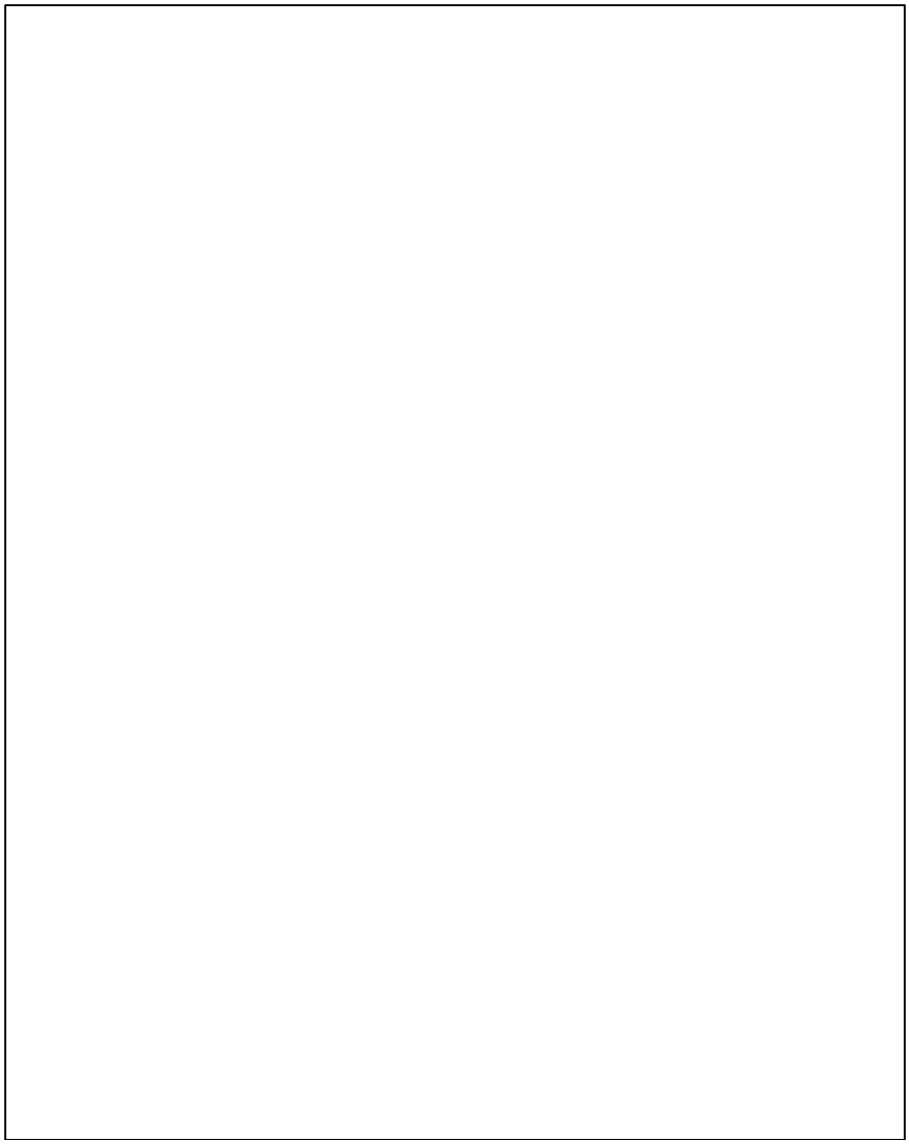
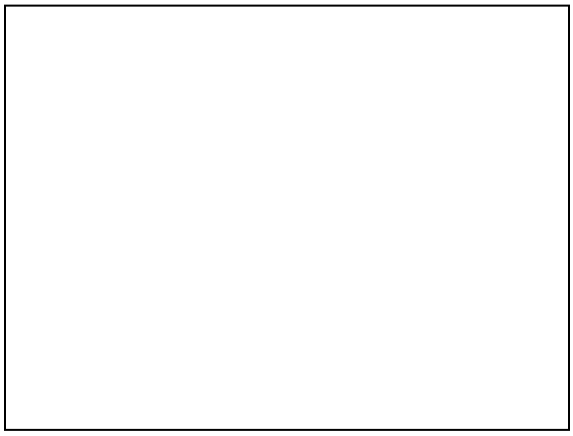
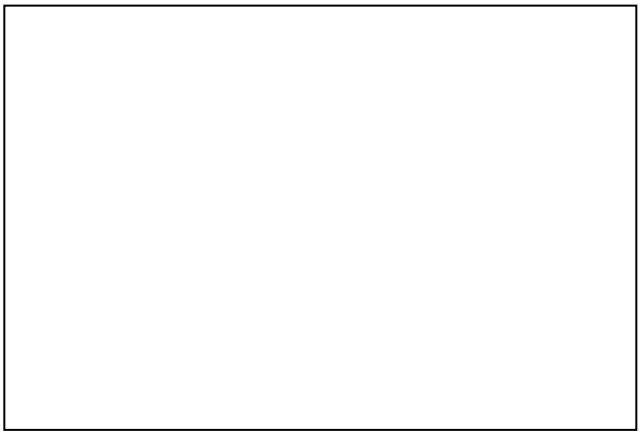
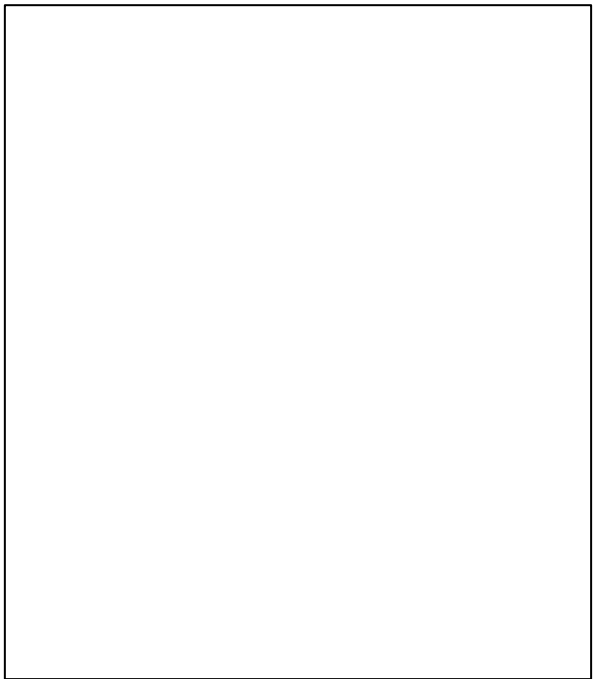
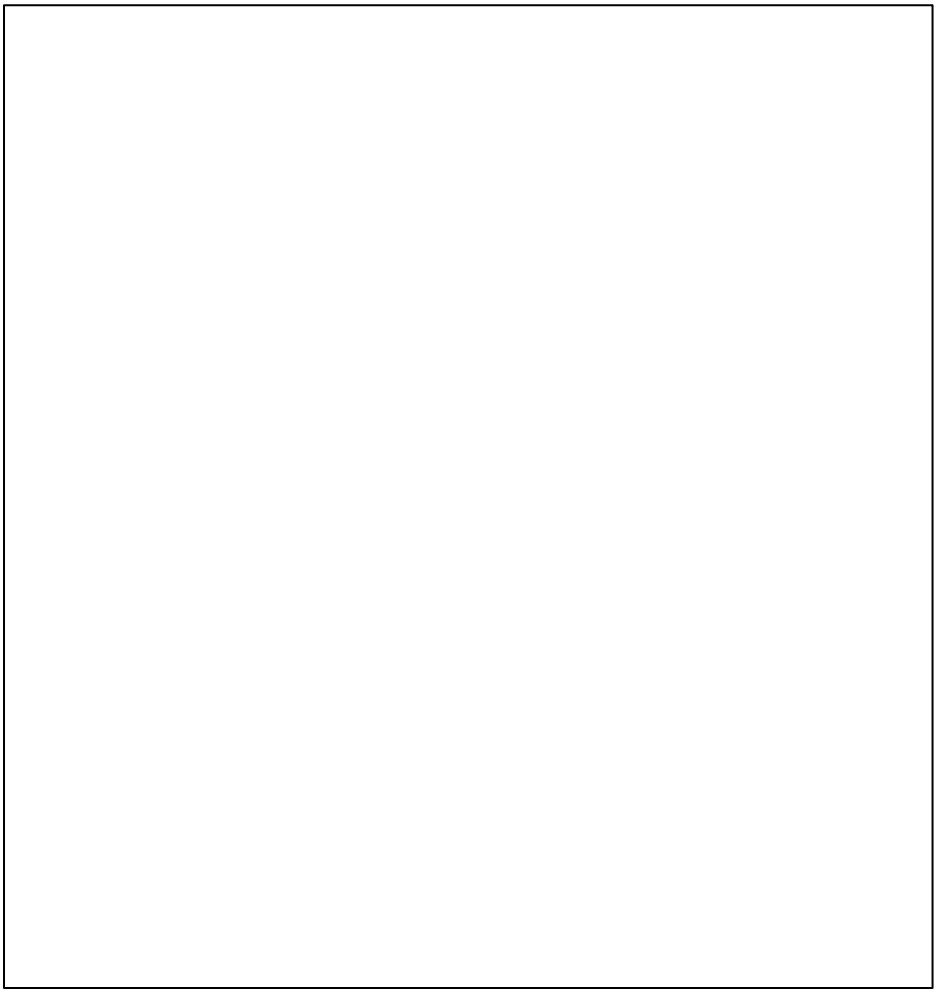










6RXUFH KWWS ZZZ QDVD JRY VLWHV GHIDXOW ILOHV ODGHHBHQFDSVXODWLRQ MSJ

7KH 0/%KDV DQ DGYDQFHG SURGXFWV

+XQGUHGV RI VXFFHVVIXO SURGUDPPHUV

75/ LV WKH PD[LPXP DWWDLQDEOH OHYHO RI WKLV PHDVXUH Z

DJHQFLHV WR DVVHVV WKH PHDQLQJIXOQHVV RI HYROYLQJ

(DFK 0/%JRHV WKURXJK HQYLURQPHQWDO VWHUOLOLWDWLRQ SDUDOOHO SURFHVVLQJ

0/%FDQ EH RSHUDWHG E\ FXVWRPHUV DQG UHVHW LQ PLQXWHV &RPSHWLQJ

7KH %LVEDXQH WKUHH ZHHN VWXGUDPPHU EDQG

$ERXQGHG WKH KHLJKW RI EDQG

7KH 0/% HQHUJHWLFV VROXWLRQ G /



H$a Ð

/ 0N,, 0/% 8VHU 0DQXDO

7KHUH DUH PDQ\ GHWHUPLQDWLRQV WKDW PXVWQ(/H%WWDBGSHKZKQDVDF7KVLWRPHFWLRQHOXWLQJVI
FKRLFHV

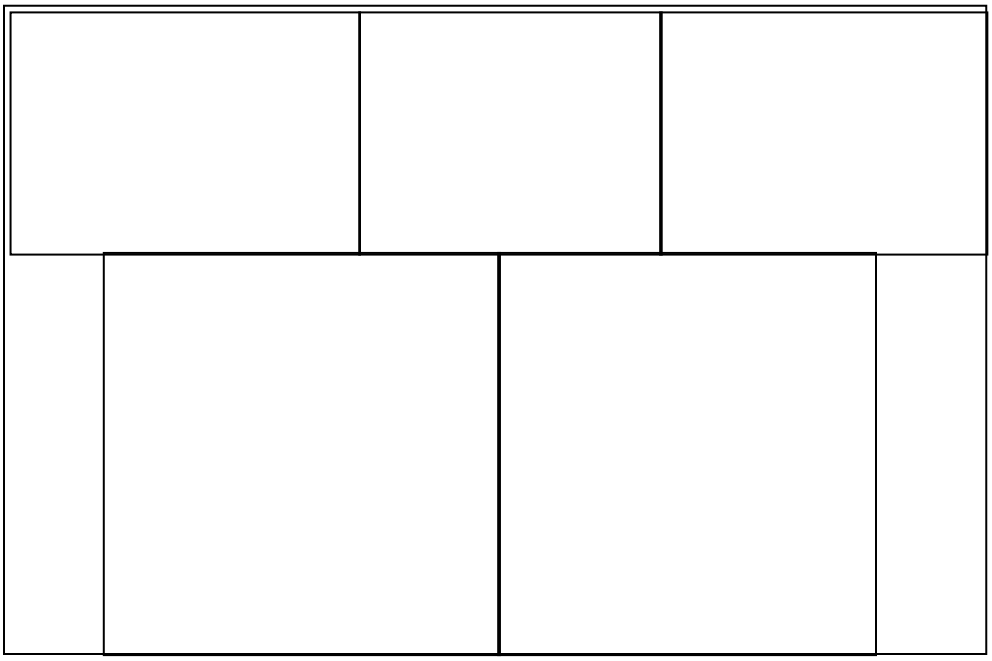
9LGHRV VKRZ/L%QRJSWUDWLQJ RQ WRSRUEULGXQDGHDZLSODEQHWDWVFRUP

)LJXUHV KRZ WKH %LQ WKH WWHRZHUJWKHWKH 5HWDLQLQJ 5LQJ LVFOLQFKRSUHZWLQWKH /HYHV RXW WKH 8SSHUKLQJNV DFHQWRERQWKH PRWRUSRZHUHQGR

)LJXUHV KRZV0WKLQWKH LQLWL8SRQGGHSORWHPHQW LQLWLDWLRQ WKH PRWRUV DUH SRZHUHG FDX DSSUR[LPDWHO7KDWWKH 5HWDLQLUHJWDFWWR

7KH 0RWRU %UDFNHWV$SSOLFDWLRQ'DWD%RRN,QWURGXFWLRQ7KH'& EUXVKOHVVFRQQHFWRUQXPEHUWHOOV\RXWKHDG6WDLQOHVVWHHO JHDUFRQQHFWLRQVFRQHFWLRQ7\SHVDFFHVVRULHV)HHGEDFN'HYLFHV6HQVRUV EHDULQJV6HUYRPRWRUV6WHSSHUPRWRUV&RQWUROOHUV&RQWUROOHU(QFORVXUHV3URGXFW&DWDORJXH[WHUQDO&RQWURO GLQJ%RXQGDU\&RQGLWLRQV&RQWURO&RQILJXUDWLRQ&RQWURO&RQILJXUDWLRQ &RQWURO&RQILJXUDWLRQ&RQWURO&RQILJXUDWLRQ 5LQJ

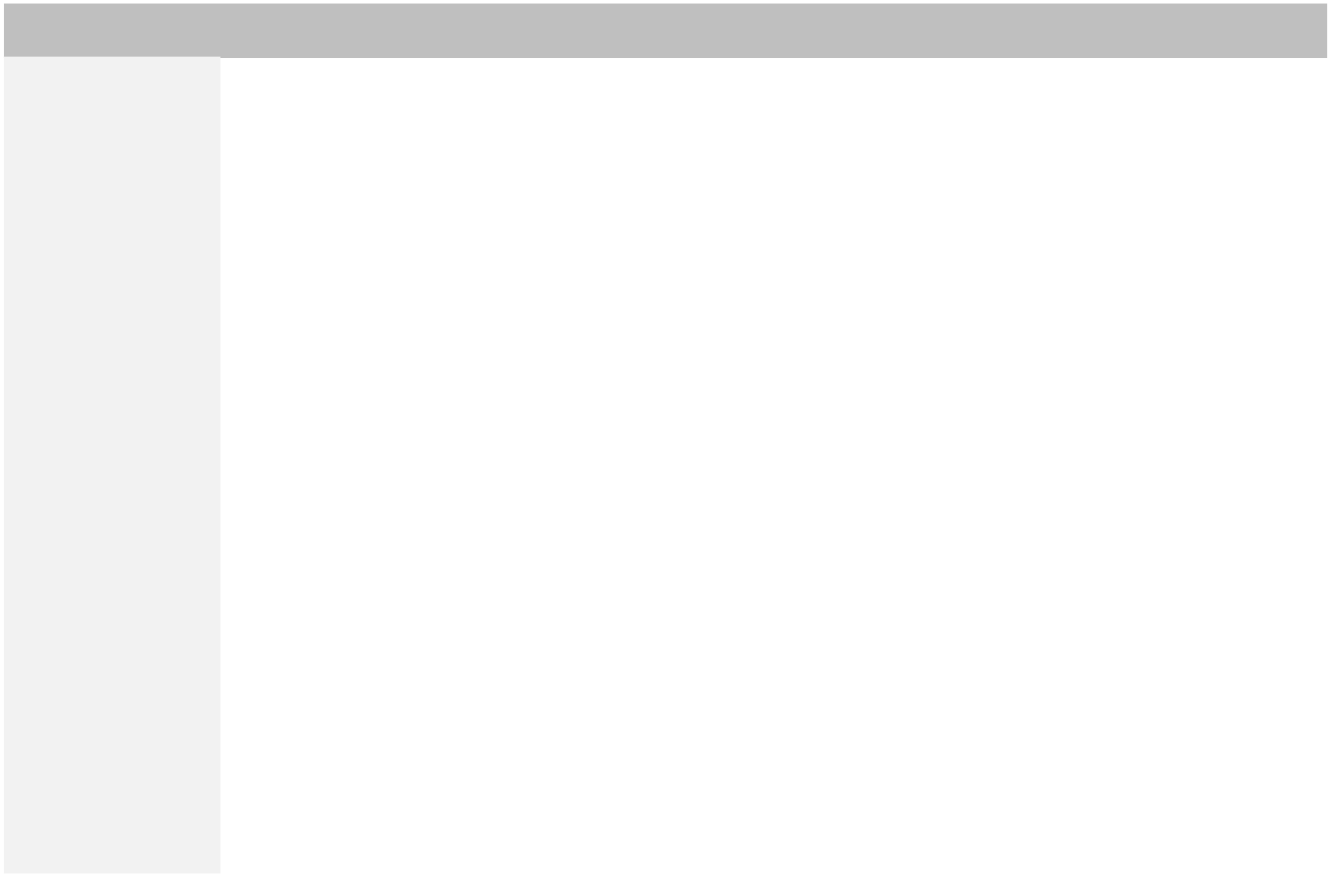
7KH0RWRU %UDFNHWV&RQILJXUDWLRQ 6WHSSHUPRWRU%



$V QRW7HDGE0HQ WKHUH DUH WZR VHWV RI UHTXLUHG IOD7KVRQHUVVIRRUHZGDWLQKDQHFWXDOXFD
UHODWLYHO\ VWLII WKHUHEHKWUHDQ IDWKHUVGMRLQLQJ VWUHWDXULYHV UHEDLWHV\ UHFHLYHVWUXFWXUH
IODW LQWHUIDFH EHWWHU6WDQDUG,QGXVWULHVRXWKH VWLIIQHVV RI \RXU DGMRLQLQJ

| 6WLII | )OH[LEOH |
|---|---|
| X 1R PRPHQW DUP IURP ZHE | X 0RPHQW DUP IURP ZHE WR EROW KROH |
| X %ROW KROHV DOLJQHG ZI | X %ROW KROHV QRW DOLJQHG ZLWK VWUXFWXUH |
| X 7KLFN ZDOOV UHODWLYH | X 7KLQ ZDOOV UHODWLYH WR EROW GLDPHWHU |
| X ³,EHDP´ VKDSH | X ³&&KDQQHO´ VKDSH |

7KH W\SH RI DGMRLQLQJ VWUXFWXUH FDQ DOVR KDYH/%RXVWHFWRQVKSHXOGWERQDZDQGHRWK
FKRLFH RI DGMRLQLQJ VWUXFWXUH EHIRUH LQWHJUDWLRQG DGHTXDWHO\ SODQ IRU DQ\ O

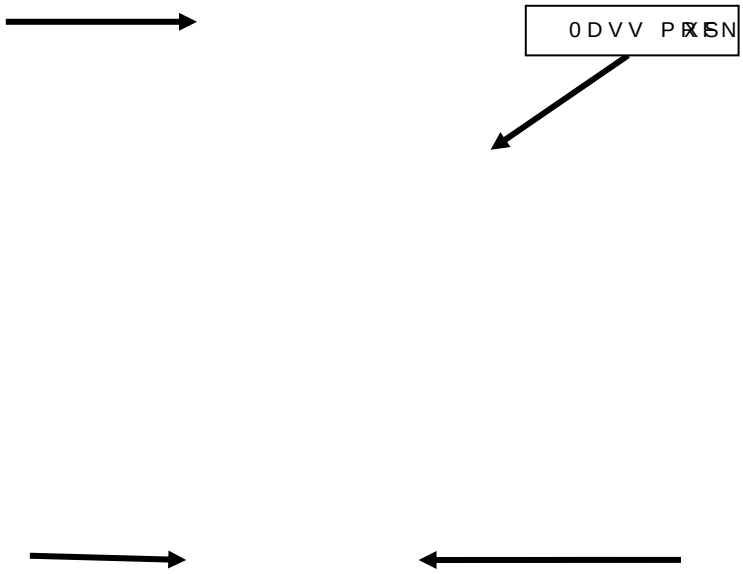


VĐ

1RWH WKDW 36& GVRFXPHQWDWLRQV OLQH ORDGLQJ LQVWUXFWLRQV IRU URSÃ31tP•/HDIR € FŽªt / 0

3 U L R U W R M R L Q L Q J W K H D G M R L Q L Q J W K H D G M R L Q L Q J W K H D G

'DPSLQJ DWWR EH XVHG WR FDOFXODWH WKH UHVSRQ%H DWWHUUDWWKHQFHWWDFKHGWRWKHR
V\VWHPLEWDWRQ7HFHVWLPDWH WKH GDP%LQHVXWRRIYLEDWLRQWKHSDWXSRIDWWDFKHG ZH
XVHG



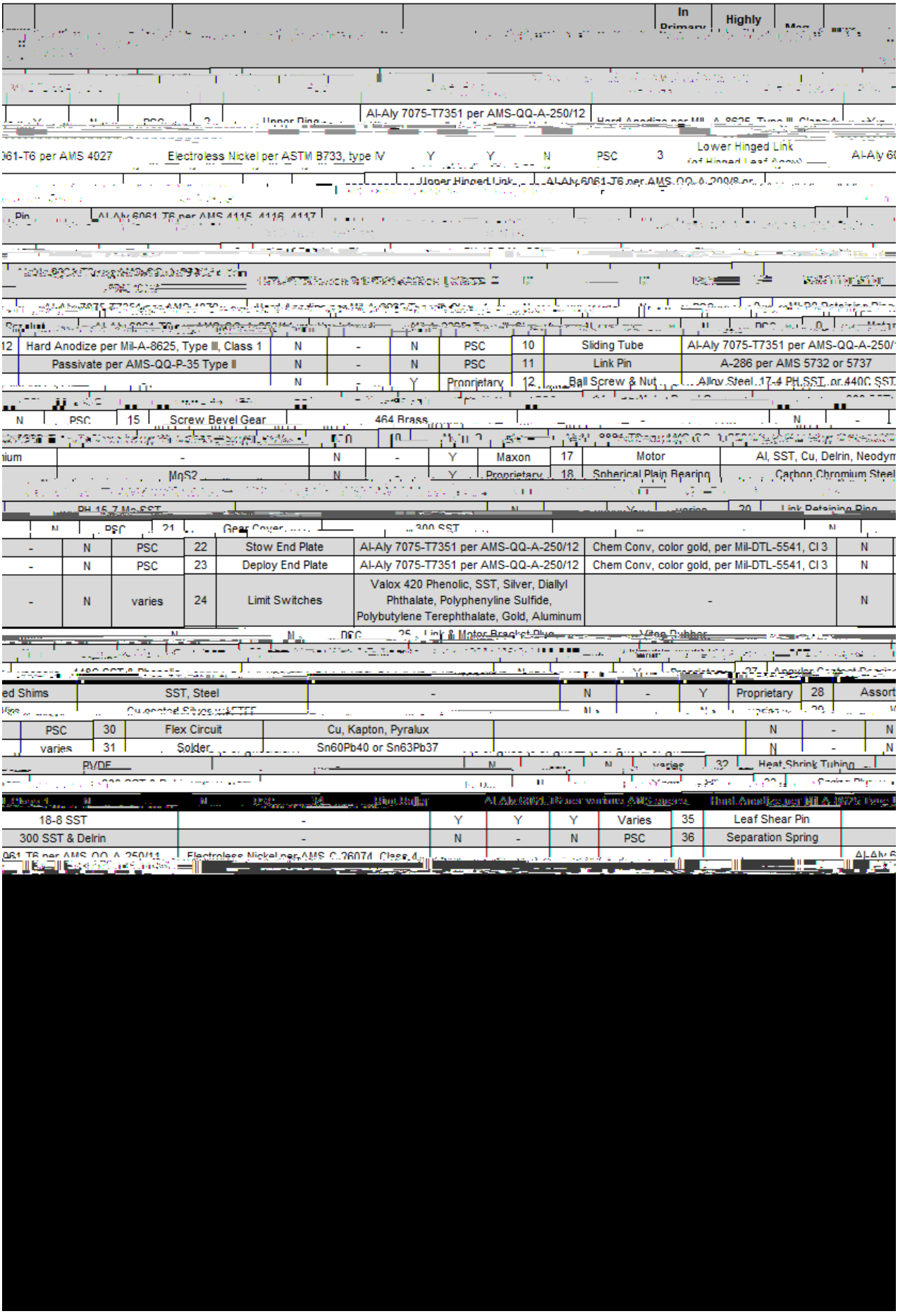

6LQFH WKH GDPSLQJ RXSWKHGPDVKHPRFN ERWHG MRLQWV LV LQFOXGHG WKH0PGDRSHQGJDP
7R DUUDYHRQWHUYDWEPHQG%GPSLQJ UDWWRXKHG GUDPSLQJ UHGXFHGWEK\RZ7DLQH

| | | | |
|---|---|---|---|
| 0HDVXUHG GDPSLQJ U | | | |
| 5HFRPPHQGHG GDPSL | | | |

7KH GDPSLQJ UDWLR FDQ EH FDOFXODWHGRLDVQVWKQRWZ UHKVHRQXDOLDWWV UDFWRRQDQFH WKH UDW
UHVSRQVH OHYHOHWRWKLHVLFDSXHWWKH LQSXW DQG RXWSXW OHKHOTXDOHWRIIDFKRUQLW GHDLQH

$$\zeta = \frac{c}{2\sqrt{mk}}$$

: KHUH
LV WKH GDPSQQJ UDWLR

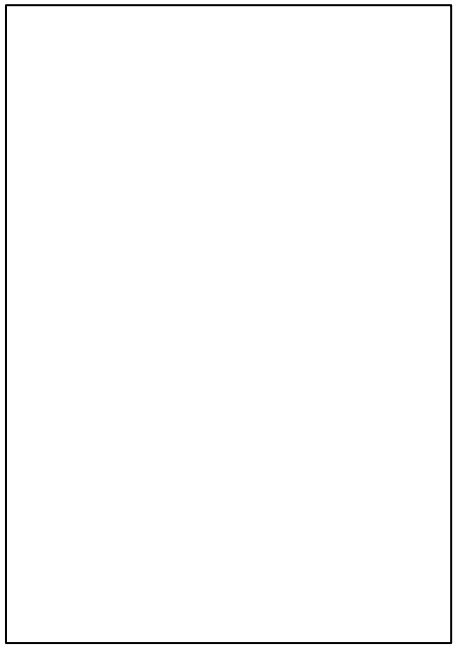


| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | In Primary | Highly | |
| | | | | Al-Aly 7075-T7351 per AMS-QQ-A-250/12 | | | | | | |
| 061-T6 per AMS 4027 | Electroless Nickel per ASTM B733, type IV | Y | Y | N | PSC | 3 | Lower Hinged Link (of Hinged Leaf Assy) | | | Al-Aly 6 |
| | | | | Upper Hinged Link | | | Al-Aly 6061-T6 per AMS-QQ-A-200/8 or | | | |
| Pin | Al-Aly 6061-T6 per AMS 4115, 4116, 4117 | | | | | | | | | |
| 12 | Hard Anodize per Mil-A-8625, Type III, Class 1 | N | - | N | PSC | 10 | Sliding Tube | Al-Aly 7075-T7351 per AMS-QQ-A-250/ | | |
| | Passivate per AMS-QQ-P-35 Type II | N | - | N | PSC | 11 | Link Pin | A-286 per AMS 5732 or 5737 | | |
| | | N | - | Y | Proprietary | 12 | Ball Screw & Nut | Alloy Steel, 17-4 PH SST, or 440C SST | | |
| N | PSC | 15 | Screw Bevel Gear | 464 Brass | | | | | N | - |
| ium | - | N | - | Y | Maxon | 17 | Motor | Al, SST, Cu, Delrin, Neodym | | |
| | MoS2 | N | | Y | Proprietary | 18 | Spherical Plain Bearing | Carbon Chromium Steel | | |
| | 17-7 PH SST | N | | Y | varies | 20 | Link Retaining Ring | | | |
| N | PSC | 21 | Gear Cover | 300 SST | | | | | N | |
| - | N | PSC | 22 | Stow End Plate | Al-Aly 7075-T7351 per AMS-QQ-A-250/12 | | Chem Conv, color gold, per Mil-DTL-5541, Cl 3 | | N | |
| - | N | PSC | 23 | Deploy End Plate | Al-Aly 7075-T7351 per AMS-QQ-A-250/12 | | Chem Conv, color gold, per Mil-DTL-5541, Cl 3 | | N | |
| - | N | varies | 24 | Limit Switches | Valox 420 Phenolic, SST, Silver, Diallyl Phthalate, Polyphenyline Sulfide, Polybutylene Terephthalate, Gold, Aluminum | | - | | N | |
| N | N | PSC | 25 | Link & Motor Bracket Plug | | | Viton Rubber | | | |
| | | | | | | | | 27 | Angular Contact Ba | |
| ed Shims | SST, Steel | - | | N | - | Y | Proprietary | 28 | Assort | |
| | Cu-coated Steel w/ PTFE | | | N | | N | | 29 | | |
| | PSC | 30 | Flex Circuit | Cu, Kapton, Pyralux | | | | N | - | N |
| | varies | 31 | Solder | Sn60Pb40 or Sn63Pb37 | | | | N | - | N |
| | PVDF | | | N | | N | varies | 32 | Heat Shrink Tubing | |
| | | | | | | | | | | |
| 18-8 SST | - | Y | Y | Y | Varies | 35 | Leaf Shear Pin | | | |
| 300 SST & Delrin | - | N | - | N | PSC | 36 | Separation Spring | | | |
| 061-T6 per AMS-QQ-A-250/11 | Electroless Nickel per AMS-C-26074, Class 4 | | | | | | | | | Al-Aly 6 |

/ 0N,, 0/% 8VHU 0DQXDO

7KH ORFDO SDQHO DOORZV XVHUV QHHG QRW EH V\PPHWULF RU HYHQ HUV ZLOO PRGLI\ WKH ORFDO SDUDPHWHUV RQ HDFK VLGH RI WKH VSOLW DQG UHEDODQFH WKH WUHH 6SHFLDOL]DWLRQ SUHFHGHV WKH GHFLVLRQ

:KHQ VHYHUDO SD\ORDGV DUH RQ WKH VDPH ODXQFK YHKLFOH HQJLQHHUV FDQ PLQLPíQHUV



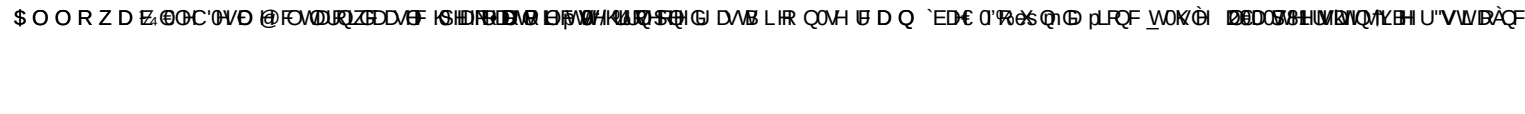
6HH 36& GRFXPHQW 0N,, 0/% 2SHUDWLQJ 3URFHGXUH IRU QS/YR SHU HOHFWULFDO FRQQHF



[illegible] DUD

/ 0N,, 0/% 8VHU 0DQXDO

,Q WKH EHJLQQLQJ RU LQ WKH EHJLQQLQJ JUDP PDQXDO WKHUH ZDV GKWLHUKOa"à HVERKKD HZEa"à



7KH IROORZLQJ DUH XVHG WR 0/%DV XWLOLWLHV WR LQLWLDOL YDULHV ZLWK WKH EHKDYLRUV DQG WH
WKH WLPH WR RQOLQH RU WKH WLPH WR RUV UHFHLYHU LVSRVHG RUTXH QHUDWHG EHWHQYLURQPHQWDO FR
1RW RQO\ LV RQO\ RQH PRWRU SRZHUHG EXW WKH SRZHUHG EDWWHU SKDVH SRZHU HQHUDWRU
FRPPRQ EHYHQD SUHDFWLFH SHU WKH 0.,, 0/% 2SHUDWLQJ 3URFHGXUH ERWK VKDOO EH XVHG IR

:KHQ RQH RI WKH 0RWRUV LV VKRUWHG WKH VKRUWHG 0RWRU ZLOO DFW DV D GXPE ZHLJKW
WR LQFUHDVH WKH GLIIHUHQFH LQ WLPH WR LQLWLDWH ZKHQ RQH RI WKH 0RWRUV LV VKRUWHG LQFUHDVH LQ WLPH WR LQLWLDWH LV FOHDUO\ DSSDUHQW DW PXOWLSOH WHPSHUDW

7KH0RWRUV DUH FRQQHFWHG WR HDFK RWKHU YLD EHYHO JHDUV

7KH UHVLVWDQFH IURP WKH8SXSSHSJHWLQJXUKDFHRZHWVRYHUDERLQJWKHSHQGHQW XSRQ WKH LQFOX
6HSDUDWLRQ ,QHQQHFWRUVDFURVVGLQJ WR WKH 0/% LVIGHLVKWHGLVWRQGHSVDPXOHQWRQWHQW
6HSDUDWLRQ &RQQHFWRUVRUHQGXHTWLVHG\WERHDXVH WKH7KSHFRQQHFWRUVLVHG WKURXJK W
&RQQHFWRU VKHOOV DQG (0, JASNHWV LQ WKHRSQDLDQGLRQQHFWRUVXSXVHVELVLHYH
IDVWHQHUV0/½WR WGMRLQ7JKWURQGXFWLYH VKHOOHDVVHPEO\DQGGR WKHFDSDFLWDQFH DO
DVVHPEO\0R% WKH

6HH 6HSDUDWLRQ &RQQHFWRU 'DWD 6KHHW IRU HOHFWULFDO UHVLVWDQFH UDQJH

%HDXKHSWHU 5DQJDQ DQRGL]HGVPXLEHHVXFHSWLEOH WR ,VFLJJWRQGXGHEOLQHDWXFWXDWLRQ DWWDFKRRQOLQHDUDFWXDWLRQ

| | |
|---|---|
| ! | |
| ! | |
| ! | |
| ! | |

7DEOH ZDV FDOFXODWHG XVLQJ 7KH 0HFKDQLVPV RE \ 3HWHU / &RQOH\ JLYHQ DSSUR[LPDWHO\ Q
KDYH FXPXODWLYHO\ EHHQ RSWLPL]HG XVLQJ JIOLJKW SRSHUDWLRQV GDWH RI W
WKH%KDV RSHUDWHG PRUH HIILFLHQWO\ LQ VSLWH RI EHLQJ EHHQ QR IDLOXUHV WR RSHUDWH LQ VS

3UIRU WR VSDFH%DVHG RSHUDWLRQV WR YHULI\ KRZ SHUIRUPDQFH EHLPSHUDWLRQV 36&DQG GGLWLRQDO RSHUDWLRQV $SSHUIRUPDQFH EHWWHU XVHU WR YHULI\ RSHUDWL
EHIRUH ODLJKW VHSDUDWLRQ

| | | | |
|---|---|---|---|
| 7\SLFDO TXDQWLWDWLYH VHSDUDWLRQV | | | • |

$OWHUQDWLYHO\ 36& WHVWV GHYHORSPHQW DQG TXDOLILFDWLRQ XQDWWR WR JHQHUDWH GHWHUPLQ
VSDFH ISOLJKWSFDO TXDOLILFDWLRQ WHVW ZLOO UHVXOW0/%Q7KRVH WHVWSDQDWLRQDOHWWR QWHSW
HQYLURQWHQWDO

%HFDXVH RI WKH UHX%DQGLGWKH RLJKSURGXFWLRQ UDWH LW KDV EHEQ LQH[SHQVLYH WR DPD

8VH WKH VORW RU DQG FRS\ LQWHUIDFH WR PLJUDWH EHWZHHQ %<2' DQG %<2' ZLWK
JORYHV DV ORQJ DV KDQGOLQJ DUH GRQH FDUHIXOO\ DQG WKH %<2' LV QRW GDPDJHG ZLW

7KH /%LV DVVHPEOHG DQG WHVWHG RQ %<2' DQG %<2' ZLWK PXOWLPHWHU SURELQJ
YROWDJH FRQWLQXLW\ DQG UHVLVWDQFH WR FOHDQ WKH

6WRUH WKH

$ OO 0% XVHUV DUH UHTXLUHG WR FRPSOHWH D WUDLQLQJ FRXUVH FRQGXFWHG E 3 6 & H Q J L Q H H U
EHHQ WUDLQHG EHIRUH RS 7KLV WUDLQLQJ LV JLYHQ WR HQVXUH FRQVLVWHQW DQG VDIH RSHUDWLRQ 36& ¶
6 SULQJ 0D 5 H Q H WUDLQLQJ LV DYDLODEOH RQ

7KH ODWHVW UHYLVLRQ RI WKH %URFHGXUH GHWDLOV WKH VWHSV WR EH IROORZHG %R SHUDWH

:KHQ WKLV VHSDUDWHG WKH IDVWHQHUV WR WKH DGMRLQLQJ VWUXFWXUH DUH FRQVLGHUHG
EXW SRVVLEOH LI UHPDLQHG LQVLGH FRQGLWLRQV DQG LQ 6 3 E\ 0 DXWKRUL]HG

)ODWQHVV RI WKH DGMRLQLQJ VXUIDFHV VKRXOG EH DW OHDVW WKUHH WLPHV WKH WKLFNQHVV RI WKH UHPDLQLQJ VWUXFWXUH VKLPV HSR[\ RU PHWDO FDQ EH XVHG WR DWWDLQ WKH UHTXLUHG IODWQHVV

)RQXUX˜PôìG IOp GX@ ˜PôìO WR3IXWR D3¦H³ PðK p p PÀ PY

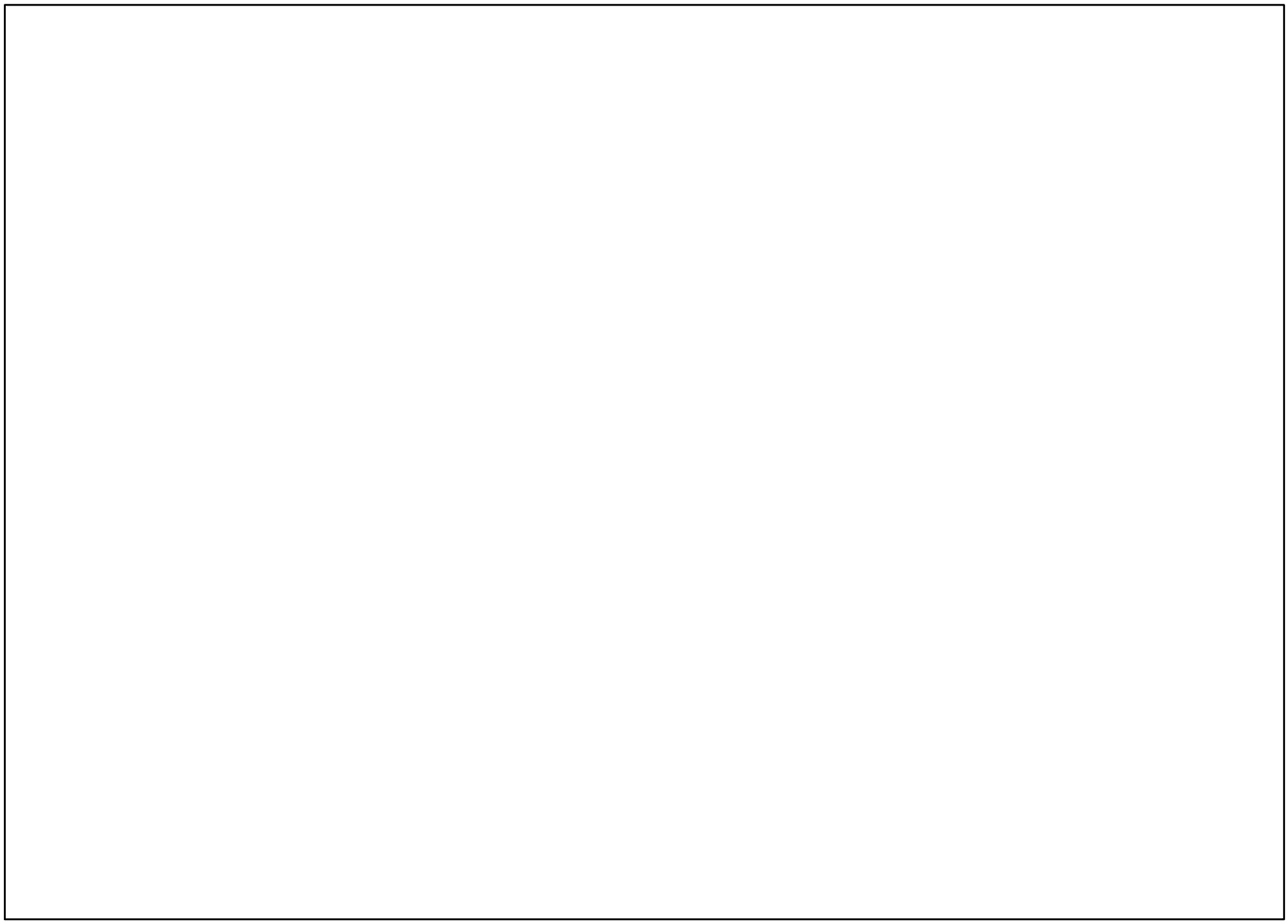
36& FRPSOHWH DQGDUG DFFHSWDQFH 9DOXDWLRQ SURFHGXUHV 7HVWLQJ HQYLURQPHQWV
EHQFKPDUN VHSDUDWLRQV ZLWK YDU\LQJ YRO O O

7KH IROORZLQJ DFFHSWDQFH WHVWV DQG GDWD UHSRUWLQJ DUH SHUIRUPHG RQ WKH 6&IRU WKHVH UHVHUYHV WKH ULJKW WR SHUIRUP IWGKHVWV RQ DQ\ IOLJKW

$Q0/%WKDW UHTXLUHV DQ\ RI WKHVH WHVWV VKDOO EH FRQGLWLRQDO XSRQ WKH GXVWRP DQG XVWRPGXOH C

36&
9HULI\ WLPH WUDQVLWLRQ UDWHV DQG UHSHDWDELOLW\
'XULQJ WKLV WHVW WKH EWHVW VWHS VHWV WKH SDUWLFOH RSHUDWLQJ WHPSHUDWXUH WKH YHORFLW\ DQG URWDWLRQ UDWHV DUH WKHQ VXSHUDWLRQ GD WLPH WR LQLWLDWH ,I QHFHVVDU\ WKH FRQILJXUDWLRQ DQG TXDQWLW\ RI WKH WHVW LWHP UHTXLUH PRQLWRU VHQVRU VHWWLQJV DUH DGMXVWHG WKH WHVW LWHP

)LJXUH VKRZV WKH ILOWHUHG UDWH VHQVRU)GDXUHIURPDFHDSWDQFH WDWH DUUHWDNHQ \hC



6RXUFH 'RFXPHQW V

7HVW 2EMHFWLYH 7KLV WHVW LV GHVLJQHG WR PHDVXUH WKDW WKH WHVW LWHP RSHUDWHV QRPLQDOO\ DIWHU TXDV
7HVW &RQGLWLRQV 7KH LWHP LV WHVWHG ORDGV DUH DSSOLHG WR WKH WHVW LWHP

7KH WHVW LWHP LV LQVSHFWHG ,$: 36& 'RFXPHQW ³0N,, 0/% ,QVSH
$OO DWWHQGHHV RI WKH 36& LQWHUQDO 7HVW &RPSOHWH 5HYLHZ 7&5 I
1RWHV ,Q D VHSDUDWLRQ VSULQJV WUDYHO DW OHDVW LQFKHV LQ DQ LQL\
LV FRPSUHVVLRQ LQ WHVW LWHP
3HDN ORDG WDUJHW LV WR HQVXUH WKDW UHTXLUHPHQW LV UI

| | | | | | |
|---|---|---|---|---|---|
| | | 0D[ /% /LQ | 0D[ /% <RU /% : | /RDG | ,QFUHI RU |
| | /RDG &DVH/RDG &DVH | /RDG &DVH/RDG &DVH | /LQH /RI | 6WHS3HUFH( | 'HFUHP " |
| | | | $[LDO >QHERW@ | > @ | |
| )/% >@E | | | | | ,QFUHPH |
| )< /% >@E | | | | | ,QFUHPH |
| )= /% >@E | | | | | ,QFUHPH |
| 0/% >LQ@OE | | | | | ,QFUHPH |
| 0< /% >LQ@OE | | $OORZDEOH RW@E | | | ,QFUHPH |
| 0= /% >LQ@OE | | 0D[ $FWXDO E | 'HULYHG 'HULYHG | | ,QFUHPH |
| 3HDN /R 'XUDWLF | | 0DUJLQ > @ | 'HULYHG 'HULYHG | | |

/ 0N,, 0/% 8VHU 0DQXDO

6WUHQJWK WHVW UHTXLUHPHQWV IRU 0/%8 VHULHV FRQQHFWHU TXDOLILFDWLRQ

7HVWDEHGSOLHGSDVKRPHRQHUVLQFK GUDZHUHWKRZQLQH

6RXUFH 'RFXPHQW V

7HVW 2EMHFWLYH WUDWH WKDW WKH WHVW LWHP RSHUDWHV QRPLQDOO\ DIWHU H[SRVH

7HVW FRPSOHWH 7KH FULWHULRQ G VKRFN SURILOHV DUH DSSOLHG WR WKH WHVW LWHP LQ WKH

7KH WHVW LWHP VHSDUDWHV QRPLQDOO\ DIWHU EHLQJ H[SRVHG WR UHTXL

7KH WHVW LWHP LV LQVSHFWHG ,$: 36& 'RFXPHQW ³0N,, 0/% ,QVSHFW

1RWHV ,Q D VHSDUDWLRQ VSULQJV WUDYHO DW OHDVW LQFKHV LQ DQ LQLWL

RI 7HVW 6SHFWUXP PXVW EH DERYH WKH 1RPLQDO 656

8SSHU WROHUDQFH LV D JXLGHOLQH QRW D UHTXLUHPHQW

V P$T W UR D 7HVW G6HSHE WG KH P Y H W LQ5 W@ EHRRY W N 5H TW WS SEHRQ RQ LQ W RQ DE Y

$IWHUVHOHFWLQJ DFFHSWDQFHEHKDYLRUV WKH PHQW

&XVWRPHUV RIWHQ FRPSOHWH VRPH RI WKHVH W0H%WRWDQGSDRHQXGHXHGIWLQFL0QJ W
VKRXOG QRW EH [RHGHUYEVWLRQVWHVWLQJ WHVWLQJ LV UHTXLUHG E\ WKH ODXC
UHTXHVWHG JLYHQy.¼YEPÊ®™P€

)RU SURJUDP SOHDYHQ[illegible] RU *6(OLVWHG KDEYHO EEZHWQ DXWHIXO WR FX*WQRHEOQLQWKEHQDVW OHYQRGXW *6(

| | | |
|---|---|---|
| | | |

0DVV PXSN ZLWK WKHR SDWWHU

$ VWUXFWXUH WKDW KDV FHQWHU RI PDVV DWWUDFWV VWUXFWXUHV VXFK DV W ORZ GDPSLQJ YDOXHV D VXEVWDQWLDOO\ LQFUH OLPLWLQJ RU QRWFKLQ

36& 'RFXPHQWDWLRQ MP82 “V

x $IWHU UHFHLYLQJ RUGHU
2(hcŽda"ëÂ öIDrTÐhcŽ a"ëÂ ÷'$qV•hcŽR` p( Ht8à y.¼!€O{Â Ö†8å& (ˆ•



H•v¼ €O(21`ØR