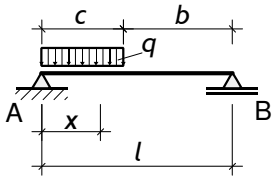
Belastungsfälle vereinfachter Gebrauchstauglichkeitsnachweis

			
Gleichstreckenlast (BF-GL.wmf)	Dreieckslast (BF-DL.wmf)	Einzellast (BF-EL.wmf)	Zwei Einzellasten (BF-ZEL.wmf)

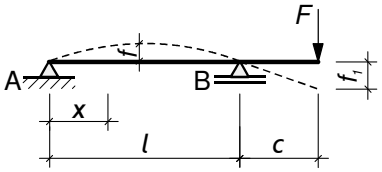
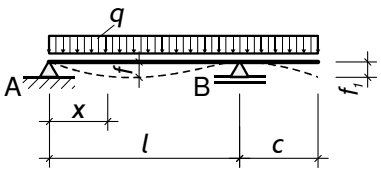
Kragträger

		
Einzellast (KT-EL.wmf)	Gleichstreckenlast (KT-GL.wmf)	Dreiecklast (KT-DL.wmf)

Einfeldträger

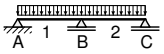
		
Einzellast (ET-EL.wmf)	Zwei Einzellasten (ET-ZEL.wmf)	Gleichstreckenlast (ET-GL.wmf)
		
Dreiecklast (ET-DL.wmf)		Abschnittsweise Last (ET-AL.wmf)

Einfeldträger mit Kragarm

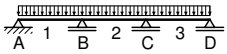
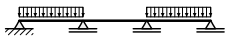
		
Mit Einzellast (ETK-EL.wmf)	Mit Gleichstreckenlast (ETK-GL.wmf)	

Maßgebende Lastfälle von Durchlaufträgern mit gleicher Stützweite

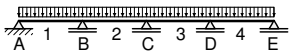
Zweifeldträger

			
Belastung Felder 1-2 (ZFT-1.wmf)		Belastung Feld 1 (ZFT-2.wmf)	Belastung Felder 1-2 (ZFT-3.wmf)

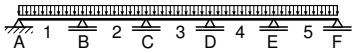
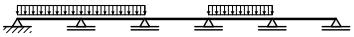
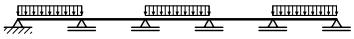
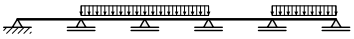
Dreifeldträger

			
Belastung Felder 1 – 3 (DFT-1.wmf)	Belastung Felder 1, 3 (DFT-2.wmf)	Belastung Felder 1, 2 (DFT-3.wmf)	Belastung Feld 2 (DFT-4.wmf)

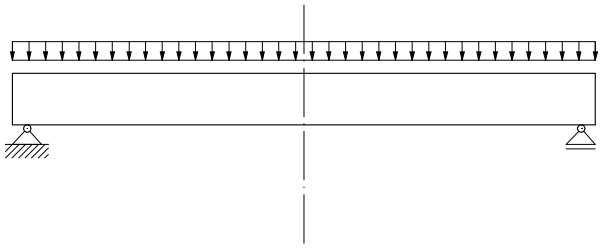
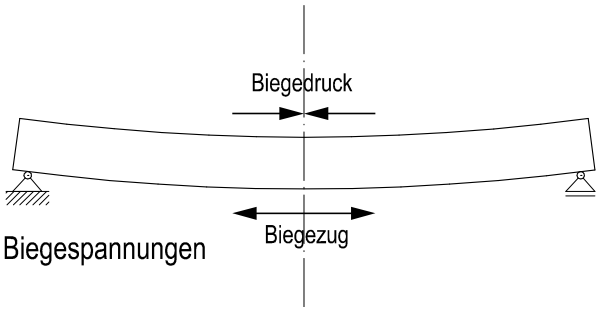
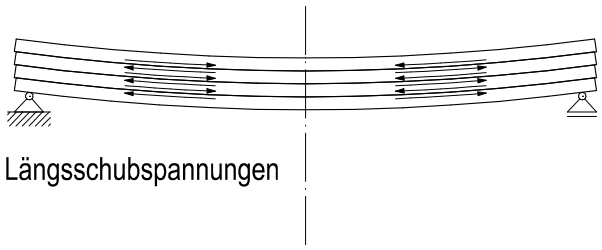
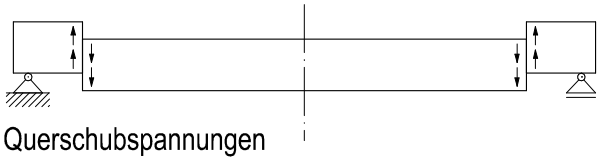
Vierfeldträger

		
Belastung Felder 1 – 4 (VFT-1.wmf)	Belastung Felder 2, 3 (VFT-2.wmf)	Belastung Felder 1, 3 (VFT-3.wmf)
	Belastung Felder 1, 2, 4 (VFT-4.wmf)	Belastung Felder 2, 4 (VFT-5.wmf)

Fünffeldträger

		
Belastung Felder 1 – 5 (FFT-1.wmf)		Belastung Felder 1, 2, 4 (FFT-2.wmf)
		
	Belastung Felder 1, 3, 5 (FFT-3.wmf)	Belastung Felder 2, 3, 5 (FFT-4.wmf)

Spannungen am Biegeträger

	
Biegeträger (Biegeträger.wmf)	Biegespannung (Biegespannung.wmf)
	
Längsschubspannung (Längsschubspannung.wmf)	Querschubspannung (Querschubspannung.wmf)